

REPORT of the
UNITED STATES DELEGATION



UNITED NATIONS CONFERENCE
ON THE APPLICATION OF
SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF
THE LESS DEVELOPED AREAS

Geneva, Switzerland

February 4 to February 20, 1963

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C.

REPORT
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Submitted to the SECRETARY OF STATE

Walsh McDermott
Walsh McDermott, M. D.
Chairman of the Delegation

August 1, 1963

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August 1, 1963

The Honorable Dean Rusk
Secretary of State

Dear Mr. Secretary:

In accordance with my instructions as Chairman of the United States Delegation to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas (UNCAST), I am transmitting herewith a report on that conference.

The report necessarily is lengthy, detailed, and technical.

I therefore should like to use this letter of transmittal to outline several essentially personal conclusions about this quite extraordinary conference held in Geneva February 4-20 of this year.

As you are aware, the terms of reference of UNCAST specifically excluded action by the conference in the form of resolutions. For this and other reasons, results in the form of specific "actions" were not anticipated.

Under the circumstances, conclusions must be generalized -- and must be drawn from fragments of objective evidence, from personal encounters and conversations, and to some extent from intuitive impressions.

At the outset I can say that I believe a considerable value was obtained by throwing on the screen for all to see, the awesome breadth and the interrelatedness of the innumerable individual problems involved in planned modernization. It was of great value to do this once so that in the future we can more rapidly depart from the general to the particular.

As a participant in the conference from the beginning to the end, I can testify that there were many instances in which there were fruitful exchanges of technologic information and experience among specific groups of experts -- though the "value" of all this, of course, is quite impossible to measure by any quantitative standard.

But as a scientist and teacher, I can attest that UNCAST was an extraordinary educational adventure -- and not merely with respect to science and technology as such.

It seems to me that the essence of its uniqueness lay precisely in bringing together, at the same time and in one place, delegates from all areas of the world to discuss in an open forum a vast range of subject-matter on which there is wide diversity of opinion and doctrine.

As the conference went on, one could see a decline in the level of exhortation and a rise in the level of rational discourse -- fewer appeals to dogma and more appeals to reason -- less belief in some single formula for national development and greater understanding of the complexities involved and the flexibility required for the task.

The trends, in short, was in the direction of a doctrinal consensus on how to approach the problem of modernization and what contributions might reasonably be expected from science and technology.

I do not wish to overstate the point.

I do not suggest that anything approaching a universal meeting of the minds on such controversial and complex topics emerged from these discussions.

But I do report that we found it possible to keep political conflict to a tolerable minimum.

And I suggest emphatically that two and a half weeks of intensive experience in an open forum had the result of exposing dogma to the erosive influence of democratic debate — and of narrowing the gap between opposing viewpoints.

The conference was, then, a happy example of the virtue of the open society — a point which I am sure was not lost on this important audience.

From a more direct foreign policy point of view, I like to think that the conference also served another purpose. Without inexcusable immodesty, I believe it can be said that the quality and performance of the United States Delegation hardly could have failed to leave a firm impression of the great breadth of scientific accomplishment in this country, of the richness of our scientific resources, and of an earnest desire to share our knowledge for the benefit of all who are ready to help themselves toward better standards of living.

More specifically, I should like to mention briefly two quite distinct advantages for our own overseas assistance programs which derived from our participation in this conference.

First, to prepare adequately for intensive participation, we arranged for the preparation of more than two hundred technical papers for presentation in this conference.

The result is something like an inventory of the intellectual capital which the United States can mobilize on the subject of modernization. This is something which should have been done in any event if we are to bring U.S. science and technology to the service of our foreign aid programs in a systematic fashion.

Second, our preparations involved, in one way or another, about three hundred scientists, technicians, educators and administrators from the very top levels of their respective disciplines and fields of endeavor.

This involvement left in its wake a variety of bridges between the scientific community and the government agencies which I trust and believe will be of continuing value to the government. This I regard as of great potential importance. It will be no more than that, however, unless people in and out of government campaign steadily to convince the members of the U.S. scientific community that they have a stake in International Development as scientists, distinct from their involvement as good citizens.

To me, the case for the involvement of our scientists can be summarized in three propositions: First, it is the business of our scientists to develop the knowledge necessary for the proper handling of the naked power to alter one of man's inheritances — his culture. Second, it is the business of the scientists and technologists to concern themselves with the predetermination of the fitness of organized innovations because in today's world there is no time for the gradual adjustment of natural development. Third, as external assistance at best can be only marginal in a national drive to modernization, it is necessary to try to identify key factors — the germinal centers — in the modernization process that are capable of sustained growth after transplantation to a developing country. As we cannot transfer the fully developed harvests we must try to trace the harvest back to the seeds and transfer them. This can only be done by systematic study and research of a sort that is clearly the proper business of our scientists and technologists.

If we are to make our assistance programs more effective, we shall have to understand much more than we do now about the implications of these propositions. And if our scientific community comes to accept them to the point of widespread involvement, we may have found

the way to realize what is yet largely the dream, that Science as the least culturally conditioned form of creativity can serve as an important practical base for increased international understanding.

Finally, Mr. Secretary, let me say that the many science groups within our government and the National Academy of Sciences and the U.S. professional societies in general, were unfailingly cooperative in all matters concerned with the conference. Moreover, I have nothing but praise and gratitude for the quality of help and advice received from the Department of State and the Agency for International Development. Above all was the cutting edge of the tool — the U.S. delegation. To see these 100 men and women from such diverse professional backgrounds and mostly strangers to each other, perform day after day as a group united with a single internationally pacific purpose was to see our country's strength most vividly expressed. To have been afforded this sight and to have served as chairman of a delegation that was so qualified and dedicated was both an honor and an exhilarating experience that I shall not forget.

Sincerely yours,



Walsh McDermott, M. D.

Livingston Farrand Professor of Public Health
Cornell University Medical College

**REPORT OF THE U.S. DELEGATION
TO THE
UNITED NATIONS CONFERENCE ON THE APPLICATION
OF SCIENCE AND TECHNOLOGY FOR THE BENEFIT OF
THE LESS DEVELOPED AREAS
(UNCAST)**

PURPOSES AND SCOPE

The Conference, which took place February 4 - 20 in Geneva, Switzerland, was an unprecedented effort to stimulate the world's scientific and technical communities to address the problems of accelerating economic and social development. As stated by the UN, its purposes were:

“to explore recent advances in the application of science and technology which will benefit the less developed areas,

to provide an opportunity for an assessment of the impact of such applications on the processes of economic and social development,

to reveal opportunities for research directed toward producing new scientific and technological advances of special utility to less developed areas,

and to stimulate and promote scientific and technological development in the less developed areas.”

About 1,600 delegates, from 96 countries and 11 specialized and related UN agencies, attended more than 100 scheduled meetings in the Palais des Nations during 15 working days. Prior to opening, the UN distributed 1,839 papers by authors from over 80 countries. These papers provided most of the subject matter and views considered.

The extremely broad agenda reflected the innumerable ways in which a nation's

life might be altered, were it able to draw deeply upon the world's fund of science and generally to bring scientific imagination to bear on matters of national development. As well as the fields where science and its applications are very significant (e.g., health, agriculture and industry, transportation), the delegates discussed science policy and planning, training of personnel, economic planning, and prospects and problems of cooperation among nations in transferring and adapting technology and in dealing with its social effects. (See Appendix 2 for the agenda in full.)

THE SETTING

The Conference had been heralded in the UN as a major event in the United Nations Development Decade. The concept of a “decade of development” was first enunciated by President Kennedy in March 1961 in his message to Congress on foreign aid and subsequently, in September, to the UN General Assembly. A resolution designating the nineteen sixties as the UN Decade of Development was passed by the General Assembly in December 1961. The extraordinary breadth of the agenda, comprehensive preparations, and large number of delegates reflect the Conference's symbolic role.

Four basic obstacles faced the UN in organizing UNCAST:

(1) The agenda could not avoid raising sensitive political issues. The danger loomed large of the Conference becoming a forum for

ideological debate — which could have ruined it. (The 1955 and 1958 Conferences on the Peaceful Uses of Atomic Energy were not nearly so sensitive on this score because more easily limited to purely scientific and technical subjects.)

(2) Interpretation and translation — always a problem, of international meetings — were particularly hard because of the great diversity of technical subjects covered. It is never easy to have free discussion when dependent on simultaneous translation, but when interpreters face many unfamiliar words and concepts — as was bound to happen in some UNCAST specialized sessions — communication is difficult.

(3) The tremendous diversity of subject matter also posed special problems in developing the agenda, in scheduling meetings and in selecting qualified chairmen, rapporteurs and discussion leaders. The breadth of the agenda posed another difficulty. With four or five meetings running simultaneously, countries with small delegations were handicapped. Their delegates could not cover all meetings, and their limited fund of expertise prevented them from giving and getting as much as they might have from some of the meetings.

(4) Maintaining high professional standards in an international scientific or technical meeting is always difficult. Even in one science or profession standards of competence vary considerably between countries.

CONFERENCE ACHIEVEMENTS

The Conference may be assessed: I. as a political event, II. as an educational experience, for both the participants in Geneva and the much wider audience that will be reached by the Conference papers and later personal contacts with delegates, and III. as a stimulus to more effective action on the tasks faced by the less developed countries.

Here, it is necessary to distinguish three phases of the experience: the period of preparations; the Conference itself; the period after its close. Obviously, ultimate success is measured by accomplishments in the last-mentioned period but months or even years may pass before they are apparent. Assessment also depends on the anticipations and objectives held by the various participants — i.e., the UN itself and its specialized agencies, the less developed countries, and the much smaller group of technically advanced countries. It is improbable that all participants would have the same perspective on Conference achievements.

I The Conference as a Political Event

In the opinion of the U.S. delegation, the Conference, viewed as a political event, was quite successful. In its symbolic role vis-a-vis the UN Decade of Development, it served as an impressive display of the interest and seriousness of almost all the advanced countries in facilitating the modernization process. It made visible the immensity and complexity of the task, and the priority it must command in mobilizing the energy and resources — human and material — of all countries. It demonstrated that blatant cold-war propaganda has a negative effect on the representatives of the less developed countries; but also that analytic discussion of important policy issues — despite their ideological overtones — is not only possible but very much desired by these countries.

On the other hand, the political impact of the Conference probably was not so great as it might have been, had the UN Secretariat been more energetic in its pre-conference public information activities. A larger and more imaginative effort in those months probably would have stimulated greater participation by the less developed countries and more extensive and balanced press coverage before and during the sessions.

II The Conference as an Educational Experience

As an educational experience, UNCAST was extremely successful in some respects — in others, less so. The Conference did stimulate an extraordinary written inventory of the world's thinking on the problems of modernization. The ideas and experience of over 2,000 people from 80 countries are contained in the 1,839 papers submitted. This written inventory, despite inevitable shortcomings, is an impressive survey of essential aspects of the development process. Most of these papers probably would not have been written except for this gathering; others might have appeared in journals of small circulation. Their publication, translation and worldwide distribution as UN documents is an accomplishment which extends the deep educational experience of the occasion far beyond Geneva.

Preparing for the Conference had other significant educational effects. The U.S. preparations, for example, required over 350 people — members of the Technical Advisory Panels, the Public Advisory Board, various members of the A.I.D. staff, people in other Government agencies, delegates, authors — to focus on and debate issues, to interact with people whom they had not previously known, to expose themselves to ideas and views which they may well not have encountered otherwise. These experiences broadened horizons of specialists, deepened the knowledge of executives and officials, developed professional contacts for future work. Presumably other countries had similar experiences.

The official proceedings of the Conference, which are scheduled for publication in September or October 1963; will include an analytic synthesis of the substance of the Conference papers and also the ideas expressed during the sessions. They will be

published in 7 or 8 volumes in the four official UN languages. Like the papers, the proceedings constitute significant educational material and stimulus to future action.

The twelve-volume paperback collection of 198 U.S. papers, and the Selected List of U.S. Readings on Development, likewise may be viewed as solid accomplishments stimulated by the Conference. These were produced in time for distribution at Geneva.

Sweeping generalizations on the educational impact of UNCAST on the participants are, of course, hazardous. The country delegations were most heterogeneous; so, also, were the professional backgrounds and experience of individual delegates, the length of time they stayed, the subjects of the meetings which they attended, and the many informal contacts made. Obviously, those who immersed themselves fully stood to gain most from the experience.

Many American delegates felt that, although they did not encounter much new technical information, they:

- (1) derived many perspectives about development matters in which they were interested, in part from delegates in fields other than their own;
- (2) learned a good many specific things about the views of representatives of other countries (advanced as well as less developed) and the reasons behind these views;
- (3) obtained insights into research requirements, and learned about research now being done by individuals and institutions in other advanced countries;
- (4) noted significant changes in the attitudes and awareness of some delegates as a result of Conference discussions regarding, e.g., the desirability and limitations — of planning; the notion that there is

some magic formula for solving development problems; the responsibility of the country receiving aid to coordinate the contributions of external sources; the matter of self-help; the kinds of assistance that are available, and the competence and experience of the various sources of aid;

- (5) concluded that apparently not one of the major aid donors — individual country (including the U.S.) or multilateral agency — has yet made any systematic effort to evaluate the extensive experience in the assistance field. Case studies of projects that had failed (often more useful than success stories) were conspicuous by their absence.*

If any delegates arrived with the illusion that pat solutions for the hard problems of development simply lie hidden somewhere in the advanced countries, it was dispelled. The complexities and obstacles faced by less developed countries in accelerating modernization emerged with overwhelming force.

The American delegation learned from numerous informal conversations that some delegates of the less developed countries arrived with the view that UNCAST was an exhibition mounted, as it were, by the economically advanced countries to display their wares. Their function was to "window shop", study what was available, then go home to think over what they might like to "buy." Some possibly left Geneva with this view intact. Many more, however, exhibited distinct changes in attitude before the Conference was over: they showed that they

*Specific impressions of U.S. delegates are included in the reports on the particular sessions in Appendix 7..

understood that modernization requires much more than asking for and obtaining the "right" technical services, "hardware" and other resources from abroad; that it involves the much tougher problems of major social change, unpopular political decisions, development of a variety of new institutions, large-scale education and training of the population, dealing with little-understood questions of motivation and incentives; and that most of the effort must be made by the people and governments of the countries striving to develop.

Several themes recurred in many sessions and were stressed in the large final plenary gatherings as well:

1. Improving and expanding education and training remains a top priority problem for all the less developed countries. Applying existing knowledge, introducing the right technology, taking advantage of known techniques in agriculture, natural resources, industry, transportation, health services — indeed, taking advantage of the resources and services offered by various donors of technical and economic assistance — requires many more trained people than are now being produced. Not only are much greater efforts required to increase the numbers being trained. Substantial improvements must be made in the quality, focus and efficiency of the educational and training programs already under way, in order to insure that the right kinds of people are trained in the skills that fit labor-market requirements, and that they are channelled into jobs requiring these skills. In this connection, the importance of manpower assessment and careful planning for successful expansion and improvement of educational and training facilities was stressed, as were incentives and institutional arrangements that will actually channel people into the right educational and training tracks and the jobs where they are needed.

The question of training students abroad in advanced countries versus the use of indigenous national or regional facilities (which often are still to be developed) was also addressed in many sessions. Dependence on educational facilities in the advanced countries should be limited, it was agreed, because too many who study abroad for extended periods — particularly the gifted — tend to remain away from home, many indefinitely.

2. Strengthening of research facilities must have much higher priority than it now does in most developing countries. It was emphasized repeatedly that effective application of science and technology requires extensive environmental research — some of which may be “basic” as well as “applied” — and that much of this research must be done in the less developed areas; that substantial continuing assistance from scientists in the advanced countries is needed to strengthen existing facilities and to establish new ones*; that such research facilities must also train indigenous scientists as one of their tasks. Many smaller countries spoke with feeling about the need for regional facilities to provide essential services which are too expensive for individual countries to create.

3. The nature of the research needed to speed the modernization process was discussed in almost every session. One aspect of the discussion was the argument that less developed countries should initially acquire the older or obsolescent technology of advanced countries because this would facili-

*A permanent link between “counterpart” institutions would give the kind of continuous aid and encouragement that is often wanted, i.e., a permanent relation between, say, two departments in the same technical field that would ensure steady interest and knowledgeable concern.)

tate the technological evolution that every country must experience, versus the view that only the latest, most advanced technology should be introduced into the less developed countries, there being no logical reason for them to repeat the historical evolution of the advanced countries. There was a general consensus that neither course may be optimal in many cases, and that entirely new technologies specifically developed for a particular environment (using this term in the broadest sense) may be needed.

Thus, the need is for extensive problem-centered, environmental research in the physical, biological and social sciences; if the world's existing body of scientific and technological knowledge is actually to be put to use in the less developed areas.

The kinds of research suggested varied from such things as improvement of materials and new or modified designs for equipment — e.g., instruments for measurement of water resources; improved wellcasings; new water-control devices for irrigation; protective chemicals for agricultural storage; cargo handling equipment for river shipping; a really cheap, dependable, battery-operated transistor TV receiver for use in educational programs — to studies of a more basic character — e.g., human nutrition requirements in differing environments; productivity and ecological studies of natural waters in relation to inland fishery resources; the natural history of many infectious diseases, and development of new treatment methods; anthropological and psychological studies needed, for instance, to improve agricultural extension methods; arid-zone hydrology; and many more. Deep interest was expressed in studying the impact of technology and the effects of economic development on social life and structure.

4. Inadequate access to the published scientific and technical information that is

produced in such profusion in the advanced countries, was often mentioned as a very serious problem. It was frequently suggested that the UN should do all it can to promote better services for exchange of information. Along with regularly published material, access to the "development experience" acquired by one country would often be invaluable to others. For example, in one meeting it came out that an extensive highway engineering study in an African country contained a technical solution applicable to a similar problem in a country of the Middle East. But the latter, unaware of the African study, made its own study, long after the first one. A properly functioning information clearing house could perform invaluable service.

5. Regional cooperation in a variety of forms was advocated repeatedly by many delegates from less developed countries. Regional training facilities, research facilities, advisory services of various types, and conferences (particularly to treat in greater depth many subjects raised during the UNCAST discussions) were suggested. More frequently than not, UN auspices were favored.

All in all, taking into account the impact of Conference preparations in the 96 countries that participated, the tremendous amount of written material published or yet to be published, and the Conference experience itself, UNCAST was an enormous educational experience, the effects of which were uneven and obviously cannot be measured, but which may prove to be very great.

III The Conference as a Stimulus to Action

The purpose of UNCAST was to exchange ideas, not to present formal recommendations for action. Its terms of reference on this point were very explicit. Nevertheless, the presumption remained that the exchange of ideas occasioned by the Conference should

lead to some specific actions or the whole effort would be largely wasted. This feeling was widely shared, and particularly emphasized by delegates from less developed areas.

What actions could the Conference promote? Of far-reaching significance would be changes in the activities of the UN and its specialized agencies — changes in program or emphasis. Individual governments could explore and act on ideas exposed in the discussions, e.g., request specific types of assistance, establish new relationships and pursue contacts made in Geneva, initiate research projects, and otherwise set about their development activities differently. For the technical and scientific communities of particular countries, follow-up actions also might include new research and new lines of work, by universities and private foundations for example; and, for such communities in various countries, new priorities, perhaps, to be pursued collaboratively through the many international organizations concerned with science and technology.

Some specific actions stemming from UNCAST have already occurred. Others are contemplated. The UN Secretary-General met on April 23 and 24 with an informal advisory group (representatives of the 17 countries that had supplied the principal Conference officers) to discuss organizational and program changes which he should recommend to the Economic and Social Council at its July 1963 meeting. Although precise steps were not spelled out, it is clear that the Secretary-General will recommend the strengthening of UN capabilities to assist the less developed countries in applying science and technology.

UNESCO also is planning to modify its program emphasis as a result of the Conference. The Director-General recently submitted a proposal to expand and intensify

assistance to less developed countries in the areas of science and technology, and a resolution of the UNESCO Executive Board on May 8, 1963, jointly sponsored by the United States, the United Kingdom, the U.S.S.R., and Mali, approves this proposal in principle. In effect, it would place the same emphasis on aid in science and technology as the current UNESCO program accords to education. If the proposal is to be implemented, a large increase in UNESCO's budget will be required.

Other specialized agencies of the UN and the UN Regional Commissions are currently reviewing the Conference in relation to their programs. It is quite probable that steps taken by these organizations will reflect the impact of UNCAST.

It is too soon to predict actions by individual Governments, by governments acting in concert, or by private bodies. In the case of the U.S. Government, the Agency for International Development has disseminated widely the written Conference materials and plans to study their implications with respect to modus operandi, program emphasis, and initiation of new activities. In research, particularly, it is likely that some of UNCAST's discussions will lead to action.

CONFERENCE ORGANIZATION

A conference on this theme and of this scope was originally proposed in May 1961 by the UN Scientific Advisory Committee. (Dr. I. I. Rabi was the U.S. Representative on this Committee.) The proposal was accepted and the Conference convened by a resolution of the UN Economic and Social Council on August 3, 1961. The preparatory planning phases by the UN Secretariat were guided by an ad hoc 12-member Scientific Advisory Panel, on which Dr. Walsh McDermott served as U.S. Representative. The Panel met three times (December 1961 in New York City, and July and September 1962 in

Geneva) to advise the Secretariat on the agenda, types and numbers of papers to be invited and accepted, organization of sessions, Conference officers, publication of proceedings, attendance and exhibits.

The agenda comprised 3 plenary sessions, 12 general sessions for broad coverage of the major subject divisions, and 81 specialized sessions on particular topics within these divisions. The opening plenary session on the morning of February 4, 1963 was largely ceremonial in character. The second plenary session, held the afternoon of the same day, was marked by addresses by eight notable scientists, among them Dr. Jerome B. Wiesner, Special Assistant for Science and Technology to President Kennedy. At this session a strongly political speech was delivered by the chairman of the U.S.S.R. delegation. He was followed by Dr. Wiesner, who countered effectively with a humorous aside that underlined the impropriety of such a speech at this gathering, and then gave a nonpolitical speech directly, on a subject of central concern to the Conference. The laughter and spontaneous applause following Dr. Wiesner's opening remarks clearly indicated that the delegates from the less developed countries were quite hostile to any efforts to introduce cold war issues.

The closing plenary session was addressed by Mr. M. S. Thacker, President of the Conference; Dr. Carlos Chagas, Secretary-General of the Conference; the heads of seventeen delegations; and Mr. Paul G. Hoffman, Managing Director of the UN Special Fund. A number of the significant ideas summarized above (see the 5 points listed under heading II above) were enunciated at this final session.

United States participation in the twelve general sessions included service of Ambassador Jonathan B. Bingham, U.S. Representative to the UN Economic and Social

Council, as Chairman of the general session on industrial development. There were nine scheduled presentations by U.S. delegates in the general sessions.

Members of the U.S. delegation participated actively in the 81 specialized sessions: nine served as chairmen, 39 as discussion leaders, and 4 as rapporteurs. The great range of technical competence of the U.S. delegation also made it possible for one or more delegates to contribute to and report on almost every specialized session. (Summary reports are contained in Appendix 7. The U.S. delegates who served as chairmen, discussion leaders and rapporteurs, and speakers, are given in Appendix 6.)

The general sessions were to set a broad conceptual framework and highlight major issues to be discussed in the related specialized sessions. Typically, a general session began with brief remarks from the chairman, followed by 5 to 7 speakers each allotted 15 to 20 minutes. The speakers were selected by the Conference Secretary-General, with the advice of the Scientific Advisory Panel, on the basis of personal eminence, country, and aspect of the subject to be covered.

The pattern of the 81 specialized sessions was similar. After introductory remarks by the chairman, the secretary summarized the principal themes in the papers for that session and the questions to be taken up. Four to six "discussion leaders" followed with ten-minute statements; their function was not to present their own papers (if they were Conference authors) but to analyze principal issues. In practice, this concept was not closely followed; most "discussion leaders" were, in fact, merely scheduled speakers. The discussion leaders were ordinarily followed by "inscribed speakers" (individuals who informed the chairman before the meeting of their desire to speak).

Since inscribed speakers gave prepared statements on aspects of the subject chosen before the meeting, it was difficult for genuine discussion to develop. Leaders of the U.S. delegation worked with some success with other delegates and the Secretariat to change the pattern of set speeches. After the first few days, the pattern did become more informal, but really free discussion occurred in relatively few meetings. This may be attributed, in part, to the fact that some developed countries expressed their views more fully through prepared statements than extemporaneously, and also to language differences which, even with simultaneous translation, tended to make spontaneous discussion difficult.

Of the 1,839 papers accepted from participating countries and specialized agencies of the UN, 170 were assigned to general sessions, the remainder to specialized sessions. (U.S. papers accepted by the UN totalled 138, of which 18 were allotted to general and 120 to specialized sessions.) General session papers were printed in their entirety in the four official UN languages; but only two-page summaries of the papers for specialized sessions were translated, the papers in full length being printed only in the language of submission. The papers were distributed to conferees prior to the Conference and are now available to the public. A list of them has been published and they may be ordered from this list. (See Appendix 5, "Guide to Publications".)

Besides general and specialized sessions, a total of 22 informal sessions were held under UN auspices. These were dubbed "fifth-room" sessions because they supplemented the formal agenda sessions that ordinarily occupied four rooms at the Palais des Nations. Fifth-room meetings were organized with UN approval at the request of a delegation or session chairman.

Twenty-three nations and five international organizations submitted 245 technical films, each of which was shown several times during the Conference. Sixteen countries and four international organizations contributed to a technical library which put on display books, reports and other materials on Conference subjects.

PUBLIC INFORMATION

The Conference received extensive coverage in the press of Asian, African and Latin American countries and also was commented on editorially by many newspapers in these areas. The comment generally emphasized the overwhelming size of the development task, the hope inspired by the Conference, and the need for vigorous follow-up action in the months and years ahead.

There was substantial detailed coverage in several European countries, notably Italy, Switzerland and Great Britain. Two worldwide news services, Reuters and the French Press Agency, sent voluminous news files daily to their clients and USIA provided comprehensive reports through its press service and the Voice of America. The two European news services, supplemented by USIA, were the primary sources of news coverage in the press of the less developed countries.

UNCAST's size, timing and technical nature presented problems to members of the international press corps in Geneva. Some of the general and diplomatic correspondents who are residents there or who came to cover as well the meetings of the UN Disarmament Committee held at the same time, were not familiar with the atmosphere and procedures of international scientific gatherings. Few publications outside Britain and France sent science writers to cover the sessions. This resulted in minimal news coverage of the Conference in some major European and

American media. The situation was aggravated, in the case of the United States, by the New York newspaper strike.

Since Conference sessions were often held simultaneously, the UN Information Office arranged two daily press briefings, at which session chairmen, sometimes aided by other participants, gave a brief summary of what transpired. Because these summaries were too brief in many cases, too few of the newsworthy elements of the meetings were exposed. The U.S. delegation sought to help matters by a steady flow of material to the press. News releases were made available on many of the U.S. papers, and American press officers also covered most sessions and then reported on them orally to the press services and correspondents of major publications and networks.

The leading UN Conference officials convened a press conference three days before the opening session on the purposes of the gathering, and another on the eve of closing. Dr. Walsh McDermott and Ambassador Bingham held a U.S. press conference at the end of the first week to clarify the American attitude on issues that had come up, particularly on the type of follow-up that would be desirable within the UN framework. The following week another U.S. press conference was held by three specialists on new approaches to teaching now being tried in the United States. Conferences were also held by the delegations of the United Kingdom, United Arab Republic, Israel, Switzerland, and Brazil - the last-named in connection with a petition to the UN Disarmament Committee which was signed by many delegates acting as individuals. Most of the conferences were widely reported in the press of the less developed areas.

UNITED STATES PARTICIPATION

The spirit of United States participation is expressed by President Kennedy's message

to the Conference, read by Dr. McDermott during the opening plenary session, which characterized the subject before the gathering -- development of the less developed countries -- as "the most constructive undertaking of this or any other age."

The interest of the United States was reflected in a number of ways:

--- it was one of five sponsors of the ECOSOC resolution which called for the Conference;

--- it sent an outstanding delegation of 106 people;

--- it exhibited some 1,000 books and technical papers as part of a 16-nation display of such materials;

--- it prepared a bibliography of 1,200 titles of works by American authors of particular relevance to the Conference audience;

--- it prepared a 12-volume set of books containing 198 papers, specially prepared for the Conference, to supplement the growing body of literature in the United States on the problems and processes of development;

--- it contributed 21 documentary films for screening during the Conference to augment oral and written presentations;

--- it carried out during the sessions its own intensive information program for a world-wide audience, using the press, magazines, TV and radio.

In addition to the formal and informal sessions under UN auspices, the U.S. delegation also organized a Conference-within-a-conference. That is, about 25 carefully prepared informal meetings were scheduled and held outside the UN premises to facilitate frank, searching discussions on specific topics. Most of these meetings were very successful.

The U.S. delegation numbered 106, including four Congressional observers and the Chief and Deputy Chief of the U.S.

Mission in Geneva. Headed by Dr. Walsh McDermott, it was made up of leading citizens drawn from public and private life -- scientists, educators, engineers, businessmen, Government officials, and representatives of research and philanthropic foundations. (Appendix 6 contains a delegation list.)

Delegates were organized by major agenda section according to their primary interest and functioned under the leadership of Section Coordinators (see Appendix 6). At regular delegation meetings, held each morning before the day's sessions, the coordinators and key participants reported on the activities of the previous day. Developments anticipated during the sessions to come were outlined, and U.S. approaches and positions agreed upon.

U.S. preparations were initiated in October 1961, when, at the request of the Department of State, responsibility for organizing U.S. participation was assumed by the Agency for International Development, which set up a temporary Science Conference Staff for the purpose. This Staff, a unit in A.I.D.'s Research, Evaluation and Planning Assistance Staff, was guided by: (1) an informal Steering Committee composed of the Assistant Secretary of State for International Organization Affairs, the Special Assistant to the President for Science and Technology, the Science Advisor to the Secretary of State, and the Director of A.I.D.'s Research, Evaluation and Planning Assistance Staff; (2) a Public Advisory Board of 17 private citizens appointed by the Secretary of State, with Dr. Walsh McDermott serving as Chairman; and (3) fourteen Technical Advisory Panels, each concerned with a major part of the UNCAST agenda.

In planning U.S. participation, these advisory groups were concerned not only to make an effective contribution but also to

learn as much as possible from the contributions of other countries (through, for example, detailed reporting on each Conference session, and on informal conversations as well).

Because of the scope of the agenda — which covered the entire spectrum of development problems — most of the technical judgments in the principal agenda areas were made by the Technical Advisory Panels. Each Panel had a Scientific Secretary who was also on the A.I.D. Science Conference Staff. Ideas were also invited from A.I.D. Missions and from Federal agencies, and were carefully considered. The Panels agreed on the subjects on which papers should be invited, suggested and assisted in contacting authors, and provided advice and aid in many other ways.

The work of the Panels resulted in the receipt of 273 abstracts by the Science Conference Staff. The UN Secretariat was able to accept only 150 U.S. papers in June 1962. Since most of the abstracts which the UN did not accept — owing to budget limits and considerations of geographical and subject matter balance — were generally of as much interest as those accepted, the authors of these abstracts were invited to complete their papers for publication in a special 12-volume paperback series containing all U.S. papers stimulated by UNCAST. (Sixty of the 198 papers thus finally published by A.I.D. were not in the group accepted by the UN.)

From earliest stages, there was concern to provide for elements at UNCAST besides the Conference papers which would communicate something of the scope and quality of American science and technology. One proposal, an illustrated presentation book to be patterned after one prepared by the Atomic Energy Commission for the 1958 Conference on the Peaceful Uses of Atomic Energy, was considered seriously but eliminated on the

grounds of limited usefulness and high unit cost. Instead, a decision was made to bring out two special publications aimed at Conference delegates but also at a much wider audience in both the less developed and advanced countries. These were the above-mentioned collection of 198 papers written by American authors for the Conference and a specially prepared annotated reading list. (See Appendix 5.) The latter was designed as a guide to the writings of leading American scholars and scientists on the whole range of development problems addressed by the Conference.

The possibility of mounting a large U.S. exhibit was explored extensively, but this idea also was dropped when it became clear that the cost would be very high, that none of the other participants in the Conference were interested, and that the only site available was several miles from the Palais des Nations.

Ultimately, two supplementary activities were carried out at the Palais. Twenty-one U.S. technical films bearing on various phases of development were exhibited during the sessions as part of the UN film program (see Appendix 4). Second, a very successful display, organized as a result of a U.S. suggestion via the UN Scientific Advisory Panel, took the form of a library exhibit of scientific and technical books and other materials specifically related to development. Sixteen countries and four UN specialized agencies participated in this technical library, which was visited by more than 2,000 people during the Conference. The American entry of 1,000 items consisted primarily of the works in Selected List of U.S. Readings on Development described above.

CONCLUSION

Despite the many difficulties associated with its organization and operation, UNCAST

was a successful conference and an important historic step.

At a single point in time, in the spring of 1962, it caused 2,000 people from all over the world to be chosen by their governments to write down their ideas and experiences on one aspect or another of the modernization process. At the Conference itself, the immense breadth and interrelatedness of the many components of planned modernization were spread out for all to see. This had a distinctly sobering influence and made patently absurd any tendency to advocate simplified dogmas and approaches to the problem. Appreciation of the rich creativity of science flashed intermittently throughout the Conference. Its failure to get primary attention at all times came not from any lack of interest in science, but from the even greater attention that was being given to education and training. For, there appeared to be a widely held conviction that without indigenous cadres of educated and trained people, the fruits of science could have little application in development. This "beginning of wisdom" with respect to science had its counterpart in attitudes toward economic planning. In neither case

was there rejection; it was simply a matter that reflection on combined experience had shown them both to be less than panaceas. This realistic appraisal seemed quite generalized; it could even be detected in statements that were purely professional made by the participants from the Eastern European countries. Indeed, in the ideologic history of international development, this Conference may well represent a turning point and be epitomized as "the time everyone got together and it was revealed that they had no secret weapons and no easy answers." But this realism - if one could call it that - was the realism of the activist, not of the defeatist. The theme was dominant throughout all the proceedings that, despite the obvious complexities of the problem, it is one that would yield to thoughtfully directed effort.

In sum, the U.S. delegation believes that the total Conference experience has brought about a significant momentum in international development, and it sincerely hopes that both our government and our community of science and technology will take appropriate action to make the most of the momentum now generated.

Appendix I

<u>Nations Participating</u>	<u>Size of Delegation</u>	<u>Nations Participating</u>	<u>Size of Delegation</u>
Afghanistan	3	Guatemala	2
Albania	3	Holy See	9
Algeria	12	Hungary	22
Argentina	21	India	10
Australia	22	Indonesia	9
Austria	7	Iran	10
Belgium	53	Iraq	3
Bolivia	1	Ireland	3
Brazil	21	Israel	29
Bulgaria	10	Italy	81
Byelorussian SSR	4	Ivory Coast	3
Cameroon	1	Japan	15
Canada	21	Republic of Korea	7
Central African Republic	1	Kuwait	4
Ceylon	1	Laos	1
Chad	1	Lebanon	2
Chile	4	Liberia	2
Republic of China	11	Luxembourg	1
Colombia	3	Madagascar	3
Congo (Brazzaville)	2	Mali	3
Congo (Leopoldville)	10	Mauretania	1
Costa Rica	2	Mexico	7
Cuba	1	Mongolia	5
Czechoslovakia	22	Morocco	5
Denmark	12	Nepal	1
Dominican Republic	2	Netherlands	20
Ecuador	2	New Zealand	5
Ethiopia	1	Nicaragua	2
Federal Republic of Germany	35	Niger	2
Finland	6	Nigeria	6
France	273	Norway	11
Gabon	4	Pakistan	7
Ghana	9	Panama	1
Greece	8	Peru	1
		Philippines	2

<u>Nations Participating</u>	<u>Size of Delegation</u>	<u>Nations Participating</u>	<u>Size of Delegation</u>
Poland	17	Trinidad and Tobago	3
Portugal	18	Tunisia	7
Romania	19	Turkey	8
Rwanda	2	Uganda	2
Saudi Arabia	11	Ukrainian SSR	5
Senegal	8	USSR	39
Sierra Leone	2	UAR	36
South Africa	7	United Kingdom	150
Spain	28	USA	106
Sudan	3	Uruguay	2
Sweden	16	Venezuela	10
Switzerland	49	Viet-Nam	1
Tanganyika	2	Yugoslavia	20
Thailand	8		

<u>Specialized and Related Agencies</u>	<u>No. of Representatives</u>
FAO	14
GATT	3
IAEA	5
ILO	11
ITU	10
UNESCO	20
UPU	3
WHO	32
WMO	5
World Bank	2
UNICEF	1

Appendix 2

CONFERENCE AGENDA

<u>Agenda Item</u>	<u>Session</u>
A	Natural resources (General)
A.1	Mapping and surveying practices adapted to use in less developed areas
A.2	Integrated river basin development in less developed areas
A.3.1	Water development policies
A.3.2	Surface water
A.3.3	Ground water
A.3.4	Particular problems in water-short areas
A.4.1	Energy development policies
A.4.2.1, A.5.2.2, A.5.2.3, A.5.2.4	Mining technology and mechanization
A.4.2.2, A.4.2.3, A.4.2.4	Upgrading of fuels and petroleum technology
A.4.2.5, A.4.3.2	Non-conventional sources of energy and nuclear power
A.4.3.1, A.4.3.3, A.4.3.4	Electrical power
A.5.1	Mineral development policy
A.5.1.2, A.5.2.1 A.5.3	Mineral exploration methods and concentration of ores and minerals

<u>Agenda Item</u>	<u>Session</u>
B	Human resources (General)
B.1	Population trends
B.2.1, K.1.1	Forecasting requirements and priorities of numbers and types of scientists and technologists. Technique of manpower assessment (Joint)
B.2.2	New systems of vocational training and apprenticeship
B.3	Sound management and management development as factor in technological progress
B.4	Employment implications of applications of science and technology in less developed areas
B.5	The application of science and technology to conditions at the work place
C	Agriculture (General)
C.1.1	Agrarian structures and land settlement
C.1.2	Agricultural credit, co-operatives and marketing
C.1.3, C.1.4	Agricultural extension and farm management and planned development
C.2.1, C.2.2	Nutrition and public health policies. General nutrition problems (Joint)
C.3.1	Soil science and soil surveys
C.3.2	Irrigation and water use
C.3.3, C.3.4, C.4.3	Soil management under low rainfalls. Shifting cultivation cropping practices
C.4.1	Plant breeding and improving varieties
C.4.2	The control of pests, diseases and deficiencies
C.5.1	Disease control

<u>Agenda Item</u>	<u>Session</u>
C.5.2	Animal breeding
C.5.3	Animal nutrition and management
C.6.1, C.6.2	Agricultural engineering and development of agricultural equipment
C.6.3, C.6.4 C.5.4	Handling storage and processing of agricultural produce. Dairy technology
C.7.1, C.7.2, C.7.3	Forestry and forest products
C.8.1, C.8.2	Marine fisheries and inland fisheries
D	Industrial development (General)
D.1, D.3.1, D.3.2, D.3.4	Special factors affecting industrial development in less developed areas
D.2	Structural and locational problems of industry
D.3.3, D.9.1, J.2.2	Specifications and standards (Joint)
D.4	Food processing and preservation
D.5	Products of animal and vegetable origin and substitutes
D.6.1	Textiles
D.7. D.8	Iron and steel. Non-ferrous metals
D.9, D.10.1	Engineering techniques and organization. Heavy engineering industries
D.11, D.12	Fertilizers and heavy chemicals
D.13, D.14	Building materials and building techniques
E	Transport (General)

Agenda ItemSession

E and L	Specialized training of personnel in the fields of transportation and communication (Joint)
E.1	Factors in the development of national transport policies
E.2	Roads and road transport
E.3	Railways
E.4	Inland water transport and costal shipping
E.5	Air transport and specialized uses of aircraft in less developed areas
E.6	New techniques in the transport of fuels and perishable goods
F	Health and nutrition (General)
F.1.1	The plan for health services and the contribution of science and technology to its formulation and execution. Need for vital and health statistics
F.1.2, F.1.3	The principles of health service planning and the development of the health programme
F.1.4	Introduction of pharmaceuticals: problems of costs and quality
F.2, F.2.1, F.2.2	Control of communicable diseases in the light of developments in science and technology
F.2.1, F.2.2	Control of communicable diseases in the light of developments in science and technology
F.2.3	The problem of mental disease in less developed areas
F.3.1, F.3.2, F.3.3	The need for various categories of health personnel. Changing responsibilities in health team
F.4	The role of medical research

<u>Agenda Item</u>	<u>Session</u>
G	Social problems of development and urbanization (General)
G.1	Problems of rural development
G.2	Urbanization problems
G.1, G.2	Rural development and urbanization
H	Organization, planning and programming for economic development (General)
H.1 (Part I)	Methodology of planning for development. Part I: Planning: Aggregate, sectoral and priorities among sectors
H.1 (Part II)	Methodology of planning for development. Part II: Regional planning
H.1 (Part III)	Methodology of planning for development. Part III: Statistics, research requirements, other problems of planning
H.1, H.3	Common problems of methodology of planning for development and implementation
H.2	Organization arrangements for economic development including some reference to methodology
H.3	Implementation of economic development plans including some reference to organization
I	Organization and planning of scientific and technological policies (General)
I.1.1, I.2.2, I.2.3	Special problems of scientific policy planning
I.2.1, I.1.2	Formulation of research policies and programmes
J	International co-operation and problems of transfer and adaptation (General)
J.1	Methods for stimulating technological change
J.2.1	Scientific and technological documentation, including the problems of language and terminology

<u>Agenda Item</u>	<u>Session</u>
J.2.2, D.3.3, D.9.1	Specifications and standards (Joint)
J.2.3, J.3.2	Technical exchange programmes. Technical co-operation programmes and co-ordination with national development policies
J.3, J.3.1	International co-operation. International scientific co-operation
K	Training of scientific and technical personnel (General)
K.1.1, B.2.1	Forecasting requirements and priorities of numbers and types of scientists and technologists. Technique of manpower assessment (Joint)
K.1.2	Specialized training at technical schools and means of accelerating formation of scientific and technological cadres including teaching staffs
K.2.1, K.2.2	Scope and place of science and technology in general education. Specific new approaches to educational programming in primary and secondary education.
K.2.3	Specialized programming for training at higher technical institutes and universities
K.2.4, L.2.4	Communications as tool of education to meet specific problems of developing countries. Educational services (Joint)
L	Communications (General)
L and E	Specialized training of personnel in the fields of transportation and communications (Joint)
L.1. L.2	Unification and expansion through telecommunications. Broadcasting and television in less developed areas
L.3	Problems involved in the development of national and international telecommunications networks
L.4, L.5	Telecommunications in specialized fields. Recent major advances and current developments in the field of electronics of interest to developing areas

Appendix 3

CONFERENCE ORGANIZATION

Background

The idea of a United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas originated within the U.N. Scientific Advisory Committee, which was comprised of the following members:

		Professor V. S. Emelyanov	USSR
		Deputy Chairman of the State Committee on the Utilization of Atomic Energy, Council of Ministers	
Mr. Philippe de Seynes,		Sir John Crockroft	UK
Chairman		(December 1961 meeting)	
Under Secretary of the United Nations for Economic and Social Affairs		Master of Churchill College, Cambridge University; Member, Atomic Energy Authority	
Professor L. C. Prado	Brazil	Sir William Penney	UK
Institute of Atomic Energy, Sao Paulo		(October 1962 meeting)	
Dr. W. B. Lewis	Canada	Deputy Chairman, Atomic Energy Authority	
Vice President, Research and De- velopment, Atomic Energy of Canada, Ltd.		Dr. Isidor I. Rabi	USA
Professor B. Goldschmidt	France	Consultant at Large to the President's Science Advisory Committee	
Director, External Relations and Programs, Atomic Energy Commission		Professor of Physics, Columbia University	
Dr. Homi J. Bhabha	India		
Secretary, Department of Atomic Energy, Bombay			

Proposals by the Committee to the U.N. Economic and Social Council in May 1961 led to the Council's adoption, on August 3, 1961, of Resolution 834 (XXXII), which authorized the Conference. This was followed by action of the U.N. General Assembly in

the fall of 1961, appropriating \$2,000,000 for Conference purposes.

At the suggestion of the Scientific Advisory Committee, the U.N. Secretary-General appointed a Scientific Advisory Panel, which assisted the U.N. Secretariat in development of principles and procedures governing organization of the plenary, general and specialized sessions, selection of Conference officers, arrangement of the program of meetings; attendance of delegates and others, exhibits of visual materials, publication of proceedings, etc. Members of the Panel were as follows:

H. E. Mr. Salah el Din Hedayat, Chairman Minister of Scientific Research	UAR	H. E. Mr. Guillaume Georges-Picot (December 1961 meeting) Ambassador, Ministry of Foreign Affairs	France
Admiral Octacilio Cunha Chairman, Brazilian National Research Council	Brazil	Mr. J. A. M. Gandilhon (July & September 1962 meetings) Chief of Maritime Engineering	France
Dr. J. D. Babbitt Secretary for International Relations, National Research Council, Ottawa	Canada	Mr. N. B. Prasad Director, Anhydra Sugars, Ltd., Hyderabad	India
Dr. Vladimir Kaigl (December 1961 meeting) Director, Institute of Economy, Czechoslovak Academy of Sciences	Czechoslovakia	Professor Dr. Raden Mas Soemantri Vice President, Academic Affairs, Institute of Technology, Bandung	Indonesia
Professor Dr. Josef Lukas (July & September 1962 meetings) Viceminister of Health, Chairman of the Scientific Council of the Ministry of Health	Czechoslovakia	Mr. Francisco Diaz Lombardo (December 1961 meeting) Director, School of Chemical Sciences, University of Mexico	Mexico
		Dr. Herando Zamora (July & September 1962 meetings) Office of the President	Mexico
		Mr. S. O. Awokoya (December 1961 meeting) Chief Federal Adviser on Education, Federal Ministry of Education	Nigeria

Professor Joseph C. Edozien
 Professor of Chemical Pathology, University College, Ibadan

Nigeria

subsequently. Principal members were as follows:

Secretary-General Dr. Carlos Chagas (Brazil)

Academ. E. K. Federov
 Geophysicist, Hydro-meteorological Service of the USSR

USSR

Deputy Secretary-General and Director of Programming Mr. G. Laclavere (France)

Sir William Slater
 Overseas Research Council

U.K.

Executive Secretary Mr. A. G. Katzin (S. Africa - U.N.)

Dr. Walsh McDermott
 Professor of Public Health and Chairman of the Department, Cornell Medical College

U.S.A.

Deputy Executive Secretary Mr. James Keen (U.K.)

Deputy Director of Programming Dr. Z. Svejnar (Czechoslovakia)

Executive Officer Mr. S. W. Bailey (U.K. - U.N.)

During the period of Conference preparation the Committee met twice - December 18-19, 1961 and October 1-2, 1962, both times at Geneva. On each occasion the major purpose of the meeting was to review the work of the Panel. The Panel met three times in all - December 1-6, 1961, in New York, and July 2-5 and September 26-28, 1962, in Geneva.

U.N. Secretariat

Early in the fall of 1961 a temporary U.N. staff, working in New York under the direction of Mr. Alfred Katzin, commenced development of the Conference agenda. This work was essentially completed by the time the U.N. Secretary-General and Deputy Secretary-General were appointed, toward the end of December 1961. The Secretariat was established in Geneva the following month, with a number of personnel from the earlier staff as its nucleus and others added

Scientific Secretary for:

A. Natural Resources Mr. M. K. Gopaliengar (India)

B. Human Resources Mr. D. H. Hobden (U.K. - I.L.O.)

C. Agriculture Dr. Ralph W. Phillips (U.S.A.)

D. Industrial Development Dr. S. N. Rostovsky (USSR)

E. Transport Mr. L. T. Kelly (Australia)

F. Health and Nutrition Sir John Charles (U.K. - WHO)

- G. Social Problems of Development and Urbanization Mr. O. Yakas (Greece)
- H. Organization, Planning and Programming for Economic Development Dr. A. Szeworski (Poland)
- I. Organization and Planning of Scientific and Technological Policies Dr. R. V. Garcia (Argentina)
- J. International Co-operation and Problems of Transfer and Adaptation Mr. S. O. Awokoya (Nigeria)
- K. Training of Scientific and Technical Personnel Dr. R. V. Garcia (Argentina)
- L. Communications Mr. Sh. Abaza (UAR)

Procedures

It was first thought that the total number of Conference papers should be limited to approximately 500. This concept was changed, however, following the December 1961 meeting of the Scientific Advisory Committee, to provide simply a limit on the total number of pages from any one contributing country with no limit on number of papers as such. The page limitation was essential because of cost considerations.

At the December 1961 meeting of the Committee it was agreed that the Conference should be postponed from August 1962 to February 1963 to allow adequate time for

preparation. The availability of conference facilities in Geneva entered into the choice of the February date.

Following on this decision, June 1, 1962 was set as a deadline by which abstracts of proposed papers should reach the Secretariat. Some 2,400 abstracts actually were submitted, including some that arrived during June and in early July. The Secretariat accepted more than 2,000 of these for the Conference agenda. Having done so, they felt compelled to set limits on the number of pages for individual papers, and these were unavoidably rather arbitrary. Ultimately about 1,800 papers were received.

The large number of papers accepted significantly affected Conference procedures, since it was impossible to have this number presented orally. Accordingly, patterns for the general and specialized sessions and provisions for advance circulation of papers were worked out in consultation between members of the Panel and the Secretariat.

Typically for general sessions, five or six persons were selected as speakers from national delegations and one or more from specialized international agencies. U.S. delegates serving as general session speakers are given in Appendix 6.

A chairman, a rapporteur, and from four to six discussion leaders were designated for each of the specialized sessions. (U.S. delegates serving in these capacities are shown in Appendix 6.) Ordinarily the chairman opened these sessions with brief introductory remarks, after which the rapporteur gave a 10 to 15 minute summary, covering the principal ideas presented in the papers contributed for that session. Each of the discussion leaders then commented on aspects of the session topic that he considered particularly significant. The discussion leaders were usually followed by inscribed speakers -- individuals whose names had

been given to the Chairman before the meeting as desiring to speak – and, in some instances, by speakers recognized from the floor during the meeting.

Papers selected for general sessions were translated in full into the three official U.N. languages other than the original language and circulated to conferees in all four languages. Only the author's summary was so translated in the case of specialized session papers; the full text in the original language and the summaries in all four languages were circulated. Some participating countries (not including the U.S.) provided translation of the full text of their specialized session papers at their own expense, and these were circulated also.

Officers

As indicated by the agenda (Appendix 2), the Conference was organized with 3 plenary, 12 general, and 81 specialized sessions. A President and 15 Vice-Presidents of the Conference were appointed. The President, who presided at the plenary sessions, was assisted in his duties by three of the Vice-Presidents, while the others presided over the general sessions. These officers were as follows:

President

Professor M. S. Thacker (India)
Member, Planning Commission
Government of India

Vice-Presidents

The Rt. Hon. the Lord Casey,
P.C., C.H., D.S.O., M.C.,
(Australia), Member of the
Executive, Commonwealth
Scientific and Industrial
Research Organization

Vice-Presidents

Dr. J. W. T. Spinks (Canada)
President, University of
Saskatchewan

H. E. Mr. Fernando Garcia-Oldini
(Chile), Ambassador to
Switzerland

Professor Dr. Josef Lukas
(Czechoslovakia), Viceminister
of Health, Chairman of the
Scientific Council of the
Ministry of Health

Professor Henri Laugier (France)
Honorary Professor at the
Sorbonne

Professor Dr. S. D. Pusponogoro
(Indonesia), Minister for
National Research

H. E. Mr. Abba Eban (Israel)
Minister of Education and Culture,
President of the Weizmann
Institute of Science

H. E. Mr. Jean Porquet (Ivory Coast)
Ambassador to Switzerland

Professor Dr. Shigenori Hamada
(Japan), Member of Electronics
Council, Science and
Technics Agency. Vice-
President, The Electronics
Association of Japan.
Member of the Board of
Governors, Japan Broad-
casting Corporation.

General Session

K

H

F

B

E

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I

L

General Session

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<u>Vice-Presidents</u>	<u>General Session</u>	<u>Vice-Presidents</u>	<u>General Session</u>
H. E. Mr. Emilio Calderon Puig (Mexico), Ambassador, Permanent Mission of Mexico-to-the European Office of the United Nations	J	Academician E. K. Fedorov (USSR) Geophysicist, Hydrometeoro- logical Service of the USSR	A
Professor Joseph C. Edozien (Nigeria), Professor of Chemical Pathology, University College, Ibadan	G	Sir William Slater, K.B.E., D.Sc. (U.K.), Overseas Research Council	C
H. E. Mr. Salah el Din Hedayat (UAR), Minister of Scientific Research	--	Mr. Jonathan B. Bingham (U.S.A.) Ambassador and Representative- Designate on the U.N. Economic and Social Council	D

Appendix 4

EXHIBITS

Background

The U.N. Scientific Advisory Committee at its December 1961 meeting recommended that the U.N. Secretariat organize an exhibit of graphic and visual materials as well as models to illustrate the contents of the reports accepted for discussion at the Conference. The group further recommended that this exhibit be situated, so far as facilities permitted, in the Palais des Nations. The U.N. Secretariat subsequently convened a panel of experts to explore this question further. This panel recommended that the U.N. consider some limited displays in the corridors of the Palais des Nations, and a room for projection of slides. After querying member governments, it was evident that there was little or no interest in pursuing either of these proposals.

At its July 1962 meeting, the Scientific Advisory Panel accepted a U.S. proposal that a technical library be organized. The Panel also suggested that motion pictures be displayed.

The possibility of organizing a large three-dimensional exhibit was also explored rather extensively within the U.S. Government. Indeed, in early July, 1962, a decision to mount a U.S. exhibit in the Palais des Expositions was made and announced at the July 1962 meeting of the U.N. Scientific Advisory Panel. Subsequently, however, this decision was cancelled when further study revealed that the costs for mounting such an exhibit would be higher than anticipated

and that no other government displayed any interest in participating in such an exhibit.

In the end, there were three exhibits at the Palais des Nations:

- (1) A library of scientific and technical literature;
- (2) A collection of scientific and technical documentary films; and
- (3) A demonstration of modern reproduction equipment suitable for use in the science and technology information field.

Technical Library

All participating governments were invited to exhibit books, journals and other technical literature pertaining to the subjects discussed at the Conference. A room adjacent to the main U.N. Library in the Palais des Nations was made available for the purpose. Sixteen countries and four international organizations participating in this library as follows:

Argentina	Portugal
Australia	Roumania
Belgium	Sudan
Czechoslovakia	Switzerland
France	United Kingdom
Hungary	United Arab Republic
Italy	United States
Netherlands	Yugoslavia
Food and Agriculture Organization	
International Atomic Energy Agency	
United National Educational, Scientific and Cultural Organization	
World Health Organization	

The United States exhibit included most of the titles contained in the document entitled "A Selected List of U.S. Readings on Development" which was published as a companion piece to the collection of U.S. papers (see Appendix 5). Over two thousand people visited the technical library and considerable interest was displayed in obtaining copies of many of the books and other publications shown.

Films

The U.N. scheduled showings of 239 films contributed by 22 countries and 5 international agencies. Two projection rooms were in operation in the Palais des Nations throughout the period of the Conference. The U.S. contributed 18 films (see Appendix 6 for titles and descriptions).

A listing of all films shown is contained in the U.N. Document E/CONF.39/INF.6.

Document Reproduction Facilities

The U.N. arranged to have a document reproduction room in the Palais des Nations

equipped to provide prompt document reproduction service for delegates, particularly for those desiring copies of documents displayed in the Technical Library. It also served as an exhibit of how certain types of modern equipment are used to meet technical document reproduction requirements of various types.

The major equipment (and staff to operate it) was provided free of charge by the Xerox Corporation and Rank-Xerox, Ltd., with ancillary equipment coming from several countries and concerns. The University Microfilms Division of the Xerox Corporation, under the personal supervision of its president, Mr. Eugene B. Power, organized and operated this facility. The services offered ranged from reproduction of individual papers or reports, using the Xerox 914 office copying machine, to microfilming, reproduction and binding of entire books from microfilm using the Xerox copyflow machine and ancillary binding equipment.

Appendix 5

GUIDE TO CONFERENCE PUBLICATIONS

Introduction

The wide range of the agenda and the unusually large number of contributors and participants are reflected in the Conference documentation. Something of its extent is conveyed by noting that one set of all the UN Conference documents issued (excluding the official report yet to be produced) weighs approximately 115 pounds. The purpose of this Appendix is to identify the types of official documents published and explain how to obtain copies of them.

UN Documents

An early UN issuance on the Conference is the Revised Information Bulletin, E/CONF.39/INF.1/REV., of February 1962. In addition to material on purpose, scope, theme, procedures, contributions, etc., this contains a detailed breakdown of the agenda as then projected.

1,839 papers were prepared for the Conference by authors from about 80 countries. These papers were assigned to particular specialized or general sessions. For each session a report was prepared by the Secretary-General which summarized the main ideas contained in the papers assigned to that session. Both the reports of the Secretary-General and the papers themselves are cataloged in UN Document E/CONF.39/INF.3, January 1963, List of Papers, by reference to which individual items can be ordered. General session papers are available in summary and in full text in all four official UN languages (English, French, Russian and

Spanish) as are the reports of the Secretary-General. Specialized session papers are available in summary in the four UN languages and in full text in the original language only.

The Conference Programme and General Information Bulletin, E/CONF.39/INF.2, Revision 1, contains information on the venue, date, purpose and scope of the Conference, material on procedures and facilities, and detail on the organization of sessions, program, officers, and by participants.

Delegates to the Conference from participating countries and from specialized and related agencies, observers from non-governmental organizations, and members of the UN Secretariat, are listed in a Directory of Participants, UN Document E/CONF.39/INF.7, February 1963, and addenda thereto.

A List of Scientific and Technical Documentary Films, UN Document E/CONF.39/INF.6, January 1963, shows the motion pictures provided by participants for screening during the Conference.

Addresses given at the plenary sessions of the Conference, and messages from Heads of State read at the opening plenary session, have been reproduced by the UN and are available in the original language only.

Rapporteurs' Summary Reports of individual sessions of the Conference have been prepared and are available in the four official UN languages. Identified by UN Document numbers (E/CONF.39/RR. — plus a numerical and letter code) but not yet catalogued

on this basis, they may be ordered by specifying the desired agenda section.

All of the foregoing, including the documents cataloged in the List of Papers, may be obtained from the Secretary-General, UNCAST, United Nations, Geneva, Switzerland.

As this is written, the UN Secretariat is in the process of preparing its report of the Conference proceedings. A one-volume summary has been scheduled to appear in May 1963. The official Proceedings will be published in 7 or 8 volumes in September/October 1963. These will be available through the Sales Section, United Nations, New York, and through other regularly established outlets for UN publications throughout the world.

U.S. Documents.

Papers prepared by U.S. authors in connection with the Conference have been published in a set of 12 paperback volumes under the title Science, Technology and Development. Individual volumes in the set generally comprise the papers related to one major section of the Conference agenda.

A companion volume is A Selected List of U.S. Readings on Development, which gives annotated citations from U.S. literature on Conference-related topics as developed by the Graduate School of Public and International Affairs, University of Pittsburgh.

All of these volumes are for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Appendix 6

UNITED STATES PREPARATIONS AND PARTICIPATION

General

Overall direction of U.S. activities in relation to the Conference was the responsibility of the Assistant Secretary of State for International Organization Affairs, the Honorable Harlan Cleveland. The Bureau of International Organization Affairs furnished policy guidance and specialized assistance before and during the Conference.

Because of the relationship of the Conference subject matter to the agency's mission, basic responsibilities for substantive U.S. preparations and for support of the delegation during the Conference were delegated to the Agency for International Development. A temporary Science Conference Staff was set up for this purpose within A.I.D.'s Research, Evaluation and Planning Assistance Staff. The organization of the Science Conference Staff resembled that of the United Nations Secretariat for the Conference (Appendix 3) in that each had a group of scientific secretaries responsible for preparation of major agenda sections. A public information element within the staff provided for liaison with press, television and radio, preparation of U.S. publications for the Conference, and selection of U.S. documentary films for Conference showing. Administrative elements were responsible for personnel, budgetary, and general administrative functions, U.S. and U.N. document control, reproduction, travel and transportation, procurement and contracting. Members of the staff, exclusive of secretarial and administrative support personnel, were as follows:

SCIENCE CONFERENCE STAFF

David Tilson, A.I.D., Director
Norman R. Tharp, A.I.D., Deputy Director

Public Information

Abraham M. Sirkin, U.S. Information Agency,
Director
Norman J. Meiklejohn, U.S. Information
Agency, Editor
Nancee W. Black, Editorial Assistant

Administration

Robert A. Fordham, A.I.D., Executive Officer
Paul V. Coles, A.I.D., Administrative Officer
Elizabeth Baskerville, A.I.D., Conference
Assistant

Liaison with United Nations Secretariat

John W. McDonald, National Science Founda-
tion, Liaison Officer

Scientific Secretaries

Stephen Bergen, A.I.D.	A. Natural Resources A.3 Water Resources
Arthur J. Sweet, Department of the Interior	A.1 Mapping
Jerome K. Delson, Federal Power Commission	A.4 Energy Resources

Alfred L. Bush, U.S. Geological Survey	A.5 Mineral Resources	Robert F. Hull, National Science Foundation	I. Organization and Planning of Scientific and Techno- logical Policies
Eugene D. Vinogradoff, Department of Labor	B. Human Resources		K. Training of Scien- tific and Technical Personnel
Jackson A. Rigney, North Carolina State College	C. Agriculture	Gerald F. Winfield, A.I.D. George W. Wood, National Academy of Sciences	L. Communications
Arthur J. Sweet, Department of the Interior	D. Industrial Develop- ment		
Leo W. Sweeney, Department of State	D. Industrial Develop- ment		
Robert B. Keating, National Academy of Sciences	E. Transport		
Richard C. Arnold, U.S. Public Health Service	F. Health and Nutri- tion	Edward C. Fei, A.I.D.	Executive Director
Elmer Starch, Consultant	G. Social Problems of Development and Urbanization	Herbert D. Turner, A.I.D.	Deputy Executive Di- rector
	J. International Co- operation and Prob- lems of Transfer and Adaptation	Jack G. Oppenheimer, A.I.D. Hugo V. Prucha, A.I.D.	Deputy Executive Di- rector Contractor Officer
Hyde G. Buller, A.I.D.	H. Organization, Plan- ning and Program- ming for Economic Development	Richard N. Viets John H. Durston, Educational Services, Inc. William B. Mellor	Information Specialist Editor Audio-Visual Consult- ant

In addition, the following personnel were actively identified with the staff for varying periods before and during the Conference in the roles specified:

Howard J. Lewis, National Academy of Sciences	Press Officer
Daniel Taylor, National Science Foundation	Information Officer
Morris M. Cohen, A.I.D.	Publications Officer
Leo W. Sweeney, Department of State	Scientific Secretary
Francis A. Lord, Department of State	Assistant Scientific Secretary
Ralph Smith, U.S.I.S., Paris	Press Officer
Roy Johnson, U.S.I.S., Barcelona	Press Officer
Marcus Rosenbloom, U.S. Public Health Service	Press Officer
Frank McGowan, University of Pittsburgh	Librarian
Frank England, U.S. Embassy, Paris	Special Assistant
Marian S. Stilson, Department of State	Special Assistant
Evelyn M. Campbell, A.I.D.	Administrative Officer

Steering Committee

An informal intragovernmental Steering Committee for the Conference was established under the chairmanship of the Assistant Secretary of State for International Organization Affairs to furnish broad policy guidance and to review plans during the preparatory period. Other members included Dr. Jerome B. Wiesner, Special Assistant to the President for Science and Technology, Dr. Walter G. Whitman and Dr. Ragnar Rollefson (after he replaced Dr. Whitman, who' retired in October 1962), Science Advisor to the Secretary of State, and Dr. Edward C. Fei, Acting Director of the Research, Evaluation, and Planning Assistance Staff of A.I.D. The Chairman of the Public Advisory Board and the Director of the Science Conference Staff attended all Steering Committee meetings.

Public Advisory Board

In the fall of 1961, the Secretary of State appointed a Public Advisory Board for the Conference, consisting of seventeen distinguished private citizens whose range of experience qualified them to help guide U.S. preparations for the Conference. The Board helped in formulating policies concerning U.S. participation in the Conference, assisted in obtaining the support of the American scientific community, in determining optimum U.S. coverage of agenda topics, etc. It met five times in all--November 9 and 30, 1961, March 9, June 6, and September 19, 1962. Members of the Board were as follows:

Public Advisory Board

Walsh McDermott, Chairman
Livingston Farrand Professor of Public Health and Chairman of the Department Cornell University Medical College

Detlev W. Bronk
President, The Rockefeller Institute

Harrison S. Brown
Foreign Secretary, National Academy of
Sciences

Robert A. Charpie
Director, Advanced Projects Research
Union Carbide Company

Frederick H. Harbison
Professor of Economics
Princeton University

J. George Harrar
President, The Rockefeller Foundation

J. Herbert Hollomon
General Manager, General Engineering
Laboratory
General Electric Company
(Subsequently appointed Assistant Secretary
of Commerce for Science and
Technology)

Allan Holmberg
Professor of Anthropology
Cornell University

William A. W. Krebs
Vice President, Arthur D. Little, Inc.

Isador Lubin
Economic Consultant
The Twentieth Century Fund

Max F. Millikan
Director, Center for International Studies
Massachusetts Institute of Technology

Robert S. Morison
Director, Medical and Natural Sciences
The Rockefeller Foundation

Arthur T. Mosher
Executive Director
Council on Economic and Cultural
Affairs, Inc.

Frank Press
Professor of Geophysics
California Institute of Technology

Isidor I. Rabi
Consultant at Large to the President's
Science Advisory Committee

Thomas J. Watson, Jr.
President, International Business Ma-
chines Corporation

Jerrold R. Zacharias
Professor of Physics
Massachusetts Institute of Technology

Technical Advisory Panels

As a means of bringing specialized technical competence to bear on the numerous subjects on the agenda, 14 Technical Advisory Panels were established. The Scientific Secretary for the agenda section served with the panel in all cases. The panels recommended the topics on which U.S. papers should be prepared, suggested appropriate authors and helped contact them, helped select the delegation, and provided advice and assistance on innumerable other matters. Membership of the Technical Advisory Panels was as follows:

Session A: NATURAL RESOURCES

Dr. Harrison S. Brown, Chairman
Foreign Secretary
National Academy of Sciences

Mr. Stephen W. Bergen, Scientific
Secretary

Subpanel on Mapping

Rear Adm. H. Arnold Karo, Chairman
Director, U.S. Coast and Geodetic
Survey

Bro. B. Austin Barry
Head, Department of Civil Engineering
Manhattan College

Dr. Edward Espenshade
Northwestern University

Mr. Albert Nowicki
Chief, Department of Cartography
Army Map Service

Mr. George D. Whitmore
Chief Topographic Engineer
U.S. Geological Survey

Mr. Richard Wilson
Chief, Forest Surveys Branch
U.S. Forest Service

Mr. Arthur J. Sweet, Scientific Secretary

Subpanel on Water Resources

Dr. Abel Wolman, Chairman
Professor Emeritus
Johns Hopkins University

Dr. Edward A. Ackerman
Carnegie Institution of Washington

Dr. Norman H. Brooks
Department of Civil Engineering
California Institute of Technology

Mr. Walter Langbein
U.S. Geological Survey

Mr. Theodore Schad
Library of Congress

Mr. George C. Taylor, Jr.
U.S. Geological Survey

Mr. Eugene Weber
Office of the Chief of Engineers
Corps of Engineers, U.S. Army

Dr. Gilbert White
Department of Geography
University of Chicago

Mr. Stephen W. Bergen, Scientific
Secretary

Subpanel on Energy Resources

Mr. Sam Schurr, Chairman
Resources for the Future, Inc.

Mr. Francis L. Adams
Consulting Engineer

Dr. Harold Barnett
Wayne State University

Mr. John Boatwright
Consultant

Mr. Robert Brandt
Vice-President, New England Power
Company

Mr. Edwin Gohr
Vice-President, Esso Research and
Engineering Company

Dr. Hollis Hedberg
Professor of Geology
Princeton University

Dr. James A. Lane
Oak Ridge National Laboratory

Dr. Louis McCabe
Resources Research, Inc.

Mr. Harry Perry
Chief, Bituminous Coal Division
Bureau of Mines
U.S. Department of Interior

Dr. C. J. Potter, President
Rochester and Pittsburgh Coal Company

Dr. J. K. Roberts
Consultant

Mr. Walton Seymour
Development and Resources Corporation

Dr. Jerome K. Delson, Scientific Secretary

Subpanel on Mineral Resources

Julian Feiss, Chairman
U.S. Geological Survey

Dr. Ian Campbell
Department of Conservation
State of California

Dr. Russell Gibson
Professor Emeritus
Harvard University

Dr. William D. Johnston, Jr.
U.S. Geological Survey

Dr. Vincent E. McKelvey
U.S. Geological Survey

Dr. Charles Meyer
Department of Geology
University of California

Mr. Thomas G. Murdock
U.S. Bureau of Mines

Mr. George Nicol
Nicol Industries Mineral Corporation

Mr. Louis A. Turnbull
U.S. Bureau of Mines

Mr. Alfred L. Bush, Scientific Secretary

Session B: HUMAN RESOURCES

Dr. Isador Lubin
Twentieth Century Fund

Dr. Frederick H. Harbison
Princeton University

Dr. Eugene D. Vinogradoff, Scientific Secretary

Session C: AGRICULTURE

Mr. Jackson A. Rigney, Chairman and Scientific Secretary

Dr. George Harrar
President, Rockefeller Foundation

Dr. Forrest F. Hill
Vice President, Ford Foundation

Dr. Sherman E. Johnson
U.S. Department of Agriculture

Dr. Erven J. Long
Agency for International Development

Dr. Albert H. Moseman
Director for Agriculture
Rockefeller Foundation

Dr. H. A. Rodenheiser
Assistant Administrator, Farm Re-
search
Agricultural Research Service
U.S. Department of Agriculture

Dr. M. B. Russell
Head, Department of Agronomy
University of Illinois

Dr. Irwin T. Sanders
Head, Department of Sociology and
Anthropology
Boston University

Session D: INDUSTRIAL DEVELOPMENT

Mr. William A. W. Krebs, Jr., Chairman
Arthur D. Little, Inc.

Dr. William Bredo
Stanford Research Institute

Dr. Robert A. Charpie
Director, Advanced Projects Research
Union Carbide Company

Mr. John Conner
President, Merck and Company

Mr. James Langley
Arthur D. Little, Inc.

Dr. Alfred C. Neal
President, Committee for Economic
Development

Mr. Arthur J. Sweet, Scientific Secretary

Session E: TRANSPORT

Mr. Robert B. Keating, Chairman and
Scientific Secretary

Prof. Donald S. Berry
Northwestern University

Col. Robert A. Cliffe, USA (Ret.)
National Academy of Sciences

Prof. Kent T. Healy
Yale University

Prof. Richard C. Jordan
Department of Mechanical Engineering
University of Minnesota

Mr. John C. Kohl
Assistant Administrator
Office of Transportation
Housing and Home Finance Agency

Mr. William R. McConochie
Vice-President, DeLeuw, Cather and
Company

Prof. Martin Meyerson
Director, Joint Center for Urban
Studies, Massachusetts Institute of
Technology and Harvard University

Mr. James J. Wright
Director of Technical Research
New York Central System

Session F: HEALTH AND NUTRITION

Dr. Robert P. Burden, Chairman
Division of Engineering and Applied
Physics
Harvard University

Dr. Harold Brown
School of Public Health
Columbia University

Dr. Kurt Deuschle
Professor of Public Health
University of Kentucky

Dr. Geoffrey Edsall
Massachusetts Department of Health

Dr. James M. Hundley
U.S. Public Health Service

Dr. Alexander Leighton
Professor of Psychiatry
Cornell University Medical College

Dr. Walsh McDermott
Prof. of Public Health
Cornell University Medical College

Dr. Robert Morison
Rockefeller Foundation

Dr. Kelly West
Office of International Research
National Institutes of Health

Dr. R. C. Arnold, Scientific Secretary

Dr. Richard Adams
Michigan State University

Dr. Conrad Arensberg
Department of Anthropology
Columbia University

Dr. Charles Erasmus
University of North Carolina

Dr. Ward Goodenough
University of Pennsylvania

Dr. Margaret Mead
American Museum of Natural History

Dr. Irwin T. Sanders
Department of Sociology
Boston University

Dr. Melvin M. Tumin
Princeton University

Dr. Frank W. Young
University of Pittsburgh

Session G: SOCIAL PROBLEMS OF
DEVELOPMENT AND URBANIZATION

Session J: INTERNATIONAL COOPERA-
TION AND PROBLEMS OF TRANSFER
AND ADAPTATION*

Dr. Allan R. Holmberg, Chairman
Cornell University

Dr. John Adair
Cornell University Medical College

Subpanel on Urbanization

Dr. Marion Clawson
Resources for the Future

Dr. Herbert Striner
Stanford Research Institute

Dr. William Wheaton
Institute of Urban Studies
University of Pennsylvania

Dr. T. Lowdon Wingo, Jr.
Resources for the Future

Dr. Elmer Starch, Scientific Secretary

*Panels G and J had the same members.

Session H: ORGANIZATION, PLANNING,
AND PROGRAMMING FOR
ECONOMIC DEVELOPMENT

Dr. Gerhard Colm, Chairman
National Planning Association

Mr. Robert E. Asher
The Brookings Institution

Dr. Everett E. Hagen
Massachusetts Institute of Technology

Dr. John P. Lewis
Indiana University

Mr. Richard Nelson
Council of Economic Advisors

Dr. Gustav Papanek
Harvard University

Mr. Hyde G. Buller, Scientific Secretary

Session I: ORGANIZATION AND
PLANNING OF SCIENTIFIC AND
TECHNOLOGICAL POLICIES

Dr. Arthur Roe, Chairman
National Science Foundation

Dr. Richard H. Bolt
National Science Foundation

Dr. T. C. Byerly
Agricultural Research Service
U.S. Department of Agriculture

Dr. Philip W. Hemily
National Science Foundation

Dr. Joseph Murtaugh
National Institutes of Health

Mr. Richard Nelson
Council of Economic Advisors

Dr. Eugene B. Skolnikoff
Office of the Special Assistant to the
President for Science and Technology

Mr. Merle Tuve
Carnegie Institution of Washington

Dr. Carroll Wilson
Massachusetts Institute of Technology

Mr. Robert F. Hull, Scientific Secretary

Session K: TRAINING OF SCIENTIFIC
AND TECHNICAL PERSONNEL

Dr. Arthur Roe, Chairman
National Science Foundation

Dr. Bowen C. Dees
National Science Foundation

Mr. Howard F. Foncannon
National Science Foundation

The late Dr. Francis L. Friedman
Department of Physics
Massachusetts Institute of Technology

Dr. Philip W. Hemily
National Science Foundation

Mr. Thomas J. Mills
National Science Foundation

Dr. Dael Wolfle
Executive Officer
American Association for the Advance-
ment of Science

Mr. Robert F. Hull, Scientific Secretary

Session L: COMMUNICATIONS

Dr. John R. Pierce, Chairman
Bell Telephone Laboratories

Dr. John T. Blake
Simplex Wire and Cable Co.

Mr. Vernon Bronson
National Association of Educational
Broadcasters

Mr. Robert S. Caruthers
International Telephone and Telegraph
Co., Inc.

Mr. Richard P. Gifford
General Electric Co.

Mr. Leonard Jaffe
National Aeronautics and Space
Administration

Mr. E. C. Laird, Jr.
American Telephone and Telegraph
Corp.

Dr. Ernest Martinelli
Rand Corporation

Dr. Carl F. J. Overhage
Director, Lincoln Laboratory
Massachusetts Institute of Technology

Dr. Gerald F. Winfield and
Mr. George W. Wood, Scientific Secretaries

Conference Papers

U.S. authors (in a few cases there were foreign co-authors) submitted a total of 273 abstracts of proposed Conference papers. The U.N. Secretariat accepted 148 of these, and 138 papers were finally submitted to and

published by the U.N. However, authors of all 273 abstracts were invited to contribute their papers for a special U.S. publication, irrespective of their status as official U.N. Conference papers. A total of 198 papers – including the 138 accepted by the U.N. – by 272 authors and co-authors, were written and published in a set of 12 paperback volumes entitled, "Science, Technology, and Development – United States Papers Prepared for the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas." These volumes were displayed at the Conference, 900 sets were distributed to delegates in Geneva, and arrangements have been made for extensive distribution within the U.S. and overseas. Volumes were distributed to general and specialized publications in the U.S. for review. The public may purchase copies from the Government Printing Office.

U.S. Delegation

The U.S. delegation numbered 106, including four Congressional observers, the Chief of the U.S. Mission in Geneva and his deputy. The list of official U.S. delegates follows:

Walsh McDermott, Chairman
Livingston Farrand Professor of Public Health and Chairman of the Department, Cornell University Medical College

Edward W. Allen, Jr.
Chief Engineer, Federal Communications Commission

Allen V. Astin
Director, National Bureau of Standards, Department of Commerce

- Stephen K. Bailey
Dean, Maxwell Graduate School of
Citizenship and Public Affairs,
Syracuse University
- Leona Baumgartner
Assistant Administrator for Human
Resources and Social Development,
Agency for International Development
- Jonathan B. Bingham
Ambassador and Representative on
the United Nations Economic and
Social Council
- R. E. Bittner
Assistant General Manager, Esso
Research and Engineering Company
- Karl F. Bode
Chief, Planning Assistance Division
Agency for International Development
- Detlev W. Bronk
President, The Rockefeller Institute
- Vernon Bronson
Director, Research and Development,
National Association of Educational
Broadcasters
- Harrison S. Brown
Foreign Secretary, National Academy
of Sciences
- J. L. Burke
President, Service Pipe Line Company
- Robert A. Charpie
Director, Advanced Projects Research,
Union Carbide Company
- Ewan Clague, Ph.D.
Commissioner, Bureau of Labor Statistics,
Department of Labor
- Harlan Cleveland
Assistant Secretary of State for International
Organization Affairs
- Frank M. Coffin
Deputy Administrator for Operations,
Agency for International Development
- Gerhard Colm
Director of Economics, National
Planning Association
- John Diebold
President and Chairman of the Board,
The Diebold Group, Inc.
- Rene Dubos
Professor of Pathology, The Rockefeller
Institute
- G. Franklin Edwards
Professor of Sociology, Howard
University
- Northcutt Ely
Ely, Duncan & Bennett
- Edward C. Fei
Acting Deputy Assistant Administrator
for Research Agency for International
Development
- Ralph C. Fish
Research Scientist, Animal Disease
and Parasite Division, Department
of Agriculture
- Joseph L. Fisher
President, Resources for the Future,
Inc.

- William M. Gibson
Deputy Representative to the European
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Other International Organizations,
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Switzerland
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- Kenneth R. Hansen
Assistant Director, Bureau of the
Budget
- Frederick H. Harbison
Professor of Economics, Princeton
University
- Kent T. Healy
Professor of Transportation, Yale
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- E. L. Hendricks
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Near East and South Asia, Agency
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- Leonard Jaffe
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- Sherman E. Johnson
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the Interior
- Joseph Kaplan, Ph.D.
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California
- Arnold Karo, Rear Admiral, USC&GS
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Department of Commerce
- Saul M. Katz
Professor of Economic and Social
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Public and International Affairs,
University of Pittsburgh
- Robert B. Keating
Transportation Analyst, Division of
Physical Sciences, National Acad-
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of Massachusetts Institute of Tech-
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nomic and Cultural Affairs, Inc.

Oscar Myers
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S. Milton Nabrit, Ph.D.
President, Texas Southern University

Wilfred Owen
Director, Transport Research Program,
The Brookings Institution

Kenneth H. Parsons, Ph.D.
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Science Advisory Committee

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Science Adviser to the Secretary of
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Interior

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E. K. Sandbach
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chusetts Institute of Technology

Walton Seymour
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velopment, Development Resources
Corporation

- Thomas K. Sherwood
Professor of Chemical Engineering,
Massachusetts Institute of Technology
- John C. Snyder
Dean, Harvard School of Public Health
- E. C. Stakman
Emeritus Professor, Institute of Agriculture,
University of Minnesota
- Eugene Staley
Director of Basic Research, Stanford
Research Institute
- Albert C. Stewart
Assistant Director of Research, Union
Carbide Consumer Products Company
- David Tilson, Secretary of Delegation
Director, Science Conference Staff,
Agency for International Development
- Roger W. Tubby
Ambassador, Representative to the
European Office of the United
Nations and Other International
Organizations, Geneva, Switzerland
- Melvin M. Tumin
Professor of Sociology and Anthropology,
Princeton University
- Ralph Tyler
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of the Interior
- Kung Ping Wang, Ph.D.
Division of Foreign Activities, Bureau
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- Eugene W. Weber
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- Thomas W. Wilson, Jr.
Special Assistant to the Assistant
Secretary of State for International
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State
- Abel Wolman
Professor of Sanitary Engineering,
Johns Hopkins University

Congressional Observers

The Honorable
James B. Pearson
United States Senate

The Honorable
Stephen M. Young
United States Senate

The Honorable
John W. Davis
House of Representatives

The Honorable
James D. Weaver
House of Representatives

B. Human Resources Dr. Isador Lubin

C. Agriculture Mr. Jackson A. Rigney

D. Industrial Development Mr. William A. W. Krebs

E. Transport Mr. Robert. B. Keating

F. Health and Nutrition Dr. Hildres A. Poindexter

G. Social Problems of Development and Urbanization Dr. Melvin A. Tumin

H. Organization, Planning and Programming for Economic Development Dr. Gerhard Colm

I. Organization and Planning of Scientific and Technological Policies Dr. Ragnar Rollefson

J. International Cooperation and Problems of Transfer and Adaptation Dr. Allan Holmberg

K. Training of Scientific and Technical Personnel Dr. S. Milton Nabrit

L. Communications Mr. T. F. Rogérs

Public Information

U.S. public information activities in connection with the Conference were directed

Section Coordinators

Because of the large number of delegates and the scope of the Conference subject matter, delegates were organized in groups by major agenda section, according to their primary interests, with a Section Coordinator for each group. Of course, many delegates were active in more than one agenda section. Each group operated with a substantial degree of independence, both in the formal Conference sessions and in the important informal contacts outside the agenda framework.

The following individuals served as Section Coordinators:

Section

A. Natural Resources	Mr. Stephen Bergen Rear Adm. H. Arnold Karo
Mapping	
Water Resources	Dr. Abel Wolman
Energy Resources	Dr. Jerome K. Delson
Mineral Resources	Dr. William D. Johnston, Jr.

by Mr. Abraham M. Sirkin, U.S. Information Agency. Information officers on his staff were obtained from the U.S. Information Agency, the National Academy of Sciences, the National Science Foundation, the U.S. Public Health Service, and the Agency for International Development.

Before the Conference, press releases were obtained from Government agencies and private organizations with which U.S. contributors of Conference papers were affiliated, and distributed on a "hold-for-release" basis to general and specialized press mailing lists, and subsequently to correspondents in Geneva. Contacts were made with U.S. editors and with news writers familiar with science and technology, economics, and development, to obtain their coverage of the Conference. Three special correspondents from the U.S. attended. (A number of special staff writers on New York papers did not attend because of the New York newspaper strike.)

A press conference was held on January 7, 1963, presided over by Assistant Secretary of State Harlan Cleveland, with the participation of Dr. Jerome B. Wiesner, Dr. Walsh McDermott, and Dr. Leona Baumgartner, Assistant Administrator, Agency for International Development. At this time the names of the Chairman of the U.S. delegation and nine other delegates were announced. The names of the remaining delegates were announced in a press release on January 15. On January 25, President Kennedy received Dr. McDermott and nine other delegates, and issued a statement on the importance of the Conference. The statement and photographs were carried in newspapers throughout the world.

In Geneva, a press room for the U.S. delegation was set up, from which press releases on U.S. papers were distributed. Each Conference session was covered by a

U.S. press officer, who provided highlights of U.S. participation for the world-wide press services and leading newspapers. The U.S. Information Agency obtained a substantial file of press material for use by its posts overseas, as well as extensive photographic and taped radio coverage. Clippings received by the United Nations after the Conference showed an extraordinary amount of interest in the Conference in the less developed areas and in many European countries.

Reading List - Technical Library

To provide for U.S. participation in the U.N.-sponsored display of scientific and technical materials, the Graduate School of Public and International Affairs of the University of Pittsburgh was asked to prepare an annotated list of selected U.S. readings on development. The project was directed by Dr. Saul M. Katz, Professor of Economic and Social Development, and Mr. Frank McGowan, Librarian. It involved faculty experts and graduate personnel in many disciplines within various elements of the University. The list covered approximately 1,200 titles, including books, journal articles, reports, government bulletins, etc., in the major subjects covered by the Conference. Items on the list were procured and displayed at the Conference, after which they were donated to the United Nations. The annotated list itself was published by the Agency for International Development, and displayed and distributed as a companion volume to the 12 volumes of U.S. papers prepared for the Conference.

Films

The U.S. was one of several countries (see Appendix 4) which furnished motion picture films for showing at the Conference under U.N. auspices. Various aspects of science and technology and certain domestic

and overseas development projects were covered in the U.S. films, which were selected by Mr. William B. Mellor, Audio-Visual Consultant, in collaboration with A.I.D. Scientific Secretaries. All the films had English sound tracks and most carried French subtitles in addition. The films were as follows:

A. NATURAL RESOURCES

1. INTRODUCTION TO PHOTO INTERPRETATION - 15 minutes, color. A survey of photointerpretation methods for the discovery and evaluation of natural resources, including minerals, soils, lumber, and water resources.
2. SCIENCE OF OIL - 20 minutes, color. A comprehensive survey of oil exploration, drilling and processing in Saudi Arabia, with step-by-step descriptions of processing procedures illustrated in animated sequences.
3. TECHNICAL INFORMATION SERVICES OF THE ATOMIC ENERGY COMMISSION. 20 minutes, color. A survey of the forms in which Atomic Energy information is available from the United States Atomic Energy Commission and its depository libraries overseas. Information includes reports, progress reviews, bibliographies, technical books, translations, engineering materials, and other special publications and films. The availability on microcards of all technical information offered by the Atomic Energy Commission is explained.

4. COLUMBIA - RIVER OF PLANNED DESTINY - 27 minutes, color. The story of the development of the Columbia River Basin, in northwestern United States, for power production, flood control, conservation of water resources, and irrigation. Also shows methods used to give continued access to the great salmon spawning grounds in the upper reaches of the river.

A. NATURAL RESOURCES and C. AGRICULTURE

5. WATERS OF COWEETA - 20 minutes, color. A documentary film showing the results of 20 years of research work at the hydrologic laboratory in the Coweeta Experimental Forest, in North Carolina. Illustrates how the management of forests affects the flow of water in the streams, and covers lumbering, grazing and truck farming methods on hilly and mountain terrain.

C. AGRICULTURE

6. AGRICULTURE, U.S.A. - 27 minutes, color. The story of how American agriculture has developed during the last hundred years, including the roles of research, agricultural extension services, land grant colleges, soil conservation programs, marketing, etc. Also illustrates dramatically the great changes in agricultural equipment during the century.
7. HARVEST - 30 minutes, color. Covers a cooperative agricultural project in Mexico, illustrating methods by which crop production was increased. Demonstrates need to

"tailor" each such project to the agricultural characteristics of the individual country or area.

8. THE ATOM AND AGRICULTURE – 10 minutes, black and white. How atomic energy has brought a new tool to agricultural research. Illustrates the use of radioisotopes in the development of new plant and animal nutrition practices, in solving the riddle of photosynthesis, and in developing new mutant varieties of crop plants.

9. TOMORROW'S TREES – 30 minutes, color. A description of modern conservation methods used by a large lumber company. Covers cutting techniques, aerial seeding, and how natural hazards, including animals and forest fires, are combatted. Also provides a valuable introduction to new equipment used in modern forestry.

D. INDUSTRIAL DEVELOPMENT and
A. NATURAL RESOURCES

10. MOUNTAINS TO MICRONS – 20 minutes, color. How Portland cement is processed. Includes a description of the many different kinds of concrete which may be made from it, and how each is used.

D. INDUSTRIAL DEVELOPMENT

11. MODERN STEEL MAKING – 27 minutes, color. Demonstration of latest steel-making equipment and processes.

E. TRANSPORTATION

12. SCIENCE RIDES THE HIGH IRON – 27 minutes, color. A survey of modern

methods and equipment in the operation of railroads. Shows how trains are made up and dispatched, traffic control, and the operation of a sorting yard. Emphasizes safety methods.

13. PROGRESS IN PERU – 10 minutes, color. How aircraft were used to haul heavy earth-moving equipment across the Andes to carve a highway across the mountains to the sea, opening the fertile plains of the interior to development.

F. HEALTH AND NUTRITION

14. FLUORESCENT TREPONEMAL ANTIBODY TEST – 10 minutes, color. A highly technical film on a new and exciting technique for detecting syphilis, rabies, and other diseases, quickly and simply, by means of fluorescent antibodies in the blood.

15. THE ATOM AND MEDICINE – 10 minutes, black and white. Covers briefly the use of Cobalt-60 irradiation for the treatment of cancer, and tracer techniques in the use of radioisotopes for medical diagnoses. Also shows how radioisotopes are used in some therapeutic applications.

G. URBANIZATION AND HOUSING

16. IT CAN BE DONE – 28 minutes, black and white. A study of the housing problem in rural areas of many lands and how it is being solved by the cooperation of the people themselves in several countries with the help of their Governments and that of the United States.

H. ECONOMIC PLANNING and C. AGRI-CULTURE

17. THE FARMER'S BUSINESS - 14 minutes, color. How the American farmer has learned to work together with his neighbors to provide goods and services through user-owned organizations, and to apply sound business methods to his buying and selling while, at the same time, maintaining his independence. Result: a higher standard of living for the farmer, and better business for the home community.

L. COMMUNICATIONS

18. ONE MILLION INVISIBLE MESSENGERS - 15 minutes, color. How

mobile radio is used not only to provide better public services, such as police and fire protection, but also in the service trades, on the farm, and in the home.

19. TELSTAR - 26 minutes, color. A description of the construction, launching and world use of the Telstar communications satellite which, after a period of silence, recently began transmitting again and is now being used by many nations for communications.

Appendix 7

Reports on General and Specialized Sessions

The purpose of this Appendix is to make available to a limited American audience a fairly extensive summary of the discussions in each of the scheduled meetings at Geneva. It should not be viewed as a substitute for the official Conference Proceedings, which are scheduled for publication by the United Nations in September or October 1963.

Except for Sections G and J, the reports below have been prepared by the Scientific Secretaries on the A.I.D. Science Conference Staff from their own notes and memoranda submitted by U.S. delegates who took notes at the meetings. The reports of the sessions under agenda Section G and J — except for the overall summaries — are reprints of the reports prepared by the U.N. rapporteurs for those sessions.

Unfortunately, space limitations prevent printing in full the many excellent interventions made by members of the U.S. delegation in numerous sessions.

Section A: NATURAL RESOURCES

Summary

The fact that 320 papers on resources were submitted, by 60 countries and 7 U.N. agencies, is evidence of an intense interest on the part of developing countries. This interest was also shown in many of the Conference sessions. Although some sessions were superficial, many did bring out

specific difficulties and needs of these countries as they attempt to adopt modern methods of resource development.

By way of summary, five key points are briefly discussed below. Many of the delegates dwelt on them and they represent, therefore, a certain consensus about important needs. As general observations, they apply to natural resources as a whole, that is, these points apply in some measure to many resource fields.¹ They concern training, indigenous resource agencies, better advice on development policy and program management, and research. The reader will find details spelled out for specific fields in the session reports and summaries.

1. Training of technicians and professionals, and basic education.

The great lack in natural resource fields is trained people at all levels who can do the work in their own countries. A proposal, made by a UAR delegate with support of other countries at the Conference, for the U.N. to supply resource-survey personnel from an international pool, was an expression of this lack.

Basic education as the basis for later specialized training in resource work also seems to be a definite need, in some countries at least. Arithmetic and other skills, for instance, obviously must precede

¹In the Conference agenda, forest resources, and inland and marine fisheries, fell under Agriculture.

training in mapping. A future technician in hydrology needs a high-school education to build upon.

Comment

Of course, the need for training in resource fields has long been recognized, and considerable bilateral and multilateral efforts have been and are being made. But in view of the stress put on training in Geneva, the emphasis to be given to it (and to earlier education) in aid programs in behalf of natural resource development, and the efficiency of current efforts, would seem to be questions worth pursuing.

2. Where training should be done; regional institutions.

Much specialized training should be done "on the spot," or at any rate in or near the home country. This may prove cheaper than use of overseas facilities, and will also avoid the difficulties of the returning student in fitting into his own society. A very effective approach in training is for it to be given "on the job" by foreign technicians who are committed to working in the country for a significant period.

Nevertheless, more opportunities for advanced study are needed, and some of these can be had only outside particular countries. In developing more opportunities, regional institutions serving a group of countries may well be the right tack. They might provide a locus for stimulating exchange of experience and take account of peculiarly region-wide factors in resource development. The auspices of the United Nations would be beneficial.

3. Building up of indigenous resource agencies.

Advice and help is particularly needed in setting up or improving agencies, usually government agencies, which will be permanent national centers for resource appraisal and research: geological and water survey organizations, bureaus of mines, mapping agencies. (With respect to development and management agencies for water resources, it was felt that the long experience of advanced countries should be very helpful, and should be made more available.)

4. Policy and planning aspects of resource development.

A few delegates emphasized in informal conversation that they need advice that is distinct from technical assistance. First-class advice to higher government levels would be beneficial in giving responsible officials wider perspectives on policy decisions and commitments in the resource sectors. The emphasis was on quality; apparently advice of this kind and quality is not available through some A.I.D. missions.

Comment

Reflecting on their own experience, some of the U.S. delegates in resources fields expressed strong concurrence with these remarks. They stressed that many difficulties in resource development overseas have to do with overall program planning and capacity for management by government agencies, with "institutional structure," and with economic and financial aspects of policies and programs.

Many delegates mentioned the importance of broad economic and social analysis,

including geographic inventory of land potentials and land use, so that the wide range of factors that should figure in plans for resource development will be seen, e.g., in the choice of particular energy, water and mineral sources for exploitation.

5. Research and development.

Less developed countries have problems in resource development peculiar to them which call for special research. (See the reports on the Specialized Sessions for some specific items.) It was felt that advanced countries could indeed help on some of these, but that indigenous research efforts are essential. Regional research institutes were frequently mentioned.

The reports for natural resources are given in the following order. They are in most cases accounts of the formal and informal Conference Sessions.

Policy, planning, overall organizational and administrative aspects.
(General Session)

Conservation of renewable resources

Mapping and surveying

Water resources and basin development

Water resources -- summary

Integrated river basin development

Policies; organization of services; law

Surface water

Ground water

Conservation techniques; desalination

Mineral resources

General evaluation; foreign aid needs; opportunities for assistance and research

Problems of the mineral industries from the viewpoint of the developing nations

Development policy

Mineral exploration methods; concentration of ores and minerals

Mining technology and mechanization.

Energy resources

Development policies

Electric power

Non-conventional sources of energy and nuclear power

Geothermal energy

Upgrading of commercial fuels; efficient use of fuels; recent developments in petroleum technology including small installations

General Session: A

Officers

Chairman – E. K. Federov (USSR)

Secretary – M. K. Gopaliengar (UNCAST)

U. S. Participant

Dr. Roger Revelle

This session provided a fair introduction to the wide range of considerations in resource development and to the Specialized Sessions that followed. Some of the 20 presentations were original and effective. An excellent presentation was given, for example, on approaches to management of water in arid regions. About one-third of the speakers were delegates of less developed countries. No overall conclusions can reasonably be drawn from such a variety of presentations, which were not organized into a coherent whole. Most of the resource fields were at least touched upon.

Matters possibly meriting attention.

1. Dr. David Davies of the World Meteorological Organization stressed that in meteorology and hydrology, owing to differences between climatic regions, practitioners in developing countries will develop their own variations of traditional techniques in designing their national programs – a point that bears on the nature of the training which these scientists should receive.¹

¹In this connection, a recent suggestion of Dr. Morris Neiburger of the University of California (Los Angeles) is of interest, that it would be less costly and otherwise advantageous for training in meteorology sponsored by the U.S. to be done on a regional basis and in institutions in the region concerned, rather than in U.S. universities. (Comment by S. Bergen)

2. A speaker from the UAR suggested that a nucleus of technicians and scientists be trained and made available on an international basis, under U.N. auspices, to do the actual surveying and appraisal of natural resources for developing countries that ask for such help. There was no further discussion of this idea at this or any other session, nor were any evaluations offered of current U.N. efforts in the resources field. The proposal is, no doubt, an indication that some countries find the appraisal of resources a chief difficulty. (The Cairo Conference on the Problems of Economic Development, held in 1962, may provide background on the proposal.)

Selected presentations.

1. Dr. Sigvard Eklund, Director General of the International Atomic Energy Agency, set forth the considerations involved in the adoption of nuclear energy by developing countries, sketched the studies required, and put his Agency at the service of these countries. In general, his remarks echoed the Conference paper submitted by the Agency on "Prospects and Problems of Nuclear Power Developing Areas" (A/103).

2. Academician Gerassimov of the USSR held out the great potential of the resources of the less developed world to be realized through science, and called in general terms for international cooperation in this effort, especially by expansion of the work of international scientific societies, agencies of the U.N., etc. He made no concrete proposals, however.

3. A. Wiener, Director General of Water Planning for Israel, Ltd., dealt lucidly with criteria and procedures for development of water resources in arid countries, including planning and scheduling of uses, and legal aspects. He spoke very strongly

against the prospect of large-scale demineralization of sea water "or other panaceas" which, because over-optimistic, can be harmful, and inhibit reliance on planning and scientific husbandry of available water resources. He cited the progress made in Israel through planning - "that this could be done in an area of water scarcity might hold some encouragement for other arid countries."

4. Roger Revelle, Science Advisor to the Secretary, U.S. Department of the Interior, spoke on criteria for resource policies and inter-relationships in resource development.

Good use of their natural resources is of the greatest importance to developing countries: production of food, fibers, minerals and fuels is usually their dominant activity, and exports of raw materials usually represent their principal source of foreign exchange. Improvements in the resources sector of the economy - especially increases in productivity per worker - are essential if the level of living is to be raised, momentum in economic growth attained, and labor freed for industrial development. A rise in the income of farmers and miners is essential to create markets for local industry. Establishment of appropriate manufacturing industries based on the countries' own raw materials will reduce foreign exchange losses and give added value to exports.

The primary aim of resource policy is to promote achievement of national objectives through development of land, water, energy, and minerals - at least cost; on a sustaining basis having in mind the conservation of existing supplies, the discovery of new sources, and the development of cheaper or more plentiful substitutes; with a high multiplying effect on further economic development; with significant contributions to better relations among nations for the ad-

vancement of all; so as to encourage a wide and equitable sharing of costs; so as to minimize or offset the difficulties of adjustment in particular regions and among particular groups.'

The strategy and tactics of resources development will be different in each country and at different periods of growth in each country. In every case, however, it will involve infusion of capital, improvement of the skills and economic motivations of the workers, and application of modern engineering science and technology.

Some essential steps are: gathering adequate information about the country's resources through many kinds of surveys; analysis of this information as a basis for deciding what should be done (in many cases the most modern tools of analysis, such as benefit-cost estimates for alternative development projects, input-output matrixes, linear programming and related techniques, can be used with profit); actions to improve resource productivity; and research and experimentation leading to additional information on which further analysis, decision and action can be tested.

Dr. Revelle described, as illustrating the interrelationships involved in resource planning, the continuing joint Pakistan-U.S. studies of irrigation agriculture in West Pakistan.* He also discussed a proposed World Resources Development Institute, an

*See Conference Paper A349, "Natural Resources Policies and Planning for Developing Countries," by Dr. Joseph Fisher (President, Resources for the Future, Inc.) and Dr. Revelle, published in Vol. I of the collected U.S. papers prepared for the Conference, Science, Technology, and Development, U.S. Government Printing Office, Washington, 1963.

idea developed by Dr. Joseph Fisher (President, Resources for the Future, Inc.) and himself.* The Institute would conduct and sponsor research, encourage education and training of resource specialists, and also work through international panels of resource experts, with emphasis on the planning of resource development.

5. Professor Stjepan Han of Yugoslavia praised the economic realism of the U.S. paper by Drs. Joseph Fisher and Roger Revelle and, along with other speakers, stressed that economic evaluation is of the utmost importance for countries attempting to develop their resources. He urged that the U.N. "elaborate a methodology enabling . . . inventory of natural resources in such a manner as to permit rapid economic evaluations of the results."

6. F. B. Haigh, of Australia, stressed that full resources appraisal is a long-term undertaking, even with modern techniques. Studies must be reviewed periodically to allow for improved scientific knowledge and changing social, economic and marketing conditions. It is frequently, therefore, not practicable to await the availability of complete resources data before commencing development of a region or country. Initial development must therefore proceed on the basis of the best information available at the time. Under these circumstances, a substantial element of judgment as to possible future requirements or developments must be used in addition to scientific and economic assessment when selecting and planning initial projects.

*See footnote page 55.

There can be a danger of overplanning as well as inadequate provision for future development. It is not always practicable or economically feasible to plan initial development as an integral part of ultimate development, or to provide initially for multi-purpose use. It may be necessary, as in Australian experience, to proceed first with a small project which is within limits of available financial resources at the time, or can provide output sufficient to meet reasonable, foreseeable requirements of goods and services, but which may have to be discarded in later and full utilization of resources. Financial resources will never be adequate for all desirable development at any one time; priorities must be determined for their allocation; secondary effects of resource development should be fully considered in determining priorities.

7. M. K. Shawki, Director of Forests, Sudan, expressed a traditional conservation viewpoint in stressing steps to insure, when development plans are being formed, rational physical management for long-term utilization of land and water and associated resources.

8. Dr. Humberto Penaloza of Venezuela spoke of the deterioration of the terms of trade in recent years to the detriment of countries exporting raw materials and commodities. "International cooperation" must mean far more than the exchange of scientific information and implies the "effective improvement" of various economies. "The sincerity of the highly developed countries should be measured in terms of the sacrifice of their profits."

9. The Session Chairman, E. K. Federov, USSR, summed up in the most general terms. He referred to the "general natural resources" which "belong to the

whole of mankind" – the world's oceans and their wealth, the atmosphere. He thought that these resources are now often "wasted" or badly treated, that "activities are not as coordinated as they should be." He made no specific proposals but seemed to be making a well-considered basic "conservation" appeal.

Informal Session

Conservation of Renewable Natural Resources

Officers

Chairman – Sir William Slater (United Kingdom)

U.S. Participant

Dr. Charles Kellogg

Participation by less developed countries was active. About 50-70 persons attended.

Two main ideas underlay the discussions. The first, in simplest terms, was: "Beware! precious resources of the land – soils, forests and plants, water sources, wildlife – are highly vulnerable to misuse." Countries entering upon intensive development should be made conscious of the possibilities of loss, for there is evidence (such as recent severe erosion in Southern Senegal) that development planners are not taking such possibilities into account nearly enough. Linked to this imperative to respect the physical interrelatedness and economy of nature was a second guiding idea: the notion of the ecology of man's total interaction with the landscape. The first idea implies the remedies of scientific knowledge and adoption of appropriate

management practices. The second calls for an awareness that relations are often subtle between natural resources and patterns of settlement and economic activity, and rational land use calls for breadth in planning.

As an example of the second idea, experience with the Gezira Scheme in the Sudan was cited. The need of the peasants for firewood was not foreseen in the original plans. The bush was entirely cleared, eventually, over an area of 2 million acres. Consequently, the cost of wood is high. The peasants save crop stalks for burning, but these heaps of stalks have been found to be "reservoirs" for crop diseases. To eliminate this practice, the managing syndicate is now introducing fuel crops and shelter belts. It was also said that a registered decrease in precipitation over the area (for which an FAO study was cited) may possibly be due to an excess of dry fallow. It was feared that areas in Sudan put into gum arabic may suffer similar effects, and the use of huge land-clearing machines and tree-crushers was questioned.

A speaker from New Zealand cited the serious effects in the settlement of his country of overcutting of forests, and haphazard introductions of exotic animals which lead to high control costs, erosion, and loss of grazing resources. Others brought out the importance of choosing management methods suited to the nature of specific soils (mentioning especially the dangers of heavy equipment); the values of wildlife to the food economy of some areas and also to tourism; the values of national parks and nature reserves.

While these discussions took place in an informal session, specially convoked, some of the topics could have been dealt with under the Conference agenda of agriculture and forestry, or of regional planning in its physical aspects. It is of interest

that at an international gathering a group of "conservationists" and others felt themselves set apart — or perhaps, bound together — by concern about the misuse of land and water resources. A Russian speaker, G. V. Bogomolov, Byelorussian Academy of Sciences, felt the matter of "the greatest importance"; he cited the work of an inter-Soviet committee on conservation of natural resources; and called for an increase in international cooperation in this sphere.

The prescriptions given were not surprising.

1. Education. Schools should include "conservation" (undefined) in their curricula. (In the session on river basin development, a French speaker alluded to a program in "resource education" for areas undergoing economic development.) Not only should the mass of people be exposed, but university students in particular, as future leaders, should be made aware of the broad implications of resource practices.

2. "Conservationists" (undefined) should be included in teams of advisors on land use.

3. Surveys of natural resources should be made with an eye to methods and limits of reasonable exploitation.¹

¹An interesting Belgian paper which stresses this point was accepted for the General Session on Natural Resources but not discussed anywhere. N. Vander Elst, "Basic Principles of Any General Plan for Developing Natural Resources in Emerging Countries", A/371.

Specialized Session

Mapping and Surveying Practices Adapted to Use in Less Developed Countries

Officers

Chairman — Lt. Gen. Phya Salwidhanidhes (Thailand)

Rapporteur — Mr. E. Janicot (France)

U.S. Participant

Rear Admiral H. Arnold Karo

The mapping session was lightly attended by less developed countries, but material prepared for this session may well contribute to future activity in surveying and mapping matters. Regional cartographic conferences under U.N. sponsorship have had considerable success in giving advice and help to less developed countries in these fields.

Many delegates believed strongly that education should be in host-country or regional training centers, giving needed training but keeping the student in touch with problems at home.

There was a consensus that country mapping (from scratch) requires appropriate aerial photo coverage, overall, if possible. Mapping should begin with compilation of 1:250,000 scale maps for entire country, with 1:50,000 scale mapping for areas of dense population proceeding concurrently. As smaller-scale work is completed, capacity can be turned over to the larger-scale work.

The wide range of capabilities of developing countries calls for a different program in each one. Equipment, techniques and mapping goals should be simple and direct, in the light of the country's situation. Whatever the program, it should be a phased one calling for completion of short-range goals which are part of a long-range plan.

A brief summary of the remarks made by each of the discussion leaders follows:

Rear Admiral H. Arnold Karo stated that maps are a universal language, transcending national differences in language, customs, cultures and politics. He stressed the need for a strong national geodetic network, tied in, if possible, to a continental datum. This requires international cooperation of the type experienced by U.S. Coast and Geodetic Survey teams establishing geodetic control in Ethiopia with ties to precise control in Sudan. Admiral Karo also mentioned the growing economic importance of oceanographic studies, which depend heavily on accurate charts and precise methods of control and navigation.

Mr. A. J. van der Weele (Netherlands) cited the Report of the Secretary (E/CONF.39/GR.24 (A) as implying that successful photogrammetric triangulation requires complex, costly equipment and procedures. Mr. van der Weele stated that effective photogrammetric triangulation can also be performed with relatively simple equipment such as the Jerie-ITC Bloc Adjustment system. He also stressed that a cadastral survey can be done very efficiently by means of photogrammetry.

Dr. Knorr (Federal Republic of Germany) discussed the advantages of various scales for maps and photographs. He cited the growing contribution being made by trained photo-interpreters. He sketched a country mapping program that would provide over-all map coverage first at a scale of 1:250,000 and then apply mapping capacity to 1:50,000 - scale coverage. The final result of all surveys should be a published map, made readily available to those who need it.

Professor Max Zeller (Switzerland) discussed the importance of technical training and mentioned the excellent training for French scientists and technicians at the Ecole Polytechnique Federal of France. He

recommended training professionals first so that they can train technicians later. Professionals can be trained abroad effectively although this requires knowledge of a foreign language.

Academician U. P. Gerasimov (USSR) described topographic maps as the basis for topical mapping for many special subjects. He stressed that topical maps are necessary for the proper development of a country, showing, as they do, the results of systematic studies of natural resources. In the Soviet Union, for instance, very detailed topical mapping was necessary for certain portions of the Union. Acad. Gerasimov mentioned the series of special maps recommended by Russian specialists in Guinea, to furnish the foundation, eventually, for a national atlas of Guinea. He stated that the Report of the Secretary (E/CONF.39/GR.24 (A) had not stressed the vital need for an atlas in the development of a country.

Following the talks by the discussion leaders, a number of inscribed speakers made contributions. The highlights of their remarks follow:

J. W. Wright (United Kingdom) described three types of organizations that are doing survey work - central government, regional or local government, and private commercial concerns. He briefed the factors that must be considered in planning a survey project, and the steps in the execution of that project, and which steps can be done more efficiently by one of the types of organizations listed above. He urged that for best results, reasonable specifications understood by all parties and followed closely will yield best results.

Mr. Bonneval (France) cited the long experience of the Institute Geographique National in small-scale mapping, much of it in developing countries. He discussed various types of control, mentioning astronomic control as being effective for early work

and geodetic control as being more appropriate for more sophisticated survey. Methods facilitating extension of control such as slotted templates and APR are worthy of consideration, and combinations of one of these with classical aerotriangulation are often possible. Use of third-order plotting instruments may be tempting but are not ultimately satisfactory because of complexity of use and relative inaccuracy of results.

Professor Daniel (France) discussed the importance of enlightened administration and financial management for development of long-range mapping program in country development.

Professor Janicot (France) urged careful planning of a mapping program to provide for maps at several scales. Scales of 1:50,000 for densely populated areas, 1:100,000 for areas of general interest and 1:200,000 for remote areas will provide reasonable coverage. He discussed the need for technical training and purchase of equipment that is suited to long-range mapping needs. A mapping advisory committee attuned to country needs can save waste. Cadastral and topographic services should be separately organized in beginning of a country program.

Professor Dr. Erwin Gigas (Federal Republic of Germany) emphasized the international aspect of mapping, stating that "maps do not stop at country boundaries." He urged the establishment of realistic accuracy standards, and, above all, the expedition and completion of surveys begun.

Professor Jezdik (Czechoslovakia) urged a progressive mapping program calling for timely completion of certain phases. A geodetic network is necessary to form a firm foundation for mapping. More and better training is required in established polytechnic schools. The need for specialized maps should be considered in the mapping program.

Mr. Guyonnaud (France) stated that rapid mapping is often very important. Such rapid maps can evolve from interpretation of aerial photographs and may be a simple document with simple symbols, valuable for hydrologic, geologic, agronomic and other studies. This may also furnish a valuable reconnaissance medium for many purposes.

Mr. John Raynon (Australia) described the medium-scale map coverage of Australia as being 80% complete. This program proceeded through 1:250,000 scale (planimetric and topographic) and 1:100,000 scale maps. Astronomic positions were established by small mobile teams. The value of super-wide-angle photography for future use was stressed.

Additional speakers attested briefly to points already raised and emphasized the need for countries to exchange map and survey information, as well as know-how on technique, training and equipment.

WATER RESOURCES

Summary

This summary is based on formal and informal discussions in Geneva, and is intended mainly as a checklist for further inquiry. It discusses some of the major interests and difficulties of less developed countries regarding water resources so far as they were stated at the Conference, and reflects experiences of some countries as they have begun water appraisal and development. Some needs are mentioned to which specific steps in aid (training, research, and other) are now being or might be addressed, or perhaps altered in nature or amount. Obviously, the variety of situations country by country is great, but it is useful to attempt some generalizations.

The following is to be read, of course, against the considerable experience and literature already available (including the 125 papers submitted to the Conference on river basin management and on water resources which are not analyzed here).

1. Appraisal of available resources.

There is strong demand for specific accomplishment in some countries for initiating projects. This demand means that appraisal of supply often must be made relatively rapidly, even if both trained people and data are short. For this difficulty, some prescriptions were given, on which some consensus was expressed. It is often possible to get on with the job on the basis of the limited measurements that can be made, bearing in mind that initial development rarely involves full use of the supply, and errors due to poor data are probably correctible in later expansion. A corollary of this prescription is that training of technical personnel be pushed at the same time, so that the country benefits permanently from the experience being gained in initial projects. In other words, a beginning can and must be made, and it is possible to build up data, as well as staff and competence, in steps. Refinements in appraisal will come in later stages; re-evaluation is aided by accomplishments in projects.

Rapid appraisal by individual foreign experts may also be possible, but some permanent means of implementing their findings will clearly be needed. A delegate from Turkey prescribed the use of teams of foreign experts, rather than individual consultants, in order to get the work of appraisal off to a good start with rapid accumulation of data, to establish good procedures and facilitate training, and to get an overall picture of the country situation.

It was proposed that the U.N. should promote, on the part of an international

scientific association for hydrology, special attention to methods of estimating run-off and discharge for areas where present data are insufficient. Regarding the science of hydrology, it was said that deficiencies in understanding are greatest, perhaps, with regard to arid areas. A delegate from Tunisia stressed difficulties of measuring flows and sediment loads with present methods and apparatus, and made a plea for more research and international collaboration on factors in sediment generation and on arid zone hydrology generally, by UNESCO and by individual advanced countries. A representative of UNESCO stressed that the special needs of developing countries are being considered in connection with the proposed International Hydrologic Decade, which is to foster joint programs of study. (Discussions on the Decade will be held in Paris in late May 1963.)

2. Water "requirements"; steps in planning; and policy.

Less developed countries apparently face hard questions of judgment regarding the type and scale of water development that should be undertaken in particular areas (including areas which have established patterns of water utilization).

As to estimates of future water "requirements," it was said that these cannot be made realistically without also considering the water development that may be already under way. Demands for water keep growing, and will be stimulated by development itself. It is the rate and the scale of progress, in the light of broad economic and social factors, that is significant. Such factors also must be weighed in the selection of projects. One moves from a general overall development sketch to the choice of priority projects. Then, more full data is sought on these. An elaborate basin or regional plan is the last stage. In other words, water

development is a step by step approximation over years, with room left for reappraisal and changes in policy along the way.

Wiener of Israel thought that, regarding projections of demand, valuable transfer of experience from country to country would be possible on a regional basis, even acknowledging local variations in per capita use. The development history of one town regarding water utilization, say, might have lessons for another. He pressed the idea of regional working groups, mentioning WHO's approach. (This was not picked up later in the discussions except by Laszloffy of Hungary, who thought that regional water institutes would be good.)

On policy, M. Selim of the UAR asked rhetorically: "Who is the better judge of water policy for an area — a local body, an outside group of experts, or a combination of the two?" The last, the combination of the two, since an intimate knowledge of local social and economic conditions will thereby be tapped. Water development requirements must be set in the light of the actual life and problems of the population to be served. For water projects to be successful (in a settled society such as Egypt), the mind and customs of the indigenous population must be taken into account, and then influenced if necessary by educational effort.

3. Training.

Discussions directly on this subject were not extensive. However, the general need for training was often cited, for instance, in discussion of relative merits of complicated and simple field instruments in hydrology where the latter were favored for the training that they give. The need for in-country training was mentioned by several speakers. Delegates from Ghana and Saudi Arabia specifically mentioned their lack of trained men.

Mr. Selim of the UAR thought that training of technicians in hydrology could be successfully done by working with small groups of high school graduates. P.O. Wolfe of the U.K. stressed basic education as a necessity in connection with water and other resource development.

4. Organization and administration of water survey and development agencies.

Little consensus emerged in the brief time given this large subject. (See, however, the Conference papers on these subjects.) It was said, of course, that no simple prescriptions can be offered. Nevertheless, it was felt by some that developing countries could certainly gain from the experience of others, that false steps need not be repeated, and that ways of transmitting the hard-won experience of advanced countries should be found. Discrimination in adopting administrative methodologies from other countries was urged.

5. Community (public water supplies).

While this topic was not on the formal Conference agenda (which may account for the few papers devoted to it), it was brought up in the sessions often. Men and beasts need water to drink — a primary need of first priority. The relation of water supply to health was emphasized by U.S. delegates, Wolman and Poindexter. Dr. Poindexter pointed to specific difficulties of small rural settlements, and listed items for research and development including cheap well covers and light-weight casings and distribution pipes. Concern over difficulties in providing firm local supplies in certain rural areas was expressed by delegates from Ghana in an informal conference on the water problems of that country.

6. Ground water.

The great significance was stressed of this phase of water resources in many developing countries, especially those lying in arid zones. Ground water "reserves" can represent most valuable capital, but one which must be rationally employed. Many scientific advances in recent years are the basis for more effective surveys and improved management.

Appraisal of the ground water available in an area or region (in which appraisal geologic study figures large) rightly includes attention to quality considerations as well as to the quantities exploitable in the light of the overall water balance. Appraisal proceeds with exploitation; it is a continuous process. The importance of a geological survey organization as an active permanent center for collection and continuous review of information as development proceeds was brought out in discussion. Many of the 25 papers submitted extolled the value of appraisal teams made up of various specialists.

Merits of techniques used in appraisal were briefly compared at the session. Regarding geophysical methods, it was said that "cheaper apparatus" should be developed. The use of isotopes (as described, e.g., in a recent publication of the International Atomic Energy Agency) can be a valuable supplement to hydrologic methods where little is yet known.

The great potential of scientific husbandry (including application of economic analysis) was well brought out by Dr. Wiener of Israel in reporting on progress in his country and on current research in maintaining quality levels of particular sources via well thought-out recharge practices. He emphasized "how much could be done" even in so-called water-short areas.

The nature and extent of the needs of particular countries for aid and training opportunities in the ground water field were not discussed. However, the fact that few developing countries submitted papers reflecting extensive experience or case histories of ground water development, and informal comments made, probably indicate that the needs are large indeed. (In informal discussions with delegates from Ghana, the need for nation-wide ground water reconnaissance studies was cited in relation to appraisal of supplies available for villages and farms.) The programs of the UN (and of UNESCO in particular) were commended by one speaker who felt that the benefits of more international cooperation in the ground water field would be large. However, no analysis was made of the merits of present programs of multi-lateral or bi-lateral assistance. Interest was lively in some research items.

7. Conservation and economy in water use; desalination

From what was said in Geneva, two broad points seem valid regarding technical possibilities of water conservation. The first is that there is considerable promise of finding new ways of reducing losses and per unit use through research and engineering. This may prove true in many aspects of water use and management, such as reduction of evaporation in water reservoirs and elsewhere, economical methods of water storage in semi-arid areas, recovery and use of "waste" waters, water-saving cultivation methods, better local materials for wells and canals. Specific technical innovations of this general sort would clearly be of enormous benefit to many less developed countries (and perhaps to some advanced countries also). Some work is under way in certain

countries on quite a few of these possibilities, but evidently not nearly enough — judging from specific requests for help made by some delegates.

The other point is that stress on experimental work should not lead to neglect of proven (even conventional) techniques of water conservation and management, "however homely." This caution was eloquently made by Wiener of Israel, who cited many known ways in which water can be economized, including economic approaches, such as allocation to more profitable uses, metering, disincentive water rates. The physical basis of good housekeeping is a refined knowledge of the hydrology of the area and region, of the total water balance. Intensive programs of management can often stretch supplies considerably, e.g., by avoiding penalties of pollution and mineralization. Economy in water use requires knowledge of the physical and social environment and imaginative social innovations — not only specific water-saving techniques. An implication here regarding less developed countries is that improvements in utilization of water will come as much from improvements in capacity for management — resting on trained people with opportunities to put their knowledge and vision to work — as from new techniques now on the horizon.

Regarding desalination of saline water, Dr. T. K. Sherwood stated his view that "we must be pessimistic as to the possibility of strictly economical processes for desalination of sea water for irrigation purposes," but pointed to the rapidly spreading use of small units as indicating that desalination is of interest to arid areas of developing countries, often for municipal supplies in certain circumstances. He noted that several nations, including the U.S.A., are undertaking research in order to reduce conversion costs.

Dr. E. Wegelin of the Netherlands thought that further reductions in cost will be gradual and was skeptical about "breakthroughs" in the offing.

Mr. J. Barnea of the Department of Economic and Social Affairs, U.N., described a current U.N. study of the potential markets, in a series of specific situations around the world, for demineralized water (excluding use for irrigation). The study, which takes the varying structures of local economies into account, will soon be available.

8. Water Law

Discussion of this subtle topic was neither systematic nor conclusive, and did not draw at all upon the five papers submitted. Problems of water rights were felt to be difficult indeed where changes in patterns of water use are contemplated. One speaker thought that some kind of overall inventory and national water policy must precede legislation; the law should spell out "basic criteria of policy," with its interpretation left to advisory and decision-taking bodies. (This speaker came from a very small country only recently under intensive development, where the notion of a "national water policy," with consensus on priorities in development, is perhaps more acceptable for various reasons.) Others were more concerned with defining the terms of water rights, with the need for "flexibility," or with protection of existing investments.

9. Integrated River Basin Development

Since water is involved in many types of economic activity, studies in breadth and depth of a basin's water, land and other potentials are the basis of wise choice among options for development, and in good selection of early projects. Fostering of a basin's economic and social growth, in which water uses play their part, should get as much attention as engineering aspects of water

projects; experience shows that achieving actual productive use of new water supplies, in irrigation agriculture, for instance, is a major task.

Regarding international basins, considerable interest was shown in how to make a start toward agreements with neighboring countries regarding development, and successful experience of the United States and Canada was cited.

Specialized Session

Integrated river basin development in
less developed areas

Officers

Chairman — Dr. Abel Wolman (United
States of America)
Rapporteur — Mr. C. S. Christian
(Australia)

U.S. Participants

Dr. Abel Wolman
Mr. Northcutt Ely
Mr. Eugene Weber

There was a consensus that an integrated approach in basin development is called for and is even essential, but speakers differed in their notions of what such an approach involves and how ambitious it can be.

Mr. Haigh (Australia) sketched the progress of his country in this field which he characterized as "stage" rather than integrated or multi-purpose development (although the latter is coming about). Inadequate technical or financial resources had prevented full appraisal of the natural resources of basins and the preparation of overall plans. But he felt that progress is made in steps, and that smaller projects and structures may well be appropriate in earlier

years. These can be incorporated into later integrated plans or even rebuilt. This approach defers large investments and allows scope for later adjustment, such as provision for new water uses. Advances in technology can then be drawn upon. He did not seem to think that there might be significant (avoidable) waste of resources in thus moving from single-purpose to multi-purpose designs. While he did not emphasize economic analysis in his remarks, he cited instances of conflicts between uses (such as between irrigation and hydropower) where relative economic returns or values come into play. He noted that irrigation was favored in some cases in Australia because other sources of power were available.

Mr. Weber (U.S.A.) spoke with greater confidence of the possibility of identifying priority projects which would be compatible with eventual integrated development. His stress was on the opportunity and importance of planning with full integration in mind even in early stages of development. He argued that this approach is peculiarly appropriate for less developed countries as a flexible guide for successive steps.

Planning for integrated river basin development is not a one-time, one-step process even in areas where objectives are clearly defined, where data are adequate and where time and technicians are available for the task. In less developed areas, where objectives are difficult to define, where basic data are scarce and where time and personnel are limiting factors, it is essential that planning for river basin development be carried out in successive stages of refinement so as to permit concentration of effort on solutions to the most urgent problems that can be shown to be compatible with long range objectives.

The progressive stages of planning for integrated development will finally reach a

point where a complete detailed plan can be formulated. Even then it must be regarded as flexible. It should be subject to constant review and revision in the light of changing outlooks, objectives and possibilities. Nevertheless at any given point in time it will be the best available basis for decisions that must currently be made.

Two French speakers, P. Bourrieres and Lucien P. Bugeat, echoed Haigh in emphasizing smaller schemes. They also went so far as to say that an integrated approach must be different in emphasis in less developed areas. Their reason apparently was that the essential job of fostering the area or regional economy (achieved in part—but only in part—by promoting various uses of water) is really primary, that one must think of this overall job first, whereas in developed countries water projects can be more readily fitted into an existing economy. Thus, Mr. Bourrieres called for chief attention to measures for agricultural and industrial development, such as extension work to introduce new crops, fertilizers, and canal systems. He pointed out that the investment required in these measures could be 5 to 10 times the capital invested in water control structures.

Mr. Bugeat (France) reported on experiments in development of relatively small basins in arid Africa (of perhaps 10- 50,000 square kilometers, and population of about 150,000 in some cases). Aerial mapping based on recent techniques enables rapid survey of resources and requirements. He also was concerned for "rural animation," for the transformation of the social and economic "environment" through schools and health centers, cooperatives, and systematic promotion of water uses. School programs were keyed to the changes in the environment which were being promoted. This work

is carried out by teams of specialists, and includes irrigation and flood control.

Mr. Garnier (FAO) would leave room for adjustment — a basin plan should not try to allot all the water. Wolf (U.K.) also wanted "flexibility" as "we are fallible men." Careful account should be taken of priority uses — in many cases, water supply for people and animals, and for irrigation, since the increase of food production is a pressing task. The indigenous population should be brought into the work of planning, as basic development is a permanent influence on its future. This is necessary, also, in order to harmonize the main interests concerned.

A representative of the USSR described accomplishments in multipurpose development in river basins of the Soviet Central Asian republics. His stress was that Soviet technical and organizational experience, characterized by rapid progress, could be put to use by other countries.

In reply to questions by a delegate from Afghanistan on difficulties in proceeding with development of international rivers, Mr. Northcutt Ely commented on current work of the International Law Association in the drafting of a model treaty for international basins. It is hoped that by 1964, the treaty will cover at least the topics of navigation, pollution, allocation, and settlements of disputes. He also cited American experience of some 50 years in dealing with Canada on boundary water matters, emphasizing the mutual understanding created through a standing body of experts of both countries which explores technical dimensions of proposed developments and possible conflicts. The work of this body became the basis for later agreements on a political level.

Mr. Simaika of the UAR pointed to the agreement regarding the Nile reached by his country with the Sudan in 1959 as a good example of an amicable solution.

The description by Mr. Wiener (Israel) of a decade of experience in "dynamic programming" indicated flexibility in approach in the combined utilization of ground and surface sources in a newly developing arid area. Mr. Wiener saw many advantages in phased development which begins with ground water where possible for several reasons: (a) lack of hydrologic data is not so serious; risks in ground water development are low in the early stages and later corrective recharge is possible; (b) surface sources require large investments (e.g., for dams) and more basic data, and decisions about their development are not so alterable later; hence, they should come in later stages (when, also, any power generated will be absorbed more readily by an economy that is farther along). Ground water storage should share in the storage function of a basin plan; surface-storage requirements may thereby be reduced.

Mr. Dorfman (ECLA) remarked that in Latin America (which has few arid stretches) the possibilities for basin development were quite extraordinary. Water is a key to the broadest and most varied development of all kinds of resources. The sheer variety of "complicated options" calls for thorough water planning, and for far-reaching economic analysis of all basin resource potentials. A recent U.N. study (1960) of the Rio Negro in Patagonia, Argentina, revealed that the water development potential is much greater than hitherto envisioned, and a better idea of priorities in projects was gained, even though present demands are not big enough to support immediate major investments. He thought the broad approach taken in this study would be of considerable interest to other countries of the Continent. Mr. Dorfman also stressed the relative intensity of manpower use on projects is a fundamental question for coun-

tries where capital is short. "Modern technology cannot exist in a vacuum."

Mr. Randhawa (India), in speaking of recent sobering experience with the actual operation of projects, touched on difficulties mentioned by others. He, too, called for attention to all phases of the economy concerned, such as changing crop patterns, marketing, and necessary extension work; for appreciation of ground water potentials and drainage hazards; for attention to physical management of watershed lands, and to lay-out of new roads to make them most useful. "New dams" bring "new problems;" among the most difficult are those of an administrative nature, as in division of responsibility between upstream and downstream areas.

The Chairman, in concluding, affirmed that integrated development was indeed applicable in less developed countries if carried out step-by-step. It was generally agreed that water often represented the key to economic and social development. Water planning and execution, hence, should go forward in consonance with economic and social planning. Since mistakes are made and will be made — in developed as well as developing countries — changes in program emphasis and in water allocation should be expected. If any priorities had to be assigned, it was considered that water supply for domestic use would take first place in program implementation.

The Chairman also recalled that one must be concerned in considering reservoir projects with some negative aspects, such as retention of fertile silt behind dams, silting of reservoirs, degradation of river channels by discharge of clear waters, elimination of some advantageous values of flood inundations, and adverse effects on fisheries. It is wise to give consideration to ground water in integrated plans, and to

drainage also. Finally, river developments involve large capital investment – the implications of this can not be neglected.

Combined Session

Water Development Policies

Officers

Chairman – Prof. Emil Mosonyi
(Hungary)
Rapporteur – Dr. Mohammed A. Selim
(UAR)

U.S. Participants

Dr. Abel Wolman
Mr. E. L. Hendricks
Dr. H. A. Poindexter
Mr. Northcutt Ely

The value of the Session lay not in systematic coverage of the set agenda, but in statements made on some major difficulties of less developed countries in the water resources field. These may be generally well known, but the descriptions given were dramatic. The Session was lively with many delegates from less developed countries participating.

There is strong pressure for rapid accomplishment, for projects, and this demand means that appraisal of resources often must be made rapidly despite shortages of trained people and of data. The provision to every community of good drinking water is vital to social development, partly for improvement of health - (a point made eloquently by Dr. Wolman and Dr. Poindexter). There are hard questions of policy - type and scale of development, and priorities among projects. There are difficulties in securing the cooperation of groups affected by water development (which sometimes involves

changes in water rights and water law). Effectiveness of training programs is also of concern. Remarks by delegates of the UAR, of Turkey, of Hungary, and of others indicated, however, that with regard to some of the difficulties described, experience is available which affords a reasonable amount of advice and encouragement.

The main topics discussed were:

1. Agenda for research. Dr. Poindexter (U.S.A.) said that community water sources are often hard pressed in small rural settlements that suffer long droughty spells, with adverse effects on local health conditions. Research-and-development are needed to produce:

(a) A non-soluble material (a polyethylene, perhaps) suitable for covering wells.

(b) Something to prevent evaporation from small reservoirs, and breeding of insects in them.

(c) Less porous well casings.

(d) More economical and light-weight well casings, and distribution pipes.

2. Appraisal of available water resources. There seemed to be consensus that, with data short and time of the essence, appraisal and actual development in some countries must go on hand-in-hand. Refinements in data collection and in appraisal can be dispensed with until later stages, since initial development rarely involves full use of the resource, and errors due to deficiencies in data can be corrected in later expansion. Dr. Ozal (Turkey) recommended the use of teams of foreign experts, rather than individual consultants, in order to get the work of appraisal off to a good start, to establish good procedures, to facilitate training, and to get an overall review of the country situation. Mr. Picard (Israel) added that it was most essential to provide beforehand for the implementation of foreign advice.

Regarding methods of rapid appraisal, Mr. H. M. Homing (FAO) reported that FAO's experience indicates that some "short cuts" are possible in making land and water studies for irrigation. These were not specified.

As to estimates of water "requirements," these cannot be realistically made without considering the development that may be already under way. Demands for water keep growing, and will be stimulated by development itself. It is the rate and the scale of progress, in the light of broad economic and social factors, that is most significant. Such factors also must be weighed in the selection of projects. One moves from a general overall development sketch to the choice of priority projects. Then, more complete data are sought on these. An elaborate basic or regional plan is a last stage. In other words, water development is a step-by-step approximation over years, with room left for reappraisal and changes in policy along the way.

Mr. Wiener (Israel) thought that, regarding projections of demand, some transfer of experience would be possible on a regional basis (i.e., from country to country) even acknowledging local variations in per capita use. The development history of one town regarding water utilization, say, might have lessons for another. He pressed the idea of regional working groups, mentioning WHO's approach. This was not picked up later in the session except by Mr. Laszloffy (Hungary), who thought that regional water institutes would be good.

3. Water Policy. On policy, Mr. M. Selim (UAR) asked rhetorically: "Who is the better judge of water policy for an area - a local body, an outside group of experts, or a combination of the two?" The last, the combination of the two, since an intimate knowledge of local social and economic conditions will thereby be tapped. Water development

requirements must be set in the light of the actual life and problems of the population to be served. For water projects to be successful (in, for example, a settled society such as Egypt), the mind and customs of the indigenous population must be taken into account, and then influenced if necessary by educational effort.

4. Training. This was stressed, as was basic education (P.O. Wolf, U.K.). Much of the training should be "on-the-spot" (Mr. Selim, UAR). He cited the success of training of high school graduates in small groups in the UAR as oil technicians - a field that he considered more difficult than hydrology. In this connection, simple (as against complicated or automatic) measuring equipment was advocated. Advanced training of hydrologists would naturally be done in universities.

5. Organization and Administration of Water Agencies. On this large topic, little consensus could emerge in the short discussion. The Chairman thought, however, that the varied experience of developed countries ought to prove really helpful in showing how agencies should be set up. All the wrong and wasteful steps that advanced countries had made need not be repeated.

6. Water law. Discussion of this subtle topic was neither systematic nor conclusive, and did not draw at all upon the five papers submitted. Problems of water rights were felt to be difficult indeed where changes in patterns of water use are contemplated. One speaker thought that some kind of overall inventory and national water policy must precede legislation; the law should spell out "basic criteria of policy," with its interpretation left to advisory and decision-taking bodies. Others were more concerned with defining the terms of water rights, with the need for "flexibility," or with protection of existing investments. On the latter point,

Mr. Ely (U.S.A.) observed that "flexibility" is a good thing in the administration of water resources if it is balanced by recognition that water rights of existing projects are not blueprints, to be torn up when better blueprints become available, but are the foundation for existing economies that must be fairly compensated if progress requires them to be displaced.

Mr. Samaika (UAR) proposed that the U.N. give more technical help to developing countries. This was not discussed further.

Prof. Laszloffy (University of Budapest) proposed that regional training institutes be set up in the water field. (He pointedly mentioned the U.S. paper by Mr. John Harshbarger which reviews recent developments in training in the U.S. and which advocates further international scientific cooperation in the water field and in provision of training facilities.) His proposal was not discussed further.

Specialized Session

Surface Water

Officers

Chairman — Mr. E. F. Durrant (Canada)

Rapporteur — Mr. L. J. Tison (Belgium)

U. S. Participant

Mr. E. L. Hendricks

The session was an excellent and lively one. Delegates from less developed countries had a good opportunity to present specific difficulties and to outline proposals meriting consideration.

The principal points discussed were:

1. Simple vs. advanced survey equipment.

If assessment as rapid as possible is wanted, a substantial outlay on the most modern equipment is worthwhile even in less developed countries. A few skilled people

will make good use of it. (Mr. P. O. Wolf, U.K.). Modern techniques are not adequate for all survey problems in less developed countries (Mr. Tison, Belgium). Sophisticated instruments require not only hydrologists, but electronic technicians and other skilled people. Simpler instruments used in permanent long-term data programs help in training of indigenous personnel, (Mr. E. L. Hendricks, U.S.A.)

2. Automatic recording instruments.

A definite need exists for development of certain kinds of instruments that can operate in remote areas. (Research in the U.S. on such instruments has not been active. Mr. E. L. Hendricks, U.S.A.)

3. Publication of data on any work in emerging countries is most important to prevent later repetition of the same survey work.

4. Deterioration of hydrologic instruments under difficult conditions of use. Mr. Samaika (UAR) reported successful design and manufacture of a robust current meter, particularly suitable for arid and semi-arid areas.

5. The proposed International Hydrologic Decade Program was briefly described by Mr. M. Matisse (UNESCO). He stressed the concern for work that will be widely useful to various countries including the less developed countries. A key organizational meeting will take place in Paris in the last week of May.

6. Prof. E. Mosonyi of Budapest, Hungary, proposed that the U.N. request that an international scientific association in the field of hydrology devote a special session in the near future to: methodology of estimating run-off and discharge in areas where present data are inadequate. Consideration of analogical methods (hydrologic, geographic, geologic and combined analogical methods); probability computations. (This proposal was seconded by Mr. Hendricks, U.S.A.)

7. Mr. Ben Osman of Tunisia recommended special work for the benefit of arid areas on flood flows, and on new methods and apparatus for measuring sediment loads in view of the difficulty of forecasting loads. He suggested also the development, through sampling, of area-type/sediment-load "ratios" that might be helpful in forecasting. He thought UNESCO could help on this. In general, he asked advanced countries to strengthen their investigations into the water problems of arid zones.

Specialized Session

Ground Water

Officers

Chairman - Dr. Mustafa Nuri Parlar
(Turkey)

Rapporteur - Professor L. Picard (Israel)

This session was the only one of five dealing with water in which there was not at least one U.S. speaker. American contributions to the subject were made available, however, in part of a U.S. Conference paper ("New Steps Toward Better Data and Investigation for Water Resources Development"); in a Chile paper on a decade of experience in ground water development where U.S. aid was instrumental (2 of the 3 authors of the Chile paper are with the U.S. Geological Survey); and in two U.S. papers distributed to all delegations in Volume I of the published series, Science, Technology, and Development. The first of these is an account of 10 years of exploration for and development of ground water in Thailand with U.S. aid. The second is a survey of recent advances in this field covering basic management, sea water intrusion, artificial recharge, use of radioisotopes, well logging and well drilling.

About 20-30 delegates from less developed countries attended with Israel,

Turkey, Afghanistan and UAR participating actively. On the whole, however, experts from the advanced countries dominated the discussions. The French spoke much of work in Africa, but often in a way that seemed to indicate ignorance of existing literature in English, e.g., regarding methods of ground water recharge.

The large number of papers submitted (25) and the general sense of the session certainly confirmed the importance of ground water for many less developed countries.

Methods of appraisal were compared, with merits and deficiencies noted. An Australian speaker illustrated how management objectives are met in long-term exploitation of aquifers through continuous appraisal and evolving measures of regulation.

On the considerable work of UNESCO and other U.N. agencies in this field, no technical comments were offered by any delegate, though a speaker from the UAR emphasized its great value, and expressed the hope that all foreign assistance efforts in this field would be integrated under U.N. auspices. The session secretary had extolled, in her opening remarks, collaborative research on an international basis on aquifers shared by several countries. Apart from the UAR speaker and G. Bogomolov (Byelorussia), no one else spoke to this point. In short, no new approaches to international aid in this field were really aired. There was consensus that trained people, modern (if often simple) apparatus, and continuous assessment of resources through an established geological survey or similar agency were essential to long-term beneficial exploitation.

Some of the items discussed which may merit further attention include:

1. Picard (Israel) stated that "cheaper apparatus" is needed for geophysical exploration, pointing out that the equipment currently in use evolved in connection with

petroleum work. The point was seconded by Degallier of France.

2. There was much interest in well casings of different types and materials, and in the experience of various countries with them.

3. A study on management of ground water quality now underway in Israel with FAO support sounded of general interest in relation to problems of storage in arid regions. The focus is on location of recharge wells, scheduling of withdrawals, and other management procedures in relation to quality.

4. Another Israel project of interest involves a new approach to recharge in coastal areas, with "late" recovery of flow through interception close to shore. Pilot tests indicate a saving of up to 1/3 of the flow usually needed to prevent salt encroachment. (These two projects are good illustrations of the vigorous attitude taken by A. Wiener, Director General of TAHAL, Water Planning for Israel, Ltd., Tel Aviv, who felt that much could be done to stretch supplies through intensive management methods.)

5. The International Association of Scientific Hydrology is working up new methods for portrayal of ground water on maps (hydrogeologic maps). A presentation of this work will be made at the Berkeley, California, meeting of the Association later in 1963.

Specialized Session

Particular Problems in Water-Short Areas

Officers

Chairman — Mr. Lassad Ben Osman
(Tunisia)

Rapporteur — Dr. Michel Battisse,
UNESCO

U.S. Participants

Prof. Thomas K. Sherwood

Some significant topics for research and possibly for foreign assistance programming

were exposed in this session. Some of these were:

1. Development of salt-tolerant crop varieties; of drought-resistant varieties. According to Prof. Moustafa M. el-Gabaly, University of Alexandria, UAR, comparatively little has been done along these lines.

2. Reduction of unit water use in irrigation in arid areas. According to A. Wiener, Director General, Water Planning for Israel, Tel Aviv, much scope exists for research regarding irrigation and cultivation methods, e.g., spraying of fruits to reduce water loss, covering of rice paddies with film to reduce evaporation, water-saving methods of mulching and soil conditioning.

3. The merits of hillside storage lakes in arid areas. According to M. L. Ben Osman, Chef de Service Hydraulique, Tunis, Tunisia, there are many technical problems to be solved before this method of water conservation is satisfactory. He mentioned some studies recently made in Tunisia. L. Garnier (FAO) commented that investigations into hillside lakes are now underway in some Mediterranean countries to cost out these rather expensive installations, for which good data and foundations are needed.

4. Developing countries need help in water conservation techniques such as terracing, water spreading, soil mulching and other practices. Little help has been given them so far, according to Dr. M. M. el-Gabaly (UAR). Mr. L. Garnier (FAO) noted that soil conservation methods developed in humid areas may be detrimental in arid areas.

5. Dr. N. Stutterheim (South Africa) pointed out that to minimize evaporation losses in arid areas, stored surface waters might be used more "rapidly," e.g., by increasing extent of irrigation even though a firm supply for the total area cannot be guaranteed.

6. Good experience in Australia with "ring tanks" for water storage for irrigation was reported by F. B. Haigh, Commissioner of Irrigation and Water Supply, Queensland, Brisbane. The tanks are filled with "surplus" stream water, and later tapped by gravity or pumping. The tanks are compacted or treated against leaks. A typical tank provides for irrigation of 20-40 acres, in rainfall areas of 15 inches plus, with costs of 20-80 Australian pounds per acre-foot of storage, which costs compare well with conventional dams. Extension service helps on dam design.

7. Importance of small-scale water development for rural areas (a program of "rural hydrology" whereby the local population need not be dependent on foreign experts) was stressed by Erienne Stretta (UNESCO) alluding to small water-conservation methods and installations in successful use in Africa. Noting that these methods were "not used" in Asia and Latin America, Stretta said that training was needed for a "middle cadre" in hydrology and that such technicians can be trained relatively quickly.

Selected Presentations

Regarding desalination of saline water, Dr. T. K. Sherwood, (U.S.A.) stated his view that while "we must be pessimistic as to the possibility of strictly economical processes for desalination of sea water for irrigation purposes," the rapidly spreading use of small converting units indicates that desalination is of considerable interest to arid areas of developing countries, often for municipal supplies in certain circumstances. He noted that several nations, including the USA (and specifically, the U.S. Department of Interior), are undertaking research in order to reduce conversion costs. He also noted that "desalination costs depend largely on energy costs," and that work is underway on the possibility of utilization of low-cost

heat from very large nuclear reactors. Dr. E. Wegelin of the Netherlands thought that further reductions in cost will be gradual and was skeptical about "breakthroughs" in the offing. Mr. J. Barnea of the Department of Economic and Social Affairs, U.N., described a current U.N. study on the potential markets, in a series of specific situations around the world, for demineralized water (excluding use for irrigation). The study, which takes the varying structure of local economies into account, will soon be available. H. T. Hale of the UK reviewed the principles of flash distillation. Allison of the UK reported on reductions in costs achieved in installations at Kuwait.

G. V. Bogomolov (Byelorussia) said that the U.N., through its various agencies, should give full assistance to developing countries. This recommendation, which was not further discussed at this session, seemed to be a standard one that was often repeated by representatives of the USSR and Eastern European countries.

Mineral Resources

Summary

Introduction

The impressions and conclusions of the delegates and the staff members in the field of Mineral Resources differ in detail and emphasis, but there is one area of general agreement: the Conference was too large, both in fields of coverage and in attendance, and too formally structured. Further, so many papers had been accepted for presentation that effective discussion of the papers was severely limited, and the value to be derived from the Conference suffered greatly thereby.

The feeling is strong that any succeeding meetings should be: 1) restricted to closely related fields, or to specific topics

involving several fields; 2) concentrated on discussion of previously circulated papers, with attendance by the authors of those papers, as well as other attendees; 3) organized on a regional rather than a worldwide basis; and 4) implemented so that there is adequate representation from the countries to whose aid the meetings are directed.

The Conference in operation

The decisions and structure by which the Conference was organized resulted in a meeting that in effect evolved into four Conferences: 1) a meeting at which copies were distributed of all the papers accepted by the Conference staff; 2) a series of formally structured sessions, both General and Specialized, at which a resumé was given of accepted papers, and additional papers were presented — some of them being virtually new papers, for the delegates in many cases were not the authors of the accepted papers; 3) a series of meetings, not previously scheduled but held under formal United Nations auspices, organized at the request of Session chairmen, where more informal discussions were held on topics of interest to the delegates; and 4) a series of completely informal, unstructured meetings in the corridors, at lunches, dinners and elsewhere, where delegates and staff members discussed problems and solutions with full and easy interchange of views. Of the four Conferences, the last was probably the most productive and valuable.

Both in general, among all the delegates, and in detail, among the delegates concerned with Mineral Resources, the atmosphere was friendly and congenial. A political note was injected at both the General Session on Natural Resources and the Specialized Session on Mineral Development Policy by representatives of the bloc countries but it was not pursued forcefully at the sessions.

Where introduced it consisted of references to the bad effects of colonialism and to the bounties and efficiencies of state planning and operations. There were mixed reactions expressed as to the investment climate for private enterprise, both domestic and foreign. Poland allows some private domestic enterprise in export minerals, Venezuela and Indonesia will restrict it to a considerable degree, Nicaragua and Liberia want it, with lesser restrictions and some inducements, most of the western countries actively promote it.

The U.S. delegation was impressed with the generally high caliber, background, enthusiasm and knowledgeability of the representatives in the Mineral Resources field from the less developed areas. Unfortunately only a minority of these countries had as representatives people technically trained in the minerals field. They were articulate, perceptive, and vitally interested in their country's problems and possible courses of action. They had numerous suggestions as to types of aid, and several offered technical aid to other less developed countries. A great many personal contacts were made between U.S. delegates and delegates from the less developed areas; in some cases old friendships were renewed.

Generally the Latin American and South-east Asian countries were least effectively represented; for many of these countries the entire delegation consisted of 1, 2 or 3 men, from the ranks of the permanent delegation to the United Nations in Geneva. Few if any of these people were technically trained or even connected with the field of Mineral Resources. To these countries the Mineral Resources part of the Conference may have been of somewhat dubious value.

The papers solicited for and accepted by the Conference ranged widely in content, impact, and value. They probably will have

more effect and value when (and if) read in the post-Conference period. They were overwhelming to most delegates from sheer volume: In the field of Natural Resources there were 14 Summary Reports by the Conference Secretary-General's staff, 15 general session papers, 219 papers in fields of Natural Resources other than Mineral Resources, and 83 papers in the Mineral Resources field alone. The very acceptance of such a number of papers froze the Conference into a mold, wherein people discussed items that came to mind, largely divorced from the content of the solicited papers.

The publication by the United States of all the papers solicited for the Conference, whether accepted by the United Nations or not, elicited much favorable comment and interest, and many requests for copies.

There was a significant amount of dissatisfaction with the formal Conference sessions, despite a relaxation of the format after the first week of meetings. The sessions in Mineral Resources all benefited from being scheduled in the last five working days of the meeting; even so the formal structure was hard to circumvent. A very worthwhile effort was made by the Conference Secretary-General for Mineral Resources to correlate the remarks of the Discussion Leaders, but with a rather restricted amount of success. Several Discussion Leaders exhibited reluctance to change the content of their remarks to raise certain issues, in part at least because they felt they were not expert in those issues. Discussion from the floor was divorced from the points raised by the Discussion Leaders, as comments from the floor were taken in strict sequence after completion of the reports by the Session Secretary and all of the Discussion Leaders. Discussion therefore jumped from point to point without a logical sequence. In addi-

tion, in most sessions there was not sufficient time for all who desired to speak.

It became apparent very early in the Conference that the formal sessions were 1) somewhat stultifying and 2) not providing sufficient opportunity for all the would-be speakers to be heard, particularly those from the less developed areas, who seemed to have some reluctance to lead off in formal discussions. Fortunately, provision had been made for additional sessions to be held at the call of Session Chairmen, sessions that could be informally organized but formally publicized and accorded full interpretation facilities. Such a session, entitled "Problems of the Mineral Industries from the Developing Nations Viewpoint" was held at the request of William D. Johnston, Jr., U.S.A., Chairman of the Session on Mineral Exploration Methods and Concentrations of Ores and Minerals. The session, chaired by the delegate from Indonesia, was specifically designed to provide the delegates from the less developed areas with a forum. It did so - they spoke for nearly 2½ hours, with replies from the more developed countries occupying only about one-half hour. The session drew considerable praise, and was generally felt to be the most productive of those held on Mineral Resources.

On a Conference-wide basis, the United Nations has established an ad hoc committee composed of the Conference Vice-Presidents, to provide a central point for considering suggestions for follow-up activities. No specific suggestions for such follow-up by the United Nations evolved in the Mineral Resources discussions. The caution was widely expressed that any succeeding conferences should be smaller, confined to specific topics, and organized regionally for better attendance and sharper focussing on the topics.

Substance of the Conference

There is widespread agreement on the nature of the general problems facing the less developed areas in the Mineral Resource field. Many, if not all, of the major problems were well understood before the Conference, and were well summarized in the reports of the Conference Secretary-General. No new solutions to these problems appeared at the Conference, but the general agreement on solutions presently being applied may have reinforced the advisability of these solutions for the newly emergent nations facing the old problems for the first time.

Numerous specific problems were disclosed — such as a need for working manuals for training technical personnel and translations of Dutch language geologic reports (Indonesia), a need for detailed cataloguing of training available in various disciplines at foreign universities (Liberia) and for an assessment of acceptable institutions (Trinidad and Tobago). Assistance in meeting such needs was informally offered by the United Kingdom and France, and the United States delegation privately suggested that it would be glad to consult on these and other problems.

Several of the lesser developed countries suggested the need for a new United Nations agency to deal with the problems of technical assistance. This is a restatement of the Cairo declaration of July 1962. Particular support was voiced by the delegates from the United Arab Republic. There is a feeling on the part of these delegations that the present agencies are too widely spread, too loosely controlled, and not fully effective in prosecuting their programs. There is an even more widespread feeling on the part of other delegations that another agency will simply dilute the effort further, that what is needed is to make the present agencies more effective. In general the

United States delegates supported the second position.

The general comments on foreign assistance can be summed up briefly. There is strong agreement by the less developed areas that the technical help they need should be given by working technicians who pursue projects to completion, and who train local personnel in the techniques by having them as co-workers on the project. They feel that short, advisory visits by foreign experts are largely unproductive. As several delegates pointed out, past United States assistance has taken both approaches, and they feel the present trend is toward the less desirable alternative — the visiting expert. Most delegates very diplomatically indicated they would accept either multi-lateral (such as United Nations agency) assistance or bilateral assistance. In the Mineral Resources field the United States delegates feel unanimously that bilateral aid is more effective, and that it frequently is diluted by competing multi-lateral aid projects.

Some countries emphasized their need for large capital investments for mineral development. It was recognized that a "favorable climate" would be needed to attract foreign funds, and that a steady and consistent long-range policy to that end is required of governments.

Opportunities for assistance and research

The most striking need is in education and training, from the elementary to the most advanced level. What is needed is the development of a cadre of trained people who can do the work in their own countries. In the minerals field, assistance could include training on the job by foreign experts for miners, equipment operators, metallurgical workers, prospectors, laboratory technicians, and so forth; it would include strengthening local college and university departments in

the basic physical sciences, earth sciences, and engineering. It would provide for more foreign training of qualified candidates at top notch universities throughout the world, and for increased exchange professorships. Support and encouragement could be given to the establishment of regional training centers or scientific institutes, serving the needs of a group of adjacent countries.

There is a great need for assistance in the establishment of integrated governmental organizations (geological surveys, mining bureaus) to conduct basic and applied research in the minerals field, and to stimulate and assist in mineral production and processing. Help is needed not only to set up these organizations but over a longer period, through, perhaps, the "adoption" of a young organization by a counterpart organization in an advanced country.¹ One particularly fruitful field is in research on and encouragement of production in those minerals (including non-metallic minerals such as fertilizer and building materials) that can be used for domestic consumption, as raw materials in local economies. An obstacle is the lack of appreciation on the part of local and national politicians and legislators of the necessity for basic geological and mineral study.

¹For case histories of U.S. assistance along these lines, see G. F. Ericksen, Carlos Ruiz F., Bernardo Pizarro A., "Development, Organization and Operation of the Instituto de Investigaciones Geologicas of Chile," and "A Cooperative Mineral Exploration and Development Program in Pakistan," by Nur M. Khan and J. A. Reinemund, pp. 45-52, 71-89, in Natural Resources, Minerals and Mining, Mapping and Geodetic Control, Vol. II, of SCIENCE, TECHNOLOGY AND DEVELOPMENT, U.S. Papers prepared for the UNCAST Conference.

In connection with the establishment of central geological and mining service bureaus and of scientific institutes, assistance in the stocking of scientific and technical libraries, provision of representative rock, mineral, and ore specimens and of technical scientific equipment, and translation of standard technical works and other scientific reports would be most useful and would be welcomed.

Conclusions

The Conference was too large, covered too many topics, was too formally structured, and was not attended by a really adequate representation from the countries it was designed to serve. The most valuable contribution of the Conference was the contact established among the delegates; it had more personal than governmental value, although it is to be hoped that a variety of assistance programs and applications of suggested techniques will be put into operation as a result. In the post-Conference period the published Conference and other papers will undoubtedly prove of value. The comments of the delegates from the less developed areas should prove useful to the Agency for International Development in planning future programs of assistance.

There is a very general feeling that the United States acquitted itself very well at the Conference, in the content of its papers, in the friendliness shown by the delegates, in its staying away from political discussion, in the composition of its delegation, in its fostering of informal sessions and discussions, in its presentation of the publication of its own papers, and in its library of selected references.

The difficulty was in the Conference, not in the delegations or the contributions to the Conference.

Informal Session

Problems of the Mineral Industries from
the Viewpoint of the Developing Nations

Officers

Chairman -- Dr. Soetarjo Sigit (Indonesia)
assisted by
Dr. Joseph L. Gillson
(U.S.A.)

U.S. Participants

Dr. Kung-Ping Wang
Dr. Joseph L. Gillson

The meeting was opened by a very brief statement by Dr. Sigit, outlining procedure for the session: each representative of a less developed country was invited to give a statement of his country's problems and to pose specific questions for up to 15 minutes. The remaining time was available for responses from the group, both from lesser and more developed countries.

The special fifth room session was useful--more because it provided a forum for representatives from the lesser developed countries to speak their pieces than because it provided any solutions to their problems. It was done with a general air of informality and there was a considerable amount of discussion although it was not as free as we had hoped. In general, the lesser developed countries revealed no new, previously unappreciated problems, nor did the representatives from any of the nations come up with unique solutions to the problems stated. After nine days of Conference sessions, however, the feeling was general, particularly on the parts of the lesser developed countries, that this was the first session where there was any concrete result and any real feeling of mutually directed attention to a series of problems. From the U.S. standpoint, perhaps the greatest gain was an

appreciation of the general high level of intelligence, and keenness interest possessed by the representatives from the less developed countries.

The session was well attended, particularly by the lesser developed countries. At the beginning of the session, there were some 40 participants, total attendance during the session was probably close to 60 people. Although there were only six speakers from the lesser developed countries, two hours of the two and a half-hour session was occupied in their presentations. Representatives from the developed countries spoke for approximately thirty minutes in response to general or specific points raised by the lesser developed countries.

The Chairman outlined the major lacks that are experienced by most lesser developed countries: funds, experienced personnel, transportation, equipment, and similar facilities. As a spokesman for a lesser developed country, Sigit then outlined the four main problems that he saw facing Indonesia: (1) Translation of some 80,000 pages of pre-1950 geologic reports, published in the Dutch language. Dutch is no longer an official language in Indonesia; since 1955 English has been the official scientific language. Younger geologists are, therefore, cut off from the bulk of the country's older geologic reports. (2) Working manuals for the use of incompletely trained personnel, in such fields as "rock description" (stratigraphic and petrologic descriptions), "outcrop description" (field observations), sampling procedures, and ore handling, beneficiation and metallurgical procedures. (3) Problems in the publication of official reports on geology and mining engineering. These problems extend to the preparation of the reports both in terms of writing and in the preparation of maps. (4) Large diversities in the working standards of the numerous

foreign advisors from nine nations now engaged in Indonesia. It is difficult to compare the results of the work because of the difference in the standards to which the work is done. He noted that Indonesia needed assistance in the development of its own standards, to which the assisting teams could be asked to conform. Of these four problems, Sigit indicated that he thought the translation problem was the greatest.

As a general comment, he stated a point that was reiterated by many of the following speakers. The people in the lesser developed countries felt very strongly that what was needed was the participation of working geologists and engineers who initiated and stayed with a project to its completion, rather than short-term scientific and technical advisors.

Mr. C. Y. Li (ECAFE) immediately reiterated this point in his discussion. (1) Asian countries need more working help and not so much advice. One of the major problems in all of the lesser developed nations is the retention in operating positions of the trained personnel that they do have. Working conditions and pay should be such that the workers stay. There is difficulty in keeping good men in field jobs because, if they are good men, they are likely to be selected as administrators; and if they do well as administrators, they will probably be made ministers. As a result, there is a progressive depletion of personnel at the top. Retirement arrangements in many of these countries lead to early retirement. Therefore, there is little continuity in the operation of some of the governmental agencies. There are many changes in directorships; and as each director feels the need to make a mark for himself and may also have a desire to engage in political leadership, there are frequent changes in the objectives and the operations of the agencies for which the man

is responsible. (2) Li pointed out the necessity for a favorable climate for capital investment. All of the lesser developed countries have large capital requirements and almost without exception they lack their own capital resources. Foreign investment is, therefore, necessary, whether private, governmental—in the sense of long-term loans from other nations, or non-governmental—in the sense of loans from such agencies as the World Bank. To attract such investment, Li pointed out that there was a very strong need for a long-range policy on the part of the recipient government. (3) As a further comment on the need for working help rather than advice, Li suggested that possibly experts in the field from other countries, who have reached the age of retirement, might come to Asia to work on the longer-term projects.

Dr. Roberto Solorzano M. (Nicaragua) pointed out that Nicaragua was a small country where most effort previously had been expended on agriculture. Mining ventures contributed only about 10% (some \$8,000,000) of the total volume of exports. (1) Nicaragua has been subjected to the effects of wide price fluctuations in its other export materials (largely agricultural products) and as a result is attempting to broaden its base; it has, therefore, turned to increasing emphasis on the mineral field. The State is now engaged in developing a national mineral export policy based on the recommendations of the geological service. It is hoped that foreign capital investment will be prompted, and it is expected that this investment will be based on surveys made by the geological service. (2) A new law dealing with mineral resources is expected to be promulgated soon. Although he did not specifically state that the following points were part of the new law, nor that they were part of present government operational policy, he did say

that in order to promote investment the provisions would be in the nature of five year concessions for as much as 5,000 square kilometers, no surface taxes (possibly meaning a yearly lease-hold arrangement instead), concessions on exploitation, minerals to be taxed according to their worth in the world market rather than on a fixed basis, exemption from other taxes, and security of tenure. He saw the problems as: (1) Never having enough funds, although such activities as the U.N. Special Fund were helping very much. The visiting geologist program was a great help, particularly as it came at a lower cost than governmentally employed foreign specialists. Assistance in the form of both funds and personnel is needed and welcomed; he mentioned specifically the International Development Bank and personnel from the United States Geological Survey, and from other organizations. (2) A major problem is the centralization of a geological service, because certain types of investigations have been set up in separate units, the investigation of water resources and investigation of engineering geology problems, for example. There is a great need to put all these diverse units together in a single agency. (3) In staffing, there is both a need and a problem in the provision of domestic geologists for the geological service. There is no local geological education program, and at present there are only two scholarships available yearly for study abroad. He pointed out the necessity for four or more such scholarships in geologic and mineral engineering disciplines in foreign universities. Nicaragua has sought some alleviation from its personnel staffing problems by recruitment from other Central American Countries. (4) There is little appreciation on the part of local and national politicians and legislators of the necessity for basic geologic research. (5)

Finally, in discussing the relationship between government and private enterprise, he pointed out that the general situation has greatly changed in the last several decades. He felt that much emphasis must be given to the establishment of strong institutions at a government level, so that there would be some continuity of effort despite the possibility of waves of nationalism and anti-foreign propaganda. His was, in general, a very well presented, well thought out and coherent discussion of Nicaragua's problems.

Mr. Joseph G. Richards (Liberia) made many of the same points. (1) He stated that Liberian geologists, are few and are young, that there was a strong need for top-notch foreign personnel. Training is a problem throughout Liberia, particularly in selecting appropriate foreign institutions to which to send students for further education. A cataloging, in some detail, of the available training in various disciplines in other countries would be most useful. He specifically commented on the lack of domestic laboratory technicians and laboratory services and asked where such help could be obtained, and how the appropriate training for such technicians could be carried on. (2) Funds for research and for mineral development are increasingly difficult to get from the Liberian government, for there is a lack of appreciation of the importance of the basic research. Some of this indifference at the governmental level may stem from Liberia's success in iron ore discoveries in the past several years. There is a feeling of complacency; a feeling that they really do not need to do anymore. Richards suggests that the provision of aid from other countries would indicate the importance that others attach to this type of effort and might increase the stature of such requests when they are presented by his department to the national government.

Dr. E. M. el-Shazly (United Arab Republic) recognized the importance of the minerals industry, the necessity for a strong geological survey to undertake essential basic research, and the need to enlarge the area of search for additional mineral deposits. (1) He strongly backs a systematized integrated geological service approach. However, the geological service should not concentrate on a laboratory approach. It must include field work, and beyond that mining and experimental drilling as needed to prove up deposits. (2) He, too, commented that foreign advisors were less useful than foreign workers and emphasized the need to integrate both foreign workers and domestic trainees into single projects. (3) In the field of training, only experienced personnel should be sent abroad. Specifically, they should have five years of work first and then should be trained in areas and problems similar to those they will encounter at home. There is an opportunity for aid by some of the lesser developed countries to other lesser developed countries, particularly where they are encountering similar problems. (4) He took a very realistic attitude toward the kind of work to be done, commenting particularly that priorities had to be established; that the work had to be concentrated on those problems that were the most pressing. In the work itself, only essential techniques should be used, fancy or sophisticated methods should be avoided unless they were absolutely necessary. (5) He mentioned a 1955 UN publication on classification of iron ore deposits as the sort of project that was useful and desirable, and suggested that similar projects were needed.

Mr. S. F. Yeh (China) once again placed emphasis on the essential position and the urgent need for training of minerals personnel. In this case, the discussion was expanded to comment specifically on the necessity for

competent leadership at what Yeh called the "foreman" level. Apparently he uses this term in a different sense than our "foreman" meaning. Presumably he refers to a position that includes technical and mechanical competence rather than simply the leadership of a working gang, as we would commonly employ the term. In connection with minerals development, communications and transportation facilities must be integrated with any proposed project. The economic aspect of effective development was stressed in his comments about the necessity for market studies. He also made a useful comment in connection with the necessity for adequate power at the mining site. Throughout he stressed the need for an analysis of available data, and the necessity of taking some action on the possibilities rather than simply discussing them in a sterile atmosphere. He made a specific comment about the necessity of involving government in the operation, but without elaborating on what role he envisioned it playing.

Mr. R. A. Thomas (Trinidad and Tobago) said that his country's only known mineral resource is petroleum. Several people have been sent abroad for training in the general field of petroleum and on their return find that adequate positions were lacking. Trinidad has found special difficulty in the selection of foreign institutions, for the training degrees granted by the foreign institutions frequently have not been recognized by local petroleum companies. A catalog of acceptable institutions is needed. He stressed the following needs and problems of his country: (1) Good geological coverage; (2) study of the problems of secondary oil recovery; (3) study of the uses and effects of water encountered in drilling for oil; (4) diversification of oil and mineral products; (5) low government salaries; (6) a civil service board; (7) increased attendance in

world conferences to keep up-to-date; and (8) educating local people in their local problems.

Professor E. Tonani (Italy) replying to Mr. Yeh's comment on the need for power in relation to mineral development, suggested that consideration should be given to utilizing geothermal energy. This energy is claimed to be lowest cost of all available types. A cost of 1½ to 2 lira, presumably per kilowatt hour, was mentioned.

Professor Dr. H. Kupper (Austria) extended the remarks of others on the matter of training and laid special emphasis on careful, methodical observational methods, a point that others had not particularly mentioned. Most of the discussion on training has been a matter of lack of personnel, lack of training facilities, without emphasis on a truly scientific approach. The most significant attribute of a geologist is the ability to observe perceptively and record faithfully the details of the geological environment. This implies noticing both the presence or the absence of many subtle features. General impressions are not enough. Kupper also commented that lack of vision on the part of the government was a characteristic that is not at all peculiar to the lesser developed countries. He felt that inspiration and esprit de corps played a dominant part in the effective functioning of a geological survey. Where there is dedication to the advancement of the nation's interest, rapid development follows.

Mr. Richard W. Willett (New Zealand) commented on the difficulties of retaining senior staff personnel. New Zealand has achieved some success by making it possible to earn top-grade salaries without administrative responsibility. In the field of training, he has found that people willing to do field geology generally are harder to find than laboratory-minded personnel. The choice

should be made early in the course of training. In the early stages of mineral development, the necessity is for field personnel. There is, of course, a need for laboratory personnel, but it is by no means predominant. Willett re-emphasized the point that a developing country should not lean too heavily on foreign specialists in only an advisory capacity. Working foreign specialists may be more useful, so long as local geologists are kept with the group to assist in the project and to constantly pick up information just from simple association. Geological activities should be concentrated in a single group—a centralized geological service. Subdivision usually leads to isolation and this in turn effects the esprit de corps. It is from the close association of people working together that most useful ideas are generated. A cataloging of educational institutions listing their fields of specific strength would be useful. Willett reiterated el-Shazly's comment about the lure of fancy equipment and sophisticated but unessential techniques in the developing stage; the essentials are the only things that can be afforded. Willett offered geologic help in the field of geothermal energy, citing New Zealand's rather lengthy experience with this form of power production. He also offered help in terms of training and field work for geologists from the less developed countries in New Zealand, as well as the provision of New Zealand geologists for projects in the less developed countries.

Mr. Albert Hamou (Morocco) prefaced his remarks by stating that Morocco has made a serious effort in the field of mineral resources and that it is a large producer at the present time. The use of minerals must be enhanced, for the more they are used the more their value is increased. The lesser developed countries, and in particular Morocco, must not be just suppliers of

minerals for then the use is only a small part of the resource available. Countries must concentrate more on the domestic use of their own resources. A major problem for the countries that are mineral suppliers is the fluctuation of price in the world market competition. Many lesser developed countries have a "cash-crop" dependence upon the world market. If they are to remain suppliers, there must be some effort toward a price stabilization.

Mr. Claude Beaumont (France) said the lesser developed countries face as new problems the same problems that were faced earlier by the developing countries. It is to be hoped that they will profit from the errors and solutions encountered or achieved by the more developed countries. He emphasized that the methods that have been taught to their geologists and mining engineers must be put into actual application. This application should not be by visiting foreign advisors, it should be by long-term technical cooperation between countries. It can and should be at many different levels. In this collaboration, both sides stand to learn a great deal from each other.

Professor H. G. Fleming (United Kingdom) noted that in the field of ore beneficiation and processing, Mr. Sigit's request for working manuals can be solved cooperatively. For example, the United Kingdom could make available manuals on standardized processing techniques. In response to Mr. Li's point on the use of retired specialists, it is a very practical suggestion and would be of real value. However, it would probably be difficult to implement. Generally, it is hard to fit older men into governmentally structured organizations. However, employment of such personnel on a private contract basis might be feasible.

Dr. Kung-Ping Wang (U.S.A.) stressed the integrated approach to the solution of

mineral problems. Numerous factors are important in stimulating productive effort in the agency dealing with geological and mining engineering projects. These include congeniality and esprit de corps within the organization. Publication of the results of the investigations by the government is probably most important, as recognition by his co-workers is a major incentive to the scientific investigator.

Mr. J. C. Webb (International Atomic Energy Agency) said that training is the most vital need, but too much of it is done overseas. What is really needed is local training. A limited number of overseas fellowships may be advisable, but the establishment of regional training institutions might better serve the overall purpose. Another item that is vital is an understanding by the country's legislators of the need for mineral personnel. Many of the problems faced by the developing countries are strictly local problems and the advanced knowledge available to them from the developed countries frequently may not be applicable to the local problems. The few human resources available are often diluted by the subdivision of the geological and mining research into smaller semi-autonomous units, such as a special uranium unit or a ground water unit. Again the integrated approach and the centralized organization must be stressed. A possible way to alleviate the difficulties of recruitment and retention of geologists is by employment through agencies outside the general governmental structure. In this way, they can be freed from the restrictive salary brackets usually found in civil service organizations. The field equipment supplied as a form of aid from the developed countries frequently is inappropriate. For example, much equipment sent to the countries in the tropical rain

forest has not been tropicalized, and generally no provisions have been made for maintenance or repair of the equipment. As a final suggestion, Webb advanced the possibility of "adoption" of the geological surveys or services of the lesser developed countries by their counterparts in the developed countries.

Specialized Session

Mineral Development Policy

Officers

- Chairman — Mr. Albert Hamou
(Morocco)
- Rapporteur — Mr. Soetarjo Sigit
(Indonesia)
- Secretary — Professor A. Marussi
(UN)

U.S. Participants

- Mr. Northcutt Ely
Dr. Kung-Ping Wang

Professor A. Marussi, the Secretary, introduced the session by suggesting that the discussion be divided into essential aspects of a national mining policy, geological organization, elements of national mining legislation, and training of geologists and mining engineers.

The basic element in a national mining policy should be to devise a legislative formula that will bring about the maximum ultimate recovery of a nation's minerals, under conditions which will yield maximum benefits to its people while affording fair treatment to those who risk their capital to bring about this development. The importance of mineral development in advancing a national economy was stressed. It was pointed out that undeveloped mineral resources, unlike money in the bank, earn no

interest. Discussion was invited on the problem of mineral ownership and foreign investment, on taxation policy, and on the utilization of subsidies, bounties, tariffs, and rewards in connection with mineral development. Another basic aspect of a mineral development policy is the extent to which refining of minerals should be done within the country. Generally, it is agreed that minerals should be processed to the maximum extent before export; it is understood here that the word maximum means the maximum economic extent consistent with a competitive position in the world market. Mineral legislation should be consistent with the objectives of the national mineral policy as defined above. Inappropriately considered legislation can completely stifle any mineral development, regardless of the political philosophy or financial arrangements under which it is to be implemented. One of the basic features has to be a continuity of objectives, as exemplified in a long-range program. Geological research and mineral development are long-range programs themselves. They cannot operate effectively if there are mercurial changes in their objectives and administration.

The field of geological organization embraces the concept that it is a responsibility of a government to supply basic geological information and maps. Whether this should be done by a governmental organization or through one or a number of private organizations or institutions is a problem proposed for discussion. The matter of staffing such an organization, and the larger problem of training of geologists, mining engineers, and other technicians, from whom the staff will be drawn, is a basic problem for all nations whether lesser developed or more fully developed. Many aspects of this problem need to be discussed. The role of technical assistance from more developed countries to

the lesser developed countries is a subject particularly fruitful for such discussion.

In the broader scope, there must be integration of the entire minerals activities with the other aspects of the national economy, including transportation, communications, education, agriculture, access to capital resources and utilization of human resources.

Mr. Joseph G. Richards (Liberia), the first discussion leader, described Liberian mineral policy. He attributed Liberia's successes to a liberal policy and adequate planning in development, to a liberal taxation policy, and to emphasis on training. He stressed that in Liberia planning was directed toward simultaneous efforts in numerous lines—minerals, transportation, communications, etc. Liberia has a ten-year mapping plan and training program. The country is now covered almost entirely by air photographs, and at the same time that aerial photography was done, aeromagnetic and aeroscintillation surveys were made.

Liberia is well aware of the role that can and must be played by private enterprise (in this case foreign enterprise) in a country where there are limited capital resources. The country has an "open door" policy, but requires 50% Liberian participation in a mineral enterprise. Inducements and assistance to mineral enterprises were cited, such as duty-free privileges on equipment, lack of an income tax or royalty on mineral industries, and aid provided by the government in the form of roads and communications.

Mr. W. R. Buck (Canada), the next discussion leader, said that Canada's healthy position in the minerals field, despite numerous government changes, is the result of a political climate basically favorable to investment. For example, there is security of land tenure and generous disposition of mineral rights. There are tax incentive

actions such as (1) a three-year exemption from taxes for new mines, starting with the date of commercial production, (2) a one-third depletion allowance to be held in perpetuity on minerals except clays, sands and gravels, (3) provision for writing-off expenses for equipment, (4) freedom from a capital gains tax, (5) waiving of customs duties, (6) incentives for further processing of ores, and (7) other temporary special tax relief for specific industries or operations. The government supplies numerous kinds of services such as basic maps of several kinds, geological and geochemical prospecting maps; it does research on ore dressing, makes economic studies of market conditions, and in some cases assists with transport and housing. Through its established geological and mining services, the government participates in the training of personnel in the earth sciences field.

Professor Marcin Borecki (Poland), the next discussion leader, stressed the vital role of the mineral industries in the development of a national economy. He pointed out that in Poland, which contains about 10% of the known ore deposits in Europe, capital investment in minerals is about 20% of the total national investment. In the last 30 years, there has been great development in the minerals field, and production is now about three times the 1939 level. This increase required great effort and was achieved by central coordination in both exploration and research. Poland now has a Central Geological Research Institute operating under a Vice Prime Minister, employing several thousand scientists of all types. Borecki stressed the necessity for the organization of an internal geological service, either regional or national. He stressed the necessity of mapping at several scales consistent with specific objectives. Again it was pointed out that exploration was vital

to all development, and that development had to be integrated into the national economy particularly in terms of priorities, in timing of effort, and in expenditure of capital resources. He suggested that cooperation between lesser developed countries was essential, based particularly on similarity of geology and in financing problems, and that such cooperation, especially in the context of United Nations agencies, was a very useful development. On the basis of Poland's experience in mining, technical assistance teams were offered as needed to lesser developed countries.

Dr. Hannfried Putzer (Federal Republic of Germany), was the next discussion leader. He emphasized the training of scientific and technical personnel, and the basic role of geology in the national economy, particularly in relationship to the importance of trained field personnel. Field men are most important for the lesser developed countries where a very large lack of personnel exists. In the choice as to the place of training at home, abroad, or both, the following points were made: home training would be cheaper and would involve no social shock, and therefore could be a more productive experience. However, Putzer emphasized in most lesser developed countries there is a lack of library, laboratory and teaching facilities, and a general unavailability of maps. In training at a foreign institution, both the costs and the time involved are large. There are problems in housing, in food, and particularly in language. However, such training is more broadening than domestic training and probably leads to a better trained man in the long run. A combination of the two types of training seems to be most beneficial. Training also involves two general types, a basic school education in the sense of undergraduate and graduate formal education, which should be attained at a compe-

tent institution, and special types of training such as are available by working with an established geological survey or bureau of mines group. Stress was laid upon the fact that a student must have a command of the language before engaging in the training, and that the most valuable result of the training is the acquisition of the habit of doing systematic work, particularly in mapping and in general study of ore deposits.

Dr. Soetarjo Sigit (Indonesia) described the new mining and petroleum laws that have just been put into effect in Indonesia. The pre-war has been abrogated and the old concessions have been invalidated. The state has reaffirmed its sovereignty over all mineral deposits and will exercise control over them. Henceforth foreign participation will be on the basis of contracts with the government. Operations will be state enterprises in various degrees of involvement, depending upon the classification of the deposits. This classification includes "strategic" minerals, which will be developed only by the state or by combinations of the state and the provinces; "vital" minerals, which will allow for private participation with state and/or province organizations; and other minerals in which private enterprise may participate directly with provinces. It appears that there will be a great many individual boards exercising control over all mineral development.

Dr. E. M. el-Shazly (United Arab Republic) stated that exploration and exploitation of mineral resources again are essential elements in the development of a national economy. In Egypt, the policy now is for state interest in integrated development, and the state will participate in ventures, perhaps not in all, however. Efforts are being directed to increase the amount of exploration and research. Increased geologic mapping is being undertaken, research is

being conducted into various processing methods for minerals, and there is increased emphasis on local training. The state is engaged in the construction of ancillary facilities in connection with mining enterprises. El-Shazly brought up a point that probably is being considered although not stated by many others in less developed countries--there should be increased attention to the development of mineral resources for use in the domestic economy; such items as local sources of cement, gypsum, limestone, and salt; others could be mentioned.

Dr. Humberto Penaloza (Venezuela) said that the mineral development policy of a less developed country, as well as that of a more developed country, must fit the country's general economic policy. In Venezuela, there are three major problems. First, much of the Venezuelan mineral and petroleum production, particularly petroleum, is for export. Second, Venezuela cannot generate its own capital. Third, Venezuela is using some of its resources at a loss. The mineral development policy must be so calculated that it will overcome these three difficulties. Venezuela is now planning to concentrate on domestic consumption of its mineral resources in order to industrialize as much as quickly as possible, but in order to gain capital resources it must also continue to export. Therefore, it is desirable to raise the value of export materials as high as possible before export (presumably still keeping the material competitive in the world market). The Venezuelan approach obviously involves the role of public versus private capital in mineral development. Penaloza's reaction was that private capital is all right if it is extended on a short-term basis and if it has decreasing importance. He did not specify whether this meant a decrease in total amount or a decrease in

percentage involvement in the total expenditure within the country.

Mr. Claude Beaumont (France) noted that mineral development policy and the appraisal of a nation's resources are very closely interlinked, and in some respects the resource appraisal has to be done before an effective mineral development policy can be established. The job is long and involves much basic research. In most countries this probably has to be supported by the state. It is necessary to establish early a geological service despite the fact that there might be a great many training problems involved. An alternative in obtaining similar results to that of the geological service may be by the use of foreign commercial enterprises. A second alternative could be the type of assistance from foreign nations as is offered by the French Bureau of Geologic and Mining Research, wherein they will do parts or all of specific projects or programs on contractual assistance basis. They offer the facilities of an established well-staffed organization without the training problems involved in the first two methods.

Professor M. I. Agoshkov (USSR) said that mineral resources are very important in and to the lesser developed countries, and there may be idle capacity in terms of deposits that are not being utilized. He pointed out that there are several countries that have mineral wealth but that are not flourishing, and stated that this was a result of their past colonial status; the Congo had been hurt by its wealth. Turning particularly to the field of training, he bewailed the lack of funds available for training. It is not correct to blame a lack of interest on the part of the lesser developed countries, it is entirely a matter of funds. He suggested that where private enterprise is involved, the state does not get the funds in the amount due it from the results of the enterprise's

work. Tax policy is a good lever with which to liberate these funds. Throughout his discussion, he referred to the "extra" profits involved in private investment. As an example of what can be done by state investment, he cited the case of Kazakhstan where the funds for the training of a great many specialists have come from the production from Kazakhstan's mineral deposits.

Mr. Thomas L. Gibbs (Union of South Africa) said the basic need of the lesser developed countries is capital. South Africa has had somewhat the same history as other lesser developed countries in this need, but it depended on private enterprise to produce that capital and has found that allowing capital redemption is the basic means of encouraging private enterprise. By allowing tax free profit up to the amount of 6%, with a sliding scale above that, South Africa has provided a congenial atmosphere for private enterprise and has reaped handsome results in terms of funds in its own treasury.

Mr. Marcel N. Timus (Romania) indicated that the state should do all the work and then went on to comment about the basic need for exploration for mineral resources and placed much emphasis on the need for training. Specifically, he commented on a higher cost for personnel training abroad.

Mr. Northcutt Ely (USA) gave a very effective summary of his paper, "Legislative Choices in the Development of Mineral Resources" (A/309).

Professor Ivan De Magnee (Belgium) proposed "school" or "pilot" mines for training purposes, and suggested that one or more countries could collaborate in this approach. Although the idea is not new, as several countries have what might be described as demonstration mines, the idea of several countries getting together is perhaps a new shading of meaning that might excite some enthusiasm.

Mr. N. R. Lefevre (France) said that training institutes are usually lacking in less developed countries, and this problem must be speedily remedied. Training of personnel can be either in or out of the country, but because of the costs it is suggested that the lower-grade personnel be trained in the country, whereas the professionals, such as geologists and mining engineers, participate in foreign training. Lefevre indicated that there was still a need for prospectors in many of the developing countries and proposed a school of rather short duration to train them. Presumably they would be trained to recognize certain minerals in certain areas, although possibly the curriculum might include a sort of basic rock and mineral recognition course.

Mr. Richard W. Willett (New Zealand) emphasized that local training was of primary importance. In all lesser developed countries, there is opportunity to use the learning acquired either at home or overseas.

Professor F. Tonani (Italy) briefly described the on-the-spot research training that is available in many mining and petroleum companies.

Dr. Kung-Ping Wang emphasized the fact that training presents different problems for different disciplines, and what might be suitable for the training of mining engineers would not be suitable for the training of geologists and vice versa.

Dr. Etienne Stretta (UNESCO) emphasized that United Nations projects are always done with domestic counterparts in the countries involved. He commented that sometimes this could not be done in bilateral arrangements.

Mr. Joseph Barnea (UN) emphasized that the UN works as a team, taking into account the economics of the projects involved. He gave a brief description of some aspects of the UN work.

Mr. W. R. Buck (Canada) referred to the informal session held the morning of February 14 and replied to some questions asked at that time. In regard to institutions for training, he felt that the United Nations could be of help. There could be cooperation in the matters of information and selection of trainees between the mineral agencies of lesser developed countries and the developed countries, and direct liaison is needed here. In the matter of retaining minerals personnel and keeping them out of administration chores, he commented on a two-track system similar to that used in New Zealand. He suggested that the Chief Geologist for a geological service be made the senior technical person and not the senior administrator. He pointed out that in the effort to obtain more funds from national or provincial legislatures, an effective way to present the problem is through the use of mineral economics. There is an understanding by most legislators of facts presented in terms of quantities of materials and prices of goods. In the matter of translation and documentation, he assigned high priority to both efforts and suggested that this would be an appropriate field for United Nations assistance.

Mr. J. M. Rayner (Australia) stressed the importance of natural resources to the development of a national economy and cited the fact that the basis for the Australian economy had been the discovery of gold and lead-zinc deposits. He felt that much of the success that had resulted in Australian mineral industries was the result of the encouragement of private enterprise in the federation of states that make up Australia.

Mr. P. C. Legoux (France) pointed out that political questions are not in the field of the technical personnel but that the actions taken by the technical people have strong political implications. If private

capital is to be used, it must be rewarded. The rules must be defined and arbitration of disputes must be permitted.

Specialized Session

Mineral Exploration Methods and Concentration of Ores and Minerals

Officers

Chairman - Dr. William D. Johnston
(USA)

Rapporteur - Dr. S. H. U. Bowie
(United Kingdom)

U.S. Participant

Dr. Joseph L. Gillson

Mr. J. C. Webb (International Atomic Energy Agency), Secretary of this session, presented the report of the Conference Secretary-General. In his summary of this excellent review of the papers prepared for the Conference, Webb stressed the emphasis on the acquisition of basic geological information and the essential need for geologic mapping. He commented on the advantages to be offered by photogeologic techniques in the preparation of geologic maps, and the fact that such maps increase the capacity of the geologists to cover ground. In a sense, they can serve as a substitute for an increased number of field geologists. Geophysical techniques also extend the range of the geologist. Specific types of assessments can be done over much larger areas by the same number of personnel. In certain types of exploration, particularly geochemical exploration, much of the effort can be done by locally trained personnel who require a lesser degree of education. Some of these types of exploratory methods can be effectively obtained on a commercial contract basis. Radiometric methods of prospecting were mentioned, and it was again

pointed out that a large proportion of the physical effort can be conducted by relatively lesser trained personnel.

In the field of concentration of ores and minerals, mention was made of some of the newer processes, but it was also emphasized that many of the older processes are still particularly applicable for use in the lesser developed countries. The need for mineral dressing laboratories in many countries was mentioned in the lack of personnel for staffing the laboratories was touched upon. Particular mention was made of dry methods of concentration for use in areas of insufficient water supply. Portable and transportable concentrating plants can serve a useful function in many of the lesser developed countries.

The lack of personnel and training facilities was once again stressed as a major problem for all the developing countries. Specific reference was made to recommendations of an ECAFE seminar on "Aerial Survey Methods and Equipment" in which it was recommended that advanced training in geophysics be provided by fellowships at existing institutions and by the establishment of a training center for all airborne geophysical methods with a parallel technical course in operation and instrument maintenance.

Mr. J. M. Rayner (Australia), in discussing the organization of mineral resource surveys, described first the organization in Australia. He suggested that each lesser developed country should go as far as possible in setting up a governmental geological and mineral research bureau; the size and nature of such a service would vary from country to country.

Each country has two basic needs for the understanding of its geology; first, reconnaissance of large areas, and second, detailed work in promising areas. Useful

help can be obtained by contracting with commercial firms for photogeologic, aerophysical, and possibly geochemical reconnaissance, but such endeavors require an adequate understanding of what the contractor produces. The governmental agency, therefore, must have competent personnel who can appraise the reconnaissance results. Aerial photogeology is a most useful tool, but it is only a tool for the use of field geologists. The most useful results are achieved when the photogeologic map is made either by a field geologist who later modifies it in the field or by photogeologists who, with field geologists, later check it in the field. Aerial and ground geophysical investigations are usually conducted by a contractor. There is a tendency on the part of most lesser developed countries to overestimate the value of an aerial geophysical survey. Such surveys indicate areas of interest but by no means provide a final assessment of possibilities; by no means do they give discrete or complete answers to the geologic problem. In the reconnaissance effort, individual prospectors still have a very useful role to play in many lesser developed countries; with an adequate number of such prospectors a "brute force approach" can be used, if necessary, for the discovery of particular types of minerals.

In the second stage of detailed work, Rayner suggested that the geologic service should do some physical exploration, particularly drilling, both for economic reasons and for geologic information, for stratigraphic information as an example. In closing, he pointed out that the geological service must be an integrated team of differing skills. No single approach will contribute the best results.

Mr. Marelle (France) directed his remarks to various types of aerial reconnaissance techniques. In the field of geological mapping, he stated that many scales of maps

were necessary, and that photogeology supplied by commercial operations should be utilized as necessary. Aerial geophysical methods are sometimes overstated, for anomalies are difficult to interpret, even magnetic ones. He cautioned again that geophysical techniques are only one of a number of tools and that geophysical anomalies must be correlated with ground work for assessment purposes. In this connection, he spoke to the point that government must have an organization that can use the results of geophysical exploratory techniques provided by private contractors. The utilization of these results can be the bottleneck in a development program. The geological service must, therefore, have personnel adequately trained to appraise the results of the geophysical exploration. Where the geological service is small, the problem of keeping up with developments in the geophysical field may be quite great. He, too, emphasized that adequate training is essential for those who produce the surveys and maps and for those who produce the surveys and maps and for those who will later utilize them.

Professor F. Tonani (Italy) also discussed the problems of geophysical and geochemical techniques and their applicability in lesser developed countries. He made the point that such techniques are suitable only if they correlate with many economic factors. Geophysical techniques generally require a larger percentage of highly trained personnel than geochemical techniques, for example. While the coverage is broader in many of these sophisticated techniques, the costs are similarly higher. All of them require the services of skilled personnel to correlate and appraise the anomalies that are discovered in both geophysical and geochemical exploration. [The translation of Mr. Tonani's talk was most inadequate and this report undoubtedly omits a great many of his points.]

Dr. Humberto Penaloza (Venezuela) discussed the establishment of geological services in lesser developed countries. He associated himself with Mr. Rayner's statement that a country should go just as far as is possible in setting up a strong organization. He then proceeded to depict the role of the state in mineral development from the Venezuelan point of view. This has become a very strongly state-centered point of view. He commented that mining produced 1.3% of the total gross national product in 1961, amounting to about \$135 million, 92% of this sum was from the mining of iron. Petroleum produced some 28% of the gross national product, \$2.4 billion. Penaloza then listed a great many individual minerals that are now mined in Venezuela through a concession system. These include most of the ferrous and some of the non-ferrous metals. Sometimes additional minerals, which were not specified, were held for public ownership. He described briefly the organization of the Ministry of Mines and Hydrocarbons, which he described as having a vertical organizational responsibility. Some operations are delegated to private contractors but under strict control. The Department of Geology and Mines of the Ministry of Mines and Hydrocarbons has the responsibility of furnishing to the government all the necessary information upon which concession systems are based. He described briefly the iron, nickel, and phosphate programs.

Mr. Abolelaziz Benchekroun (Morocco) described briefly the organization of the geological service in Morocco, and indicated that among their primary jobs were the preparation of a general geologic map of the country, a study of the sedimentary basin that occupies a great deal of Morocco, and search and study for ore deposits, with particular stress upon clays, sands, and building materials—materials that can be

used directly in the domestic economy. The geological survey has the responsibility for checking and coordinating the work of private concerns. In addition, there is an ore treatment organization, whose responsibilities include study of ore characteristics and techniques of upgrading minerals, making detailed reserve appraisals, and conducting laboratory tests. Among the accomplishments of these organizations, he indicated that there had been a great deal of work with new techniques in geology. In the field of ore treatment, he mentioned the building of a phosphate beneficiation plant and a "milling laboratory," the preparation of flow sheet studies, and specifically study of magnetic concentration for high silica ores, of impurities in phosphate, and of copper flotation. Among the needs and problems for developing countries which he listed were: (1) Creation of a well-planned geological services bureau; with priorities established on an economic basis for the various efforts that it will undertake. (2) Reasoned choice in exploration methods to be used. (3) Feasibility studies must be conducted so that mining of ore deposits and ore dressing techniques can be coordinated. (4) Study of special methods of concentration, particularly dry flotation methods. He supported the idea of mobile units in processing ores. (5) Implementation of all these efforts, requiring large amounts of capital. For this the technical assistance programs that are now available are very good, and this was Morocco's first solution to its problem. It is now investigating the possibility of borrowing ahead on capital in the sense of a pre-sale of ore product in exchange for the financing of the plant to process the product.

Dr. E. M. el-Shazly (United Arab Republic), reiterating his remarks of an earlier session, concentrated on the essentiality of making good choices in exploration methods.

He stressed the possibility of two different kinds of work being conducted by a geological service concurrently, reconnaissance study via aerial photography and detailed field study of known deposits. In both of these efforts, the principle of similar environments must be borne in mind as clues to the geology of the area being studied. He mentioned that color is particularly useful in aerial photography in arid countries. The establishment of an integrated geological service is vital, a point that almost every speaker has dwelt upon. Stating that the 1955 United Nations Report on the classification of iron ore deposits was a particularly useful effort, he went on to suggest that a new United Nations Agency for mineral assistance and for exploitation be established. This follows a suggestion of such an agency at a conference in Cairo in July 1962.

Mr. S. H. U. Bowie (United Kingdom) holds the same general views on the feasibility of aerial photogeology, airborne geophysics, and geochemical appraisal methods as most of the previous speakers have held. As an expert in the field of uranium mineralogy, his comments that radiometric reconnaissance was not nearly as good as claimed has a considerable amount of weight. In the context of how far a less developed country should go in establishing its own geological service, he, too, felt that every possible effort should be made. The reconnaissance and detailed mapping that a geological service would do is of great importance, but prospecting for mineral deposits should not wait upon completion of maps. A less developed country should be very cautious about going in too deeply on sophisticated methods of analysis, of exploration techniques, and so forth. He subscribed to the idea that the individual prospector still was very useful, primarily in the less developed

countries. In other discussions, it has been tentatively suggested that a mono-mineral approach to prospecting be taken; that is, that a prospector look for a specific mineral rather than a range of minerals. Bowie very strongly supported the point that in any kind of geologic work all the information possible must be obtained about all the geologic features that are observable, obviously a multi-mineral approach results.

Dr. Soetarjo Sigit (Indonesia) noted that his country has special problems; it is a mountainous archipelago, inaccessible, occupying about 4% of the earth's surface, covered by deep soils developed on young volcanic rocks. In doing the geology of such an area, the most effective approach is a multi-purpose one. He stressed the need for geologists to have field level training; local training for about 2½ years would be sufficient for an "assistant" level. Indonesia has instituted a new one-year training program for prospectors, involving some 70 men at the present time, directed toward the recognition of specific minerals. Systematic mapping is needed in Indonesia, but it is being done modestly. The concentration of effort at present is on the geology of detailed areas. In Indonesia, the emphasis is first on aerial photogeology, second on geochemical exploration, thirdly and lastly on geophysical exploration. Some 40,000 square kilometers of photogeologic work are planned for the present year. Sigit asked for aid for Indonesia, but asked for "aid with understanding" of Indonesia's problems. He noted that there are some 46 Russian geologists engaged in Indonesia on specific projects.

Mr. A. L. Shaw (United Kingdom) has had some 20 years experience in the lesser developed countries as a geologist. He too stated that a geological service was necessary, but in addition to the reasons advanced previously, he suggested the necessity for

continuity of the record in the geologic data and for the building up of experience. Discussing aerial techniques, he commented that they give quick coverage, but it must be remembered that they give only a first result; they may disclose more problems than solutions. He then cautioned that a photogeologist must first of all be a geologist.

Professor Henri Ladmirant (Belgium), after long experience in Africa, has developed a flow sheet for the preparation of photogeologic maps. He offered this experience to the lesser developed countries on a private basis. He suggested the desirability of a training period for geologists in institutes in Africa.

Mr. W. R. Buck (Canada) pointed out that in 1950 only one-third of his country had been mapped. By 1960, some 70% had been mapped by speed-up methods utilizing aerial photography. In 1961, contracts were let to commercial companies for surveys. Field geologists have been brought from the various provinces to central training areas for intensive work. The objectives of much of this work are to provide the mineral industry with basic geologic data. Buck supported the idea advanced earlier in the Conference by Revelle and Fisher—the idea of a World Resources Development Institute.

Dr. Angel V. Borrello (Argentina) discussed the presence of magnetism in geosynclinal belts. In the geosyncline that occupies western Argentina and parts of Chile, there are some 12,000 mineral deposits in an area of tectonic folding. Aeromagnetics allow for identification of stratigraphic facies over wide areas and are also useful for the tracing of certain types of ore deposits (such as chrome-bearing rocks and phosphates). He catalogued some of the ore deposits.

Mr. Richard W. Willett (New Zealand) stressed the necessity for a centralized,

integrated geological service. Base maps are absolutely essential, for the topography and geology are intimately interrelated. Therefore, it seemed to him to make sense that the topographic or cartographic work and the geologic work should be handled within the same organization. He, too, commented upon the status of aerial photogeology, pointing out again that it is only a tool, not a panacea. He mentioned the necessity to have a competent staff to appraise the results of the geophysical techniques that are employed. Personally he valued physical exploration (in the sense of drilling and geochemical exploration) more highly than geophysical exploration. He stressed the need for training and the lack of students interested in the fields of geology, geophysics, geochemistry, and earth sciences. In some countries, there are local universities which each had some type of geological department, but none of which was really adequately staffed. As a solution, he suggested the possibility of the establishment of a central geological institute, taking the staff from each of the local universities and combining them into a single stronger organization.

Professor H. G. Fleming (United Kingdom) said that because the rate of consumption of minerals has been great, the more difficult refractory ores are now being treated. Most of the progress in the last two hundred years has taken place in the last thirty years, and there are no indications that this rate of speed-up and progress is at an end. He stressed the necessity for feasibility studies on ore deposits, commenting that the ability to dress an ore is a limiting factor upon the ore reserves. Turning to the establishment of local mills and portable mills, he voiced a word of caution. Blending of ores from several sources, although attractive, may not be feasible. Portable

mills in addition may not turn out to be good pilot plants. In the field of training, he mentioned that the standards of entrance are very high at many foreign institutions. By inference he suggested that entrance standards at institutions in some of the lesser developed countries are quite low, that the students graduating from the latter universities may not be sufficiently trained to undertake work at the foreign universities. He suggested that technical schools could add specifics on geology and mining to the basic physical sciences and that this would be most useful in the preparation of students for additional work elsewhere. He strongly suggested that the training of shift bosses be done at the local mines.

Dr. Joseph L. Gillson (U.S.A.) dealt with the subject of beach sands and pointed out the opportunity for the recovery of several different elements from this type of deposit. The so-called magnetite sands, for example, are good likely sources of titanium, for in the weathering process ilmenite associated with the magnetite is more resistant and remains after the magnetite is leached. In the fields of concentration, he mentioned that while gravity concentration is used and is inexpensive, spirals of the Humphrey type may be better. Pan concentration methods are good—they have more capacity, but less selectivity. Further separation of these heavy minerals usually is accomplished by electrostatic and electromagnetic methods.

Mr. Lecoq (France) stated that in certain areas where there is also a strong background (granitic areas for example), radiometric prospecting can be done—but it needs ground discrimination. In particular, he mentioned the occurrence of radioactive laterites, where again ground discrimination is essential. In simpler terms, this means that you must find out first what the background

count is, in order to distinguish significant anomalies above that count.

Mr. L. Scheffer (Switzerland) stated that before a survey could be made it was necessary to know the laws under which the survey is to be made. He also suggested that there should be cartels for the control of rare element production. He stressed the need for cooperation between the geologists and the mining engineers in order to provide for a good team. In discussing the role of large companies, he posed the oratorical question: "Should they provide their data to the less developed countries?"—and gave a categorical answer of "No." As a side comment, he stated that bauxite deposits should be state-owned.

Summary

Regardless of the country involved—whether it is more developed or less developed—there seems to be a complete understanding of the basic necessity of several things. There is a need to impress national legislatures with the essentiality of basic research in the natural resources field. This research should be conducted by a strong, integrated geological and mining service. Each country within its capabilities must attempt to establish this service in the fullest possible scope. The service must be staffed adequately by well-trained personnel from many differing disciplines who can work together as a team. Generally, it is felt that the focus of the service's efforts should be directed at applied research as well as basic research. This may well include physical exploration such as drilling, experimental or small-scale mining development, feasibility studies on ores, and analysis of markets. It is generally agreed that one of the major problems in staffing such a

service is the training of the professionals. Generally it is agreed that advanced training can be only acquired in the more developed countries. However, the training in the less developed countries at the undergraduate level should be strengthened considerably, in order to provide personnel with the best possible preparation for future training at other institutions. There is general agreement that there is a role to be played by the prospector, and various schemes have been suggested for short term one-to-two-year training of such people. It is generally agreed that a multi-mineral approach in prospecting should be adopted rather than a single mineral approach. In terms of exploration techniques, there is general agreement that aerial geophysical surveys serve a useful purpose if they are understood. They are only a tool; they do not delineate or locate significant deposits in every case. They must be interpreted and are subject to many uncertainties in such interpretation. The role of photogeology has been somewhat overstated. It will provide quick, wide preliminary coverage of large areas, but it must be used as a tool by the ground geologist. Inasmuch as photogeology is largely a study of geomorphologic features, some of which are capable of multiple interpretation, checking on the ground is essential. It must be considered as another tool for the field geologist. Geochemical exploration is highly thought of because it can employ a large number of relatively unskilled personnel for sample collection, and can thus cover large areas. The number of highly trained personnel required to analyze the samples and to analyze the results of the samples is relatively small. Generally it has been agreed that reconnaissance geologic mapping and detailed studies of known deposits should go on concurrently. The known deposits should then be used as clues to favorable

areas that might be encountered in the reconnaissance surveys.

It was unfortunate that few delegates from the lesser developed countries presented papers at this session. Generally, however, it was felt that there was some benefit from the session in that the basic nature and the common appreciation of the problems was once again made evident. The report of the Conference Secretary-General was extremely well done, adequate, objective, and gave thorough coverage.

The suggestion by Benchekrout of Morocco that one way to get capital resources for the erection of processing plants is to exchange future ore deliveries for the plant is perhaps worthy of note. El-Shazly of Egypt called for the establishment of a new U.N. agency to participate in exploitation of mineral deposits and general mineral assistance to the less developed countries. This is a proposal that apparently was first made at a conference in Cairo in July of 1962. Buck of Canada supported the idea of a World Resources Development Institute as proposed by Fisher and Revelle in a general paper from the United States. Willett of New Zealand suggested the establishment of a central geological institute in those countries where there are several faculties, none of which is particularly strong in mineral resources. He would transfer these faculties to the central geological institute, thereby establishing a single stronger teaching group. The idea might be expanded for the use of several neighboring countries, perhaps something that might be called a regional geologic institute.

Specialized Session

Mining Technology and Mechanization

Officers

Chairman - Dr. R. W. Willett (New Zealand)

Rapporteur - Mr. J. M. Rayner (Australia)

U.S. Participants

Dr. Kung-Ping Wang
Dr. Joseph Gillson
Mr. Harry Perry.

This session excited little interest. Over-all attendance never exceeded 40 people and at the end there were about 20. Not more than five or six less developed countries were represented at any one time, and except for China, did not participate in the discussion.

Mr. J. C. Webb (International Atomic Energy Agency) Secretary of Session, noted that most of the developments in mining technique have been in the field of mechanization, particularly in hydraulic mining, and in the field of transportation. Generally, these developments have been most suitable for large scale operations. In the lesser developed countries, government commonly encourages and participates to varying degrees in the development of mining technology and in mechanization. A major problem is the acquisition of capital funds and, in particular, the acquisition of foreign exchange for equipment requirements. There are many limitations on mechanization, including funds, problems of trained personnel, and the provision of power, either electrical, water, or internal combustion. Mechanization has additional effects on the labor resources. As mines tend to be more mechanized, the number of employees usually decreases; on a national scale mechanization of large-scale mining enterprises may result in large-scale additions to whatever type of relief is provided for the unemployed. In addition to the economic reasons for mechanization, there is a responsibility for humanitarian relief of human labor, in certain hazardous

or physically exhausting occupations. In summation, mechanization always has some type of impact on the local labor situation.

Dr. Kung-Ping Wang stated that the scale of operations in mining must be very carefully selected, whether for coal, ferrous metals, non-ferrous metals, or non-metals. It must be integrated with available power, market conditions, efficient underground operations, availability of labor, equipment, and many other factors. Mechanization always holds out the lure of more efficient operations and is, therefore, particularly attractive. However, it is as easy to over-mechanize as to be under-mechanized, and equally bad results may be obtained. The basic rule in mechanization is to use only what you can maintain. Mechanization implies that foreign exchange must be available for equipment and for repair parts. Trained personnel must be available for operation and for maintenance. Training of personnel is important, therefore, at several levels and training on the job is vital.

In the general field of mining, fairly recent advances in blasting (using ammonium nitrate-fuel oil as the blasting agent) and air drilling techniques (which have partially replaced diamond drilling techniques) have made it possible to use open cast mining methods where previously underground methods were necessary. Generally speaking, the open cast mine is cheaper to operate and easier to run. The possible use of the open cast technique should be borne in mind, particularly in areas where there is a reluctance on the part of labor to work underground. There have been many advancements in underground mining techniques; all of them give attention to safety in operations. In underground mining, good technical supervision is particularly important. If working is to be done underground, attempts should be directed toward the use of the adit mine

rather than incline or shaft sinking, for reasons of economy and efficiency.

There is a wide field for research in mining engineering and in mine operation; an intercountry cooperation in this research would be most useful. Many new advancements have been made in the technology of the non-metallic minerals and there may be fertile fields here for the development of deposits in the less developed countries. Geologists should become aware of the marketing and metallurgical problems associated with mining. In conclusion, Wang stressed the fact that mechanization is helpful but is no panacea, and that man is more important than the machine.

Mr. Antonio Caso (Spain) confined his remarks to coal mining technology. He pointed out that coal still supplied some 50% of the world's energy. Deposits vary greatly in distribution and habit, and so must the techniques of extraction. Exploration of the deposits obviously is required. Planning, research, and organization are three points vital to the operation of a successful mine. Changes in the use of coal have required the establishment and increased employment of coal washers. Normally this is a rather expensive operation, so an individual coal washer may have to service several mines. In all coal mining, specific and ever watchful vigilance is required in the realm of safety measures. As new techniques enable extremely rapid rates of advance, using loading shovels, conveyor belts, and coal cutters, safety measures become ever more important.

Professor Marcin Borecki (Poland) briefly sketched the status of the coal industry in Poland, discussed the Polish governmental organization in respect to mining, indicating that there were special institutes for safety, for health, for operating new mines, and for rehabilitating old mines.

He made an interesting comment to the effect that private enterprises were involved in the planning for export coal. He then indicated that because of its experience, Poland could export plans for mining to the lesser developed countries and offered to give aid in response to specific country requests. In quick summation, he indicated that in Poland there were (1) independent mines, (2) group mines, (these are presumably mines operated by a single group and in a generally restricted area), and (3) what he called cooperative mines, without very clear definition. Presumably these would be mines operated by different people under different organizations but cooperating to use common equipment or inclines or shafts. He stated that the cooperative mines are the best means of operation.

Mr. Thomas L. Gibbs (Union of South Africa) said that the discovery of an economic ore deposit is a great stimulant to the development of a lesser developed country. For example, discovery of diamonds and gold helped immensely to develop South Africa. There is no guaranteed approach to successful operation, but there is a key. This is adaptability, the ability to meeting changing conditions successfully. Gibbs also detailed the usual problems faced by all mining enterprises, shortages of power, of water, of labor, of goods. In large operations, specific men have responsibilities for those specific areas. In small mines, all these problems may have to be handled by one or at least a small number of men. In this sense, the operation of mines in a lesser developed country is a pioneering effort, and pioneering efforts by their very nature have large effects on the areas in which they occur. Gibbs feels that government assistance should not be advanced to mines as direct subsidies, with a few exceptions. There might be government loans, however.

Gibbs felt that the most effective stimulant was a reasonable tax formula—one with a sliding scale, larger taxes for larger profits to discourage high-grading of a deposit. The government should provide free advice. Lack of advice or bad advice can ruin mining enterprises, literally making deposits unworkable in the future, as well as ruining mining companies financially. In many areas where power and transport requirements are vital, Gibbs felt that the government should supply both on a reasonable basis. In conclusion, the nature of the ore body and the availability of labor must be known before any decision can be made on mechanization.

Mr. S. F. Yeh (China) made the point that even in a developed nation, newly opened mining districts are usually in less developed areas. He placed a great deal of emphasis on the safety aspect of mining, giving as examples new techniques in the production of pre-stressed concrete posts for mine support in Taiwan. The government has a large role to play in the development of mining sectors in Taiwan. For example, there are several leading agencies that supply funds, technical assistance, and marketing assistance. Government supports various types of construction with loans of up to 80 percent. Mechanization is very popular, and the government guarantees the sale of coal obtained as a result of mechanization. Numerous exploration efforts, for example, studies of offshore geology and specific drilling projects, have been started. Mr. Yeh suggests that one way to alleviate the requirements for large amounts of foreign exchange would be to have mining equipment produced by foreign companies, but built locally in Taiwan. Assistance from the United Nations would be good in the field of financing of small mines, but is needed as long term, low interest loans.

Mr. D. Sutton (United Kingdom) stressed the importance of obtaining good advice before opening or mechanizing a mine. He suggested that the government department of mines should help. Private advice can be used as a check. It is essential that proper equipment be selected, that spare parts be obtainable, that maintenance be at a high standard. He pointed out the possibility that working at the very highest rate possible might not be as advantageous, in the long run, as working at a somewhat slower rate; there might be a decrease in costs and hazards at the slower rate. He felt that the ore minerals should be concentrated to the highest degree possible, for doing so offers a great many advantages that over-ride any difficulties. The mine operators should take a long-range view of this problem rather than a limited week-to-week purview; they will benefit thereby. He mentioned also that open cast mining costs generally are 1/3 to 1/7 of underground mining costs.

Dr. Joseph L. Gillson discussed placer mining of heavy minerals and exploration of unconsolidated sands. In this connection, he mentioned the Banka drill, a driven-casing drill, producing a hole of 3/4 inch diameter, which allows for the collection of mineral sands by water jetting. He briefly mentioned various methods of sand mining and stressed that hand methods were useful, particularly in areas where equipment could be wrecked by storms along the beach. He discussed hydraulic methods for mining magnetite in Japan, and the uses of bucket lines and suction lines in dredging.

Mr. Harry Perry pointed out that mechanization cannot be used indiscriminately, but where it has been used production has increased greatly. In the United States, for example, the increase was from 7 to 14 tons per man day in the course of some twelve years. He gave comparative figures

to indicate that coal production in the USA is about 10 tons per man day for underground mining, 23 tons per man day for open cast mining, and 31 tons per man day for a development called auger mining or high-wall mining. He mentioned that it costs between 8 and 12 dollars per ton to mechanize and that the cost of openings and cleaning went up with mechanization. Mechanization has a great effect on labor in the U.S.; employment in coal mining dropped in ten years from 400,000 men to less than 150,000 men. He pointed out new developments in open cast mining—for example, shovels in use now have about a 45 cubic yard capacity, but 90 cubic yard capacity shovels are being built and 110 cubic yard capacities are anticipated. Similarly in trucks, 50 ton capacity trucks are in use, 90 ton capacity are being built.

Mr. X. Rey-Jouvin (France) said that coal mining can now be done to a depth of 1500 meters. Much progress has been made in diamond drilling and in mud circulation so that friable coal can now be cored. These new techniques in drilling allow for information on coal beds that could not previously be obtained and, therefore, open up new coal seams for mining. Drilling advance sometimes is 8 to 10 meters daily. He mentioned a double waterproof core barrel which can obtain some of the coal and gas in the coal at the same time, but this device was not very well described.

Mr. Falecki (United Nations Economic Commission for Europe) discussed the problem of international cooperation and the work of the coal committee of the Commission. He mentioned the reports published by the Commission and suggested that, as this work has broad coverage, it embodies information that would be useful for the lesser developed countries.

Dr. Mario Fragiaco (Italy) described the San Cataldo Mine in Sicily where kainite (a potassium-magnesium sulfate containing about 13% K) is being mined. The mine is very completely mechanized. They have a six-month training program for their 100 best employees, selected through an aptitude testing program. Output is now 25 tons per day per worker.

Mr. W. R. Buck (Canada) in connection with the development and mechanization of mines, discussed loans in Canada and specifically the Mine Development Bank. To obtain a loan from this bank, the borrower must prove that he cannot get funds from other private sources and must put up some of his own funds in the effort being suggested. As a general comment, Mr. Buck suggested that very careful review is necessary for all loan applications.

Mr. Marelle (France) stated that mechanization led to economies in operation. He stressed the fact that man preceded and was more important than the machine, and that better use had to be made of the labor displaced by mechanization.

In his closing remarks, Dr. Willett mentioned the aspects of assistance to small mines as discussed by Mr. Buck and stressed that as Dr. Wang had pointed out, mechanization was neither a magic word nor a cure-all.

Specialized Session

Energy Development Policies

Officers

Chairman — Mr. Celso C. Papadopoulos
(Argentina)

Rapporteur — Giancarlo Facca (Italy)

Secretary — Mr. Gustaaf van Rhyn
(ECE)

U.S. Participants

Mr. Northcutt Ely

Dr. Joseph L. Fisher

Mr. Walton Seymour

Summary

The questions posed in the Report of the Secretary-General for this session were discussed by the speakers, but as can be seen from the individual presentations, there was no consensus. This summary contains some of the significant points made during the meeting.

Since the theme of the entire Conference was economic development, the steps proposed for increasing production in less developed areas were complex and, in many instances, rely on availability of "energy." Coal, oil, natural gas, hydraulic and nuclear power furnish the means to generate electricity, and to supply other heat and motive power. These sources release the less efficient draft animals and allow wood, animal dung, and vegetable waste to be used as fertilizers and construction materials. Under appropriate geological conditions, geothermal energy and tidal power can supplement the above energy sources, and there is an increasing variety of ways, but generally of limited scale, in which wind power and solar energy can be exploited.

The agenda for "energy development policy" consisted of three items: the need for national organizations to formulate plans and carry out projects, the necessary evaluation of existing resources and future requirements, and the use of taxation, subsidies, tariffs and other legislation to implement policy.

The organizational basis of energy enterprises may be either public or private ownership. In the case of private ownership, the role of regulatory commissions as established in the United States for

protecting the public interest was not discussed, but one of the points developed at the Conference was that special forms of public ownership could be used. A form described was a government-owned, independent agency run as a non-profit business operation. But there could be a mixture of types, some private, some public, each chosen to best fit a particular situation. The form of the agency will influence the appraisal of whether it is a stable, low-risk investment, and thus how readily, and at what cost, investment funds can be obtained.

The question of how to coordinate activities also was discussed. Projects sponsored by separate agencies might not complement each other in making best use of the available energy resources. Some device or agency for coordination is needed to cover all energy resource development, including water resources if hydraulic power is an important factor.

Adequate geological and hydrological surveys are time consuming. It is best to start in the most promising areas, to initiate the surveys at the first opportunity, and to base initial projects on the data which is on hand.

Data on energy use and resource requirements can be simplified by reducing various quantities such as the energy from coal, dung, firewood, etc., to a common set of units. Data on other countries collected by such organizations as the World Power Conference may be of value for comparison. It was proposed that a "World Resources Development Institute" be established to undertake, among other things, statistical research on natural resources and foster exchange of such information.

Energy requirements should be forecast several years in advance as it takes this long to construct major electric power installations, to develop processing and distribu-

tion facilities for coal and oil, etc. When establishing new sources of supply, the extrapolation based on past trends in demand may not be valid, as development implies a break in the pattern of energy utilization, with substitution of energy sources and rapid increases in utilization. Extra capacity can be installed to furnish a reserve if some equipment breaks down or if the load grows unexpectedly fast.

Assistance in planning is available from consulting firms, from nations offering technical assistance, and from international organizations, and this type of assistance would also be the task of an "International Electric Power Agency" that was proposed by one of the speakers.

To increase productivity, it may be wise to encourage use of energy by avoiding heavy taxation of energy sales. A danger of subsidizing the cost of energy is that this may prolong the life of high cost energy enterprises and reduce the availability of funds for development. On the other hand, subsidy applied to such things as mechanization of a coal mine may improve performance and achieve a reduction in real costs. The devices used by governments to create a plentiful supply of energy and make it available at low cost to the consumer may cause other curtailments: balance must be achieved in relation to the overall needs of the economy. The desire to conserve exhaustible energy reserves may lead to favoring hydroelectric or nuclear projects before they are economically justified.

In sum, development will be retarded if economic criteria are not consistently and extensively applied.

Presentations

Mr. Gustaaf van Rhyn, the Session Secretary, stated that the interdependence of activities in the energy field will require an integral policy which would coordinate the

different sectors such as coal, oil, and electric power. Some type of centralized organization, although it could be made up of separate boards, would be required. An energy plan should be constructed in light of all requirements of the economy of the country—taking into consideration the requirements for industrialization, for equipment which would utilize electric power, etc.

In view of the long period required for the construction of electric power plants and the development of coal mines and oil fields, long range planning is quite important in the energy field. Energy requirements in less developed areas cannot be found by simply extrapolating from past experience.

The test of a successful policy lies in supplying energy at as low a cost as possible. Subsidies may be dangerous, but in rural electrification this may be justified by social and economic benefits.

Mr. Walton Seymour discussed examples of the type of organization which could be set up for resource development. He referred to commissions, authorities, and corporations which had been established by legislation both in the Commonwealth of Puerto Rico and in continental United States, in El Salvador, Greece and Iran to furnish electric power, develop water resources and, in the case of Greece, to produce lignite. These agencies own and operate the facilities, serve customers, and receive appropriations from their governments, but are set up as independent entities to be run as non-profit business operations and not as branches of regular government agencies. These agencies also raise funds in capital markets and have been able to show that they are stable and represent a good, low-risk investment. In each case, the system has been successful in attracting competent personnel, in raising the required capital, in encouraging effective use and in making the resources available.

Dr. Peter Lazar (Hungary) emphasized that energy development policy should be treated as a part of general economic policy. Productivity of labor is raised by use of power.

Reduce the measurement of the various forms of energy such as heat, mechanical energy, and chemical energy, to one common unit of measurement such as the calorie or the kwh. It is then easy to calculate the national efficiency in particular uses of energy. For example, one square meter of textile requires "X" kwh in one country and "Y" kwh in another. Time is scarce. Don't wait for an inventory before going ahead with energy development. The danger of delay is greater than the danger of not making the best choice. It is also impossible to plan energy production without developing distribution and utilization.

Dr. Joseph L. Fisher said that one should not look at "policy" as a complete set of principles that cover all contingencies and integrate all action, but rather it is a statement of objectives (appropriate at a particular time in a particular country), plus a changing set of programs to meet these objectives. Therefore, he said that a country could be rewarded if it retains an open mind regarding types of fuel, whether the sources be from domestic reserves or by importation, and sees that it takes full advantage of substitutions. In answer to the question "Should the policy allow free choice of fuels by consumers?" Fisher answered that a primary objective might be for a country to widen choices available for meeting its energy requirements. In response to the query "What type of organization for outlining and implementing an energy policy?", Fisher suggested that a country should experiment in its organization—public, private or mixed, either on a national or regional scale—to find a suitable and effective form. He initiated his

comment on "methods of forecast of energy needs" by listing several techniques which have been used, and then urged that each country make deliberate experiments in order to choose and improve its forecasting methods.

Dr. Albert Parker (U.K.) was appreciative of the Secretary-General's well-balanced general reports. In regard to the proposal by Fisher and Reville (A/369) that a "World Resources Development Institute" undertake among other things, statistical research on natural resources and foster exchange of such information, Parker pointed to work already carried on by the World Power Conference. He referred to a series of publications, and in particular, the World Power Conference Survey of Energy Resources, 1962, which includes tables on areas and population and on resources of solid, liquid and gaseous fuels, of water power, and oxides of uranium and thorium as nuclear fuels. Bhabha (India) has claimed that on the basis of World Power Conference statistics, the estimated reserves of economically recoverable fossil fuel would be exhausted in about 75 years. Parker does not accept this and claims that these reserves will last more than 75 years, but agrees that nuclear power, first fission then later fusion, will play an important role. Reactors are only 1% efficient, which leaves much room for improvement. Noting the increase in the world's population, Parker claims a food shortage may develop, but not an energy shortage.

A national energy policy requires trustworthy information on indigenous energy resources, so that if these are not adequate, import could be considered. The survey of resources should include the possible markets for energy. The survey can be conducted through a contracting firm, and also secondary and scientific technical education could

be promoted in order to have occupants in an area conduct the survey.

The national policy should be toward financial gain and not just being "modern."

Mr. Northcutt Ely urged a policy in which a country would not impose high taxes on the consumption of fuel or electric power. Energy, he said, should be made available abundantly and cheaply. The investment in equipment for the energy-producing industry is one which is paid back slowly over a long period of time. The large amounts of required capital cannot be obtained in the form of non-reimbursable foreign aid, but rather this money must be borrowed from private investors or foreign governments. Interest must be paid. A step which can be taken to obtain a low interest rate is to achieve a good reputation for respecting foreign investments, neither repudiating debts nor expropriating foreign funds.

Mr. Adolfo Dorfman (ECLA) agreed with Fisher that mere extrapolation did not have validity as the basis for forecast of energy requirements in the less developed areas. He pointed out that coal, petroleum, and electric power may each have a different function, which should be considered in relation to their price. The pattern of fuel consumption is subject to change, for instance, in the relative use of gasoline and oil. No coherent price policy exists in Latin America. Subsidies, both hidden and open, favor one fuel over another, in order, for reasons of social welfare, to keep industry of low productivity in business. In most Latin American countries both oil and electric power industries are part of the public sector.

Dr. Igor V. Komar (USSR) said that the contributed papers, particularly in the concrete aspects they discuss, should be very useful, particularly the Mexican paper A/329 and the Romanian paper A/205, both of which deal with the appraisal of existing resources

and foreseeable requirements. On the other hand, "lower price" or "general availability" are too abstract for a policy concept; they do not form a rational basis as both factors work in the same direction, and vary from country to country.

Although this session is devoted to energy policy and does not deal with general over-all economic questions, energy policy could play a subordinate role; it must fit into the economic policy of the country as a whole, and a rational policy should be of general benefit to the country.

The U.S.S.R. has developed its oil deposits, and a huge pipeline is almost finished which extends from the Urals to the Volga. This will be the biggest in the world, bigger than the "Big Inch" and other pipelines. With this development, and because of socialist cooperation, the absence of oil in a socialist state will not hold back its development.

Ely's statement that a socialist state is transformed into a capitalist one by assisting less developed areas is just a play on words.¹ Parker's view that there will not be a general world shortage of energy resources, but possibly there would be a shortage of food, is a surprising statement. He should leave this subject to the agricultural experts—they say that the potential for food is sufficient.

Mr. A. F. Peters (UK) commented that the question of whether or not to develop indigenous resources must be decided in terms of comparative costs. Import duty and

¹Mr. Ely's statement was "This is true whether the money is borrowed from a foreign private investor, or a foreign government, because the foreign government that lends money, expecting to get it back, operates as a capitalist with respect to that transaction, even if it is a Socialist government."

revenue taxes on fuel are not good policy, as the demand for fuel is not inelastic. A tax can make export products noncompetitive — such is the case for some British exports because of United Kingdom taxes. Also, a profits tax can impede the inflow of capital. Komar is right that "low price" and "general availability" are not true alternatives — there is the question of generating sufficient revenue to obtain the required foreign exchange.

Forecasting energy requirements is not easy. For instance, six to seven years ago a general fuel shortage in Europe was predicted, but this did not materialize.

Dr. M. A. el-Koshairy (UAR) said that in 1953 the U.A.R. Electricity Commission was established to appraise power needs and organize, under a 5-year plan, the coordination of plant construction. Standard voltage levels were chosen, plan continually revised, and consultants called in. Research and development equipment being purchased include a network analyzer, digital computer, and a soil analyzer. Personnel from other countries may share the use of these facilities.

The generation capacity in Egypt, including plant installed by industrial companies for their own use, amounts to 340 mw (megawatts) in 1952, 1000 mw in 1962 and 1500 mw in 1966 for thermal capacity; negligible in 1952, 345 mw in 1962 and 2400 mw in 1970 for hydro capacity; and 150 mw in 1967 for nuclear. A high-voltage transmission network with voltage levels up to 500 kv will interconnect each of the load and generation centers.

An "Electric Power Agency" should be established in Geneva to offer technical advice and help countries set up their own organization.

Prof. Remus Radulet (Romania) noted that sizable expenditures are required for

exploration of resources, but in Romania this had led to the discovery of new oil fields. It requires decades in order to obtain reliable hydro data, but such a survey is worthwhile and will give a good return.

Regarding the methods described by the Economic Commission for Europe in A/119 for the evaluation of foreseeable energy requirements, functional relations cannot be made for developing countries because of lack of appropriate data. However, the direct method of extrapolating growth rate gives good results for those countries beyond the first stage, provided there is no radical economic or social changes of structure. Long-term power balance sheets can be compared and the most favorable one selected through use of "linear programming" of electronic computers.

Mr. J. M. Rayner (Australia) pointed out that Australia is an example of a country without indigenous production of oil or natural gas, but with resources of both brown and black coal. Petroleum is imported in increasing amounts each year, and in 1960/61, this amounted to 10% of the total value of all Australian imports. As part of the oil policy, large scale oil refining was established in 1954, with the refinery output proportioned according to the consumption of the various petroleum products. When the refinery was able to meet the demand, imports of fuel oil were prohibited in order to conserve foreign exchange. This restriction was lifted in 1960.

To protect the coal industry, a subsidy was given for new equipment for coal mines and some subsidy was also given for coal transport. With mechanization the real cost of coal was reduced and production has increased. Now the customer can choose the fuel he prefers.

Although direct control of allocation of imported fuel is a method of protecting the

coal industry which does not alter the cost of fuel, the control of consumer operations has the disadvantage that it may retard technological development. A tax policy, unless it is severe, is not effective in changing the relative consumption of coal and oil.

Academician G. V. Bogomolov (Byelorussian SSR) said that a new source of energy can be utilized. This is ground water which is hot and under pressure, and which is found in zones of recent geological age. The temperatures range from 50°C to 100°C. The pressures are such that in Tunisia the water rises 100 meters above the earth. The water is located in "faults" from one to four kilometers below the surface. Both fresh water and electric energy can be produced. The zones are found in U.S.S.R., the Sahara-Morocco, Algeria, Tunisia, Libya, Egypt-Italy, Australia, and New Zealand. The exploitation will not be expensive.

Mr. R. W. Willett (New Zealand) responded to the question raised in the Report of the Conference Secretary-General, "How can exploration for fossil fuels be speeded up?" by stating that, although aerial surveys and photogeology are helpful, detailed ground exploration and drilling are required. The knowledge gained may be put to more than one use. Coal studies in New Zealand have helped in the search for oil, and in this work young students of geology have been trained.

The thermal gradient of faults referred to by Bogomolov is found in areas of young volcanic activity - including Japan and El Salvador. In New Zealand, the faults are at a depth of 3,000 feet.

Dr. Humberto Penaloza (Venezuela) reviewed petroleum production in Venezuela, investments being made for economic development from oil receipts, and made the point that certain international policies of other countries could be of harm to a developing

nation. He gave as an example the policy by which the U.S. in 1959 protected the U.S. domestic oil industry, the action of the German Federal Republic in the protection of its coal mining industry, and the activity of the U.S.S.R. on the world oil market. He looks forward to the time when an increased standard of living throughout the world will raise the demand for petroleum.

Mr. J. Barnea (U.N.) said that the obstacle to development may not be the lack of technology, but rather the lack of coordination within a government—one agency going forward with a construction program or a policy in direct conflict with that of another agency. For example, a thermal station at a coal mine and a hydroelectric plant both constructed, when one would meet the requirements. Barnea further questioned the development of hydroelectric power in areas where natural gas was available, or the establishment of industries in which maximum use was not made of the equipment installed. Unnecessary steps should be avoided — such as resource surveys when known deposits will do. Necessary information, however, includes knowledge of one's energy processing and energy transport facilities already available.

The United Nations activities in the energy field include organization of a series of conferences: On New Sources of Energy, Rome, August, 1961; seminars to be held in 1963 in Latin America, the Far East, and Africa, and in 1964, an inter-regional seminar on oil. The U.N. furnishes assistance for training and exploration. Through the "Special Fund," energy surveys are conducted, but these funds are not used for investments.

Mr. L. Lebacqz (Belgium) pointed out that in energy policy, it is not only important to develop low cost energy sources, but also cheap energy transport. In Ruanda-

Urundi, an experiment was conducted in 1958-59 in the use of protected wood poles for electric power rural distribution lines, operating at 15.kv.

Mr. W. Keith Buck (Canada) said that Canada has been successful in developing its oil industry by means of its subsidy, tax, and tariff policies. Depletion allowances were generous, there were tax incentives for pipeline construction, and a 3-year tax exemption was allowed. Canada depended completely on imported oil 12 to 13 years ago, but now the country is 80% self-sufficient.

Mr. Korgut Ozal (Turkey) agreed that a single organization for energy development might be of advantage, but asked the question, in view of Turkey's dependence on hydro power, whether there should be a single organization for both power and water.

Mr. Celso Papadopulos (Argentina), the Chairman, gave a summary at the close of the session. He said that some believe there should be national energy agencies, others do not. Some approve of subsidies and feel taxes should not be imposed, others do not agree. Evaluation of existing resources is necessary, but some actions, such as prospecting for mines, may take too long to be depended upon.

But it is possible to establish an energy policy, provided it is not rigid and can fit the changing situation. The goal is not to produce energy, but to build a country.

Specialized Session

Electric Power

Officers

Chairman — Mr. P. Ailleret (France)
Rapporteur — Dr. M. A. el-Kosheiri (UAR)
Secretary — Mr. M. K. Gopaliengar (UN)

U.S. Participants

Mr. Walton Seymour

Dr. Jerome K. Delson

Summary

Electric energy has proved less expensive when it is produced on a large scale and when it is delivered to customers, grouped near the supply centers, who sustain their demand for power a good portion of the day. These conditions are found in urban, industrial economies. On the other hand, high costs can be expected in an area, particularly a rural one, which is not well developed economically. This describes a vicious circle—high costs slow down the growth in utilization, while low level of demand keeps the cost high.

For small-scale or "first stage" power supplies, there is some urgency on the engineering side to achieve, through technical innovation and careful system design, lower costs for construction and operating expenses.

Concurrent efforts are necessary, as the supply of power is made available, to meet social and economic problems which may inhibit the full and productive use of the power.

Pertinent innovations in equipment, particularly in generator design, can be reported. Equipment which has proved its usefulness and is now in a mature stage of development should be "standardized." In this type of equipment, further modification is unlikely to bring substantial gain. Through the acceptance of restricted choice, a limit placed on the variety of equipment sizes and designs reduces the cost of manufacture, simplifies training of personnel, and cuts the necessary stock of replacement parts. Properly written standards can permit di-

veristy of manufacture and encourage competition.¹

Rural electrification may be supplied by generators serving individual villages, and this becomes practical where a load can be developed for a capacity of at least 25 or 50 kw. Even at this stage, a standard frequency and voltage would help prepare for the eventual interconnection into a network. In this regard, American manufacturers were urged to adopt the European standards of 50 cps (cycles per second) and 380/220v. for equipment they shipped abroad.

For the hundreds of thousands of villages in India with a population less than 500, the electrical load that could be initially developed may be below the level for economic operation of individual 25 or 50 kw generators. (The exception in some cases would be the application of small hydraulic- or wind-powered generators). Barring the possibility of relocating the people into towns to concentrate the electrical load, an alternative is to distribute power from each generator site to a cluster of villages via low-cost lines.

Large motors, over 5 to 10 horsepower, generally require a three-phase supply. If only small motors are used, which is often the case for rural loads, a single-phase supply is sufficient. In this case, the neutral conductor may be of reduced cross-section if the earth used is part of the return circuit. Completely omitting the neutral in a single-phase circuit entails the expense

¹A speaker proposed that a small but highly competent team of experts, financed through the U.N. technical assistance budget, conduct systematic study of the standardization of the electric plant and equipment specially suited to sparsely-populated, low-consumption countries.

of a fully reliable earth connection at each load point, but in a less developed area the small number of load points represented by a group of villages may favor this type of construction.

Above certain load densities, a three-phase system is less costly than a single-phase system. An economical approach may be to design part of the lines three-phase and part single-phase, with provision made for converting the single-phase section to three-phase as the load level increases. Small loads would be served with a single-phase connection, even if they are located along three-phase line sections.

Once the load on a rural network develops, or sizable domestic and industrial loads are reached in urban centers, stations can be employed which are larger than the usual limit (between 5,000 and 10,000 kw) for diesel stations. The innovations in generation previously referred to include the gas turbine and free-piston generator which are finding application in the intermediate range of 6,000 kw to 25,000 kw stations. Steam turbines are most economic for large stations, except for locations with favorable sites for hydroelectric power.

Selected Presentations

Mr. M. K. Gopaliengar, the Secretary, noted that the papers contributed to this session dealt primarily with electrical generating plants. A U.S. research team pointed out that 10 kw to 15 kw generators utilizing local fuels such as agricultural wastes, wind, or solar power, were too small, and that the minimum size for consideration should be 50 kw with additional capacity for growth and standby. This would be suitable for a town of 2,000 - 3,000 population. Yet, in India 67% of the villages have less than 500 people and there the 50 kw unit would not be effectively utilized.

In meeting the requirements for electrical generators of various sizes, diesel generating units may be economically employed in stations up to about 5,000 kw, while the large thermal stations use steam power. There is an intermediate range when gas turbines, or the free-piston gas generator may be most practical. For small hydroelectric plants, machines with simplified construction and operation are available. Standardized construction should be adopted for small scale generators to reduce their cost, simplify maintenance procedures and reduce the requirements for spare parts.

Wind power can be of significance in some cases, particularly where it is possible to make use of an intermittent supply.

Rural electrification is not a paying proposition, therefore economy measures are important, such as the use of single-phase distribution lines (if the load is not made up of large motors), simplified and standardized construction of networks and use of volunteer labor and of local materials in line construction.

Mr. E. V. Golding (United Kingdom) noted that most of the papers submitted discuss large generating plants, but before such stations are economical the utilization of electric power must be developed. In rural areas, one starts on a modest scale, but even there a balance must be struck between distributing power to several load areas from a single plant, and the alternative of installing a small plant at each of the load centers. Cost reductions must be sought, perhaps through use of single-phase transmission with a ground return, and use of local materials and labor. A Brazilian paper argues against single-phase construction, but such construction can reduce the cost by 30% to 40%. It permits the very long, single-conductor spans which are used in Australia. It also may be possible to relax

the regulations for overhead lines. As the load grows, it is possible to change over to three-phase construction.

To reduce the unit cost, load levels must be built up. To justify the expense of electrification, the power must be used in ways which will increase the consumers' income. Although it is good to furnish electric light, one can do without it if there is not enough money to purchase food. Electrification may be subsidized at first, but eventually it must stand on its own feet.

There is a limit of 20 to 30 kilometers to which it is economically feasible, with relatively light load, to extend distribution lines. There will remain in some areas the question of serving the small, isolated loads. If the consumers can be moved closer together, as is being done in Russia and Japan, electric power can be furnished more economically. But to meet the small, isolated loads, diesel units or in some cases wind power should be used. As for size of plant, the presentation in the U.S. paper (A/356) was excellent, but their specific recommendation of a minimum size of 50 kw for diesel plants would not apply to the small villages of 500 people. Here a 25 kw unit with a 12-1/2 kw standby would be more suitable.

Wind power has often been dismissed because of technique of charging batteries during periods of high wind so that power is available when the wind subsides involves extra expense. But storage is not always essential and, if such is the case, wind power, using standardized equipment, could furnish the most feasible power supply.

Training schemes are often too ambitious. Based on experience in Nigeria and Uganda, elementary "ad hoc" training is sufficient. Training for a certificate is not needed. Just train to run the machine. Pictures, instead of written instructions, could be

used to show how to maintain diesel equipment.

(Distributed at the Conference were copies of the booklet "Power Supplies," written by Mr. Golding and published by the Overseas Development Institute, London. It contains a more detailed review of the considerations in establishing a power supply.)

Mrs. N. S. Kurbatove (Ukraine) said that the rate of electric development in the USSR has determined its rate of development in terms of its per capita Gross National Product. Electricity brings whole areas alive, particularly in agriculture. It is important to the nations of the world. They can be classified:

	<u>% World Population</u>	<u>% World Electric Power</u>
Industrially developed	30%	84%
Developing (Asia, S. America, Africa)	20%	1%
Other (intermediate) countries	50%	15%

Two billion people do not enjoy the fruits of electricity. It is a problem to be solved by all of mankind. The highly developed nations must not stand in the sidelines, but must give direct help with machines and technical assistance. The example of development in USSR shows that one can be optimistic. Russia in 1913 had less than 1,000 mw installed capacity, ranked 15th in the world and 7th in Europe. Lenin saw that electrification was paramount. Today Russia is second in the world in electric capacity and is building the world's largest hydro stations.

In developing a power supply, local conditions determine the preferred source: organic fuel complemented by nuclear, solar, and wind power. Time is important to developing countries, and under present conditions, the sources will mainly be the classic ones. It is not necessary to debate the size of stations. Build large and small, but don't be afraid of large stations. In USSR, stations were built in the desert and in the forest, and industries and cities grew up about them. The unit costs are lower on large units, even though large stations are built individually and not mass produced.

Rural electrification starts with units from 10 kw up to 1,000 kw. In 1955, in USSR, 30% of local stations were less than 50 kw. The country covers a large territory and, in 1960, small stations (25 or 50 kw) were still 10% of the total. Small stations are not sufficient for growing needs. Small thermal stations are expensive. Small hydro stations require fewer operating personnel, but do not assure constant supply. If a network is built, advantage can be taken of diversity. For example, two 250 kw units were able to serve 20% more load when their two networks were interconnected. This lowers the cost and permits increased use. If the network functions well, its expenditure will be paid back many times. As for large scale networks, the power systems in USSR are being integrated with those of Czechoslovakia and Romania.

There were no trained workers to start with. The numbers are large now, but still insufficient. Evening and correspondence courses allow individuals to be trained for highly skilled tasks without a loss in production due to time off from their work. Leave-time is given for examinations, special subsidies are given, modern audio-visual methods

are used, and books and publications authored by outstanding authorities are supplied.

Mr. Stjepan Han (Yugoslavia) emphasized that electrification and economic growth go hand-in-hand. This is also a vicious circle, in which high cost at first prevents development. Reduction of electric power costs can have an important effect on the entire economy. The profitability of electric power need not always be judged in terms of its own costs and revenues. Use of power is closely tied to economic utilization of natural resources. Projects should be initiated, even with appraisals based on limited data; additional study can be carried on concurrently.

Noting that papers A/162 (USSR), A/201 (Mexico), and A/333 (Yugoslavia) each speak of standardization, he recommended that a committee should be formed to promote standardization.

Mr. Harry Werner Bjerkebo (Norway) said that in his country the fertilizer and aluminum industries have developed their own supply, but the state has helped in the financing. Distribution and sale is not done by the state, but rather by counties. The state furnished financial assistance particularly in bringing power to areas which are not heavily populated. Today, 99.4% of the population has a regular supply. The larger municipalities, counties, and the state have financed the large units which feed the transmission networks.

Norway, with the use of its hydroelectric resources, tops the list in per capita use of electricity. Initially, the supply was from thermal plants and was used in the cities for illumination and industry. After a transmission system was started, hydroelectric power was developed. Many excellent sites were available.

<u>Date</u>	<u>Capacity</u>	<u>No. of Plants</u>
1901	37 mw	614
World War I	560 (50% Thermal)	
World War II	2,100	2000 (of which 1460 were less than 100 kw)
1962	7,400 (all hydro)	1950 (of which 1260 were less than 100 kw)

The number of small plants has decreased, due to their retirement or relatively high running expense. Only 1/3 of hydro resources have been developed. The public supply is owned jointly by municipalities and the state.

In Norway, the pattern of growth followed a natural development, starting with small plants, installing the plants of larger size as the interconnections grew. To facilitate interconnections, it is necessary to standardize voltage and frequency used in the individual areas. The International Electrotechnical Commission works toward such standardization. In regard to plant construction, it will be difficult to standardize hydroelectric plants, as the plants must be individually designed to fit each site. In regard to rural transmission lines, three-phase construction was found most economical, one-phase being used only in special cases. A study on this will be released shortly by the Norwegian Research Institute.

To train personnel, after primary schooling, give specialized training with emphasis on practical demonstration courses. Follow and take interest in the progress of each individual.

Mr. F. Auroy (France) discussed the advantages of "bulb type" hydraulic turbines: compact construction, reduced weight, adaptability for sites with a head as low as 1.5 meters, and automatic operation (controlled by the level of the river). The sets come in a range of sizes and are under continuing development. One of the newer types uses permanent magnet excitation. Some sizes are already at the point of standardization. The sets can operate efficiently either as a turbine-driven generator or a motor-driven pump. A special application is in harnessing tidal power.

Mr. Roland David (France) discussed improvements made in construction of generators used in central power stations. He mentioned the use of synthetic resins for insulation, hydrogen for cooling, simplified rotor construction, etc.

Mr. P. Chambadal (France) said that the best choice for prime mover in thermal power stations of up to 6 or 7 mw (megawatts) is the diesel engine; over 40 or 50 mw, the steam turbine. In the intermediate range, gas turbines or free-piston engines are better.

The free-piston stations are made up of "gasifier" units of 750 kw or twin units of 1700 kw. The units are connected in parallel and supply gas under pressure to drive a turbo-generator. Power station equipment is available for stations ranging from 1500 kw up to 25,000 kw. Because the stations are made up of several independent "gasifiers," the turbine can operate at variable loads without substantial changes in efficiency and operation can continue while a gasifier is out of service for maintenance. The station can utilize gas and liquid fuels including very heavy fuels and crude oil.

Mr. Garlet (France) said there are now 72 "free-piston" power stations with a total capacity of 250,000 kw installed or

under construction. In addition, there are about an equal number of free-piston installations employed for other uses—propelling ships and locomotives and driving pipe-line pumps.

A 26 mw free piston power station is under construction in a suburb of Paris. It will operate under remote control and will use Bunker C fuel at a thermal efficiency of 36%.

Mr. Korkut Ozal (Turkey) urged that separate electrification plans — one for rural areas and another for the rest of the country should not be made. Take advantage of interconnected systems. Small diesel plants are difficult to operate and are so costly that consumers can afford to use this electricity only for lighting. In Turkey, for small diesels (25 kw) it was difficult to find operators and to obtain spare parts. Delivery of fuel requires 3 or 4 days. Since small hydroelectrical stations up to 75 kw are quite expensive, often over \$1,000 per kw, it is better to develop regional stations. In Turkey, a 5 mw station can produce power at a cost (in United States currency) of one mill per kwh. With such a power supply, it is possible to develop textile units, irrigation, etc., and obtain, over a period of time a substantial electrical load. On-the-job training is recommended, extra operators placed on each job can learn as they work.

(The Session Chairman commented that there have been improvements in reliability of diesel engines and, because of their use in trucks, more people are familiar with their operation.)

Dr. Mohammed Saleh Quraishy (Pakistan) agreed with U.S. paper (A/356) that instead of an individual supply for each village, a program of village electrification can be most practically accomplished by establishing power supplies for clusters of villages. This

would be the case in Pakistan. The power requirements are developing in agriculture — mostly for irrigation — and in rural industries, but the load is not such as to think in terms of "super-grids."

In East Pakistan electrification of villages is proceeding at a slow rate. In West Pakistan 800 villages were electrified by 1960 and 586 additional villages in the following two years, but the rate of progress is limited by lack of funds.

He remarked that Pakistan is one of 19 countries at this Conference which have suggested that a new agency be formed to supply capital and give technical assistance.

Mr. Adolfo Dorfman (Economic Commission for Latin America) stressed the need for more orderly development of both energy policies and the solution to technical problems in Latin America. For example, there is a great disparity in prices of fuel in Latin America. Capital costs are very important and careful consideration must be given to the effect of interest rates. Two-thirds of electrical capacity is either directly or indirectly government-owned. Hydroelectric production accounts for 55% of the total. The growth rate is 12% — 15% per year. At this rate, capacity doubled in 5 to 6 years, rather than the traditional rate for electric development of doubling in 10 years. In Mexico, the rate of growth might well exceed 15% per year. Revenues for reinvestment can fill a very important need, as it is hard to get loans at reasonable interest rates. Part of the equipment is manufactured locally, particularly in Brazil, Mexico and Argentina. Prices of imported equipment are quite high.

Mr. J. Apertet (France) said that for rural transmission networks, one-phase construction is cheaper for light loads, but it may be difficult to convert to three-phase construction as the load develops. Rural

electrification can be based on diesel generators supplying load centers of 50 to 200 kw each. Power should be supplied at the same voltage and frequency at each load center, so that eventually these centers can be readily interconnected and served from a large station. One organization could be set up to operate all the diesel generators, and maintenance could be handled by sending a team from one area to another.

Mr. Walton Seymour remarked that case histories in five locations show the specific steps which can be taken to organize a modern electric power supply, to operate it on a business-like basis, and to attract competent personnel.

Dr. Jerome K. Delson pointed out that the system found most economical for rural electrification in the United States was to have a combined system, part three-phase and part one-phase. Small customers are served one-phase even if they are located along three-phase line sections. Single-phase line consists of a phase conductor and a reduced size, multi-grounded neutral conductor. Maintenance of good earth connections has not been unduly expensive.

Mr. Francis Tommy-Martin (France) said that highly trained personnel are not required if the electrical system is made up of simplified and standardized equipment. Installation of such equipment requires only technicians, not engineers. Techniques have been developed in France for training personnel in less developed areas.

Mr. Allier (France) remarked that giving illiterate and unskilled manpower technical training also stimulates general interest in education and prepares people for jobs of responsibility. Electricity de France has cooperated on such programs in Morocco, Cameroon and northeast Brazil.

Dr. Luc P. Gillon (Congo, Leopoldville) emphasized development of uniform service

in regard to frequency and voltage. Eventually the electric power system in African nations may be linked to those in Western Europe. A frequency of 50 cps (cycles per second) and voltage of 380/220v. should be applied throughout Africa. Equipment furnished to Africa from American suppliers should conform to this.

Specialized Session

Non-Conventional Sources of Energy and Nuclear Power

Professor Antonio Carrelli
(Italy)

Rapporteur - Dr. K. M. Koch (Austria)

Secretary - Dr. F. A. Miles (International Atomic Energy Agency)

U.S. Participants

None

Summary

Both the non-conventional sources of energy and nuclear power offer a series of contrasts in their application.

The less developed areas of the world are also the areas which have the least per capita resources of conventional energy. At the bottom of the scale is the South Asia and Far East Regions, and this is given as a principal reason for nuclear power in that area. Yet the economics of placing a reactor in Karachi is challenged due to the proximity of the low price oil from the Persian Gulf. Furthermore, to utilize nuclear power, large electrical grids must be available. Yet in the less developed countries, there are only five or six places where this state of development has been reached.

The less developed country delegations were well represented with nuclear power people. For instance, the United Arab Republic had three delegates who had been or were now connected with its Atomic Energy Commission and two others, both professors, with experience in nuclear power technology.

At the session, representatives of Tunisia, U.A.R., India, Pakistan, Brazil, and the Economic Commission for Latin America spoke of definite commitments to or potential benefits from a nuclear power program.

Exploitation of geothermal energy requires expensive exploration and drilling, so that a plant must be at least 1000 kw to be economic. The location of geothermal sources may be in remote areas where the power cannot be utilized. Yet, geothermal power can be the cheapest: no more expensive than the hydroelectric power utilized in Norway. Aside from the geothermal energy obtained from steam-producing wells, it was reported that at wells in the Sahara and in Algeria, pressurized water was found which could drive turbo-generators and, in addition, be used for refrigeration.

Wind power is an intermittent source and storage of any large amounts of the power which is generated is too expensive. Various means, including reversible "fuel cells," have been investigated without showing promise. But it was suggested that devices could be developed or certain applications could be found for putting electric power to productive use in the random intervals during which wind was available.

Since the review at the Rome Conference on New Sources of Energy held in 1961, there have been developments in application of solar energy, but none was reported here which changes the conclusion that the practical applications remain in the direct

application of heat, such as in heating water, and not in the production of electricity for public use.

It was recommended that local research or development groups be established to survey energy resources available in rural areas and to test suitability of "non-conventional" power supply under practical operating conditions.

Formation was suggested of a well equipped UN research center for promoting exploitation of geothermal energy.

The delegation from the Congo (Leopoldville) called for assistance from specialists in using radioactive isotopes for agriculture and medicine.

Main Presentations

Dr. T. A. Miles (International Atomic Energy Authority), Secretary of the session, opened the discussion by stating that the application of non-conventional sources of energy and nuclear power may be classified by two types of demand: (1) Small amounts of energy required in isolated areas - applicable to wind power and solar energy, and (2) demand for large blocks of power - applicable to geothermal, tidal and nuclear sources.

The most important conclusions of the Rome Conference on New Sources of Energy, August 1961, were that wind power and solar energy offer favorable prospects only in certain applications such as water heating and water pumping, but not for production of inexpensive electricity.

Tidal power is in the process of being harnessed in France, and there are favorable sites for such projects along the coasts of Korea and Mexico.

Geothermal energy is not necessarily limited to volcanic areas, but due to the high cost of exploration and drilling, the

minimum economic geothermal plant must have a capability of about 1000 kw.

With nuclear power, the key question is deciding at what stage it should be introduced. Large electrical grids must be available to distribute the power. The energy resources of the less developed areas are generally not abundant. In certain areas, the cost of nuclear and conventional power are equal.

Mr. E. W. Golding (United Kingdom), the first Discussion Leader, remarked that this discussion of non-conventional and nuclear power in the same session not only throws together consideration of large and small plants, but also includes plants which can only be located in very limited areas and plants which are not so limited. For example, tidal power requires a large expensive installation. There are favorable tides along the northern part of West Australia, but there is no electrical network or population in this area. The same problem of limited location applies to geothermal energy. This raises the question of utilizing the power from these sources. As another example, these large scale geothermal plants would not be the complete answer to problems in rural development because a transmission and distribution system would still be required.

Energy from small plants (wind or solar) is not necessarily expensive, provided one is prepared to use energy on a random basis when it is available, or to make provisions to do with only a small amount of firm power assured by energy storage.

Mr. Golding challenged the statement in the report of the Secretary-General to the effect that "wind power plants of a size exceeding 50 kw are not generally justifiable." He claimed that if power can be fed into a network, a large windmill would not be expensive.

Dr. H. J. Bhabha (India), the next Discussion Leader, said, regarding the economics of power, there is "no power so expensive as no power at all." Nuclear power must be developed because there will be no alternative resource. The less developed areas of the world are also those with the least per capita resources of conventional energy. The energy resources are equivalent to under 400 tons of coal per capita for the less developed areas, 1,400 tons for Europe, over 8,000 tons for North America, and 25,000 tons for the U.S.S.R. The area worst endowed with conventional energy resources in the South Asia and Far East region, and, with its population of 925 million, this region will be the earliest one to require nuclear energy.

In India there are limitations on available hydraulic resources because of the seasonal nature of the rainfall and the high cost of storage reservoirs. As for coal, the cost of mining and the transport across the country brings the price of electricity from this source up to about the price of nuclear power. It is not necessarily the case that nuclear power would be more economic in a developed area than in a less developed area. The present cost of \$200/kw for a nuclear power station in India is not much different than the cost of a conventional station.

Academician G. V. Bogomolov (Byelorussia), the next Discussion Leader, noted that geothermal energy will soon be used for heating in many cities in the U.S.S.R., and this application could be of interest in less developed areas. Another source of energy is from water which is under high pressure found underground in Algeria and the Sahara. From wells 1,000 meters in depth, the water rises 100 meters above ground with a flow of 200 cubic meters per second. Turbines

could be set up on such wells, and power, as well as water for irrigation, could be obtained.

Mr. Daniel Shimshoni (Israel), the next Discussion Leader, commented that in areas where a grid for transmission of electric power has not been installed, there is possibility of obtaining the power from wind and solar energy. Also, by combining production of water and power in a desalination project, the energy which is employed is used more efficiently.

Solar energy research in Israel started with the study of materials having "selective" surfaces in order to find types with a "collectivity" greater than their "emissivity." The difference is only a few percent, and dust can collect on the surface and cancel its effectiveness, but these materials formed the basis for a solar water-heater, practical for household use. This development showed the need for basic research.

Improvement and cost reduction have continued on the solar-powered electric generating plant which incorporates a turbine operating on organic vapor and which was reported on at the Rome Conference. Costs are now 25% higher than a comparable diesel generator using a typical price for fuel. Work has also continued on the "solar pond," also reported on at the Rome Conference.

As for nuclear power, the investments are large and changes are occurring rapidly, so that it might be wise to wait until the technology is further developed before embarking on an ambitious program.

Dr. G. Facca (Italy) said that geothermal energy can furnish the cheapest power known, comparable to the hydroelectric power in Norway. The energy is practically inexhaustible. The current theory is that geothermal energy is tapped from hot convection currents which are confined in somewhat the

same manner that oil is held in an oil trap. The wells at the top of the formation yield hot, pressurized water. Areas which are likely sources of geothermal energy include some in Africa, Turkey, the Dead Sea area, Australia, Antarctica, and the whole Pacific coast.

The Rome Conference was instrumental in promoting interest in geothermal energy.

Mr. J. Apertet (France) said that although improvements and cost reductions have been made, the view is still pessimistic for considering as a general source of electric power for public service either fuel cells or wind power.

However, tidal power is expected to be practical. Such a project is under construction in France, on the River Rance. At this site, there will be installed 24 "bulb-type" axial-flow hydraulic turbines of 10 mw each. This type of turbine had to be specially developed. It is closely related in construction and operating characteristics to the Kaplan-type unit. The bulb unit is of simpler design which permits higher rotational machine speeds and requires less powerhouse structure. Unlike the Kaplan unit, the bulb turbine is also efficient when operating as a pump.

Mr. Mustapha Chine (Tunisia) stated that Tunisia has power costs of 2 - 3 times those in developed areas. Nuclear power should thus be more competitive there than in some developed areas. Tunisia needs to prepare itself right now, including contacts with others, for nuclear power development. They are conducting a feasibility study of a 50 MW plant for the South which would yield both power and water. Other less developed countries should also prepare themselves for nuclear power investigations

Dr. Abbas A. Zaazou (U.A.R.) said that the U.A.R. intends to participate fully in the technology of the nuclear age. In 1956,

U.A.R. decided to secure necessary training before moving ahead. They established relations abroad, are securing aid from others and are establishing a nuclear research and training center. Having recruited a number of scientists and engineers and having undertaken projects of a semi-productive nature, they are now convinced of the necessity of embarking on a nuclear power production program. Cost of power should not be the only criterion. Perhaps justification can be found for some extra costs.

Mr. A. L. Shaw (United Kingdom) remarked that the U.K.'s best coal is produced at about 36 pence per million Btu and delivered to London at about 50 pence per million Btu. It is this competitive cost level against which nuclear power is confronted.

Mr. Adolfo Dorfman (Economic Commission for Latin America) said that nuclear energy has a significant role to play in Latin America, but each situation should be considered individually. Latin America has a wealth of good water power resources, but the best of these will be pretty well developed in 10 - 20 years. Hydro development has the advantage of multipurpose use. There are also natural gas fields with great potential. More published information is needed in resources.

Generally, there are two categories of nuclear power opportunities; first, the great urban centers which will soon each require 3 - 5 million KW and second, the isolated areas with no other energy service.

Dr. I. H. Usmani (Pakistan) noted the paradox that the developed countries have all the nuclear power technology and also large fuel resources. Therefore, they have no urgent need to develop nuclear power aside from production of Plutonium for military purposes. They tell the less developed countries to wait until they develop economic nuclear power. The less developed

countries can't wait because they need cheap and abundant power now. The less developed countries should determine their power needs, see what part can be met from conventional sources, and provide the balance from nuclear sources. In Pakistan, they believe nuclear power from a MW plant will cost 7 to 9.5 mills per KW against 20 to 22 mills from a conventional plant. Each country should make its own decision as to when to begin to develop nuclear power.

Mr. Garlet (France) commented that at the 1955 Conference, people were optimistic about nuclear power. Afterwards there was pessimism. Now he believes nuclear power will be competitive in about 10 years. This will only be with large plants, 500 MW or larger. Cost goes up fast as size decreases. The advantage of an indigenous nuclear plant is illusory: it does not change a country's economic prospects. Fissionable materials are different from conventional energy sources on this point.

Nuclear power is not yet competitive in France.

Dr. Luc P. Gillon (Leopoldville, Congo) said there is a lot of good hydro power in Western Africa, but isotopes are important in medicine and agriculture. They have had a reactor for 4 years with encouraging results. They need help from developed areas. Help is needed in developing research centers. Professionals and technicians are needed.

Mr. Fernando B. Franco (Brazil) said Brazil presents a clear example of the need for nuclear power. Energy is a very pressing need, particularly with the rapid growth in population. He was struck by the conclusions of the recent Sao Paulo conference in energy problems:

1. Nuclear plants can be economical where large base plants are possible and

other fuels are high in cost. These conditions exist in the industrial regions of Brazil. They figure that from 1975 on, nuclear power will take all growth, and fossil fuel generation will become obsolete.

2. Rapid industrialization will require fossil fuels for chemical raw materials.

There are three large hydro plants of 1 - 3 million kw capacity underway now. Growth by 1980 will exhaust hydro-possibilities. Brazil has a plan for nuclear power development with the first plant scheduled for completion in 1965-66 and others to follow.

Mr. J. Barnea (United Nations) noted that the UN Special Fund has agreed in principle to finance exploration for geothermal energy.

A report to the Economic and Social Council of the United Nations is being prepared for next year on progress since the 1961 Rome Conference on New Sources of Energy (solar energy, wind power, geothermal energy).

The less developed countries must make careful decisions as to source, timing and magnitude of needed power resources. Nuclear power presents real difficulties to less developed countries:

1. Nuclear power must be used for base load and only a small percentage of load is of this nature in less developed countries.

2. Only 5 or 6 transmission grids exist in less developed countries.

3. The economics of an isolated nuclear power plant are difficult to justify. For example, it seems difficult to justify setting up a nuclear plant in Karachi on the Persian Gulf where very low priced oil is available. The United Nations is not opposed to nuclear power, he noted, and is now studying a proposal for the Philippines where it may actually be economical. There appear to be very few such cases.

Mr. Tae Sang Won (Korea) commented that development of tidal power in Incheon Bay in South Korea could create 1.3 million kw of capacity for \$400 million.

Mr. F. Bacon (United Kingdom), who had presented a paper of fuel cells, said that since the time his paper had been written, the technology has advanced significantly. This was due especially to U.S. work on Gemini and Apollo Space vehicles. The objective must be to bring fuel cell costs down to diesel generator costs, and this may be done in 5 - 10 years. They must use condensed hydrogen and air instead to pure hydrogen and oxygen. Reversible fuel cells store energy as a battery, but a large container would be required for the hydrogen, and the main problem is cheap storage of this gas.

Mr. Vadot (France) said that wind energy may be economical where the price per ton of fuel is 300 NF or more, and where the price of electricity is 0.2 NF or more. Applications are generating electricity, pumping water, and making heat directly.

Dr. Niccolo Gennai (Italy) recommended that the United Nations study the possibility of having a well-equipped center to collect results of geothermal developments like Larderello. Possibilities of geothermal power are good, but research is expensive. Large investments are required. At Larderello, there are 400 mw installed and the annual generation is 2.5 billion kwh.

Mr. F. Tonani (Italy) noted that geothermal energy is so cheap, it should come first as a priority for development. All exploration costs should not be charged to geothermal energy, since very many valuable minerals may also be present.

Informal Meeting

Geothermal Energy

The meeting, which was called at the request of Professor A. Carrelli, Chairman of the session on Non-conventional Sources of Energy, was chaired by Mr. R. W. Willett (New Zealand).

The subject of geothermal energy received a rather thorough discussion at the conference held August 21 to 31, 1961, in Rome on the subject of New Sources of Energy. A total of 77 papers on geothermal energy were presented at that time. These are very ably summarized in a document published February 9, 1962, by the U.N. Economic and Social Council as document number E/3577.

The main points raised in this session were: (1) how the United Nations Special Fund could apply a limited amount of money in promoting the development of geothermal resources; (2) what has been accomplished, since the Rome conference; and (3) the present status of theoretical work in geothermal development.

The contributions were primarily from two speakers from Italy, from several speakers from the British Commonwealth including Australia, Canada and the United Kingdom, a Russian speaker, a Japanese speaker and one from Austria. Several questions were raised by a speaker from Korea, but there was no active participation by delegates from less developed areas.

One proposal was made during the meeting: an international organization, such as the International Union of Geodesy and Geophysics, should look into the problem of mapping temperature variations within the earth's crust in order to locate sites for possible geothermal development. The proposal was put forward by Professor H.

Kupper of Vienna, Austria. The chairman of the session agreed that such an investigation of the global geothermal gradient would be an excellent proposal for the next meeting of that organization. (In paper A/360, Dr. Gennai (Italy) proposed that an international technical organization be created to study the possibilities of geothermal exploitation in the various parts of the world.)

An example of international cooperation in this field was given by Dr. Kupper: joint scientific studies are carried on between Hungary and Austria, despite their political differences.

Mr. Barnea (U.N.) noted the interest of the United Nations in promoting the use of geothermal energy. He pointed to the Rome conference and also to the willingness of the United Nations Special Fund to commit part of its resources in this area. Certain facts impressed Mr. Barnea. For example, steam of a lower quality is utilized in New Zealand (wet steam), while in Italy only the higher quality dry steam is utilized. He also pointed to the possibility of combining production of electricity with the use of processed steam for demineralization of water. Such a scheme has been worked out for Venezuela by an American company (Westinghouse). Mr. Barnea reported that an investigation was underway in one African country (Kenya) in which the question of using condensed steam as a water supply is being investigated as well as a survey of a market for sale of the electric power within a reasonable transmission distance. He raised the question of the steps to be taken to survey the possibilities for geothermal exploitation. (These steps are outlined in the paper A/320 by G. Facca of Italy. The paper is entitled Geothermal Energy Exploration.)

Dr. S. Kurosawa (Japan) reviewed Japanese experience in geothermal work.

Japan is rich in hot springs, and has made some attempts to use geothermal energy, but without too much success. Before World War II, 30 KW of electrical power was installed at one spring, but this power generation did not continue because of corrosion problems. The largest post-war attempt was made by the Geological Survey Institute, also an installation of 30 KW which operated for six months before a corrosion failure occurred. A 1,500 KW installation is now being considered, but geothermal energy in Japan will remain a rather small portion of the total electrical output, being located primarily in those areas remote from the more heavily industrialized areas of the country.

Dr. L. B. Lewis, (Canada) stated that the thermal energy utilized in geothermal exploitation is due to radioactive energy in the earth's crust, and he said there are references to back up this point. (It seemed, however, that there was no agreement on this point among those in the room.) Dr. Lewis pointed out that in those areas in which the heat comes out of the earth's crust, such as in hot springs, the access was easiest. But they are also likely to be an area of limited supply of steam and of steam with high contamination. He felt that the excitement over geothermal energy was comparable to that in the development of nuclear power a few years ago. But he pointed out that people have now become more accustomed to the idea that there is an abundance of energy sources, and are apt to take a more philosophical look at the question now. Practical economic considerations are overriding.

Dr. Gennai (Italy) then spoke on the work he had been doing on the theoretical questions involved, such as the origin of the fluids and the methods which could be used to evaluate a deposit. He pointed out that some failures in locating geothermal

sources in drilling wells could have been avoided by more thorough exploration prior to drilling. The necessary conditions for success which he listed were the availability of a geothermal fluid, namely ground water, and a thermflux strong enough and at a high enough temperature. He emphasized that the reservoir must assure high water circulation. There is a close relationship between the quantity of water circulated and the steam extracted. He felt that the steam must be super-heated, and he pointed out that the degree of super-heating is practically the same at Larderello in Italy, Wairakei in New Zealand and the Geysers in the United States. He claimed that the enthalpy of the steam can be calculated from his theory, and that this theory furnishes an argument in favor of one of the explanations for the origin of this steam. The permeability of the stratum affects the size of the field, the formation of the steam, the separation of the steam from the water, and the life of the wells.

He claimed that thermal prospecting is comparable to geochemical prospecting when searching for mineral resources. He referred a question of the availability of the necessary ground water to the field of hydrogeology. He claimed that a horizontal thermal gradient was a necessary condition, and said that he could furnish examples to prove this. He also said that a physical theory as well as a geological theory was necessary. To furnish this he drew a phase diagram, of pressure vs. temperature for water showing the line which separates the liquid from the vapor base, i.e., water from steam. He said that the ideal condition is that with an increase in depth and hence an increase in pressure there is a corresponding increase in temperature such that the temperature at each point is actually the critical temperature. He stated that if the temperature is too low, the volume of flow of fluid would

be too low. There would be an outburst of water, but no steam, and the well would eventually be clogged because of salts. On the other hand, if the temperature was too high, the lack of equilibrium would make it physically impossible to have steam.

A Belgian then spoke on the situation in Northern Katanga and described the 225 KW station in operation there. He pointed out that the work had been carried out successfully without any initial exploration. The supply was water of 91° centigrade from a spring flowing at 40 litres per second. There was no water supply available for condensing the steam, so the discharge of the turbine was at air temperature of approximately 30° centigrade. The thermodynamic cycle from 91° centigrade to 30° centigrade was therefore not too efficient, but the installation was quite successful, and the energy was used for pumping the condensed water so that it could be utilized elsewhere. The total installation cost approximately \$400,000, and it was constructed by a British firm. The cost, for this small unit, therefore came to approximately \$2,000 per KW.

Mr. Facca (Italy) then referred to the work of Professor Tonani which was to the effect that the age of the water emitted was about 50 years. This conclusion had been based on the amount of dissolved oxygen as well as on the isotope structure.

A speaker from the USSR challenged this point. He said that the age might be several thousand years and said that this theory could be used to calculate the total amount of the resources, which appear to be very large. He stressed the importance of making maps of these resources in order to evaluate the potential for each region and the importance of examining the quality of the strata of the earth, which in many cases would determine the success of the exploi-

tation. He referred to a report published in the USSR on this subject. There is a problem of corrosion of the installation and the use of the energy must also be studied: whether it was to be for electric power, or heating, etc. In drillings which have been made to a depth of 3,000 meters, fields of 100 meters in thickness have been uncovered. He said that the subject is a worthy one, and called for international cooperation of scientists. This would be of value to the less developed areas. There is a need for theoretical research. He was sure that our ideas on this subject would change and he said that an investigation at very great depth could uncover reservoirs in which water was collected.

Mr. Barnea returned to the question of how to locate geothermal areas without actually drilling a deep well.

A Mr. Shaw from the U.K. raised the question, in regards to Kenya, whether it was necessary to find super heated steam, or whether one could be satisfied with boiling water.

The Chairman explained that it was sufficient to have boiling water, as this was the situation in New Zealand. In New Zealand they separate the steam from the water by a flashing over process, and discharge rather immense quantities of hot water into a river, without using the heat of the hot water at all.

Mr. Facca discussed this question also, and he gave the example of a well hole drilled 500 meters through a clay surface to reach a permeable layer at which water at a temperature of 73° centigrade and a pressure of 50 kilograms per square centimeter was obtained. He said that when the drilling mud was cut out that a pressure of one or two atmospheres resulted and that evaporation occurred around the bottom of the well.

The amount of evaporation could be calculated by a formula. He said that if the diameter of the well was too small, the evaporation would take place in the well itself and contamination would occur. He said normally there would be a high speed flow of steam, 500 meters per second, which is near the speed of sound. Also there is a turbulence in the movement which adds to the thermal energy available. Although a well of large diameter was required for exploitation, a well of small diameter would be sufficient for exploration in order to take measurements of temperature.

The question was asked whether a geothermal plant for electrical production was being planned in Iceland. The answer given was that a plant of 12,000 kilowatts is being put up this year. This plant was also reported on at the Rome conference.

Mr. Willett gave a review of the motivation behind geothermal exploitation in New Zealand. He pointed out that New Zealand consisted of a north island and a south island, and that the geothermal resources were in the north island whereas the main hydroelectric resources were at the other island. Due to poor rock formations, it was difficult to develop hydropower in the north island. Also the coal which is mined in the north island is rather costly. In three or four years time the north and south islands will be linked by an electric cable, but until that time the most economic supply of electric power for the north island was through geothermal exploitation.

Mr. Willett pointed out that steam on the north island was quite manifest, and many large geysers were present. People were sent from New Zealand to Italy to compare the conditions and they found they were not quite the same. Therefore a straight-forward geological survey using gravity measurements, etc., was started, but this seemed to

add to the confusion. A hole was drilled and it was found to be on a fault and it was also found to have good steam conditions. A photographic survey was then taken to determine the location of other faults of this nature. It was thought that the best chances for liberation of steam would occur at these faults. In the Wairakei area this has seemed to be the case, but this has not been the case in other areas in New Zealand. The geophysicists have not been able to help us locate good sites for drilling wells. Geochemists are also working on the problem, but so far without results. The main basis for locating drill holes is based on geological evidence. (In Italy at Larderello the situation does not seem to be influenced by young faults.) Also, the aquifer is quite young, and the rate of recharge must be watched. Drilling to 3,000 or 4,000 meters is possible, but so far they have only gone to 2,000 meters. Some holes have gone out of control due to a breakthrough in the casing of the hole. Boiling mud resulted. They realize the danger that the whole Wairakei area could become a boiling mud flat. The drilling of the holes is a fairly tricky job but so far there have been no fatalities. The present aim is a base load of 250,000 KW. When an electric cable is put in, the development of the north island geothermal resources will be slowed down.

Mr. Facca summarized by saying that the cost of geothermal exploration was not higher than the cost of a hydro-electric dam or of drilling for oil. He felt that it was worthwhile to spend considerable sums in developing this resource. The cost is now lower than it was five years ago. Also, it is possible to train, in a few months time, a young geologist to do this type of exploration.

Mr. Willett observed that the first place to start is at an obvious surface

manifestation of hot water or steam, and that any drilling beyond 1,000 meters is costly.

Specialized Session

Upgrading of Commercial Fuels, Efficient Use of Fuels, and Recent Developments in Petroleum Technology Including Small Installations

Officers

- Chairman — Dr. D. A. T. A. Townend
(United Kingdom)
Rapporteur — Dr. Humberto Penaloza
(Venezuela)
Secretary — Mr. Z. Falecki (Economic
Commission for Europe)

U.S. Participants

- Mr. R. Bittner
Mr. Harry Perry

Summary

The speakers from Brazil, China (Taiwan), Indonesia, Trinidad and Tobago, United Arab Republic, and Venezuela, all of whom represented countries which are generally less developed, except in their petroleum technology, spoke of their accomplishments, not their problems.

Among the less developed countries, the conflict of interest between the exporters of refined petroleum products and those who wish to buy crude oil and do the refining in their own countries was apparent. Descriptions were given techniques to build low-cost refineries, designed to meet a local market, but the oil companies were accused of promoting these refineries against the interest of those less developed countries interested in exporting refined products. The arguments advanced in favor of establishing small refineries included conservation of

foreign exchange, national prestige, training of skilled labor, and establishment of service industries such as small maintenance shops. Descriptions were also given on how a refinery could be the basis for developing a petro-chemical industry.

Facilities for local research on petroleum were described, and a suggestion was made urging the establishment of an international agency to study matters such as the problem of sulphur in oil production. Another speaker opposed this idea, saying that such an agency was not necessary, but that local research facilities should not specialize on one type of fuel, but should cover coal, gas, and oil.

The other subjects on the agenda—efficient use of fuels and upgrading of commercial fuels—also generated suggestions for research. It was claimed that even in developed areas, where much attention had already been given to the efficient use of fuel, there was still much room for improvement.

It was pointed out that because coal is a non-homogeneous material with a range of problems in mining, upgrading and utilizing, in each country the particular combination of problems should be given research attention. It was claimed that a local laboratory could spark the effective utilization of indigenous coal resources.

Selected Presentations

Mr. Z. Falecki (Economic Commission for Europe) the Session Secretary, called particular attention to report A/215 from Mexico, where a petrochemical industry has been developed by setting up catalytic cracking plants, ethylene plants and aromatic plants, and a variety of basic chemicals are being produced. He also referred to the reports which discussed economical small refineries located in consuming areas: one

paper dealt with refineries handling 20,000 barrels of crude oil a day; another described refineries designed to process 2,500 to 5,000 barrels per day.

He pointed out that the Coal Committee of the Economic Commission for Europe had done much work on efficient use of fuels and mentioned several of their publications.

Professor R. Radulet (Romania), the first discussion leader, provided statistics on the output of the coal and petroleum industries in Romania, referred to the metallurgical coke which is produced and gave a specific example of the application of back-pressure steam turbines used to produce electric power and furnish process steam for the petrochemical industry. He noted that to promote efficient use of fuel, central distribution of hot water for domestic heating is used in Romania.

Mr. Francisco M. de Mello Franco (Brazil), the next discussion leader, said that Brazil has reached self-sufficiency in oil refining. There are two large refineries with a 110,000 and 90,000 barrel per day capacity and seven smaller refineries ranging from 30,000 down to 5,000 barrels per day. Attention is being given to avoiding an over supply and to development of a petrochemical industry.

He was followed by Dr. A. Mustafa (UAR) who reviewed the development of the petroleum industry in Egypt. Of the 11 oil fields, 7 were discovered in the last decade. A publication, "Petroleum in U.A.R." with a description of their petroleum policy, was displayed in the Conference Technical Library. Their research program includes study of local crude oils and of hydrocracking of the whole crude as an alternative to the coking process. There other projects, such as study of various catalysts. A petroleum research center to study local problems will soon be established. But there are some

problems, such as the study of sulphur in petroleum, which should be studied by an international organization. Such an organization should be set up.

Mr. R. E. Bittner (USA) then pointed out that, unfortunately, small refineries and petrochemical plants are inherently more expensive on a unit-cost basis than larger ones. It is possible for refineries as small as 2500 - 5000 barrels per day to be installed which have unit-costs comparable to refineries an order of magnitude larger, if the small refineries are not designed as miniature versions of large ones.

The desired product quality must be carefully studied to establish minimum requirements. Existing patterns set by previous imports from highly industrialized areas should not be accepted. Minor quality reductions should be made, and the deficiencies in quality made up by importing high quality blend stocks, if this will result in decreased cost.

To match product distribution to product requirements, if imported crude is used, it can be shipped at the source with selected components of desirable boiling range, or finished or semi-finished blend stocks can be imported to supplement short supply. Also, if the cost is justified, the method of processing can be selected according to how well it matches product requirements.

Cost reductions can be achieved by eliminating unessential items, such as paved roads and elaborate office buildings, and by simplifying customs control to cut crude and product storage requirements. A suitable construction site can cut the cost of grading and filling land and cut the requirements for piles. Local mechanical codes should comply with the international codes. The use of air fin coolers, hydrogenation treating process, floating roof and tanks substantially reduces the need for elaborate pollution

abatement facilities. Unnecessary features should not be included.

New design principles which can be applied include complete integration of the process into a single unit, which increases heat efficiency, elimination of spares because of high reliability of mechanical equipment and elimination of blending tanks by blending finished products in the lines leading from the process unit.

To establish a petrochemical industry, it is possible to extract or distill chemicals naturally occurring in the product stream of the refinery—solvents for paint manufacture; aromatics, particularly benzene, for pesticide manufacture; and asphalt. The manufacture of paints and pesticides can be done with rather small, inexpensive equipment. Importing bulk raw materials and carrying out the final step locally helps establish industry at minimum cost, and after outlets are established and marketing is in hand the full installation can be made.

Mr. Harry Perry (USA) initiated the discussion on coal. He said that prior to the introduction of highly mechanized mining methods, the slate and rock were separated from the coal by hand as the coal was mined, but as mining became more highly mechanized an increased amount of rock and fine materials were included and washing and cleaning of the coal became necessary. Under these conditions, the coal is separated into a highly cleaned product and a "middling product," with high ash content, which is suitable for power generation. Special coal preparation methods can be used to reduce the sulphur content, if the coal is to be made into coke for use in a blast furnace, or to alter the burning characteristics if the coal is to be used for domestic cooking.

There are methods of converting low-rank coal to a product suitable for the produc-

tion of iron. Lignite can be dried and formed into briquettes suitable for domestic use, but the treatment for each type of lignite depends on the moisture, particle size and other factors. Briquettes from low-rank coal can be used in low-shaft furnaces to produce pig iron, and low-rank coal can also be used in "direct reduction" processes to produce pig iron.

Low-rank coal can be dried so that it can be burned successfully in cement production, can be treated to produce a soil stabilizer and fertilizer, and can be used to produce special carbons such as activated carbon.

There are research programs studying the production of chemicals and synthetic liquid and gaseous fuels from coal, but large-scale plants, with the exception of one in South Africa, have not been built because petroleum products are less expensive.

Coke production is a special problem, and those countries contemplating the use of coals for coke-making should become intimately acquainted with the devices for determining coke quality, optimum coal blends and predicting the expansion properties of coal and blends.

Supplemental fuels consisting of oil, natural gas or coal can be injected into a blast furnace along with the air and in this way reduce the amount of coke required in producing pig iron. This is a new and important technology currently under development.

If a country is about to develop its coal resources it must commit itself to the establishment of laboratory and research facilities, adequately equipped and staffed with personnel trained—at least initially—in the countries with a history of coal research and use.

Mr. L. Clegg (UK) said that fuel efficiency has been actively promoted in

the United Kingdom, but even so, further improvement is expected. Industrial practice will vary from country to country (e.g., use of continuous or batch processes, the number of hours per day that factories are operated, the question of heating in some climates and cooling in others) and this will influence techniques for improving fuel efficiency.

In 1954 a National Industrial Fuel Efficiency Service was set up as a non-profit organization, independent of government control, but initially financed by the nationalized coal, gas and electricity industries. The organization has trained over 6,000 boiler operators and has published manuals for their use. Assistance is being given to other countries through training programs in Britain.

The advantages of combined heat and power generation may be marginal in many industries, but such a combination, using back-pressure turbines, is often of value and should be based on the plant's thermal requirements, rather than on the electrical capacity necessary to meet the factory's electrical requirements.

Mr. M. Zvegintsov (UK) remarked that one organization for fuel policy is sufficient—it is not necessary to have a separate organization for coal, petroleum and gas. The local research organizations suggested by Brazil and U.A.R. should not specialize on coal, oil or gas, but should treat all fuels. Local research and development is very important, but another international agency for the transfer of information, as suggested by the U.A.R. is not needed.

Dr. S. H. Zaheer (India) commented that India has large deposits of coal but relatively small deposits of coking coal. The United Kingdom has helped India start production of coke from coal and lignite.

The use of non-commercial fuel (e.g., wood, dung) amounts to the equivalent of

200 million tons of coal per annum. This is depleting forests and causing erosion. Instead, more kerosene should be used.

The railways are the largest users of coal, but they use it with an efficiency of only 5 to 10%.

Mr. R. E. Ingall (UK) pointed to the tremendous reservoir of experience in the oil companies in construction of facilities and refining. Extensive local training and 6, 8 and 12 month courses are offered in Britain. He further stressed that there is no standard design for a refinery; design depends upon a whole series of local factors.

Mr. de Beaudéan (France) talked about the problems of producing gas from the Lacq fields, where a power station, built near the deposit, furnishes electricity for an aluminum plant. They also put petrochemical plants at the site using the gas for both raw material and fuel.

Mr. S. N. Yeh (China) said that in Taiwan the plan is to use their newly-developed natural gas for petrochemical purposes rather than fuel. Excess gas will be re-injected to help oil production.

Mr. Oliverio Phillips-Michelsen (Colombia) said a fertilizer industry using natural gas has been set up in Colombia. Colombia also reinjects excess gas. He wants to produce synthetic fibres, but he doesn't want to pay royalties and said that the patent owners restrict output.

Mr. Humberto Penaloza (Venezuela) noted that the problems of small refineries in less developed countries are divided into those who have raw materials and those who do not. Refineries should be built for the benefit of the country. Sometimes profitability is a question, but every effort should be made to concentrate production on those products which are most expensive in foreign exchange outlays. There had been a tendency to build large refineries for petroleum

export, but now the less developed countries are planning and building small refineries for their own market. There are 13 in Africa with an average capacity of 20,000 barrels per day. These combinations are warping the structure of fractions available on the international markets. Some promotion of small refineries by the international oil companies has not always been done in the best national interest.

Prof. R. M. Soemantri (Indonesia) stressed that the principal for a petrochemical industry in the less developed areas is the problem of scaling down to local market demands. The choice of the type of petrochemical plant is critical. Possible products include detergents, fertilizers and insecticides.

Mr. Clement Thonon (France) stressed that establishment of a petrochemical industry requires analysis of market potential and

social and political factors. The technical possibilities are unlimited. Local technicians will be most aware of local conditions.

Mr. F. Nadau des Islets (France) discussed the transport of natural gas by international pipeline and tankers. He advised that a chemical by-product—rather than the gas itself—should be exported.

Mr. R. A. Thomas (Trinidad and Tobago) said that most of his questions were answered during the session. Although Trinidad and Tabago is a less developed country, it was "developed" in oil. However, he pointed out that their oil legislation was outdated and asked advice on what type of new legislation could be drawn up which would obligate the private oil companies to furnish interpretive data, cost data and to release other information.

Section B: HUMAN RESOURCES

Summary

The effectiveness of the Conference can best be judged months or years from now. If it was successful, there would be a better understanding of the goals and approaches to the problems of developing human resources. This improved understanding would lead to modifications of existing programs and the initiation of new ones by the less developed countries.

First impressions lead one to believe that the Conference was successful. While many delegates had suggestions concerning its improvement, none who discussed it with the U.S. delegates participating in the sessions on Human Resources thought it was a failure. All were exposed to discussions of problems in programs in a broad range of human resource areas. All heard leaders in the field of economic development emphasize again and again the importance of planned human programs and of the critical need to integrate these programs with programs for the development of other resources. Many heard and participated in discussions of specific facets of the manpower problems. Inevitably participation in the Conference added to the knowledge of some of the delegates, changed some attitudes, stimulated desires for further knowledge and created or reinforced personal contacts with knowledgeable people.

Many of the delegates raised the question of follow-through indicating a desire for continuing an exchange of ideas and experiences. Some suggested a new international agency for economic development; others a regional approach. A number were critical of existing international agencies citing

inefficiency, petty bickering and bureaucracy as faults.

A number of delegates from both less developed countries and other countries thought the Conference had too many topics, too many reports, too many persons in attendance, was too formal and too structured, leaving little chance for informal discussion. As noted, however, none stated it was a failure and most were interested in follow-up to implement policies and programs discussed.

Attendance and participation by less developed countries' delegates in meetings on Human Resources were surprisingly good considering the relatively small size of the total group. Only one meeting (B.5, Occupational Safety) had exceedingly poor attendance. It was on a Saturday afternoon at the same time as a special meeting devoted to discussing ways of improving the Conference.

The major areas requiring future attention are the need to institute overall programs for the development of human resources; to integrate these programs closely with other economic development programs; to analyze population trends in terms of trends in gross national product to avoid a lowering of the standard of living in situations where the introduction of technology results in a "population explosion;" to balance carefully the introduction of technology with the need to create jobs for numbers of unemployed and underemployed people; to establish programs to improve food, health, shelter, education and provide higher incomes for masses of people.

General Session

Officers

Chairman – Professor Henri Laugier
(France)

Secretary – Dr. D. H. Hobden (I.L.O.)

U.S. Participant

Dr. Isadore Lubin,
The Twentieth Century Fund

The speeches all emphasized the importance of human resources in economic development. There were no important differences on the goals in human resource development – a productive, well trained, housed and fed, fully utilized labor force. The great waste of human resources was discussed and the fact emphasized that investment in developing human beings is as productive as investment in physical goods.

Mr. Ardant (France) made a proposal to use agricultural good surpluses more widely as non-inflationary incentive wages to encourage unemployed or underemployed rural workers to undertake projects in soil conservation, reforestation, and land clearance. Such schemes have been successfully tried in Tunisia and Morocco, using U.S. agricultural surpluses. They added appreciably to capital investment in rural areas.

Mr. Lubin emphasized the importance of investment in education and training as an essential factor in economic development. He pointed out that although education and training is essential to raising productivity, the mere increase of material goods which enables people to increase their standards of living is not an end in itself. The ultimate end that we should seek, he stated, is the development of well-rounded individuals, men and women, who can live in dignity under conditions which permit them to realize their individual spiritual and cultural

aspirations. He stated that the increase of resources in a manner which does not fit into the social and cultural patterns of a people may prove to be a boomerang and might even lead to eruption and violence which are the enemies of economic growth.

Attendance was large and there were many – perhaps too many – enrolled speakers.

Joint Specialized Session (Sections B and K)

Techniques of Manpower Assessment –
Forecasting the Requirements and Priorities
of Numbers and Types of Scientists and
Technologists

Officers

Chairman – Professor L. Massart,
(Belgium)

Rapporteur – Dr. Lucien Piche, (Canada)
Secretary – Mrs. A. Beguin, (I.L.O.)

U.S. Participants

Dr. F. Harbison, Princeton University
(Discussion Leader)

Dr. Howard Johnson, M.I.T.

Dr. Charles Kidd, H.E.W.

Dr. Joseph Fisher, Resources for the
Future

Dr. Harry Kelly, National Science
Foundation

There was general agreement that labor market forecasts are essential to planning and no marked disagreement concerning the methods to be used. There was also agreement that long-range forecasts, necessary for estimating needs of professional people, must be derived from the economic development plan. Short-range forecasts generally could be based on sample studies of employer demand and worker supply. The discussion centered on specific examples of

particular problems and solutions. Professor Martins, (Portugal) described the Mediterranean Regional Project; Mr. McDougal, one in Southeast Asia; Mr. Tabb, (Israel) approaches to training programs in Israel; Mr. Solomon, UNESCO's role; Mr. Taigar discussed problems in Roumania.

Mr. McDougal recommended a conference of university heads from developed nations to assist in improving the quality of education in less developed countries. A Tunisian delegate recommended a regional approach to both the problems of assessment and education. Professor Martins recommended a general strengthening of international cooperation in this field using the Mediterranean Regional Project as an example of what can be done.

Less developed country attendance was poor because of a special meeting, at the same time, for representatives of less developed countries to discuss steps to improve the effectiveness of this Conference.

Specialized Session

New Systems of Vocational Training and Apprenticeship

Officers

- Chairman - Major General C. Lloyd
(United Kingdom)
Rapporteur - Professor T. Ionescu
(Roumania)
Secretary - Mr. B. Fortin (I.L.O.)

U.S. Participants

- Dr. Thomas E. Posey, A.I.D. Mission
in Turkey
Dr. J. Nabrit, President, Texas Southern
University
Dr. F. Harbison, Princeton University

The session was devoted to presentations of detailed descriptions of training projects in several countries.

Mr. Murakami (Japan) gave a highly detailed description of the methods of vocational training adopted in Japan. He stressed the importance of the apprenticeship system that has been developed in private industry and described the public institutions run by the government for vocational training. He emphasized the fact that the government exerted pressure on industry to train workers in accordance with government-set standards. He illustrated his talk with pictures of various institutions that have been established for vocational training in Japan.

Professor Ardant (France) recommended that in less developed countries, the development of the labor force should be tied up with credit advanced for developing productive units. He recommended, in effect, that part of the terms for advancing credit for the establishment of industry should include a requirement that the employer undertake to train the necessary labor force.

It was recommended both by the representative from Roumania and the representative from Israel that an arrangement should be made for the U.N. to summarize the experiences of the various countries taking part in the Conference and that the U.N. draw conclusions from the experiences of the different countries in this field of training so that other countries can profit by what has been done in various parts of the world.

Particular attention was paid to the importance of training foremen and other higher echelons in the labor field. Emphasis was placed by the Roumanian delegate on the importance of recruiting foremen from the most efficient workers already in a plant.

Emphasis was also placed on the need of flexibility in vocational training. The

representative of Turkey laid particular stress on the importance of a broad, general training which could be followed up by further training within industry, once a worker moved into a particular job.

The representatives of Israel were very much concerned with the importance of quality in training. They described the manner in which they have trained newcomers to Israel—people without any experience in modern industry—through various discussion techniques. They emphasized the importance of leadership which could organize discussions which enabled these newcomers to understand the reasons for the things that they were doing and the importance of performing their work in a given manner.

A description of the American education system, particularly that of Southern California, was presented by Dr. Nabrit (U.S.A.). He stressed the importance of providing a means for individuals to move up in the industrial scale and recommended that the junior colleges, regular colleges and universities be utilized for the training of teachers who are necessary for efficient vocational education.

The Canadian representative mentioned that Canada had trained 5,000 people from different parts of the world through its fellowship system which covered virtually all of the cost of such training.

Mr. Posey (U.S.A.) cited the importance of training trade union leaders who could be very helpful in developing the participation of the work force in economic development. He stressed the importance of cooperation and understanding, and the willingness to take part in change, if economic development was to be successful. To this end, far-sighted and well-trained trade union leaders were an effective instrument in bringing about a democratic procedure in arriving at decisions at the place of work.

The U.A.R. representative felt that the developing countries could not use the methods that had been developed in the industrialized nations because their plants were too small to profit by the procedures developed in large-scale industry. He was skeptical of training in industry and insisted that vocational education must be part of the general educational system.

One of the representatives of Israel warned against developing "status seekers." He pointed to the fact that people who were given the advantages of education often looked upon themselves as superior to others, and suggested that a system of upgrading the employee be developed which would make it possible for the largest feasible number of people to become part of the higher echelon in industry. He felt strongly that provision should be made to aid villages which are short of skilled craftsmen by training construction workers, machine shop workers, and others to meet the requirements of these villages by accelerated training.

The representative of Senegal questioned the value of what has been done in the highly developed countries. He pointed out that 90 percent of the people in his country are engaged in agriculture, and that emphasis should be placed on training for crafts in agricultural villages. The representative of Iraq repeated what he had said in a previous session relative to the importance of free education for all children, and agreed with the representative of the U.A.R. that vocational training was the responsibility of the State and not that of industry.

An interesting sidelight was the suggestion of the representative from Turkey that the many thousands of workers from Turkey, Italy, Spain, and Greece who are now employed in Germany should be given special courses while they are in Germany which will

fit them into the needs of their own countries. He stated that the one thing that the 12,000 Turks who are now working in German industry have developed is an appreciation of the importance of efficiency in their work.

Dr. Harbison (U.S.A.) made a statement to the effect that employers are the largest producers of skilled workers, and that the developing countries should take advantage of this fact. He stated that employers are not only producers of goods and services, but of skilled workers as well, and that the various governments should exploit this particular facet of the productive capacity of employers.

The USSR representative gave a history of the changes that have taken place in Russia's vocational training and educational systems. He pointed out that people being trained are given free housing, free food, free uniforms and from one-third to one-half of the regular wage paid to trained workers in the various categories where training is being given. He ended by saying that the USSR is always ready to share its experience in the development of skilled workers with the underdeveloped countries.

Specialized Session

Population Trends

Officers

Chairman — Mr. K. T. de Graft-Johnson
(Ghana)

Rapporteur — Dr. M. Magalhaes da
Silveira (Brazil)

Secretary — Mr. K. J. Penniment
(I.L.O.)

U.S. Participants

Dr. Hollis Peter, Foundation for Research on Human Behavior

Dr. A. H. Leighton, Cornell University
Dr. Isador Lubin, Twentieth Century
Fund

This session revealed a fundamental difference in approach to the population problem between the USSR and the East European nations on the one hand and the West European nations and U.S. on the other. The former took the position that population growth does not present a problem that cannot be met by effective planning and programming in the economic sphere. The latter took the position that in many countries even well planned economic expansion could not hope to keep pace with uncontrolled population growth, and that specific measures would have to be taken to curb the latter if the standard of living is not to fall.

Representatives of the West discussed the "population explosion" in a number of developing nations where gross national product was not growing rapidly enough, this endangering an already low standard of living.

A number of less developed country representatives actively participated in the discussion. One of them pointed out that in some areas of the world, population density is very low in relation to the area's economic potential. In others, where population density is high and the rate of economic development slow, a rapid increase of population obviously would endanger the standard of living.

Specialized Session

The Application of Science and Technology
to Conditions of the Work Place

Officers

Chairman — Professor N. Tsamboulas
(Greece)

Rapporteur – Professor Sven Andersen
(Denmark)

Secretary – Mr. E. Hellen (I.L.O.)

U.S. Participants

Dr. Isador Lubin, Twentieth Century
Fund (Discussion Leader)

Dr. Ewan Clague, Department of Labor
Dr. Thomas Posey, A.I.D.

This was not a successful meeting from the point of view of the less developed countries. The U.N. had scheduled the second special meeting to discuss the effectiveness of this Conference at the same time. Thus, this session started with only five or six less developed country representatives. By contrast there were many representatives of France, Britain, Russia and United States present.

Dr. Lubin emphasized that a program for occupational health and safety is more than a matter of procedures and equipment. It must receive the unqualified support of workers and management. Some of the same points were covered by representatives from France and Britain. The USSR delegate placed great emphasis on worker's councils in promoting safety.

Dr. Noro (Finland) described institutes for occupational health in Finland and several other countries citing functions, organization and staffing. He was obviously an expert in the occupational health field as were Messrs. Gion and Besson of France who spoke on plant and national approaches to the problem. Mr. Besson's presentation was particularly specific. Using slides, he presented suggestions on how to train workers in safety measures when working with high voltage; how to teach first aid; and how to use color cards to designate areas of danger.

The Secretary recommended regional institutions to promote safety practices and worker training.

Specialized Session

Sound Management and Management
Development as a Factor in Technological
Progress

Officers

Chairman – Dr. Milos Macura (Yugo-
slavia)

Rapporteur – Dr. Thomas E. Posey
(U.S.A.)

Secretary – Mr. Dufty (I.L.O.)

U.S. Participants

Dr. Fred Harbison, Princeton University
(Discussion Leader)

Mr. E. K. Sandbach, Vice President,
Koppers International, C. A.

Dr. Hollis Peter, Director, Foundation for
Research on Human Behavior

Dr. Charles Kidd, H.E.W.

Dr. Isador Lubin, Twentieth Century
Fund

Dr. Eugene Staley, Stanford Research
Center

The session brought out little that was new and, unfortunately, was dominated by representatives of developed countries who presented numerous prepared statements.

The speakers covered every phase of sound management and management training. Many speakers emphasized the critical need of good management in economic development. Dr. Sherif (U.A.R.) and Mr. Soloyanis (Ghana) underlined that management of big enterprises does not pose the same problems as the management of small ones, the latter being particularly important to developing countries. The discussion included both these facets of the problem.

Dr. Harbison (U.S.A.) made the point that good managers are themselves developers of men and cited examples of a number of enterprises (some of them small

onés) in various countries that were managed by persons developed in a particular, relatively large, well-managed institution. In addition, he stressed that good management in government, education and research is just as important as in industry. These points were supported by representatives from many developed and less developed countries.

It was emphasized that good management in government not only improves utilization of the labor force but affects all economic development through management decisions concerned with the use of funds, resources, power, equipment, etc., as well as creating an environment that will encourage the development of good management throughout the economy.

Messrs. Moreno (Spain), Pardal (Brazil) Gomes-Cardoso (Portugal)—among others—discussed off-the-job educational centers for management training. Some of these institutions were part of the education system, some attached to particular industries, others to a ministry such as Industry or Labor. In general, these institutions gave short, full-time practical courses for employed persons, most of whom are in managerial and technical positions.

It was stressed that managers must know not only how to use their technical and other staffs effectively, but also be motivated to accept change both in organizations and institutions. Mr. Sherif (U.A.R.), among others, indicated the need to affect management attitudes and to train management as a "profession." He stressed that government alone can create the conditions likely to promote the desired management attitudes.

Dr. Martin-Bates (United Kingdom) discussed the "administrative staff college" as a device to assure exchanges of opinions and a broadening of viewpoints. Others

pointed out that this device is most useful in more advanced countries.

Mr. Soloyanis (Ghana) described a government management development project that includes courses and seminars for industrial and government personnel, produces training films, conducts research in management techniques and collaborates with management associations and universities in promoting better management.

Mr. Tabb (Israel), among others, emphasized that many of the formal training techniques are not very useful to managers of small enterprises who cannot leave their jobs for protracted periods of time and who need to be not only good personnel managers, but also technical specialists and cost accountants; need to know appropriate government regulations and taxes, and be able to estimate present and prospective markets and market risks. He indicated these men need technical assistance which helps in the solution of day to day problems.

Specialized Session

Employment Implications of the Application of Science and Technology in Less Developed Areas

Officers

Chairman — Dr. Ewan Clague (U.S.A.)
Rapporteur — Dr. V. M. Kollontai (USSR)
Secretary — Dr. D. H. Hobden (I.L.O.)

In view of a number of administrative problems, this was a surprisingly successful session. (It had been impossible to arrange a meeting of the session officers and participants before the session; the time and place of the session were changed without adequate notice to participants.) Despite these difficulties a relatively large audience appeared.

The major problems discussed were: the balance between technological advance and the need to create jobs, and the mass migration to metropolitan areas. On the first point, Dr. Podiachnick (USSR) and representatives of other East European countries took the position that the most advanced industrial techniques and the newest equipment should be made available to developing countries whatever the immediate effect on employment. On the second, that migration should be permitted without check. Unemployment would be held in check by an economic plan which would put all people to work.

Mr. Ardant (France) and representatives of other West European nations took the position that an economic plan must have

full employment as one of its goals and that development should be preceded or accompanied by a series of integrated steps including the improvement of agriculture and the supplying of adequate food; employment projects to assist agricultural incomes off-season and to slow the rush to the cities; urban improvement projects to keep down unemployment in the cities; and social welfare measures to prevent the development of slums in expanding industrial areas.

Dr. Rao (India) suggested that export industries must compete in world markets and therefore need the most efficient productive methods and equipment as quickly as possible. By contrast, industries selling in the domestic market may be relied on to create the maximum number of jobs.

Section C: AGRICULTURE

Summary

Evaluation

This Conference was of considerable value to the U.S. in terms of providing to 100 top scientists and technicians a good overview of the complex world-wide relationships in which we find ourselves in this Decade of Development. The U.S. delegates in Agriculture were almost all completely enthusiastic over what had been accomplished during their stay. However, to document the impact of the Conference on U.S. as well as less developed country delegates is difficult. Initially, results will no doubt be relatively private and personal between the persons involved, and formal institutionalization of the relationships may be a long way off. The personal impact of this experience will be reflected in many ways throughout our own private, academic and governmental institutions.

We found out much about the inadequacies of our university programs for foreign students. We learned of the impact of university and private business as well as governmental associations on development in the less developed countries. We found that after 10 or 15 years our former students are now in positions of importance in less developed countries and looking now for renewed acquaintance and technical guidance. We found that there is no country in the world that does not have a corps of able and sophisticated people actively concerned with the various phases of development.

The reactions of less developed country delegates reflect similar feelings—possibly

overwhelmed at first—through private discussion and informal contacts they began to grasp the enormity of the scientific and technological know-how that was being made available to them now and in the future.

The comprehensive nature of the Conference in terms of subject matter coverage did succeed in conveying to both less developed country and U.S. delegates the very complex nature of national planning and all the facts that must somehow be taken into consideration.

The delegates in Agriculture were almost unanimous in the following major points:

(a) The Conference was too large. There were so many papers summarized that no one could do more than write superficially for each major section. There were so many people who wanted to be heard that no one could have time to develop a point in depth;

(b) Agriculture still carries the brunt of initial development in emerging countries not only for supplying food but for the major basis for economic growth, and this without recognition or prestige;

(c) The U.S. paperback books were very well received and will be the source of a great deal of follow-up inquiry and interchange;

(d) The movies were very poorly attended, and under these circumstances added little to the Conference. The delegates were too thinly spread, with 8 sessions per day, to take on any additional activity;

(e) The U.S. library was a real asset and was appreciated by delegates from the

less developed countries. The U.K. exhibit really caught the agricultural public's eye.

Areas Meriting Future Attention

There were areas for international cooperation and exchange exposed in every session in Agriculture. Very few, if any, of these were new but the fact that they recur gives some weight to them.

One theme appeared in almost every session with the same emphasis and merits recording: there is a very strong need for more research and training in all fields and activities in agriculture. However, very few less developed country delegates felt that this could be provided by using facilities in the developed countries. The research cannot really be done except under local conditions, and the education and training at the university level must also be done under local conditions if it is to be meaningful to the country. This has a very strong and definite implication for USAID policies regarding the use of technical aid funds.

There also was a recommendation that a regional conference on agrarian reform be held in an African country.

Less Developed Country Participation

In general, less developed country attendance was very disappointing. Delegates participated well in many sessions, but generally the same man had to appear 16 different times on as many different subjects if his country was to be heard from in each session.

Films

Very few movies were viewed by U.S. delegates, but one of the U.S. delegates reported as follows on three from the U.S.S.R.:

The Hungry Steppe - 25 min., English, color

An excellent movie photographed in beautiful color and with an attractive script. While it shows many interesting technical details, it is written to appeal to a wide audience. It stresses sociological development made possible by irrigation of previously barren desert, and the great joy which has come back to the people. It shows splendid agricultural produce, impressive agricultural machinery (including machine cotton pickers), extensive new housing, prosperous state farms, and happy people.

Irrigated Agriculture - 30 min., English, color

Very well done in brilliant color with attractive script. It shows many interesting technical aspects of water supply development and the introduction of irrigation agriculture into previously barren desert. Like the film above, it stresses the effects of this development on the happiness of people.

Thus Build the Moscovites - 25 min., English, color

A very impressive story on development of Moscow stressing prefabricated construction and showing many favorable views of Moscow.

General Session

Officers

Chairman - Sir William Slater (U.K.)

Guest Speaker - Mr. Binay R. Sen (F.A.O.)

Oral Presentations:

- Mr. C. S. Christian (Australia)

Professor E. Saari (Finland)

Dr. D. P. Cuthbertson (U.K.)

Dr. C. E. Kellogg (U.S.A.)

Dr. V. G. Bogarov
(U.S.S.R.)
Secretary – Dr. Ralph W. Phillips
(UNCAST-U.S.A.)

U.S. Participants

Dr. C. E. Kellogg
Dr. Arthur T. Mosher

This was the first of the general sessions and was quite stiff and unimpressive. There was little in this session of significance outside of the specific papers written for it.

Mr. Binay R. Sen, Director-General of F.A.O. gave the opening address with the following major points:

(a) In less developed areas, agriculture must supply the first accumulations before industry can be expected to thrive;

(b) Adaptive research is the most important type in the less developed countries;

(c) The Land Grant Institutions of the U.S. made them agriculturally strong;

(d) Adverse trends in international trade makes growth in less developed countries difficult;

(e) Give present U.N. agencies additional responsibilities in science and technology rather than create a new agency.

Dr. R. W. Phillips gave a resume of what should happen in the specialized sessions.

Mr. C. S. Christian (Australia) described the land survey and classification system in his country and noted its advantages. He urged the less developed countries to use scientific approaches in employing scientific principles developed in other areas.

Dr. D. P. Cuthbertson (U.K.) reviewed various ways that less developed countries might increase their supplies of animal products, and finally urged the training of a sizeable corps of general practitioners as a

means of efficiently exploiting the possibilities.

Professor E. Saari (Finland) reviewed the special qualifications needed by forestry specialists who are advising the less developed countries.

Mr. V. G. Bogorov (U.S.S.R.) described his studies in marine ecology and deplored the absence of Red China, a country that had much to tell the world about fisheries.

Dr. C. E. Kellogg (U.S.A.) emphasized the need for simultaneous improvement in all the factors which limit production rather than trying to benefit from one or a few at a time.

Seven inscribed speakers, including Dr. Mosher (U.S.A.), were allotted four minutes each. They spoke mainly to points in their own papers that were not covered by the scheduled speakers.

Specialized Session

Soil Science and Soil Surveys

Officers

Chairman – Acad. U. P. Gerasimov
(U.S.S.R.)

Rapporteur – Professor P. O. Ripley
(Canada)

Discussion

Leaders – Dr. Istvan Szabolcs
(Hungary)

Mr. Sadikin Sumintawikarta
(Indonesia)

Mr. Sarot Montrakun
(Thailand)

Dr. E. W. Russell (U.K.)

Secretary – Dr. V. Ignatieff
(F.A.O., Rome)

U.S. Participants

Dr. C. R. Kellogg

This session did not bring out any new developments but did underscore the great importance of integrating soil survey work with soil management research, advisory services, irrigation schemes, and demonstrations for cultivators. These needs are becoming increasingly recognized in all the Asian countries, in most of the African countries, and in most of the Latin American countries. United States prestige in this area seems to be high, but there were comments to the effect that, with few exceptions, we have not made available from either the Department or the colleges our most skillful soil scientists for this activity.

Certainly we shall have many requests for training soil scientists from other countries. It will be even more helpful to help them establish good research and educational institutes in their own countries. It is exceedingly difficult to arrange demonstrations of diagnosis of field problems within the United States that are meaningful to young men from tropical areas.

The Secretary of the session, Dr. V. Ignatieff, did an excellent job of summarizing the many contributions into a useful document. Really not very much was added by the Discussion Leaders and other speakers, although several did give specific examples of the application of basic principles within their own countries.

Most of the delegates who had a chance to speak or to talk privately emphasized the need of soil surveys for guiding agricultural development. Dr. Russell of the United Kingdom and Mr. Christian of Australia clearly had reservations.

Dr. Kellogg emphasized the relation of soil surveys to systems of agricultural development. Soil surveys must be interpreted according to the reasonable alternatives for use in management. This process

involves a system of steps, all of which are important to adequate interpretation.

After the meeting, Academician Gerasimov invited Professor Aubert of France and Dr. Kellogg of the U.S.A. to attend the press conference along with the Secretaries. He made a summary to the press people and called upon both Professor Aubert and Dr. Kellogg to make brief statements. There were, however, no questions from the reporters.

This session gave rise to an additional one formally scheduled by the U.N. on "Simple Methods of Determining Fertilizer Requirements in the Tropics," chaired by Dr. Kellogg. It was relatively well attended by less developed country delegates. The major consensus arising from this session was that under the direction of competent soil scientists, exploratory plots could be used by advisory people. Several persons pressed for a more complete description of the soil sites when recording experimental results. Finally, suggestions were made for consideration by F.A.O. that: (1) they press for wider adoption of the above suggestion, and (2) that a pamphlet be prepared describing the soil, fertility, and peculiar mineral requirements of the major tropical crops.

These sessions were followed by a continued series of personal contacts by Dr. Kellogg as well as a Sunday afternoon "coffee session" with some ten representatives from the less developed areas.

The overall value of this session and its follow-up contacts is difficult to evaluate. Our delegate was kept busy day and night answering requests for interviews, and the same was true to a less extent of soils men from other developed countries. In spite of the small number of delegates from less developed areas with specialized technical competence in soil science, this session will undoubtedly stimulate their interest.

Specialized Session

Animal Breeding

Officers

Chairman – Mr. V. Brunini (Argentina)
Rapporteur – Mr. Gonchig (Mongolia)
Discussion
Leaders – Mr. R. A. Hutchinson
(Ghana)
Professor P. Hoekstra
(Netherlands)
Dr. J. L. Lush (U.S.A.)
Secretary – Mr. N. R. Joshi (F.A.O.)

U.S. Participants

Dr. J. L. Lush

This particular session seemed to have very little ultimate value to either the U.S. or the less developed countries. The summarizing reports were somewhat pedestrian. There was little participation on the part of the less developed countries and there was essentially no floor discussion. Dr. Lush gave a provocative and well received statement and the U.K. delegation hoped that this would be made available to all countries. In this respect, it should be stated here that there is considerable enthusiasm for the paperback volume which the U.S. delegation brought with it, and there was great demand for copies of this.

As a result of this meeting Dr. Lush had several requests for private conversations. One of the most interesting was from the delegate from Mongolia who was particularly interested in getting a list of the better books on beef cattle and sheep production in the United States. Dr. Lush supplied him with such a list from memory and promised more if it were needed.

Specialized Session

Forestry and Forest Products

Officers

Chairman – Professor E. Saari
(Finland)
Rapporteur – Mr. Agne M'ba (Gabon)
Discussion
Leaders – Dr. J. H. Jenkins
(Canada)
Dr. M. S. Randhawa
(India)
Mr. L. Birkner (Sweden)
Secretary – Mr. R. G. Fontaine
(F.A.O.)

U.S. Participants

Dr. Kenneth H. Parsons

This session went fairly well with reasonable discussion among the approximately 16 inscribed speakers, three of whom were from less developed countries (India, Gabon and Sudan). Of particular interest was the statement by the delegate from Sudan that it was extremely difficult to secure good training for a forester or forest products analyst because training programs in the U.S. or other advanced countries cannot meet the needs of foresters from tropical areas. The discussion showed quite clearly that research and training facilities in the advanced countries could not be made adequate for the needs of developing countries, particularly those with tropical forests, yet few of the less developed countries can possibly establish and support adequate forestry educational and research facilities on a strictly national basis. The suggestion was made, especially for Africa, that some sort of international school for tropical forestry be undertaken under auspices of the Economic Commission of Africa.

Discussion ranged from forest management and intensive silviculture, through extraction and utilization, to economic and social factors involved in the balance of forestry vs. agricultural and other uses of land.

Principal points seemed to be:

(1) Tropical forests are low yielding and composed of 10 to 20 species with none dominant. The latter results in an un-uniform product and, therefore, more cost in harvesting;

(2) Conventional, temperate zone kinds of forest management based on selective cutting, natural reseeding, etc., will not result in productive tropical forests starting with natural stands;

(3) The wood characteristics and potential for utilization are not known for many tropical species. This suggested to some speakers the need for early establishment of wood products research in the developing countries. The possibility of utilizing laboratories in developed countries was also suggested;

(4) Given the limitations of natural tropical forests, plantations or planted tree farms using known superior species in pure stand was advocated by several speakers.

Need for resource inventories and a forest plan for each country was given high priority, but from the Sudan came the warning that less developed countries could not wait for total inventories and comprehensive plans. They need to start with inventories of local areas.

Specialized Session

Agricultural Engineering and Equipment

Officers

Chairman -- Dr. W. M. Myers (U.S.A.)
Rapporteur -- Professor V. G. Petrenko
(Ukrainian SSR)

Discussion

Leaders -- Mr. T. Vanchev (Bulgaria)
Mr. M. Novak
(Czechoslovakia)
Professor T. T. Pedersen
(Denmark)
Mr. M. Mobery (Sweden)
Secretary -- Mr. K. Stenstrom (F.A.O.)

U.S. Participants

Dr. W. M. Myers
Dr. R. M. Hagan

About 40 delegates attended this session and evidenced much interest. However, more delegates wished to speak than time permitted so there was no time for informal discussion.

The session was ably chaired by Dr. W. Myers who suggested that discussion of this broad subject be grouped under the following headings:

(1) Relationship of mechanization to displacement of labor and increased production;

(2) Comparison of problems of joint use of mechanized equipment on small land holdings vs. consolidation of holdings into units large enough to support investment in mechanized equipment;

(3) Research and development of new designs for mechanized equipment;

(4) Training of cadres of specialists;

(5) Servicing of equipment.

The above headings indicate the general nature of the discussions.

Ben Osman (Tunisia) pointed out that land tenure is a serious obstacle of agricultural development. This will require a time-consuming period of adjustment. He called attention to the need for an integrated approach to introduction of mechanization in agriculture, since agricultural workers must

not be displaced until industrial developments are able to absorb the labor displaced in agriculture.

Chang (Taiwan) pointed out that only small machines can be used by small land holders. (He did not seem to be considering the possibilities of land consolidation.)

Christian (Australia) urged greater attention to development of indigenous implements. (Note: An American, Dr. William Chancellor, Professor of Agriculture Engineering, University of California, Davis, has been carrying on a very effective project on developing indigenous implements as a visiting staff member at the University in Bangkok, Thailand.)

Magee (Australia) pointed out need to consider implements for insect and disease control as well as weeds.

Tison (Belgium) urged greater use of demonstration centers to show usefulness of mechanized equipment but cautioned that demonstrations must provide for accurately accounting for all costs in a realistic manner in evaluating advantages of mechanization.

Moberg (Sweden) stressed that less developed countries begin mechanization on a modest basis in order to build up confidence in the value of new practices and equipment. If large and complicated machines are introduced at the beginning, the project is likely to fail. After initially-introduced equipment is successful, then more advanced machines can be introduced with a good chance of success. Urged that less developed countries avoid importing too many different makes of machines because of spare parts and maintenance difficulties. Ben Osman (Tunisia) agreed, remarking that in Tunisia they have 200 different makes of machines and many cannot be repaired because of spare parts shortages. Suggests less developed countries set up centers for testing equipment under their operating

conditions indicating that very useful tests can be made with simple test equipment. More elaborate testing facilities can be added later. He also pointed out that less developed countries had many things to buy with limited foreign exchange and suggested they carefully balance expenditures for machinery against such other agricultural needs as fertilizers, insecticides, irrigation equipment, etc.

Cibrian (Spain) commented that irrigation by traditional methods involves building terraces which interfere with mechanization. He advocated increased use of sprinklers.

Guyon (France) discussed French developments in sprinklers and described sprinkler test equipment at Provence.

Molina and Lundberg (Argentina) discussed the development of successful crop rotation and soil conservation practices based on ideas introduced to Argentina by Professor Bradfield (Cornell) and Mr. Hugh Bennett (Soil Conservation Service).

Hagan (U.S.) spoke on water control techniques and equipment (with projected photographs) pointing out the importance of using sound principles in irrigation developments and stressing opportunities to use simple, indigenous equipment and materials.

Shalon (Israel) made a strong and effective advertisement of special four-year curricula in agricultural engineering given at Technion in English. She pointed out that courses were theoretically sound and practically oriented, were planned by experts who had actually worked in less developed countries and thus knew actual problems and conditions, and students were selected by interviews in home countries rather than depending upon transcripts, recommendations, etc. She stated that training in Israel had great advantages, i.e., (1) Israel has only recently developed, (2) Israel's need to maximize use of minimal resources, and (3)

climatic conditions similar to those in many less developed countries. (The Israeli delegation distributed to all delegates an envelope of materials on training opportunities in their country. Obviously this country is making a major effort to offer technical training to future leaders of developing countries.)

Walsh (Ireland) pointed out that in European institutions, teaching of agricultural engineering (and engineering in general) is not sufficiently integrated with other disciplines. This suggests that the European plan not be used as a pattern for education institutions in developing countries. He pointed out that in Ireland agricultural engineers are now working side by side with soil physicists, plant physiologists, sociologists, etc.

Cibrián (Spain) stated that large farms are a "luxury" and constitute a "strangle hold" on agricultural development. He called for land reform.

Vanchev (Bulgaria) pointed out the possibility of rapid development under a socialist system. He stressed the role of state farms and machinery pools. As a result, Bulgaria now has highly mechanized agriculture including sowing, harvesting and livestock operations. He gave a long list of equipment now available on state farms.

Novak (Czechoslovakia) pointed out that high agricultural production is assured by the socialist approach, large state farms and tractor pools. His country stands ready to transmit their experience to the less developed countries.

The U.S.S.R. delegate pointed out that "small, poverty-stricken farmers will not use even the simplest tools." He indicated the advantages of cooperative use of machines and establishment of government-operated tractor pools.

Belli (Rumania) discussed the rapid progress of Rumania in the last decade. Any country can achieve mechanized agriculture like Rumania's by (1) change in land tenure, (2) establish industries to supply agricultural machines, and (3) joint use of agricultural machines. He did not share the view expressed by some speakers that developing countries must go through all the steps to achieve mechanized agriculture. This leads to unfounded delay. Advocates moving directly to use of large modern machinery (which is possible only by land consolidation and state-operated farms).

The Rapporteur (Petrenko, Ukrainian SSR) in his closing remarks commented that he was surprised that even the speakers from the developed countries (presumably meaning Western countries) had advocated cooperative use of machines.

Specialized Session

Marine and Inland Fisheries

Officers

Chairman - Mr. Victor Angelescu
(Argentina) substituting
for Mr. Zender (Peru)

Rapporteur - Dr. S. Lazcaynski
(Poland)

Discussion

Leaders - Mr. Victor Angelescu
(Argentina)
Dr. Atusushi Furukawa
(Japan)
Mr. B. G. Bogorov
(U.S.S.R.)

Secretary - Dr. H. H. Broan (F.A.O.)

U.S. Participants

Dr. L. A. Walford
Mr. Charles Butler
Mr. Robert Keating

This session went well and was quite well attended (approximately 45). After a series of formal statements, delegates of the less developed countries got into the discussion fairly actively. Comments were made by delegates from Uruguay, Senegal, Congo, and Ivory Coast. There was sufficient interest generated here to justify an additional "Fifth Room" session.

The additional meeting on inland fisheries in tropical regions was participated in rather heavily by members of less developed areas. This session gave these people an opportunity to talk about their own conditions and also to ask for advice and scientific counsel on many of their problems. This was one of the first sessions where genuine scientific exchange was observed to be free and open and not hampered by the stilted type of presentation which had characterized the regularly scheduled sessions.

The session did not bring forward much in the way of new information as far as the U.S. scientists are concerned. There is considerable evidence that the members from less developed countries who participated in these discussions thoroughly enjoyed them and established effective rapport with scientists from the developed countries. This is probably the most useful result that will come from this particular interchange.

There were very few fish specialists from the less developed countries and from this point of view, again, it was very disappointing. Dr. L. A. Walford made the point that full utilization of marine fishery resources is dependent upon scientific knowledge about the organisms exploited and about their environments. The problems of acquiring this knowledge often covers such vast areas that they can be attacked successfully only by international cooperation. He further pointed out that the U.S.A. is a

member of several organizations for conservation of fisheries resources, for example, the North Pacific Fur Seal Convention, the International Pacific Halibut Convention, the Inter-American Tropical Tuna Commission, the International Commission for the Northwest Atlantic Fisheries, the International North Pacific Fisheries Commission, and the Great Lakes Fishery Commission. In all of these organizations, scientists of the member nations design and carry out researches to solve problems of common interest, to recommend courses of action, and where these are put into effect to test their success and improve them as necessary.

As fisheries continued to expand geographically and to increase the intensity of their operations, the need of more international action will become ever more acute. A convention on fishing and conservation of the living resources of the high seas was one of the four conventions of the law of the sea formulated at a United Nations Conference at Geneva in 1958. This was widely acclaimed among scientists and conservationists as a great step forward in codifying international law regarding the exploitation of high seas fishery resources in the interest of all humanity. Twenty-one nations promptly ratified this convention. It is to be hoped that in due course, the U.S.S.R. and its associated countries will also ratify.

Dr. Walford went on to make a strong plea for international cooperation in the publication of statistics on the quantities of fish caught, by species, locality and time and method of capture. The accumulation of such information on an international scale will be of tremendous value to all nations in conservation of their fisheries resources.

Mr. Charles Butler made the points that as we look forward to the time when the sea will be the source of much of our protein, the development in the use of this protein

will proceed in an orderly series of steps from exploration to the persuading of people to eat fish products. He gave several illustrations of countries which in recent years have initiated increased fishery activity and which are now beginning to use fish products in their human diets. As this activity increases there will be an increasing need for the development of international standards on food products which enter into international trade. Such standardization would minimize differences in products and in the problems of international trade.

Mr. Robert Keating discussed briefly the importance of transportation to the fishing industry and made several helpful comments regarding the possibility of making improvements in transportation such as feeder roads, containerized transportation facilities, etc., which should immeasurably assist the marketing of the fish once it is landed.

Professor Bogorov (U.S.S.R.), in his remarks as a discussion leader, commented on the connection between fishing and oceanography, and on the international migrations of fish populations. He pointed out that there is no reason why the fish of the ocean should not be managed as effectively as agricultural crops or animals and that the forecasting of fish occurrences and abundance depends on changes in environmental conditions. This is analogous, according to him to weather prediction. Dr. D. F. Hall, Director of the East African Fishery Research Organization, pointed out that we do not have the basic fundamental knowledge of managing fisheries. The Indian Ocean expedition which provides 40 research vessels will no doubt produce much valuable information. If there is a pressing need for food now, we should select the most likely areas and concentrate the efforts on the developments there. Dr. Furukawa (Japan) reviewed Japan's statistics in fish harvest and also

commented on fish culture techniques that have recently been developed there. He described new techniques of prawn culture where young larvae are collected at sea in spring and summer and reared in enclosures to marketable size. The demand for oceanic fish such as yellow tail, is greater than for shallow water species and these are the ones they would like to cultivate.

Specialized Session

Credit, Cooperatives and Marketing

Officers

Chairman - Mr. K. W. Svardstrom
(Sweden)

Rapporteur - Mr. Salvador Serrats
(Spain)

Discussion

Leaders - Mr. Y. S. Landau (Israel)
Mr. Vasile Malinschi
(Rumania)

Mr. N. I. Anisimov
(U.S.S.R.)

Mr. Sherman Johnson
(U.S.A.)

Hon. Nguyen Huu Tan for
Ho-Yem (VietNam)

Secretary - Mr. R. N. Henry (F.A.O.)

U.S. Participants

Sherman Johnson

This session provided an excellent opportunity to examine the differences in the meaning of the term "cooperatives" in the bloc and the free nations. The debate clearly pointed up both semantic and substantive differences.

Very straightforward and unbiased. A good review of the nature of fields under discussion, noting that it pertained to the organizational and institutional environment

within which science and technology could be incorporated into agriculture.

The formal discussants from Rumania and the U.S.S.R. sought to make the points that cooperatives can only succeed after agrarian reforms have been effected. Then the State can provide credit at 2% and guarantee a fixed price for the produce — no marketing problems and no money problems are involved. They would welcome an opportunity to share their experience with the less developed countries.

Sherman Johnson (U.S.) pointed out the differences in procedures for forming and operating cooperatives depending on educational and cultural level of the farmers — emphasized that for genuine success farmers must be free from “compulsory cooperation,” and that they must have “package assistance.”

Serrats (Spain) made a fervent plea for “aiding” nations not to dump agricultural surpluses in less developed countries at prices below cost of production and thereby destroy local farmer initiative.

Chang (Taiwan) described the multiple services of Taiwan cooperatives as supply stores, banks, and extension services.

The delegate from Israel concluded the discussion of the day by pointing out that their cooperatives were “free choice” and not imposed upon the farmers.

There were perhaps 30 people present, of whom one-third were from the less developed countries. The participation was still pretty tightly controlled by the Secretariat and no opportunity was given for open floor discussion. Inscribed speakers were from Israel, Spain, Taiwan, France, Ireland, Tanganyika, and the U.S.S.R.

Specialized Session

Handling, Storage and Processing of Agricultural Products — Dairy Technology

Officers

- Chairman — Professor M. Sode-
Morgensen (Denmark)
Rapporteur — Professor Hermann Mohler
(Switzerland)
Secretary — Dr. J. G. Thierne (F.A.O.)

U.S. Participants

- Dr. A. L. Ryall
Dr. Sherman Johnson
Dr. N. Scrimshaw

The session was a straightforward technical one, well moderated, with no direct political discussion of any kind and no bloc participation. In fact, the first two hours of it were really a reasonably well organized scientific symposium — by representatives of the U.K., France, Switzerland, and the U.S. — with no participation from technically underdeveloped areas. It was largely directed, however, to the problems of the technically underdeveloped areas. The discussion flowed freely; everyone who wished had an opportunity to speak. The session was quite informative but unfortunately there were few delegates from the less developed countries.

Because of the difficulty in obtaining information regarding smaller machinery for various processing procedures suitable for use in technically underdeveloped areas, it was proposed that an international register of such available machinery be established in F.A.O. or some other appropriate agency.

The Chairman, Professor Sode-Morgensen (Denmark), gave a straightforward summary of the number and nature of the papers pertaining to the topic. He pointed out that

they were divided into those relating to handling and storing, processing and dairy technology, and the subjects would be discussed in this order.

Dr. Mohler (Switzerland), the Rapporteur, gave a balanced summary in which he stressed the importance of the improved storage procedures at the level of the village, the community and the nation, each level with its own problems. He pointed out that the chief hazards are insect infestation and the consequences of high humidity. He strongly affirmed that the only practical measure of controlling insect infestation was the use of chemicals and that any toxic hazards in their use had to be overcome by seeing that they were used properly. He indicated that drying was the only practical means of humidity control for most less developed countries because cold storage was usually too expensive. Regarding processing, he pointed out the need for the development of simpler and less expensive machinery for many processes and cited as examples a machine for shelling pecan nuts, one for pressing palm oil at the village level and one for decorticating fibrous plants. He placed special emphasis on the fact that it is often easier to order equipment for a huge factory than for a small mill and that it may even be very difficult to get information on simpler and cheaper machinery. He closed by indicating that dairy industry can be very important to a country although there are many unsolved problems regarding the application of methods from the more highly developed countries to the lesser developed ones, including lack of veterinarians and dairy techniques, of refrigeration, the more rapid spoilage, off flavors, and the like.

The first Discussion Leader, Mr. Ryall (U.S.) gave a good summary of handling and storage problems in technically under-

developed areas and provided considerable specific information. He pointed out that many perishable commodities will be benefited by even small reductions in temperature without true refrigeration, and that there are a number of supplements to refrigeration, including various disinfectants, fumigants and controlled atmosphere storage, which may be of some help, re-emphasizing that ionizing radiation had little or no application to lesser developed areas at the present time. He introduced the relatively new idea of insecticide treated packaging materials. He realistically emphasized that until refrigerated storage, transportation and maintenance facilities can be developed, preservation will be largely by heat processing or drying in the developing areas.

The second Discussion Leader, Mr. Rouge (France) described small prefabricated low-cost concrete silos now being used in Africa. The fact that dehydration must often be the preservation method of choice affects the desirability of a dairy industry and the advantages of using concentrates to improve the rations of cattle kept in urban centers during the evening and allowed to graze in the countryside during the day as in some parts of Africa. He also mentioned the probable need for subsidies to increase milk production.

Dr. Lyman (U.K.) as the third discussion leader spoke from the extensive experience of the Tropical Products Institute. He discussed some of the problems of farmers' cooperatives in Ghana and Malaya who wish to pass from ginning their own cotton to pressing the seed, and of groups in Nigeria wishing small mills for pressing African palms. He too described the difficulty of learning of available low cost small processing machinery and suggested the need for a register in F.A.O. or some appropriate agency to list the decorticators, pressers,

peelers, slicers, dryers, cookers, packaging units and the like which might be needed for small scale operations. He indicated the danger of failure to consider the poor nutritive value of cassava in setting up facilities for producing cassava flour and the difficulties of finding suitable processed oil seed meal to combine with it because of the frequency of protein destruction and mold growth. He then turned to the problem of poor or nonexistent food inspection services and lack of food hygiene. He stressed that food control laws should not be copies of those of the U.S. and Europe, but should be greatly simplified.

A U.K. delegate suggested that consideration might be given to the respraying of grains just before packaging in order to reduce the problem of insect reinfestation. He also indicated that a citrus industry taking advantage of squeezing the fruit to make juice, use of the skin for essential oils and the residue for pectin, as in the U.S. and Israel, should provide a remunerative industry for some of the lesser developed areas with high quantities of citrus.

Mr. Goldberg (U.K.) discussed the inherent fallacy in the idea of non-toxic chemicals; i.e., chemicals not acutely toxic may turn out to be chronically toxic. His point was that rather than use a less suitable insecticide because it is supposedly non-toxic, it would be better to choose the best chemical for the purpose and use it in the specific way indicated.

Dr. Milner (U.S. food technologist) of UNICEF pointed out that the large scale processing techniques now in current use in the Western world may not always be adaptable to small scale use in the lesser developed areas and that some further research and development may be required. He also warned against the danger of oversimplifying the problem of oil seed residues

for suitable human consumption indicating these residues have been around for many generations and have presumably been tried and rejected in the past for good reasons. They can now be made suitable for human consumption but special processing is required. His final point was that in scaling down the size of processing operations, the main problem may not necessarily be the scale by hygienic and nutritional considerations.

Mr. Taveleau (France) discussed the economic aspects of cold storage. He recognized that lesser developed countries, particularly the hot ones, are considered too poor to afford costly refrigeration equipment, but suggested that when consideration is given not only to the loss of food which would otherwise occur, but also the improvement in quality, nutritive value and acceptability, some use of refrigeration may prove practical. He suggested use of refrigeration machinery of the types used on U.S. farms 20 to 30 years ago, and consideration of the possibilities of using solar energy for ice production and cooling of water, taking advantage of the difference between day and night heat radiation from the air, the dry atmosphere of many lesser developed countries which makes evaporative cooling more efficient and combinations of the above. He strongly urged imagination in solving problems of the underdeveloped areas rather than using techniques from developed countries blindly.

Mr. Groom (Tanganyika) then presented a simple, clear exposition very much in the spirit of the Conference, of the way in which they had taught farmers to build a simplified drying unit for copra which succeeded in doubling the price which they could get for the copra due to the better quality of the product. The device consisted of a triangular shelter with doors which would open

outward to admit the sun, or close inward to keep the rain off when necessary and which could be padlocked at night to avoid the necessity of carrying the copra into the house. He then raised a question regarding the control of the Kaffir beetle, stating that while the grain was inspected in the ports, it was stored in silos with mud and stick walls which had to be disinfected. Since the beetle can penetrate up to four inches into such a wall, he asked what chemical would be adequate for the purpose. He also asked how to dry cardamon seed cheaply. Neither of these questions was answered in the subsequent discussion.

Mr. Gabriel Ramalanjaona, Head of the Madagascar Delegation, then gave a simple, appropriate and very refreshing discussion of the problems of fruit conservation in the tropical areas, indicating that all methods for preserving fresh fruit at the family level are too costly; that under some circumstances cooperatives can be established for cold storage at the community level, and that at the national level a large installation may sometimes be possible by applying the techniques of the developed areas. At the family level, however, he pointed out that use should be made of such techniques as the preparation of preserves, jams, canning, drying, candy making, and the squeezing of juices. Since such techniques are not generally known to the families, there should be simple pamphlets and bulletins indicating how this can be done.

Mr. Sherman Johnson of the U.S. then spoke on the economic aspects of storage, pointing out that the methods selected should get maximum output from the scarce factors, mainly management and capital. This will generally mean labor intensive methods rather than a maximum of automation. He also stressed the economic importance of

saving the product already produced, and of simple but sanitary processes.

A European, probably from one of the Scandinavian countries, pointed out that the very successful processing industries in his own country had usually had very small beginnings at a time when the country was much less developed and suggested that the pattern in developing areas might well be similar. Some of these started as cooperatives, some were sponsored by the government, and others were private enterprise. He recognized that cooperatives are desirable but difficult to establish in poor and backward areas and indicated that the government will frequently have to be of assistance in establishing, or at least encouraging, processing industries.

Mr. Sene (Senegal) stated that this country had had difficulty in the use of insecticides because they became ineffective after two to three years because the insects became resistant. He asked the question whether, under these circumstances, one should vary the insecticide or use a mixture of insecticides. This question was not answered in the subsequent discussion. He also warned that before a large mill is planned for an area, consideration should be given to the fact that it may be economically necessary for the farmer to grind his own grain. Under these circumstances, small village mills to which the farmer can bring in grain to be ground and take the flour away with him are likely to be more useful.

Mr. Kay (U.K.) then gave an excellent summary of the problems of dairy technology in technically underdeveloped areas stressing the importance of first surveying the fodder available, determining the size and type of plant, the process to be employed, nature of the water supply, type of energy, building most suitable for country conditions,

how the product is to be distributed to the consumer, the advisory services needed, and a realistic survey of the prospects and problems of a dairy industry. He made this presentation as a discussion leader on the subject of dairy technology, but no one wished to comment and there was no further discussion on this point.

Dr. Scrimshaw (U.S.) then warned that most of the cotton seed cake available in tropical areas was not even suitable for feeding pigs or chickens because of its low protein quality and high gossypol content, and under no circumstances should be used for human consumption. He then went on to outline the steps necessary in obtaining a cotton seed flour suitable for human consumption, including careful selection and cleaning of the seed, cooking at low temperatures, taking care that temperatures do not rise excessively during pressing, and screening through an 80-mesh screen to raise the protein and reduce the crude fiber content. Under these circumstances, the toxic substance, gossypol, goes into the oil and does not bind with and damage the lysine to too great a degree. He cited the WHO-FAO-UNICEF Protein Advisory Group specifications for cotton seed flour for human consumption and emphasized that such flour could make an important contribution to the protein nutrition of the people in any area where cotton was grown extensively.

Dr. Thieme (F.A.O.), the Secretary of the session, spoke of the problems of processing cashew nuts and the need for simple mechanical equipment for this purpose, the need for machinery for processing long vegetable fibers, particularly those which are soft, and the need of an inexpensive decorticator for handling such fibres as kanel and jute.

Mr. Groom (Tanganyika) then took the floor again to ask whether Tanganyika was

ready for even a small scale dairy technology program. He indicated that in the area in which he worked, the yield was only 75 gallons per cow per year because of insufficient fodder and dairy husbandry. If they could prevent vancidity or sissal waste, it could become an important feedstuff and asked whether there was a way to do so. He also asked if there was a way to make cashew wine acceptable to go to the people who could afford to pay for it. No one attempted to answer these questions.

Mr. Kay (U.K.) again took the floor to point out that the problem of milk production in Tanganyika was probably not one of genetic potential. He cited experience in India where cows were producing only 80 gallons per year. After intensive efforts to achieve good feeding and competent management, in two generations the same varieties of cattle were producing 800 gallons per year. His suggestion for Tanganyika was to either produce more fodder or kill off some of the cattle.

The delegate from Tanganyika replied that they had one special situation where a cooperative managed to increase production from 75 to 250 gallons per cow in two years, so they knew it could be done if they could get the feed.

The concluding comment of the afternoon was by Dr. Ku of Taiwan who recommended ramie as both a fiber and a forage crop. He indicated that in Taiwan they had a simple machine to process the fiber, using a bicycle as generating power, and then the leaves were a good fodder. (Ramie is a very useful and hitherto somewhat neglected forage crop. If cut at 15 inches of height before the fiber has developed, it is as good a forage as alfalfa. If allowed to grow taller, the fibers begin to develop, but the young can still be used for fodder.)

Specialized Session

Plant Pests, Diseases and Deficiencies

Officers

Chairman - Dr. C. J. P. Magee
(Australia)

Rapporteur - Dr. E. C. Stakman
(U.S.A.)

Discussion

Leaders - Dr. J. W. C. Geyer
(South Africa)
Professor C. W. Wardlaw
(U.K.)

Secretary - Dr. Lee Ling (F.A.O.)

U.S. Participants

Dr. W. M. Myers

Dr. A. L. Ryall

This was an exceptionally satisfactory session from the standpoints of attendance, participation, sustained interest, spontaneity of discussion, scientific content and sensible attitude. The attendance ranged from about 35 to 65 and averaged more than 50 with representatives from 15 known countries, including several developing ones. Certainly all of those who attended must have developed a broad, sound sensible concept of the urgency of concentrated and coordinated effort in combatting the numerous biologic enemies of economic plants and of supplying certain soil deficiencies. The most unfortunate feature of the entire session was that there was a minimum of attendees from less developed countries.

The general topics discussed covered a wide range, as would be expected, because of the diversity of pests, diseases, and deficiencies. However, the contributions were general and specific, conceptual and factual. Estimates based on reliable data regarding the destruction caused by weeds,

insect pests and diseases in certain countries indicate that there could now be food for approximately 7,000 million additional people if this destruction were prevented. If the destruction by other organisms such as birds and rodents were added, the figures would be much larger. Considerable attention was given to the hazards of using chemicals in the control of various types of pests, particularly where the educational level of the people is quite low. It was also pointed up that advocating the use of chemicals was useless unless these chemicals are available at costs that permit their use. There was considerable emphasis on the strong need for cultural and biological control of pests and diseases in addition to the chemical controls which are more popular at the present time. Dr. Myers (U.S.A.) made a strong plea for breeding for resistant varieties as a much safer and less expensive way to control many of the current diseases and insect pests, and he gave outstanding examples from U.S. experience to document his point.

Dr. Ryall (U.S.A.) gave a formal intervention, by request of the Chairman, in which he pointed out the problems of protecting foods from pests once they have been produced. He briefly reviewed some of the current research that is going on in this area.

A number of the delegates from the less developed countries indicated an interest for pursuing some of these questions more deeply with the U.S. delegates. As a consequence, Drs. Stakman and Myers held a coffee hour for many of the participants and each of them was continually requested to hold private conversations. It was repeatedly suggested that it should be possible to devise some method of capitalizing on the potential value of this excellent session, but this could only be done if ways were

found to attract into the audience a larger number of representatives from less developed areas.

Specialized Session

Plant Breeding and Improved Varieties

Officers

- Chairman — Mr. Miguel Pereira
 Continko (Portugal)
- Rapporteur — Professor Yuen-Liang Ku
 (China)
- Discussion
- Leaders — Acad. Pavel Popov
 (Bulgaria)
- Dr. H. A. Togby (U.A.R.)
- Dr. Ryuji Ito (Japan)
- Secretary — Dr. M. Theilebein
 (F.A.O.)

U.S. Participants

- Dr. W. M. Myers
Dr. E. C. Stakman

More than 40 papers were covered in this session. Of those dealing with specific crops, a disproportionate number were on industrial crops and only two dealt with seed production and distribution.

A question was raised regarding private vs. public breeding programs, private vs. public seed production and distribution where breeding programs are public.

Most papers were straightforward plant breeding. Emphasis was correctly placed on importance of testing introductions and on conventional methods of breeding.

The inscribed speakers were Dr. Myers (U.S.A.); Dr. Hurwitz, Israel; Professor Colin Donald, Australia; Dr. Stakman, (U.S.A.); Professor Russell, U.K.; and East Africa.

Hurwitz emphasized importance of introductions. Donald stressed breeding varieties

for specific fertility levels. Russell emphasized the extremely primitive agriculture into which the varieties must be fitted. He proposed use of tetraploid varieties which will not be contaminated with the local types. (He sees unaware of the problems the Swedes have encountered with tetraploid rye, red clover and alsike clover varieties.)

Dr. Myers cautioned against seeking a panacea via use of mutagens and other exotic approaches. Dr. Stakman urged use of simple field epiphytotics to select for resistant types in heterotic materials.

The only organizational proposal was Dr. Popov's that F.A.O. should establish a documentation center for recording varieties, their characteristics and qualities, to facilitate world-wide interchange.

This session was the first of the Conference and it was extremely mechanical and stiff with essentially no participation by the less developed countries. U.S. presentations precipitated several requests for private conversations and finally in a coffee session on Sunday morning at the hotel. It was really in these informal sessions where our delegates had a chance to contribute most in this subject.

Specialized Session

Agrarian Structures and Land Settlement

Officers

- Chairman — Mr. Roland Dizian
 (Cameroun)
- Rapporteur — Mr. Colin M. Donald
 (Australia)
- Discussion
- Leaders — Mr. Adamandios
 Pepelossis (Greece)
- Dr. D. G. Kotovsky
 (U.S.S.R.)
- Mr. S. Haggrass (U.A.R.)

Secretary — Dr. E. H. Jacoby (F.A.O.)

U.S. Participants.

Kenneth Parsons

This session laid bare the real basic differences between agrarian reform communist style and western style, and the real implications of each. It was really one of the most lucid comparisons of recent times, with each side making its case quite effectively. This certainly set the stage for every less developed country to know what it is really committing itself to in making its choice.

There were repeated allusions to the excellent Madison, Wisconsin Conference on Agrarian Reform and the need for another one now, preferably held in an African country where these problems are complex and can be studied on location. This suggestion seems to be a very good one and should be followed up.

It was not clear at the outset how much genuine confusion of terms existed, but no stones or words were left unturned in clarifying the points. Dr. Klatt (U.K.) did an excellent job of clarifying the proper use of "feudalistic" and similar terms. Dr. Parsons (U.S.A.) ensured that there was no misunderstanding of the terms such as "cooperatives," "state-supported institutions," etc., by clearly pointing out that when socialist delegates used these terms, they referred to "forced cooperatives" based on the principles laid down by Lenin. When western nations use these terms, they do so in the sense of freedom of individual choice as expounded by Locke.

Pepelossis (Greece) made a strong plea for more study and research on a case-by-case basis and not within the hallowed walls

of academic institutions, but out where the problems are being posed. The hypothesis that where large rural labor surpluses exist they can be automatically resolved by moving them into industrial areas has been proved false in Greece.

Kotovskiy (U.S.S.R.) spoke along the following lines: Agrarian reform is a basic pre-condition to increased agricultural production. It is of necessity and by definition a marked departure from classical procedures and, therefore, cannot avoid certain disruption of individual farmer's patterns. If the basic goal is to increase agricultural production in a country to feed the hungry masses, the first visible result must be the elimination of the old feudal system. A basic decision in land reform is whether to take only part or all of the land away from the feudal landlords for redistribution. Less developed countries should form impartial groups to assess their agrarian reform problems and to devise solutions for them. These groups should be made up of people from academic institutions because they are less subject to pressures and biases.

Hagrass (U.A.R.) gave an eloquent account of the U.A.R. reform program and the basic principles upon which it is founded that ensure individual freedom.

Jacoby (F.A.O.) closed the session with brief remarks to the effect that each country should establish its own reform policy in accordance with its own social and economic conditions, and it should not be designed to achieve a particular ideology.

Strong suggestions were made for additional conferences on agrarian structures, held in an African country. Also, a strong and repeated plea was made for more serious research on agrarian structures and unbiased appraisal of case histories.

Specialized Session

Animal Nutrition and Management

Officers

Chairman – Dr. P. Receveur (Niger)
Rapporteur – Professor V. G. Petrenko
(Ukrainian SSR)

Discussion

Leaders – Mr. W. Webster
(Australia)
Professor E. Jacobsen
(Denmark)
Dr. F. N. Bonsma
(South Africa)

Secretary – Dr. J. H. Anderson
(F.A.O.)

This session was presided over by Mr. Receveur (Niger) who opened it with a few general remarks and remained an impartial chairman throughout. The session began with an excellent summary by the Session Secretary, Mr. J. H. Anderson (F.A.O.), in which he emphasized that it was hoped that the discussion would bring out a statement of the main problem, the way in which scientific and technical knowledge could be applied to it, the probable impact of this knowledge, the research opportunities, gaps in present knowledge and, finally, action to be taken. In view of the world shortage of animal protein, he emphasized the need for a 4-point program: (1) Improvement of breeding stock; (2) protection from disease; (3) better feeding; and (4) good management. He pointed out that much of the earth's surface must remain in permanent pasture for either technical or economic reasons and that for this reason grass is a particularly neglected crop whose potential is still largely unrealized. Other points covered in his introductory summary were the existence of non-

technical problems such as inefficiency, of market methods, out-moded land tenure systems, inadequate credit facilities, and the like; problems of importing breeding stock, the fact that the imported stock were not universally successful; control of the frequency and intensity of grazing and the need for more attention to drying and silage as methods of conserving forage for use during the dry seasons. He suggested that more attention might be given in some areas to game animals and even to game farming. He concluded by stating that the chief bottlenecks to increased animal production in technically underdeveloped areas were the lack of trained personnel, the lack of extension services and the lack of research.

In the first of the discussion papers, Mr. Webster of Australia presented a discussion that dealt entirely with cattle and sheep farming in northern Australia, an area which he considered underdeveloped because it was much less prosperous and less efficiently managed than southern Australia.

He was followed by Dr. Bonsma of South Africa whose theme was that availability of basic knowledge is not the limiting factor in promoting livestock development in underdeveloped countries, but rather the problem is how to apply existing knowledge. He pointed out that it is more difficult to apply knowledge to animal production than to crop production because genetic advancement is much slower, the knowledge required is more complex and competition between the animal and man for food is likely to be involved. He suggested that control of epidemic and endemic disease in animals was a government or an international agency obligation generally beyond the possibilities of the individual farmer. His emphasis on the need for training people from the technically underdeveloped countries themselves to

carry the burden of these programs was appreciated. He concluded by particularly emphasizing the need for additional training and for both internal and external economic support for programs of improved animal production.

The third discussion paper was to have been given by Professor Jacobsen of Denmark, but he was unable to be present and his salient points were presented by another member of the Danish delegation speaking in his name. He covered a number of specific technical points including (1) the amount of protein required by a high-yielding dairy cow (2) the nature of specific amino acid deficiencies in cereals and the need for them to be made up from other sources (3) variations in the quality and in general poor quality of fish meal due to heat damage during manufacture (4) the recent "paper of Carpenter" showing that bound lysine is not liberated by intestinal enzymes, and, therefore, that measurement of total lysine in a feed is "valueless." He then went on to suggest the value of determining epsilon amino lysine or "free lysine" in order to determine the degree of heat damage and to control the heat damage to fish meal, meat meal, bone meal and the like. Suggesting the destruction of lysine would also indicate the sum parallel damage to triptofene myophine, threonine and other essential amino acids. In general, these points are well taken and were a refreshing change from the generalities which had preceded. Various laboratories have been using Carpenter's method for two to three years now and have found it useful. Total lysine determination is not valueless, but it is correct to indicate that it is of limited value where heat damage has occurred. The paper was short and concise.

Before continuing to the interventions, the Chairman made some fairly extensive

observations emphasizing that while much application of scientific and technical knowledge was no doubt possible, he would like to call attention to the difficulties which frequently existed in technically underdeveloped areas, in following the advice of highly qualified experts. Adverse social and the political conditions, low or inadequate resources, low level of education, poor living conditions and the like were all obstacles. In his country, breeding with animals is frequently in the hands of a few individuals whose way of life is hard to change. He referred to "tribes" living under extremely difficult conditions and poor pasture, and emphasized the frequent difficulty of improvement because anything required investment. He asked how a breeder with 100 animals and a series of adverse conditions which he listed could spend \$200 improving his herds or his pasture, particularly when he was not sure of a market for his improved product. He continued to ask a series of rhetorical questions - how, when you are applying technical knowledge can you modify the other factors which must go along with it, such as improving human living quarters. He indicated that sometimes changed practices meant the replacement of one evil by another without necessarily leading to improvement. He asked the question, "What is an underdeveloped area?" and answered it by saying that it is one in which there was not the human material for technical development, pointing out that when credit, machinery, seeds or whatever were supplied, the human material was still found to be the heart of the matter. He mentioned that many experts are frustrated by seeing the products of their work, their reports and recommendations stay in a drawer. He felt that these experts should be encouraged to be responsible for implementing their reports and not

just making the recommendations, or at least in making their recommendations, they must take into account the actual resources within the country or available to it, and particularly the staff available to implement their recommendations.

There was unusually loud applause at the practical approach that he took to the problem for it was evident that he was trying to establish the frame of reality for the discussion which was to follow.

The first discussion to follow was by a delegate from Ghana who made a very useful presentation on the differences between mating cows and sheep at the beginning of the dry season and the beginning of the rainy season. He showed that the greater weight obtained at the time of weaning indicated the advantage of the latter. In concluding, he spoke quite frankly of the fact that technical personnel are becoming more scarce and difficult to hire for work in Africa due to the lack of attractive working conditions and career prospects. Although at first it seemed he might be referring to the problem which trained local people had upon returning to their countries, he followed this with the statement that unless the African countries were going to be willing to hire Europeans, they would experience great difficulties in expediting their own development.

Lundenburg (Argentina) described the way in which they were able to very greatly improve animal production and keep pastures green the year round, in the provinces of Rosales and Buenos Aires. Without additional machinery or new investment, the elements of the methods were better pasture management, rotation, including rotation of pasture use, stubble mulch and techniques of moisture conservation. He translated this into specific economic gains and invited members of the audience to a more

detailed presentation of this and other papers by the Argentine delegation at an informal meeting in the Hotel Richelieu. He strongly and confidently recommended the simple method of improving livestock production as thoroughly tested in Argentina and applicable to other areas.

Cuthbertson (Scotland), an eminent authority on animal nutrition, gave a statement on several technical points, emphasizing the Jacobson's remarks regarding the destruction of lysine and animal feeds did not reduce their value for ruminant feeding. Commenting on Hutchinson's presentation, he referred to their own studies indicating that supplementation of the diet of the ewe in the last weeks before parturition helped greatly in the rate of growth after birth and provided an explanation for the results reported. He then posed a direct and interesting challenge to the group to consider the possible application in some circumstances of feeding animals a prepared ration the year round without any use of pasture or natural feeds. He indicated that this is attracting a good deal of attention in Britain and some other countries and, although at first consideration, it might seem impractical for technically underdeveloped areas, it might have some use in permitting large amounts of meat to be raised in close proximity to cities where the meat was consumed, reducing problems of transportation and loss in transit. The method of feed is simply 15% of a concentrate of 50% soy bean, 16.25% fish meal, 11.25% barley meal, 7.50% molasses, 15% minerals, added vitamins A and D combined with 85% barley. His presentation stirred some interest and was appreciated.

A French delegate with experience on the Ivory Coast gave a presentation of possibilities for forage improvement in West Africa, emphasizing particularly that good

management of grass and pastures was economically attractive and also that in the so-called forest areas good breeding and stock raising was possible.

A delegate from Algeria described the difficulties of animal production in the Sahara.

A Belgian, experienced in Rwanda in the Congo, emphasized the tendency to look upon cattle as a sign of wealth rather than to think in terms of their cattle raising as an economic enterprise. He emphasized the human factor and difficulty of interesting the herdsmen in the technical and economic aspects of cattle raising. He did not give specific indications as to how this should be done other than to indicate that it involved human contacts, presumably extension agents.

An Australian delegate made a pertinent and clear plea for remembering the importance of legumes in animal production, emphasizing the enormous value of the nitrogen return to the soil by nitrogen fixation associated with legumes. He contrasted the situation in the U.S., where a pound of beef commands a very much greater price than a pound of concentrate, with that in Australia and even more technically underdeveloped areas where the ratio was small, his point being that where prices for meat were low, legumes may prove to be better economically and for building fertility of the soil than the use of concentrates.

A delegate from Argentina emphasized the savings to be made by bringing an animal to market weight sooner through improved feeding practices.

A delegate from Uruguay also gave examples of economic advantages of good animal management.

A delegate from one of the French African countries spoke of the value of a milk industry in utilizing raw materials for feed which might otherwise be wasted.

The "interventions" were concluded by a very interesting statement by Mr. Sene of Senegal regarding the desirability of integrating cattle raising with crop raising in many underdeveloped areas. The integration of stock raising with other agricultural practices had not been mentioned hitherto.

The Secretary's summary made no attempt to cover the entire discussion, but mentioned the following 7 points as particularly worthy of note:

1. The frustration which results if technical advice is given at too high a level. Sometimes the recipients of the advice are forced to say that if this is the way we must solve the problem, we're unable to solve it at the present time.

2. The loss of advisors due to poor conditions of service is very serious.

3. That no one had answered Dr. Cuthbertson's question regarding the applicability of an all concentrate diet to technically underdeveloped areas and that this remained a very interesting question.

4. That the advisor and the person advised must work together on the basis of mutual confidence, a point emphasized by Hutchinson.

5. That the search for suitable legumes for animal feeding in tropical countries should be extended.

6. That at times there is value in making dairy industry an objective in itself.

7. The importance of breeding for local conditions.

In summary the session was, on the whole, a satisfactory one in terms of participation by the delegates and pertinence of their comments.

Specialized Session

Animal Disease Control

Officers

- Chairman — Dr. G. H. Buck
(Madagascar)
- Rapporteur — Dr. Ralph C. Fish
(U.S.A.) substituting
for Dr. W. H. Hagan
- Discussion
- Leaders — Professor G. Wilson
(Netherlands)
- Dr. B. C. Jansen
(South Africa)
- Professor B. G. Petrenko
(Ukrainian SSR)
- Secretary — Dr. K. V. L. Kesteven
(F.A.O.)

U.S. Participants

Dr. Ralph C. Fish

The U.S. delegate, Dr. W. A. Hagan, was appointed as Rapporteur for this session, but he died enroute to the Conference. This session was opened by a brief eulogy for Dr. Hagan and the audience stood for a few moments in his honor. This respect paid Dr. Hagan was due largely to the very great international reputation he has enjoyed in the veterinary field over many years.

The session was well attended, particularly in view of its being held on Saturday afternoon following a strenuous first week of the Conference. Maximum attendance was about 60, with a reasonable representation from the less developed countries. Some 16 interventions from the floor were offered, and discussion persisted even after the session formally closed.

More technical knowledge and research is needed before adequate disease control can be accomplished in relation to some diseases. However, for many animal dis-

eases, sufficient scientific know-how exists if the local people and government are really interested and if technical and financial assistance are provided from outside.

Although it was not stated in so many words, allusion was made to the real danger of the many European veterinarians who are leaving some of the newer less developed countries. In some of these areas, fairly adequate laboratory facilities are rapidly being depleted of qualified technical personnel prior to the availability of native replacements. The danger in such areas exists that ground will be lost in the fight against disease.

At least two speakers made reference to gains in disease control or research as the result of cooperation of the United States. For example, one speaker from Portugal commented on the excellent cooperation and coordination between the U.S. and his country on African swine fever research.

One speaker stated that the day of the "visiting expert" is past. All too often such visits result only in recommendations to local disease control authorities which they or their country have no means of implementing. The inference was that technical aid should be on longer term basis with the expert actually staying and working with local authorities on the problem.

Many of the personal contacts made during the session will continue to be mutually valuable long after the Conference closes.

Specialized Session

Agricultural Extension and Farm Management and Planned Development

Officers

- Chairman — Professor Vasile
Malinschi (Rumania)

Rapporteur – Dr. K. Van der Meer
(Netherlands)

Discussion

Leaders – Mr. Roland Diziain
(Cameroun)
Dr. J. C. Gilson (Canada)
Mr. Carl Christian
Thomsen (Denmark)
Professor J. Tepicht
(Poland)
Mr. R. J. M. Swynnerton
(U.K.)

Secretary – Dr. D. C. Kimmel (F.A.O.)

U.S. Participants

Dr. Sherman Johnson

This was a rather dull session with only about 30 attendees about 5 of whom were from less developed countries.

Gilson (Canada) made a worthy contribution. He classified new technologies as (1) output increasing, and (2) labor saving. Japan illustrates the former. Labor saving technologies are likely to be hazardous in densely populated areas because surplus labor cannot be absorbed by growth in non-farm employment. He also warned against using large and comprehensive models constructed for over-all national development in the formulation of agricultural plans.

Johnson (U.S.A.) and Thomsen (Denmark) stressed points made by U.S. authors Malone, Hill and Mosher regarding the "package plan" approach in less developed countries.

Three speakers from less developed countries described extension activities in their country.

Specialized Session

Nutrition and Health Policies

Officers

Chairman – Professor Tran Vy
(VietNam)

Rapporteur – Dr. Nelson Chaves
(Brazil)

Discussion

Leaders – Dr. K. Suvornakich
(Thailand)

Dr. F. T. Sai (Ghana)

Dr. B. Hollgren (Sweden)

Secretary – Dr. B. M. Nicol (F.A.O.)

U.S. Participants

Dr. N. S. Schrimshaw

This was a reasonably good session. There was wide participation, including more from the less developed countries than in most of the sessions. Although about one-third of the papers were pedestrian descriptions of programs, there were a number of well-informed speakers from both the developed and less developed countries. The session touched at many different significant problems, but did not really have time to come to grips with any of them. Recognition of the seriousness of the malnutrition problems and the need for finding local solutions to those problems was the dominant theme of the session, but emphasis was also given to the need for training additional personnel from the less developed countries in the areas of health and nutrition.

The opening statement by Dr. Bruce Nicol of F.A.O. as Secretary was a competent one, although it stressed the F.A.O. approach of food balance sheets and food consumption surveys as initial steps in

obtaining information regarding nutrition problems of a country and clinical observations and surveys as well as vital statistics as later stages. (W.H.O. would express these in the reverse order.) He emphasized the need for the cooperation of ministries of health, education, agriculture, economy, community development agencies and the like to solve the nutrition and health problems of a country, stressing that it is not a task which can be done by any one ministry or agency. He called attention to the gaps in our knowledge of nutrient requirements and food composition. He pointed out the need for the application of food science and technology in technically less developed areas, the development of protein rich foods, and the improvement of environmental hygiene. He concluded with a summary of the applied nutrition programs of W.H.O., F.A.O., and U.N.I.C.E.F.

Dr. Suvarnakich of Thailand was the first Discussion Leader. He pointed out that the importance of nutrition is generally accepted, but that it is still neglected in development programs, because nutrition problems are not well understood by planners and government leaders and because the respective responsibilities of the various ministries for nutrition are not well defined. He pointed out that it is not unusual to find the Ministry of Agriculture promoting crops for economic reasons in an area where the Ministry of Health is struggling to combat malnutrition. What is needed is better communication.

Dr. Sai of Ghana as the second Discussion Leader gave one of the best talks of the afternoon on changing food habits. He said that an example of this in Ghana took place during a famine of 1958 in which people were greatly disappointed at the attendance of children at a newly constructed school and concluded that the

people simply weren't education minded. When skim milk and corn was made available from the United States, and sugar was provided them by the government, they were able to prepare a gruel for the school children which they accepted without question and which brought about a very marked increase in attendance at the school. It had been assumed that the people were not education minded, when one problem was a difficulty of their walking 5 to 10 miles to school with no food. He pointed out that the matter of resistance by people to changing food habits should not be over-emphasized since nearly all of the foods consumed in his country and in many others had been introduced within the last 30 years. He emphasized the need for new foods of good nutritive value, taking into account cost and availability and ease of production within a country, as well as adaptability to conventional methods of storing and cooking. He cited the failure of soy bean introduction into Ghana some years ago, not because the people would not eat the cooked beans but because they did not have the fuel to cook them all day first. He pointed out that eggs are sometimes taboo, but more often the economic value of an egg as an equivalent to a pound of grain precludes its use by the family as food. He made a particularly interesting recommendation that the prestige value of a newly introduced food should not be so high that only the most pretigious member of the family, the father, get it, but should not be so low that no self-respecting woman would give it to her toddler. He also suggested that to get most nutrition programs instituted, it is necessary to get the support of high government officials. He stated that most of the less developed countries have strong central governments who either want to do something for their people or want to seem to be doing

something, so that it is frequently possible to enlist the help of the central government. An interesting example of solving nutrition problems which Dr. Sai cited was the elimination of pellagra in Yugoslavia when a tax was placed on corn, but not on the importation of wheat: as a result, corn became a higher priced delicacy, wheat the more common cereal grain, and pellagra disappeared.

Mr. Hallgren of Sweden as the third Discussion Leader gave a straightforward technical discussion of the preparation in Sweden of a deodorized, defatted fish protein concentrate for human consumption. He emphasized that when treated at 150° centigrade temperatures or higher, protein destruction occurs, but using a process in which the temperature does not exceed 100° centigrade, they were able to obtain a very constant protein percentage (80 - 85%) and a high available lysine which did not vary more than 5% from batch to batch. He indicated that the maximum fat content for a product suitable for addition to cereal grains was 0.3% and that if it was as high as 0.5%, it was no longer acceptable for this purpose.

The last of the Discussion Leaders, Dr. McCreery of Canada, described needs for research and training, emphasizing the lack of precise knowledge on nutritional requirements and the tendency for the recommended allowances of the developed countries, copied in large part by the less developed countries to overestimate actual requirements. He acknowledged the support coming from the United States and other developed countries for research in the less developed areas, but indicated that this must be very greatly expanded in order to come anywhere near meeting the need. Similarly, he mentioned that nutrition requires physicians, biochemists, public

health workers, and the like, with an orientation toward nutrition problems rather than persons trained specifically as nutritionists. He indicated that the training programs in the developed countries for persons from the underdeveloped ones should be more oriented than at present to the problems of the latter and should provide for field training. He cited the University of London program with arrangements for field work in Nigeria and the program of Columbia University with arrangements for field work in Guatemala, Haiti, and Egypt as outstanding examples of what is needed. He concluded by strongly recommending regional training centers in the technically underdeveloped areas and cited the many advantages which these would have.

Discussion was begun by Isabel Leech of the U.K., who discussed the question — what is hunger? She referred particularly to the tendency in the developed countries to set the standards higher and higher, frequently by physiologically meaningless "mathematical manipulation." Her theme was to urge the less developed countries to look not to Western standards for the perfect diet, but to look for the best diet within the resources of their own country, and then try to achieve it for the largest possible number of people.

Tallis of Nigeria mentioned the 300 cases of quashiorcore seen per year in the clinic for which he was responsible, and pointed out that if the estimate of at least 100 cases of malnutrition for every one of quashiorcore was reasonably correct, the total magnitude approaching malnutrition in the country was exceedingly great indeed. Yet he found his medical colleagues more interested in the pathology of quashiorcore than in the ecology of it. For Nigeria and other similar areas, he recommended the cooperation of health and agricultural

authorities in the investigation of the environmental factors responsible for the high prevalence of syndral. He also mentioned the need for better data on normal heights and weights on composition of tropical foods (standards for biochemical normality).

A woman delegate from the Ukraine urged that the nutrition problems of technically underdeveloped areas be considered from the viewpoint of agricultural economics. She tended to deride the emphasis on special surveys to demonstrate the widespread prevalence of hunger in many countries, saying that it was only necessary to visit them and see the malnutrition on every hand. She stated that economics are often a major problem even where there is adequate food production and adequate food available because a portion of the country always goes hungry. She warned that many developing countries were taking the very dangerous course of greatly increasing the importation of food using an increasing proportion of their funds for this purpose, spending, on food which could be produced locally, currency which should be spent on industrial equipment. There is a tendency to promote the mono-culture of raw material crops to be processed elsewhere. She criticized the increasing importation of food products from Western countries and stressed the need to increase the productivity of food crops in less developed countries not only by increasing the area under cultivation, but also, as in the developed countries, by increasing the yield per unit of land. She added that less developed countries should follow the example of the U.S.S.R. where they had gone from one person producing 5 to 10 kilos per day to mechanization which could produce 2 tons per day. (The crop or product was not cited.) To achieve this, she indicated

agriculture should be put on a cooperative basis as a result of government action.

Dr. Schrimshaw was invited to comment on Dr. Sai's presentation and referred briefly to the difficulties and delays in introducing low cost protein rich foods even after they had passed the phase of laboratory development and testing. This was due to the inevitable delays in finding the best types of production machinery, receiving it and assembling it in the less developed countries; and obtaining packaging materials; training workmen; setting up a distribution system; obtaining cooperation of health workers, agricultural extensionists, and teachers; meeting government requirements, and all the rest. Technical people responsible for such mixtures should not become discouraged and give up, but persist in their efforts, recognizing that 2 to 5 years is a minimum period for really establishing any new food product.

The head of the Nutrition Institute of Indonesia gave a report which was brief and to the point describing the introduction of saradeli, a fortified soya milk preparation, in Indonesia and their substantial progress toward the introduction of other soya products and obtaining the increased use of African palm oil as a source of vitamin A.

The representative from Switzerland referred to the great increase in dental caries in Ghana due to the introduction of sugar and refined foods which Dr. Sai had described. He pointed out that this process occurred in Europe, repeated itself in the Far East, and is now taking place in Africa. He asked what is being done about it and made a plea that dental problems be included in nutrition surveys.

Groome of Tanganyika, a young British agricultural officer, who had made practical contributions to previous sessions on food

conservation, pointed out that by improved methods and the introduction of mosaic resistant strains, they were able very greatly to increase the yield to a point where it was in excess of local requirements. This permitted the people to exchange their excess for fish and other food and thus greatly improve their diets. He stated that at the present time this is going on actively to the benefit of all. He indicated that what they needed now was a short term pulse crop and asked for suggestions. Nobody gave him any.

A French speaking delegate referred to the success of Japan in industrial microbiology. He then discussed briefly the possibilities for the use of micro-organisms to produce food. He admitted that algae and various chlorelus are not practical at the present time. He also indicated that in the past efforts to establish food yeast plants had failed because the final product has proved to be too costly. He speculated that there might be some hope for the production of microbial solids from the recent discovery of strains that grow on hydrocarbons, but made no suggestions of immediate application.

Dr. Milner, U. S. food technologist with U.N.I.C.E.F., emphasized a need for a re-evaluation of agricultural possibilities for food production through the application of food technology. He emphasized that oil-seed meals can now be processed as a concentrated source of protein for human consumption. He referred to an example cited by Dr. Sai of a failure of soya introduction in Ghana because people did not have the fuel to boil them all day, as an example of a failure to apply existing food technology. He referred to the many ways in which soya is utilized for food in the Western Pacific and Far East without prolonged boiling by the appli-

cation of various micro-biological processes at the home level.

Senecal of Senegal referred to the success of treating quashiorcore in the hospital, but the need for the physician to apply this experience to the prevention and treatment of quashiorcore before children reached the hospital was brought out. He described their own efforts in Dakar using a mixture of fish flour, peanut and millet which satisfactorily passed animal and human biological tests and proved acceptable to the population. He, too, emphasized the amount of help which is needed in the production, distribution, and promotion of new foods and the time involved. He recommended more outside technical assistance to enable countries to do this successfully.

Miss Hollingsworth of the U.K. then introduced the subject of research and training, pointing out first the need to have people in government with some experience in human nutrition so that there were people who could interpret and act upon the advice of nutrition experts, a national nutrition committee or outside consultants. She discussed some of the problems involved in the formation of national nutrition committees.

A delegate from Argentina then presented a detailed catalog of the various responsibilities of the public health service toward nutrition and health problems.

Professor Sode-Mogensen of Denmark, the Chairman of a recently appointed National Protein Committee, summarized the history and function of this Committee.

Dr. Prawiranegara, the Director of the Nutrition Institute of Indonesia, described the intensive training program for nutritionists and medical officers now underway in Indonesia, stressing the usefulness of auxiliary nutritionists and the central part played in this training program by the National Nutrition Institute of Indonesia.

He particularly referred to the requirement for both nutritionists and physicians to spend the last year of their training working under field conditions.

Discussion was then opened on any of the preceding topics and Dr. Rachmilewitz of Israel gave a brief but good technical discussion of nutritional anemias, stressing their world-wide importance and the fact that they might be associated with deficiencies if iron, vitamin B12 and folic acid in any combination. He then cited specific studies in Israel showing that during pregnancy there is a decrease in the serum vitamin B12 levels of the mother, even in normal pregnancy, and that chord blood is actually several times higher in iron, vitamin B12, and folic acid than maternal blood. This means that a woman suffering from a borderline deficiency of one or more of these hematopoetic factors might be rapidly precipitated into severe anemia during the latter part of her pregnancy if her diet continued to be inadequate.

Dr. Omen of Holland stressed the very widespread occurrence of vitamin "A" deficiency in the tropics. He pointed out that this was ironic because in Europe, in the winterime, where one scarcely sees anything green, green and yellow vegetables continue to be consumed. While in the tropics where one sees green leaves, sources of vitamin "A" and other essential nutrients everywhere, green leafy vegetables are neglected in the diet. Furthermore, horticulturists emphasize other crops without placing sufficient emphasis on the value of raising green and yellow vegetables.

Professor Dewilmers of the Delegation of the Holy See referred to work carried on in Leopoldville showing electransophographic changes in children who were deficient in protein. He claimed that these changes

improved when the children were fed protein before the age of four, but subsequently became fixed and were not correctable by diet. (This is a very important observation, if true. Dr. Morrison of the U.S. Delegation has discussed this with him, and both Dr. Morrison and Dr. Scrimshaw plan to follow up the references which he gave them.) He concluded that it was particularly important to improve the diet of children before they reach school age.

A representative from France made a statement that Marine plankton are not suitable for human consumption at the present time and that research is needed to find out how to make use of them.

Dr. Fierro of Ecuador painted a graphic picture of the very low economic and social level of the people of rural Ecuador and then complained bitterly about a nutrition film supplied for showing to these people which was so far from their knowledge of foods or their level of sophistication as to be absurd. He made a plea for films and other teaching materials which were adapted to the nature and needs of people such as he had described.

The session concluded with a summary of experiences with the promotion of nutrition in Egypt touching on such points as the difficulty of getting personnel to do surveys, the usefulness of the food balance sheet despite its many deficiencies, the general ineffectiveness of national nutrition committees in his country, failure of attempts to introduce soy bean because the yields are too low, the important contribution of ignorance to protein deficiency among young children in Egypt, and the importance of looking at nutrition problems from their social, psychological, and economic aspects.

Specialized Session

Irrigation and Water Use

Officers

- Chairman — Mr. I. T. Rittani (Iraq)
Rapporteur — Mr. Ben Osman (Tunisia)
Discussion
Leaders — Mr. E. J. Davies
(Sierra Leone)
Mr. A. Z. Zahidov
(U.S.S.R.)
Dr. R. M. Hagan (U.S.A.)
Secretary — Mr. L. Garnier (F.A.O.)

U.S. Participants

- Dr. R. M. Hagan
Dr. A. T. Mosher

Hagan's (U.S.A.) lead-off paper, illustrated with slides was an excellent setting for the discussion. He pointed up principles of good water-use. Dr. Mosher later pointed to the necessity for preparing advisory personnel with information and some experience so they can assist farmers in the first years of operation on new irrigation sites.

All presentations were appropriately brief and there was participation by perhaps fifteen additional speakers.

There was unexpectedly frequent reference to the problems of how to use irrigation water in individual fields. Only Hagan's paper, however, presented any actual data on this.

The delegate from Turkey emphasized that while careful preliminary studies are useful when there is time for them, need is so great in some underdeveloped regions that it is better to proceed with a calculated risk and without some of the preliminary studies than to dishearten people further by more delay.

The session itself was not particularly helpful in terms of new ideas or approaches. It did, however, expose specialists from developed countries who had information and background, and these people were sought out in private. For example, the Laotian delegate, who is a member of the Mekong River Commission, has a lengthy conversation with Dr. Hagan; there was a session with the Ghana Ambassador regarding village water supplies, and later several less developed country delegates had a "coffee session" with Dr. Hagan and two U.S. water resources delegates.

An additional formal U.N. session was also scheduled to go into detail on the Pakistan irrigation project under consideration. This session had a large attendance (approximately 70) and perhaps the highlight was Dr. Revelle's summary report. Mr. Kovda (U.N.E.S.C.O.-U.S.S.R.) expressed concern about the large size of area to be developed, and urged that small scale experiments precede the enormous gamble by both Pakistan and the U.S.A.

Informal Discussions

Irrigation Problems

Guests

- Professor Ozal (Turkey)
Dr. Ashgar (Pakistan)
Mr. Turjoman (Saudi Arabia)

U.S. Participants

- Robert M. Hagan
Leon Damours
E. L. Hendricks
E. W. Weber

Professor Ozal pointed out that considerable data had been gathered on hydrology, soils, etc., but Turkey lacked

personnel to make decisions on undertaking projects and responsibility for design. He indicated that American A.I.D. personnel had been very helpful as specialized technical experts, and as a result of their activities, many reports have been prepared, many of which will remain unused in files unless top-level decision-making personnel can assist. He made a plea for sending experienced decision makers who could review present information and get some projects actually started. He further suggested A.I.D. provide a team of design engineers who could carry out project designs and at the same time train Turkish engineers in design operations.

Dr. Ashgar discussed the problem of water delivery through canal distributaries, and particularly in water courses. He pointed out the extreme inadequacy of present set-ups in terms of quantity of water allowed per unit of land, inability to control water flow and shut off water when not needed, and abuses in water allocation between farmers on single water courses. He discussed possibilities of installing tubewells to augment inadequate supplies on many distributaries. Consensus was that

many of the older irrigation systems in Pakistan should be extensively revamped and that their inadequacy is a prime factor in low yields and salinity.

Mr. Turjoman, a scientist in the Ministry of Agriculture, pointed out that water determines Saudi Arabia's future. He was anxious to get some irrigation projects started in scattered areas and although he made no request for help, it is clear that his country really could use some technical help on water supply and irrigation.

The delegates from both Turkey and Pakistan offered their full assistance to Saudi Arabia pointing out that their experience would be valuable to Saudi Arabia as it undertook to develop irrigation agriculture.

Ozal and Ashgar spoke very favorably of Near East South Asia Irrigation Seminars as providing excellent opportunities for exchange of information and experience and contributing to technical cooperation between countries of a region.

The problem in Pakistan illustrates the need for research on design and re-design of distributaries and on simple turn-outs and water-control devices.

Section D: INDUSTRIAL DEVELOPMENT

Summary

The utility of a Conference such as UNCAST is difficult to assess on the spot or even for several months thereafter. The meaning of the Conference may manifest itself through changes in attitudes toward development problems or development techniques as they are faced by the Conference participants for months and perhaps years in the future. I have talked to no participant who thought he had not learned something from the Conference. Individuals tend to be exposed to a broader framework than they have faced in their jobs. They tend to understand opportunities for activity in areas which they may have been exposed to in their countries but which they had previously seen only in light of special pleading on the part of one ministry or another. Inevitably, certain persuasions are broken down in this process, but others tend to be reinforced. The worth of an individual's participation in the Conference thus becomes a function of the changes in attitudes and operations over the future.

Most of the participants from the less developed countries were somewhat overwhelmed by the size, complexity and formality of the Conference. Some succumbed to the enormity of the undertaking. A larger share of these delegates fought back, attempting to counter this surfeit through insistence on a simple solution to development—the notion of a new U.N. Agency for Economic Development—or through identification of specific local problems which they might or might not be able to define very clearly.

The representatives from less developed countries will believe that this Conference has failed unless there are clearly defined areas of multilateral follow-up through existing or new United Nations' organizations. Strenuous efforts on the part of the U.S. delegation and on the part of West European delegations to create and to expand bilateral opportunities for attack on the development problem will not be a totally satisfactory resolution of the Conference. No matter how unrealistic assisting nations may feel this less developed country attitude to be, and no matter how much the less developed countries may appreciate efforts made to increase the substantive and procedural utility of the Conference, they expect action.

The need for speed in economic and industrial development in the less developed countries is the most urgent message that the modern industrial nations should receive from the Conference. The impatience of less developed country participants with the procedures and complexity of the Conference is symptomatic of this urge to get on with development.

Most of the less developed countries represented at the Conference knew about major developments in science and technology before this Conference was convened. They came here to discover a means to accelerate the introduction of these techniques. Thus, they seek solutions which will give them the education, training, and instruments (machinery and equipment) to operate the technology rather than illustrations of its

nature or direction. The less developed countries will evaluate the Conference solely in terms of whether or not it shows any probability of immediately increasing the rate of economic development in their countries.

Few of the sessions on industrial development were well attended. Two of the three basic industries were treated in the sector on natural resources and the chemical industry was divided between the two sectors. There was substantial less developed country interest in heavy industry and construction and little interest in the consumer goods industries. The session on special problems in industrial development in the less developed countries was well attended. Less developed country participation was highest in the latter session, in the session on construction, and in the ferrous metals meeting.

There were no films directly useful to the general context of industrial development of less developed countries. The French movie Building in Our Times covered the general subject of industrial development effectively but within the context of an industrialized society.

One major substantive problem in industrial development other than speed, discussed above, is the polarization of industrial development solutions. The representatives of the less developed countries tend to characterize U.S. and Soviet solutions as unbridled capitalism and unbridled state control, respectively. They insist that they want to pursue a path between these poles with the implication that this has increased the difficulty of securing economic assistance.

The political-economic problem of how to finance or otherwise to arrange the transfer of science and technology should be examined as a substantive problem of the Conference. Identifying the modern science and technology useful to less developed countries is only part of the problem; how to

apply it is the key question. Science and technology is not a free, good like air, it can only be produced and consumed at considerable cost. Thus, if it is to be applied in the less developed countries, both the developed countries and the less developed countries must look for means to defray these costs. The political implications of these means may well be more important than the economic or financial implications. Perhaps planning sessions discussed this problem, but it was never discussed in Industrial Development or in the International Cooperation sections in which one might have expected it to arise.

The official reporting of the Conference was, in general, excellent. It maintained an intellectual balance between competing viewpoints while doing the utmost to direct the content of the papers and conduct of the sessions to the greatest possible contribution to the participants from the less developed countries. Although there was some tendency toward polarization of the Bloc and U.S.-Western Europe solutions in the published reports, most of this was absent from the summaries presented at the Conference sessions.

I thought that the most noteworthy presentations of the meeting were those presented at the Special Session convened by the Conference President on 9 February at 1530 hours. Several speakers from the less developed countries presented very clearly that there are some fundamental conflicts between the more developed and the less developed countries, in some cases it was indicated that their interests were diametrically opposed. The need for speed, the urgency of economic development was particularly apparent at this meeting. The need for restrictive foreign trade arrangements among the less developed countries to promote indigenous economic growth was contrasted with the effort by industrial countries to promote

freer trading arrangements. The less developed countries were plainly in a revolutionary mood. One delegate made an almost inflammatory statement in which he said, "we must not go on with a situation in which some countries seek assistance and others dispense it."

The follow-up actions that seem indicated by the discussions in the various sessions on Industrial Development are:

1. The U.N. Commissioner for Industrial Development should (a) acquire a staff of senior advisory personnel consisting of individuals with direct operational experience in the industrial sectors to which they are assigned; and (b) initiate use of ad hoc advisory services, in one or two key sectors, such as ferrous metallurgy and construction materials.

2. Both A.I.D. and the U.N., operating in their respective spheres of responsibility, should assist directly in financing detailed feasibility surveys for industrial projects made by competent survey organizations where these projects serve to implement broad economic surveys or plans.

3. Both A.I.D. and the U.N. should intensify assistance for upgrading basic education, expansion of technical training and augmenting university programs. To the extent that the Peace Corps can expand its function in these areas, it should likewise be encouraged to do so.

4. In providing assistance in the industrial development sector, a much greater role should be played by individuals with broad experience in private industry.

General Session

Officers

Chairman—Mr. Jonathan B. Bingham—
U.S.A. (Conference Vice-
President)

Secretary and
Rapporteur—Dr. S.N. Rostovsky, UNCAST
Scientific Secretariat, USSR
national

U.S. Participants

Dr. J. Herbert Hollomon, Assistant Secretary of Commerce for Science and Technology

Jonathan B. Bingham, U.S. Representative to the Economic and Social Council of the U.N.

Dr. William A.W. Krebs, Vice-President, Arthur D. Little, Inc.

Ambassador Bingham made an excellent introduction of the session. The speakers dealt with rather general issues and inevitably focussed on some of the political issues that lurk near the surface. Each of the major groups of states delivered statements of national attitudes and policies. Each speaker attempted to relate these policies to the Conference objectives, but the keynote was policy rather than development.

Three principal avenues of approach to the economic organization of the development process.

1. The representatives of the USSR and the Eastern European countries insisting on essentially complete state control of economic activity.

2. The U.S. insisting on as little state control of activity as is consistent with economic development.

3. The developing countries insisting on an admixture of these views which accommodates local cultural and economic patterns as well as their desire for rapid economic growth.

Attendance at the General Session on Industrial Development was large and almost all of the less developed countries were

represented in the session. There was vigorous participation from the limited number who could get the floor during the session. Mr. Tata of India did a distinguished job in presenting the case of the less developed countries and Mr. Schwab of France did an effective job of stating the thesis of a mixed economy in a large industrial country.

Specialized Session

Engineering Techniques and Organization

Officers

Chairman—Professor K.N. Plotnikov, Institute of Economics, Academy of Science, USSR

Rapporteur—Dr. Fredrico Rivero, Engineer in the Venezuelan Institute of Technical and Industrial Research

Secretary—Mr. R. Muller (ECE)

U.S. Participants

None

This session was at best somewhat marginal in utility. It started with only 10 persons in attendance and never exceeded 30.

The Chairman effectively set the stage for discussion but the discussion leaders did little to unravel the need or desirability of development in the machinery industries. Professor Dudley gave a good basis for using well established equipment rather than prestige items, many of which may prove to have missed the mark and have a very short service life. Technical efficiency and production efficiency need not be coincident. Dr. Colanovic, Yugoslavia, made a strong plea to buy only the latest possible equipment otherwise workers don't stay progressive and costs are higher.

There is an obvious clash between these points of view, yet the clash is probably less severe than it seems. Dr. Colanovic really objects to obsolete equipment and Professor Dudley really objects to equipment whose productivity has not been proven through sustained operations.

Dr. Selim of the UAR had several comments of interest directed at high-pressure salesmen of equipment and the international system of patent control.

Mr. Mora of Portugal made an excellent statement of the problem of what technology to buy by indicating that this is a function of alternative choices rather than some fixed technology which is absolutely superior. A state uses all levels of capital technique over the many different enterprises operating within a given industry to say nothing of its several industries.

The meeting was well conducted and it was a matter of regret that it was not better attended.

Attendance by the less developed countries was very small; however, those representatives who were present participated actively and made their interests clearly known.

Specialized Session

Ferrous and Non-Ferrous Metals

Officers

Chairman—J.R.D. Tata, Chairman of the Board of Tata Industries and Air India, Bombay

Rapporteur—Mr. Coheur of Belgium

Secretary of the

Session—Mr. G. Mikhalevich (ECE) USSR

U.S. Participant

Mr. E.K. Sandbach, Vice-President, Koppers International, C.A.,

The utility of this session to the Conference and to the less developed countries was high. The session got into the technical matters which lie at the heart of ferrous metallurgical development in the less developed countries and stayed there throughout the meeting. Delegates of the less developed countries raised questions readily during the meeting and the speakers and the Chairman saw to it that the questions were answered. The Chairman did an extraordinarily effective job throughout the session to assure that the delegates who were interested in the session got to talk to each other about the problems.

Mr. Buck of Canada gave a concise statement of the origins of the Canadian steel industry which imported almost all its materials from the U.S. originally, but was able to develop a rather considerable steel industry despite their material shortages and their proximity to the enormous steel industry of the U.S.

Mr. Sandbach read an effective paper, the message of which was that a relatively economical small-scale steel operation is now available to those countries with the raw materials or export capacity large enough to pay for imported raw materials. Moreover, it is possible to use these units as a nucleus for the expansion of steel-making capacity through addition of ancillary equipment and processes to the original mill.

Dr. Bhabba raised a question as to the preference for investment in machine-building rather than iron and steel. He thought that the former ought to enjoy a higher priority as the rate of basic industry expands.

Mr. Miller of the U.N. presented some excellent data on the relative size of steel mills in various countries. Many countries have a mixture of a few large mills and many small mills. Others have only one or a few

large mills with no small mills whatever in the country.

Less developed country attendance and participation were both exceptionally high at this meeting. Over half the audience was from the less developed countries and much of the talk from the floor was raised by them. Specific questions were asked of the speakers and the Chair and they were answered as fully as possible.

Specialized Session

Building Materials and Building Techniques

Officers

Chairman—Dr. F.M. Lea, Director of the Building Research Station, D.S.I.R., U.K.

Rapporteur—Mr. Sang Keun Chun, Director, Bureau of Technical Control, Economic Planning Board, Korea

Secretary—Mr. H.F. Broughton (ECE)

U.S. Participant

Dr. Joseph F. Gillson

The session was well chaired and the official reporting was excellent. The presentation by the Secretary was rather long, but it was well organized. Papers were relevant, the principal areas requiring elaboration were pointed out, and the session was given a firm lead for discussion.

The discussion was very lively and attendance excellent. Over 120 people attended, more than half from less developed countries. There was a general interest in the subject matter, agreement on general outlines of objectives, detailed and operational proposals both from the more developed and the less developed countries on the principal lines of attack on the problem of construction

and a remarkable consensus among the several countries represented in the session on techniques to be employed—recognizing, of course, that there is enormous range in construction problems within individual countries as well as between countries.

There was general agreement on the use of stabilized soils for construction in areas where there is a sufficient dry spell to permit construction. The role of cement in local construction and in complex construction projects was likewise agreed. There was a consensus on the need to prefabricate certain elements in construction such as doors and windows yet equal agreement to avoid prefabricated elements in other parts of construction. The need for on-the-job training (not apprenticeship) and for common construction procedures was also agreed. It was possible at this session for the less developed countries to block out large parts of the development of the construction and construction materials industry and to have some confidence that certain procedures would be followed with some assurance. Moreover, there was an effort to identify the manner in which local variations might be treated within the agreed framework.

There were a number of excellent presentations among the discussion leaders and universally excellent comment from the floor. The proposals contemplated the building situation in the less developed countries and sought solution which would make the maximum space availability for the object of the structure and the individual contribution of the builder. A number of permutations and combinations of builder and owner construction activity were discussed and a most excellent illustrated comment was made by Mr. Oakley from the U.K. Delegation showing these techniques in their application in Jamaica. This was one of the best prepared statements at the meeting and went off well

despite the superhuman incompetence of the technician who was handling the slides.

There was perhaps less comment on great projects applications than might have been desirable, but I think the concentration on the problem of housing and the basic construction problems of these areas was greatly appreciated by the less developed country participants. This session represented something of a switch from grandiose planning and disdain for the consumer that characterized other areas more directly concerned with the consumption sector of the economy.

The Israeli Delegate, Mrs. Shalon, proposed U.N. sponsorship of joint construction research projects and regional and national seminars dealing with local building problems and local building materials.

Dr. Siddiqui (Pakistan) discussed a new building material which his organization has been experimenting with. He called it marbellite. The material is made from local materials. He indicated that they are working on a pilot plant operation now, but need help to get the pilot plant going and to get into scale production.

Specialized Session

Textiles

Officers

Chairman—Professor Emil Honegger,
Technical University, Zurich,
Switzerland

Rapporteur—Dr. A. Hogazy of the United
Arab Republic

Secretary of the
Session—H. DeBruyn (UNCAST) Belgium

U.S. Participants

None

This would have been a useful session for less developed countries who were interested in industrial development, but no delegates from those countries attended.

The report of the Secretary of the session was complete in its coverage of the papers and new developments in the industry, but did not fully identify the critical areas for discussion.

Both Professor Centola of Italy and Professor Vincent of the UK gave excellent presentations on the problems attendant on development of local textile industries. Professor Centola particularly discussed the mistakes Italy had made in trying to develop synthetic fiber industries on too wide a basis, too quickly, a lesson that would probably have saved many of the countries at this Conference a great deal of pain and money had they heard it.

Specialized Session

Structural and Locational Problems of Industry

Officers

Chairman—Mr. J.E. Oberholtzer, Deputy
Minister, Department of In-
dustry and Development

Rapporteur—Academician A.A. Arikelian,
Economist, Armenian Acad-
emy of Sciences

Secretary of the
Session—Mr. Ole Pedersen (IAEA)
UNCAST Secretariat

U.S. Participant

Dr. Eugene Staley

This session came as close to produc-
ing absolutely nothing as the Conference
achieved. With the exception of Mr. Staley
and Mr. Colonavic of Yugoslavia, the speak-

ers were delivering addresses given in the
earlier sessions on industrial development.
The Yugoslav paper was highly regarded by
people from the less developed countries to
whom I talked. It did not, however, advance
locational theory. The session was poorly
attended.

The official reporting for the session
was variable. It summarized the papers well,
pointing to the major gaps which they created
to be filled by the discussion. Mr. Pedersen
did a particularly able job in setting the
stage for the discussion, but no discussion
developed.

Mr. Pajestka from Poland made an excel-
lent inscribed statement on the structure of
industry during development. He urged that
investment in the infrastructure should lead
investment in heavy and light industry, that
over-investment in this sector should be
conscious policy beyond just the excess as-
sociated with indivisibilities. Capacity in
infrastructure is necessary to sustain maxi-
mum activity in other sectors. Failure of in-
frastructure means failure of other output
even though the capacity is present.

Specialized Session

Specifications and Standards

Officers

Chairman—Mr. Pedro Carriquiriborde, Di-
rector of the Tests and Meas-
urements Laboratory, Argentina

Rapporteur—Dr. V. Weidemann, State
Counselor, Federal Adminis-
tration of Physics and Tech-
nique

U.S. Participant

Dr. Allen V. Astin, Director, National
Bureau of Standards

The utility of the session was high. Although most of the less developed countries know of cooperative programs to train people for developing and testing standards, the participants had an opportunity to meet leaders of major standards bodies and to relate the experience of their development problems in standards to the experience of major testing institutions.

About 55 people attended, of whom about one-fourth were from the less developed countries. Less developed countries delegates participated actively in the discussion.

Official reporting for the session was an accurate reflection of the papers and posed the more important questions which might be discussed at the meeting.

Several items of some substantive importance emerged. Mr. Neurala of Czechoslovakia mentioned that socialist economics required more standards because consumer demand couldn't operate in this area.

Mr. Romanov of the USSR indicated that some 8,000 standards are in use in the USSR, 600 organizations meet annually to revise standards, 200 institutes and enterprises are called in to work on standards.

Professor Shalan of Israel suggested that they develop an admixture of state-specified standards and consumer-enforced standards in the less developed countries until testing procedures improve and production establishments achieve the techniques for effective control.

Mr. Allison of the UK raised the possibility of an international specification covering the most important metals and construction materials.

Mr. Nichols of Australia urged that standards be administered by private institutions rather than the government.

Specialized Session

Products of Animal and Vegetable Origin and Substitutes

Officers

Chairman—Mr. Hachemi Larabi, Charge of the Mission to the Permanent Organizations in Geneva, Algeria

Rapporteur—Dr. Thomas Walsh, Director of the Agricultural Institute, Dublin, Ireland

Secretary
of the Session—Mr. R. Eklund (FAO)

U.S. Participant

Lyle F. Albright, Professor of Chemical Engineering, Purdue University

The utility of this session to the less developed countries was nil. None of their representatives were present. About 30 delegates attended. The Secretary's report covered the contributed papers in considerable detail. It was well organized. The report was perhaps less effective in setting out the principal issues for discussion.

W.D. Raymond of the UK gave an excellent and useful series of remarks, extending his earlier paper, much of the content dealing with methods to reduce the recovery of oils from tropical raw materials and to increase the rate of recovery (tonnage of oil per tonnage of crop) of these oils. Dr. Jenkins of Canada presented an excellent summary of development in lumber, pulp and paper industries.

Specialized Session

Food Processing and Preservation

Officers

Chairman—Professor Svend Aage Anderson
of Technical University,

Copenhagen, Denmark
Rapporteur—Professor Eugenior Tropa of
Technical University, Lisbon,
Portugal

Secretary
of the Session—Mr. Z.I. Kertesz (FAO)

U.S. Participants

Mr. James E. Wickersham
Dr. Nevin S. Scrimshaw

The utility of this session would have been exceedingly high to the less developed countries if more members had attended, there were only 2 or 3 participants in the room. The tendency of the less developed countries to stay away from industrial sessions devoted to consumer goods was apparent throughout the Conference. They showed great interest in heavy industries and special industrial problems but almost no interest in consumer industries.

One noteworthy related substantive aspect was the fact that there was no Soviet participation in any of the light industry meetings.

The report of the Conference Secretary was exceedingly comprehensive. It was a competent analysis of the subject and the papers which had been submitted, including their limitations and relevance to the less developed country problems in food processing.

The discussion papers and the papers from the floor presented an excellent survey of established practices and many new developments in the food processing industry. Unfortunately, it was a case of industrial country talking to industrial country. The principal processing industries covered included: additives, freeze drying, antibiotics for preservation, antioxidants, refrigeration, salting, smoking lactic acid fermentation, synthetics from wood and petroleum process-

ing, etc. The papers also dealt extensively with problems of distribution of goods and training of individuals in these industries.

Mr. Wickersham gave an excellent presentation of the interest of private enterprise in these industries and its ability to create the equipment and plants needed to expand food industries and to create industrial skills and capital for the acceleration of industrial development.

Specialized Session

Special Factors Affecting Industrial
Development in Less Developed Areas

Officers

Chairman—Professor Jozef Pajestka, Director of the Economics Research Center of the State Planning Commission of the Council of Ministers, Poland
Rapporteur—Mr. Guy B. Gresford, Secretary, Commonwealth Scientific and Industrial Research Organization, Australia
Secretary—Mr. Ole Pedersen (IAEA)

U.S. Participants

Dr. William A.W. Krebs
Dean Howard W. Johnson
Mr. William J. Lawless
Dr. Alexander Leighton
Dr. Kenneth F. Powell
Dr. Albert C. Stewart
Dr. Carroll L. Wilson

Utility of the session was exceedingly high in the sense that it was one of the few early sessions which provided a substantial two-way communication between the less developed countries and the industrial countries. The session was large (over 250 present) and more than half those present

were from the less developed countries. Speakers from all shades of political and economic persuasion presented their views on special circumstances required for development. Almost half of the inscribed speakers were from less developed countries.

The principal substantive points developed in the session were the need for recognition that less developed countries are not homogeneous. Each country differs from each other in terms of culture, natural and human resource base, economic institutions, climate, etc. There are some similarities in terms of need for capital and pressure to develop, but these are less significant to the development process than the differences.

The official reporting at the session identified the problems to be faced by the discussion somewhat better than it summarized the papers. The Secretariat summary was instrumental in directing discussion in the inscribed speeches to specific topics of utility to the session. Moreover, the official reporting of the session did an affective job of shrinking a wide range of papers into a manageable session.

Individual subjects of interest covered in the discussion and comment were:

- (a) Conflict between industrial development and technological development in states with limited resources;
- (b) Necessity for strict allocation of priorities in assigning development funds;
- (c) Need to centralize authority and responsibility for development;
- (d) Need for the most rapid increase in vocational and professional training;
- (e) Need for investment promotion activity to familiarize external investors with the nature of the national economy and the opportunities and liabilities which exist;
- (f) Simple uses of data processing equipment for the less developed countries;

(g) A host of papers outlined the critical nature of management problems and the need to develop effective managers.

(h) The less developed countries must depend fundamentally on their own resources, there will not be enough foreign aid;

(i) Optimum use of radio isotopes in industry, their association with inquiry into new techniques.

Informal Session

Cybernetics

U.S. Participants

Mr. John Diebold
Mr. William Lawless
Mr. Norman Roem

Mr. Diebold opened the meeting by outlining the evolution of the concept of cybernetics, which he indicated was a concept developed from the confluence of information technology, electronic computers, management science, and application of specific computer problems. He made the point that one should be cautious of the area of application of these concepts to less developed countries.

Mr. Lawless followed with a series of illustrations in which computer techniques were applicable to existing less developed country problems. Some required such elegant techniques as simulation, others needed simple linear programs of transport cost nature and optimizing solutions.

The speaker from Lebanon, the only less developed country representative to participate actively, held that available data in many of these countries were insufficient to offer any assurance that solutions to simulation problems would have any assurance of

accuracy at all. He indicated that Lebanon was using computers in the following areas:

- (1) irrigation impact on agriculture;
- (2) reclamation of land and its impact on agricultural technique;
- (3) unsuccessfully in several industrial applications; he attributed lack of success to the absence of realistic capital output

coefficients—shadow systems having proved useless;

- (4) analyzing invisible payments items.

The principal constraints have been coherency relations and tie-in equations. They have had help from French technicians over the last three years.

Roem discussed the use of cybernetics in planning, information systems, and applications to less developed countries.

Section E: TRANSPORTATION

Summary

1. The Conference brought into sharp focus the unique role played by transportation in the development process. Accessibility and mobility were cited as essential elements in almost everything that the less developed countries are striving to accomplish. Lack of access and absence of mobility frustrate efforts to accelerate development and are often reflected in unused land and other resources, large tonnages of food left in the fields to rot, and excessive prices of commodities. The absence of both personal mobility and commerce means an absence of trade in ideas as well as goods. Thus, transportation was recognized as a key factor in the success or failure of the entire development effort.

2. In consequence of its importance, transportation has taken a large share of the funds available for national development programs. In the developing countries, transport is absorbing 20 to 40 percent of their public capital allotted for development. During the past decade and a half, 30 percent of all U.S. economic aid to the developing countries has been for transportation. Approximately the same emphasis has been given to this sector in the programs of the World Bank and, in 1960-61, the Bank's loans for transport jumped to 51 percent of its total transactions.

3. Although the transport sector pre-empted extensive resources, the Conference revealed a lack of understanding of the developmental effects of transport investments; of the many factors that condition the desirable timing of transport improvements; the relative merits of alternative transport media,

of various administrative solutions, and of different approaches to financing, rate-making, and regulation. Yet all of these aspects of transportation can have profound effects on the achievement of economic, social, cultural and political objectives in the less developed countries.

4. In large measure, these critical gaps in knowledge were considered the result of an almost universal tendency to view the transport needs of a country in isolation from the goals that transportation could help to achieve. Many solutions, unsatisfactory from a development standpoint, can be traced to the undue emphasis on separately programming and providing transport facilities without full consideration of the economic and social circumstances. Of equal importance is the failure on the part of agencies with a history of aid in transportation to assess their work, i.e. to review original proposals, statements of economic justification, traffic forecasts, and anticipated benefits, and to compare these with what has happened. As a result, developing countries do not benefit from their own or others' experiences and continue to use essentially the same techniques and make the same assumptions about their transport needs as were made in the early days of foreign aid. To permit foreign aid to play a more effective role in overcoming transport inadequacies will require a total look at transportation as part of the over-all development process.

5. Also apparent in all sessions on transport was the paucity of factual data to guide developing countries. Many experts at

the Conference were amazed at the number and extent of the deficiencies in information exchange, e.g. engineers who had experimented with a feeder road system in one country found that exact answers to their problems had been worked out some time before in another area. Only fragments of useful information are available on the transport systems of the less developed countries: on what approaches are proving successful or unsuccessful, on what possibilities are best suited to accelerating the accomplishment of transport programs in countries of varying characteristics. In order better to understand the critical problem areas in the transport sector, data are badly needed on costs, resource needs, training requirements, developmental effects, financial methods, survey techniques, organizational problems and solutions, methods of integrating transport systems, and specific transport problems relating to agriculture, industry, education, and other sectors. In short, the effective study of transportation and the determination of desirable courses of action call for the collection, processing and dissemination of many types of basic data and statistical information.

6. The Conference emphasized that developing countries today have a number of potential advantages compared with the past. First, they do not have to move slowly and laboriously through successive stages of transportation evolution, but can adopt the latest and most efficient advances in conventional transportation. In addition, the accumulated benefits of science and technology are at their disposal, and a judicious selection of novel means of transport, as they become economically feasible, could hasten economic development. Among the most promising innovations now being developed or already in operation are the vertical take-off aircraft, off-road locomotion, the ground

effect machine, pipeline for solids, the hydrofoil ship, interchangeable freight containers, simplified cargo handling techniques, and unitized mechanical refrigeration systems. Outside the transport field, other new technological developments are underway which could yield important economies in transport requirements, e.g. new sources of motive power and forms of energy distribution, new techniques of processing and preserving food, and new possibilities for substituting communications for transport, as well as the use of advanced analytical techniques and electronic computers. Properly used, these technical advances could minimize or reduce the need for much costly and time-consuming construction of transport facilities, thus freeing more resources for other urgent needs.

7. A second major advantage advanced for less developed areas is the trend towards general acceptance of national planning, which makes it possible to relate transport planning more closely to over-all development programs. Developing countries are thereby able to base their allocations of resources to transportation on the needs of the economy as a whole and to schedule transport investments in balance with the growth of production and distribution. The Conference emphasized, however, that much more careful scrutiny of the claims of the transport sector for development resources is desirable as the opportunities for waste are very great.

Recommendations

8. In order to provide effective planning guidance, much more needs to be known about transportation programs—the present physical condition of a given project, the uses or unforeseen benefits that have actually developed, and what expectations failed to materialize and why. At best, foreign assisting agencies have only an incomplete and

spotty indication of the impact on development that has resulted from efforts to improve transportation. In appraising transportation assistance activities, therefore, the most obvious need is to find out what has happened as a result of transport investments to date, and to direct future activities in the light of what is discovered. This need for a general reappraisal is increased by the growing number of nations seeking the assistance needed to make their development plans a reality in the Development Decade.

9. In addition to such improved substantive appraisal of transportation projects, there is an urgent need to answer other questions involved in effective planning of transportation development. What kind of strategy is guiding or is implied by diverse transportation efforts? Is it a strategy that will make a maximum contribution to development? Are resources being scattered too thinly to expect anything significant to follow from them? Does planning take into account the new revolution in transport technology and the possibility that wider choices are already or will soon be available? Most importantly, are transportation investments needlessly diverting scarce resources from other urgent requirements? To date, only a few countries have made a major effort to estimate their total transport requirements on the basis of national goals, or to link specific transport proposals to a total plan geared to the nation's anticipated development program. Consequently, if available foreign assistance funds are not to be wasted, much more attention will have to be devoted both to the development of techniques for relating transport programs to national plans, and to the staffing and training of permanent organizations in the less developed countries capable of carrying out this assignment. Failure to provide such guidance will continue to make it extremely difficult for planners to estimate

what will be moving, in what amounts, or how and where the need for transport capacity will have to be met.

10. Another essential step discussed at the Conference is the establishment of international machinery by which information on transport problems and solutions could be made known in a systematized way. In the field of improving knowledge through research and training and through the exchange of information, the industrialized nations have hardly begun to tap their resources for the improvement of transportation in the less developed countries. What is eventually needed is a worldwide program of information exchange and research cooperation that could multiply both the knowledge of transportation and the rate of progress in overcoming transport problems. It was generally agreed that guidance should be sought from the United Nations on this matter, although at present there is no UN agency which is empowered to take action in this field. New arrangements would be required to ensure an interdisciplinary approach and a maximum of cooperation and coordination.

11. In conclusion, transportation is a sector that is being affected very rapidly by progress in science, both within and from the outside. Properly channeled, the technical advances being made could open the way to important departures from previous efforts to overcome transport difficulties in the less developed areas. The Conference provided substantial evidence that research of a fundamental character is essential, and that the A.I.D. research program in transport may be the badly needed first step towards a global research and development effort. For while it is important to know first about today's problems and solutions, attention also must be given to relevant applications of new types of transport equipment and systems; new methods of projecting transport needs;

and new approaches to changing the nature and magnitude of the transport problem through innovations in energy resources, food processing, education, and communication. In effect, foreign assistance agencies must avoid being caught ten years from now with transport concepts and methods no better than those of today.

General Session

Officers

Chairman—Prof. S.D. Pusponegoro
(Indonesia)

Secretary—Mr. L.T. Kelly (U.N. Staff)

U.S. Participants

Mr. J.L. Burke

Dr. P.R. Carlson

Prof. K.T. Healy (Formal Presentation)

Mr. E.H. Holmes

Mr. R.B. Keating

Mr. W. Owen (Floor Speaker)

Mr. C.D. Roach

Mr. A.L. Ryall

Mr. R.M. Whitton

1. In opening the General Session on Transport the Chairman emphasized that the emerging countries which have gained independence since World War II are in the fortunate position of being able to reap the accumulated benefits of present day transport technology without having to experience the lengthy periods of research, experimentation, and transportation operations which had been the lot of more developed countries. The less developed countries, however, face major problems in selecting the most suitable form of transport development to achieve national goals, in providing adequate investment capital to accelerate progress, and in the training of skilled personnel for construction, operation, and maintenance purposes,

as well as the establishment of research facilities. It was also stated that as the developing countries improved their living standards and opened up new territories and industries, a greater emphasis on internal transportation networks will be required than had been the case when their transportation systems were geared principally to export markets.

2. The first oral presentation was by Mr. Furniss (U.K.) on the subject of the modern trend towards higher aircraft speeds. The speaker felt that no attempt had been made by aircraft manufacturers to produce an airplane suitable as a replacement for the DC3 which was now reaching the end of its useful life after over 30 years of service. He suggested that the DC3 now failed to meet the higher performance standards required for modern aircraft and was only allowed to operate because civil aviation authorities were not strictly enforcing air safety requirements. The speaker then cited the high cost of providing aviation services, in particular the training of flying and ground personnel and the extensive ground services required for the newer type aircraft. Although a replacement for the DC3 is urgently required in the less developed countries, no aircraft manufacturer appears ready to build an airplane mid-way between the 8-10 seater executive type and the 45-50 passenger planes currently offered as DC3 replacements. A slow speed airplane with a 20-30 seat capacity which would not require costly ground services would be the optimal choice. He concluded with the remark that the Conference should also consider the special advantages of helicopters in less developed areas.

3. The second oral presentation by Prof. Healy (U.S.A.) dealt with the general social, political, and economic factors of transport in less developed areas. The

speaker stressed the general stimulating forces which could be associated with the introduction of modern transport methods in developing areas as well as the obvious direct gains of cheaper and quicker movement of people and goods. The dynamic force inherent in the improved accessibility of resources, the more varied opportunities for people, and the sheer excitement that comes with increased mobility can be important stimuli to the attainment of higher living standards. But while improving transport will promote general development, its effectiveness will be greatly dependent upon parallel improvements in a country's marketing arrangements, general industrial operations, and other broad aspects of economic activity. Additionally, the problems of politics and public administration can significantly affect transport development. An important issue is the degree to which centralization of control at the national level may result in less effective application of technology than might be achieved with greater participation at the lower level. It was emphasized that different transport technologies contribute in varying ways and degrees to overall plans, and that the variations must be given important weight in guiding the relative development of the different transport media.

4. The first speaker from the floor, Prof. Postelnicu (Roumania), stated that transportation poses one of the most complex and difficult problems for the less developed areas. In many cases, the mechanical means of transportation have to be imported with resultant heavy drain on foreign exchange and undue demands on inadequate power systems. The speaker referred to the progress made in the rehabilitation of Roumania's transport systems after the destruction of World War II. He concluded that the development of heavy industries, as part of a general economic plan

coordinated by the Roumanian Government, now permits his country to manufacture most of the transport means needed for further expansion.

5. The next speaker, Mr. Glynn (Australia), referred to current experience in Australia where the crucial link in the development of rural areas was the feeder road system linking main trunk roads and residential and industrial sites. He referred to low cost road development in his country, particularly where frost penetration does not occur, and said that in such cases the procedures included tests to enable existing soil formations to be used, raising of the formation height with appropriate side drainage, compaction by traffic, coverage of the compacted formation with a minimum skin of granular material, and, when warranted, provision of a thicker base and a light surface seal.

6. Prof. Podoski (Poland) referred to statistics which indicate that the world's population has grown in the last 200 years from 300 million to 3 billion people and would reach the 4 billion mark by the end of the century. At the same time, extensive mechanization of rural industries has caused a large number of rural workers to migrate to cities and urban areas with the result that cities and towns now have painful transportation problems. He stated that railways created conditions for the concentration of large numbers of people in a restricted area, but did nothing to relieve resultant urban congestion. He suggested that a partial solution was the development of rapid transit means to satisfy the internal demands for passenger movement. Reference also was made to the traffic problems created by the private automobile, with the concluding statement that at least two-thirds of the passenger movement in urban areas must be by public means of transport.

7. Mr. Owen (U.S.A.) stated that the demands of transportation are indicated by the rapid rate of traffic growth during the Indian third Five-Year Plan where expansion of traffic demand is expected to be three times greater than the growth of national income. This suggests that other developing countries must allocate a large proportion of their resources to the transportation sector, oftentimes to the neglect of other vital needs. He indicated, however, that the attempt always to increase transport capacity may not be the right way for developing countries to solve their transport problems. Just as transport requirements are dictated by activities in other sectors, so also may transport solutions be found outside the transportation field. The goal of increasing the food supply, for example, may not be served best by expediting movement if new methods of processing and storing what is grown are introduced. Nation-wide power grids supplying electricity over wide areas can reduce local demands for coal and effect major savings in railroad transport. And the advent of low-cost telephone, radio, and television could make it possible to accomplish much of the educational and technical training which at one time was possible only by traveling to remote places. Thus, technical innovations in energy distribution, food processing, and communications may do as much to alleviate the transport burdens of developing countries as anything done to improve transport itself.

8. Each of the next two speakers, Mr. Mohtadi (Iran) and Mr. Fioc (France), emphasized the heavy burden of cost that is borne by the developed countries in operating their transport systems and the implications therein for the less developed countries. Proper planning and coordinated programming are essential to achieve the most beneficial results possible from available funds. Mr. Fioc stressed, however, that transportation

plans should not be too theoretical and that transport solutions must differ according to local circumstances, nature of the soil, profile of the country, and rainfall of less developed areas. In his view, railways are always up-to-date means of transport, beginning with small inexpensive gauge lines with capacities of 200,000 to 800,000 tons to the mining railroad with a very heavy single track line able to carry many millions of tons. Transport progress made possible by telecommunications in control and operations was also emphasized.

9. The last speaker, Mr. el Hakim (U.A.R.), took exception to the earlier statement of Mr. Furniss concerning the continued operation of the DC3 aircraft. It was his understanding that no aircraft was permitted to fly unless it conformed to the International Civil Aviation Organization (I.C.A.O.) safety standards. In most of the less developed countries where the DC3 is mainly used, reliance is placed on technicians from the technically advanced nations to maintain the standards and progress of civil aviation in general and air transport in particular. He concluded that a relevant technical advisory agency should be established within the U.N. and I.C.A.O. to (1) ensure that I.C.A.O. objectives were properly implemented, and (2) provide advice to less developed countries as to the best use of aircraft to accelerate economic, social and cultural aspirations.

Comment of U.S. Section Coordinator: The speakers, while mainly relating their remarks to specific transport fields which were in most cases more suitable for specialized sessions, indicated their beliefs in the need for national planning and research supported by a far greater exchange of scientific and technological information on an international basis.

Specialized Session

Factors in the Development of National Transport Policies

Officers:

Chairman—Mr. W. Owen (U.S.A.)
Secretary—Mr. L.T. Kelly (U.N. Staff)
Rapporteur—Mr. R.S.P. Bonney (U.K.)
Dr. R.S. Millard

U.S. Participants

Mr. J.L. Burke
Dr. P.R. Carlson
Mr. K.T. Healy
Mr. E.H. Holmes
Mr. R.B. Keating
Mr. M. Myerson
Mr. C.D. Roach
Mr. R.M. Whitton

1. In opening the session, the Chairman remarked that when transport needs are examined within the broader framework of national goals, resort to transport solutions may prove unsatisfactory from a development standpoint. The goal of increasing food supply, for example, may not be served best by expediting movement. An alternative may be to introduce new methods of storing or preserving what is grown. When modern storage is made possible in producing areas, peak traffic demands typical of agricultural economies could be flattened by spreading the transport burden over a longer period of time, and investments in transport capacity reduced accordingly. For perishables the establishment of processing plants close to sources of supply could reduce spoilage and eliminate the need for fast transport or refrigerated equipment. Economies also may be secured through the judicious use of modern communications or utilities. It may be cheaper, for example, to burn coal at its source (or at another location) and transmit

electric power through an electric power grid to industry rather than to transport the coal over a highway or railway which has to be constructed almost exclusively for the purpose of carrying fuel. Transportation also may be avoided through extensive use of television or radio where personal services rather than goods are involved. The approach that must be taken is one that not only looks at transportation as a whole, but also beyond transport itself to the processes of production and distribution.

2. The U.N. Science Secretary commented on the poor response to the Agenda Item on Institutional Arrangements for the Regulation and Control of Transport. It was thought that this was not due to a lack of appreciation of the importance of control and regulation in the development of a viable transport system, but rather the lack of experience in the application of present systems to less developed countries. It was brought out by one delegate that the hasty adoption of advanced systems of control and regulation by less developed countries could lead to adverse results unless local conditions were carefully considered. A further disappointing feature was the absence of delegates from many developing countries who are directly concerned with transport matters. Since transport is absorbing 20 to 40 percent of their public capital available for development, it was not thought that the poor representation was due to non-recognition of the importance of transportation, but rather an unawareness of the growing body of expertise available to help them solve transport problems.

3. Discussion developed first on the need to provide an integrated or coordinated transport system suitable to the particular needs of individual countries. Most delegates agreed that an integrated transport system was essential, but that the number of

possible planning approaches suggested that comparative studies in coordinated transportation are required to provide effective guidelines. The organization of port facilities in some less developed countries was cited as a particular example where large benefits accrue from a unified port authority system. Closely connected with the question of transport coordination are promising technical innovations such as freight containers that are interchangeable among all forms of carriage. The use of containers may be particularly advantageous in less developed areas where there are gaps in the transport system and frequent trans-shipments are necessary. Examples were quoted of reduced cargo costs and greater protection of shipments against damage, pilferage, or adverse weather.

4. Methods of evaluating transport needs were discussed to determine optimal transport investments, the type facilities needed and where, and the standards and specifications required for individual facilities. These methods range from theoretical approaches in which a relationship is sought between transport investment and their effects on national income, through cost-benefit studies of the type employed in assessing the value of road projects, to relatively simple estimates to minimize total cost of railway tracks and rolling stock. The extreme difficulty in cost-benefit studies of making proper allowance for the effects of transport provision in encouraging development was noted.

5. During the session it became clear that although there was no lack of methods to help in the formulation of transport policies, the useful applications of these methods were greatly handicapped by the scarcity of reliable statistical information in many of the developing countries. Data on railway construction and maintenance costs, for ex-

ample, could frequently be obtained, but not on roads and road transport, and in both instances insufficient data exist on their effects on rural development.

6. There was general agreement on the need for field studies to relate land use and agricultural production under varying conditions with transportation provision. Important considerations would be the influence of human factors, such as the traditional ways of life and skills, and the education of the inhabitants of areas in need of better transport facilities. Several countries reported that they were undertaking or intended to start such studies and would welcome international cooperation in the exchange of ideas and the sharing of experience and field work in order to make the results widely known.

7. Urban transportation was also considered. Industrialization accompanying economic development has created heavy concentrations of population and economic activity in large cities. The rapid rate of migration from farm to city has greatly intensified capital requirements for transportation in these urban centers. In addition to the social problems of developing a viable urban culture and the economic problems of providing power, water, sewage, education, transportation, and other facilities for the rapidly expanding urban populations, the conditions are made more difficult by the fact that expansion of urban economic activity does not necessarily provide either full employment for the incoming labor or increased per capita income in the hinterlands where that labor originates.

Comment of U.S. Section Coordinator: The practical issue of finding solutions to the transport problem caused by the increasing migration of rural workers to urban areas requires that less developed countries seek

criteria for the allocation of available investment funds that will best promote balanced transportation development in the city-hinterland complexes. There is an urgent need not only to assure the necessary capacity for urban transport, but also to avoid unnecessary transport requirements growing out of current trends. The latter may be possible either by urban design aimed at minimizing the generation of traffic, or by national policies aimed at altering the present distribution of new employment opportunities to avoid the further build-up of major urban concentrations. These problems indicate the need for research in selected urban areas on transport relationships in the city-hinterland complex as well as to other public investments in the city.

Specialized Session

Roads and Road Transport

Officers

Chairman—Mr. J.A. Gandilhon (France)
Rapporteur—Mr. D.F. Glynn (Australia)

U.S. Participants

Dr. P.R. Carlson
Mr. E.H. Holmes
Mr. R.B. Keating
Mr. W. Owen
Mr. C.D. Roach
Mr. A.L. Ryall
Mr. R.M. Whitton

1. In opening the session, the Chairman invited discussion on training of personnel, the design and construction of roads and road transport, and the planning and operation of highway systems.

2. The comments of the discussion leaders may be summarized as follows:

A. Prof. Volmuller (Netherlands) stressed the importance of taking into account local

conditions in engineering rather than designing on the basis of "averages." He cited the benefits of stage construction and urged that engineers familiar with the practical problems of design, construction, and costs be brought into economic planning and programming early in the process to permit more realistic appraisals of local conditions and needs.

B. Prof. Podoski (Poland) expressed disappointment that national highway planning seemed to ignore the city. He felt that U.S. experience, as reflected in our Highway Capacity Manual, did not take proper account of the sharp demarcation between rural and urban conditions, and that the U.S. tended to carry rural standards too far into the city. He proposed that city streets be classified both by function (e.g., arterial, collector, etc.) and traffic volume. Thus a street classified B-3 might be identified as a 3-lane arterial street. (Comment: In U.S. experience, system classification is essential and usually is followed, but it is doubtful if Prof. Podoski's suggestion is practical, inasmuch as not only traffic volumes but also city street functions change over time.)

C. Dr. Millard (U.K.) stated that road systems and highway programs should support the developmental goals of a country—its industry, agriculture, educational needs and social aspirations. Essential to the construction of an efficient and economical road system is precise knowledge of the nature and behavior of terrains to be encountered—soils and sub-soils, hydraulic and climatic information, and the characteristics of expected traffic. The collation of this information is necessary not merely for the construction of roads, but will influence decisions in other important sectors of an economy.

3. Following these oral presentations, Mr. Berliet (France) advanced the view that road transport should not be restricted by

regulations as to vehicle size and weight, but rather that roads should be built to accommodate the vehicle. In his opinion large vehicles of a standard make not only reduce the spare parts problem but are efficient carriers that are better suited to the needs of less developed countries.

4. Mr. Whitton (U.S.A.) responded that U.S. experience does not support Mr. Berliet's thesis. In the United States, roads are built for the public good and not for particular vehicles. He held that it is fundamental in the development of highways, roads, and bridges that reasonable limits as to vehicle size and weight be established and observed if the road system is to be maintained and operated economically. Each country should establish its own regulations and standards based on its own conditions, with due regard to uniformity between neighboring countries where any appreciable movement across borders may be expected.

5. The training of highway personnel was then discussed and it was generally agreed that all types of personnel require specialized training to permit them to perform their duties efficiently and thoroughly. Engineers and technical assistants, in particular, need to be familiar with the results and techniques of appropriate research in their fields, knowledge that oftentimes can be supplemented by overseas training and the advice of visiting experts. The creation or development of a national corps of road engineers would in itself be a valuable resource for the training of competent technicians.

6. The advantages cited in establishing local assembly plants and repair shops include:

(a) Training of personnel for all phases of road and road transport;

(b) Provision of essential plant maintenance and spare parts facilities;

(c) Ensuring maximum use of local facilities—both materials and labor;

(d) Allowing possible savings in production costs when compared with the cost of importing vehicles and parts;

(e) Providing scope for plant design especially adapted to local conditions.

7. In the area of road planning and programming, it was thought important that the developing countries make adequate provision of sufficient land to facilitate the widening of roads at a future date, as well as allowing room for crossroads and bypasses.

8. In road construction and maintenance, it is important to constitute a base which has a uniform resistance to traffic pressures along the entire length of the road. Over this base various layers will be placed and finally the exposed surface layer. The strength and thickness of these layers will depend upon the resistance of the sub-soil and the loads to be borne; the resistance of the sub-soil is primarily dependent upon its degree of moisture content. It is unlikely that most terrains encountered will provide traditional construction materials such as crushed stone. In order to avoid excessive costs, therefore, it is advisable to use whatever materials may be found on the spot.

9. For road building, where stabilization is of utmost importance, the simplest method advanced was consolidation of particles with moisture content held within a favorable range. Where simple mechanical stabilization is inadequate, chemical additives may be required, usually cement and lime. Problems that require study are the interaction of additives with soils and gravels, the relations between strength gain and temperature, and the effects of organic and other soil components. It was emphasized that stabilization techniques must be carried out by trained personnel with properly designed equipment.

10. In tropical climates with lengthy dry and wet spells, the maintenance of unsealed surfaces was recognized as a major problem. The best solution blends the proper binder into the top course of the base, and commonly used binders are cement and lime where an addition of four to five percent is usually sufficient. Bituminous by-products from coal and oil also are excellent binders and are indispensable for surface layers where imperviousness to water is required. Unfortunately, their cost restricts their use to important roads. Chemical binders such as lignosulphate, resins and acrylates are now only beginning to be used. Even though relatively expensive, the small amounts required may reduce transportation costs which, in turn, can offset the initial expense. Binders of a particular sort for dust control present individual problems, but satisfactory results have been obtained from the use of magnesium salts or bittern, a saltwater by-product obtained from salt marshes.

11. Research on the loss of road strength due to the increase of subgrade moisture content has not, as yet, produced positive results. Anticapillary barriers such as plastic or bituminous sheets have been offered as one solution, but it is contended that such membranes are often perforated by tropical ants or vegetation. An alternative suggestion that requires verification is the possibility of using a cheap form of cement, lime or asphalt stabilization to decrease slightly the sensitivity of the subgrade to moisture increase.

12. Corrugation and dust are the two major defects of unsurfaced roads. Under average conditions where the traffic flow is above 150 vehicles a day, a bituminous seal may be justified and its cost more than compensated for by both reduced accidents and vehicle and road maintenance. In some cases, the use of deliquescent agents (e.g.,

calcium chloride or sodium chloride) may be warranted after a properly bonded surface has been established (in dry weather, these chemicals are not deleterious to vehicles).

13. A centralized approach suggested to ensure good road homogeneity was the description of a fixed installation for the simultaneous preparation of cement to stabilize a base and bitumen for the surface. Manipulating cement, however, requires precautions against moisture, but a recent process of bulk transportation and transfer by pulsated air offers an interesting solution.

14. It was disclosed that recent research on vehicle/road relationships has provided the following guidelines for road maintenance:

(a) Rapid deterioration in the surfaces of light roads occurs with tire pressures of about 25 lbs./sq.in.;

(b) Road deterioration increases rapidly as tire inflation pressures increase;

(c) Vehicle maintenance is less with lower tire inflation pressures;

(d) Larger tire print areas tend to damp and reduce road corrugations.

15. In view of the lack of factual data on many aspects of road construction and maintenance in less developed countries, it was considered that the systematic collection and broad exchange of relevant information on critical problem areas would greatly assist current efforts to provide practical low-cost roads and road transport.

16. For the U.N. Decade of Development, it was estimated that not less than 30 percent of national expenditures will be spent on roads and road transport in less developed countries. In comparison with other means of transport, road transport was considered, on the whole, less capital intensive and far more flexible in its technical and economic characteristics. The extension of road mileage, however, remains far short of

traffic demands and efficient planning, programming, and management of road systems are among the most urgent tasks facing less developed countries. Mr. Whitton (U.S.A.) outlined some of the significant characteristics of road transport for planning purposes as follows:

(a) Flexibility. Roads can be planned on a long-range basis, and developed through shorter-range programs that can be modified as necessary and geared to other phases of economic development.

(b) Stage Construction. Roads can be constructed in stages. At first an inexpensive road, perhaps with a stabilized earth surface, might suffice. As travel increases the surface can be strengthened and widened to accommodate traffic needs.

(c) Use of Local Resources. Local materials; usually with the addition of small amounts of stabilizing or cementing material, generally make good roads. Locally available labor can be readily trained to perform most of the tasks involved in construction and maintenance. Careful design and location are important to make full use of local resources.

(d) Versatility. Highways provide for the movement of people and goods in a wide variety of vehicles and can effectively support national purposes and goals.

17. Mr. Pollock (U.K.) urged that less developed countries give careful consideration in their systematic expansion of road networks, particularly feeder roads, to the choice between a large mileage of low-cost roads or a smaller network of better roads. In the early stages of development where traffic volume is low, a reduction in road quality with consequent capital savings would have less effect on traffic efficiency than at a later date. In these calculations, road user benefits should not be the only considerations; general economic, social,

and health benefits should be quantified and included to the extent possible.

18. In trucking operations in less developed countries, a most important factor cited was the need to reduce costs by providing return freight. A partial solution may lie in the design of special containers (e.g., collapsible or disposable containers for petroleum products). The United Kingdom Road Research Laboratory expects to produce data on the costs of truck operations over unsealed roads by the end of 1963.

19. Finally, general technical points were raised. Mr. Allison (Kuwait) asked about the reliability of nuclear probes for measuring soil moisture and density. Mr. Davies (Sierra Leone) expressed the need for better aerial photography techniques to help determine soil conditions in tropical countries, as well as maintenance methods and equipment suitable for both wet and dry seasons. He also requested help in determining the load capacity of highway bridges in Sierra Leone for purposes of regulating vehicle size and weight. The question of when to build a bridge to replace fords or ferries was also raised, with some discussion of the advantages of prefabricated and standardized bridge components.

20. In summary, Mr. Glynn (U.N. Rapporteur), found that five major points had been highlighted by the discussion:

(a) The advantages of stage construction in transport planning and programming;

(b) The need for more effective maintenance techniques for road surfaces in tropical areas;

(c) The need to establish regulations and standards for vehicle weights and dimensions to permit more efficient operation of road systems;

(d) The need for training programs to alleviate the shortage of skilled personnel for road transport;

(e) The need for advanced countries to pool their research knowledge and experience in materials-testing for the benefit of the less developed areas.

Comment of U.S. Section Coordinator: More understanding is required of the proper levels of maintenance needed to protect capital investment in various types of roads in less developed countries. If roads are "over-built" in relation to a country's ability to maintain them, then they are of less use to the economy than a system of low cost roads which could be maintained. The achievement of a balanced level of construction and maintenance expenditure is one of the most important planning aspects of road and highway development in less developed countries.

Specialized Session

Railways

Officers

Chairman—Mr. F.H. Fakiner (Federal Republic of Germany)

Rapporteur—Dr. M.S. Quraishy (Pakistan)

U.S. Participants

Dr. P.R. Carlson

Prof. K.T. Healy

Mr. R.B. Keating

Mr. A.L. Ryall

Mr. R.M. Whitton

1. The Chairman in his introductory remarks stressed that in many developing countries more than 50 percent of the heavy bulk materials moved are carried by rail. In spite of the development of air and highway transport, enormous investments are being made to modernize the railroad, to increase its capacity, and the quality of its service as well as its earnings. The less developed countries

are able to profit from modern technological advances, and can draw on the vast experience of the industrialized nations in railroad planning and operation.

2. In the general discussion that followed, the following major points were made:

A. Importance of surveys. A comprehensive survey of rail transport needs should be made within the framework of the national goals to be served, and in balanced comparison with other transport media. If the survey indicates relatively light traffic initially with substantial increases expected at a future date, then a rail system should be developed that will be practical in first cost, but which will lend itself to upgrading for handling heavier traffic volumes later by merely adding to existing facilities.

B. Exploitation of single track lines. Developing countries have many single track railroads, the capacity of which may be increased by:

(1) A more rational exploitation based on traffic studies, improved communications systems, and centralized control;

(2) Increasing the power and capacity of rolling stock;

(3) Improving the structure of the line itself (e.g., providing adequate passing tracks).

C. Motive power and rolling stock. The selection of motive power should be based on a number of factors which include type of service, fuel, speed of operation, and size of train. In selecting motive power, it was considered preferable to employ one standard type of locomotive in order to minimize repair costs and reduce spare parts inventory. The use of a standard type locomotive also minimizes the problems of training operating and maintenance personnel.

(1) The use of diesel engines has largely replaced steam locomotives due to the higher overall thermal efficiency of the diesel cycle

which permits greater power, speed, and economy of operation. It is possible to build general purpose diesel locomotives weighing approximately 120 tons which can be used interchangeably for freight, passenger, and switching service to provide maximum flexibility. Diesel locomotives also can be built with both electric and hydraulic propulsion systems. The hydraulic drive locomotive may present certain advantages in less developed countries through eliminating the need for skilled electricians and maintenance equipment required for the rewiring of coils, armatures, and general electrical repairs of this type.

(2) When electric locomotives are used, the horsepower output can be doubled at certain speeds by merely working the locomotive at a higher rate, a condition that cannot be obtained in a diesel locomotive where the power is limited by the maximum output of the engine. Electric locomotives can use either hydro- or coal-fired steam power plant energy which may be desirable under certain circumstances. The added investment for transmission, catenary and trolley wires will be difficult to justify, however, unless significant traffic loads are hauled annually. The installation of an electrical power grid could, of course, provide both power for a railroad and energy for industrial and rural development.

(3) Lighter weight rail cars present advantages of quicker starting, higher speeds, and shorter braking distances. For greater passenger comfort and speed, new types of bogies have been developed which can be adjusted to poor tracks.

D. Rail construction and maintenance techniques. Advances in metallurgy, chemistry, and applied engineering have resulted in increased durability of track, reduced maintenance requirements, and lengthened life of rolling stock. Long-welded rail,

treated wood cross ties, concrete cross ties, flexible fastenings, and prefabricated components for bridges and buildings are technical innovations that present advantages for improved rail construction and maintenance techniques.

(1) Gauge of track. Selection of the gauge of railway track should be given careful consideration, particularly if the railway line of a country will connect with that of another. The standard gauge in most countries is now 4 ft. 8½ in. Considered adequate for handling any type of rail traffic, its wide use facilitates interchange of equipment and reduces the cost of rolling stock and track accessories.

(2) Rail. Every effort should be made to use as large and strong a rail section as possible. The life of rail is long and benefits in track maintenance costs make flexural stiffness and strength of the heavier rail section an attractive investment. Long welded rail presents advantages of reduced construction and maintenance costs, longer track life due to fewer number of joints, and more efficient conduction of current and signal circuits.

(3) Cross ties. The selection of cross ties will depend to a large extent upon local materials available. If wood ties are used, their life expectancy can be more than doubled if impregnated with a mixture of either creosote and petroleum or creosote and coal tar. In general, the creosote and petroleum mixture is preferred in hot, arid regions to prevent ties from drying out and splitting. Gum, oak, walnut, fir and pine all lend themselves to this preservative treatment. Where suitable wood ties are not available, the use of prestressed concrete ties, although more expensive initially, results in greater track stability and length of service. If continuous welded rail is used, the added weight and firmer fastening of the rail to the prestressed

concrete tie is an advantage, but the inherent inability of concrete to absorb impact, particularly that resulting from derailments, is a distinct disadvantage.

(4) Flexible fastenings. Double elastic fastenings and rubber tie pads are proving more efficient for the fastening of rails to cross ties than traditional clamps or spikes. Essential components of the long welded rail and concrete cross tie, their use will also prolong the life of wood cross ties.

(5) Ballast. Ballast applied over the roadbed is important from the standpoint of drainage and tie support, and efforts should not be spared to obtain the ballast best suited to track conditions. Crushed limestone, granite, cinders, gravel, and crushed slag have all been used for ballast with acceptable results. In certain areas there may be other materials that will be satisfactory.

(6) Bridges, trestles, and culverts. Prefabricated components are of great assistance in railway construction. Standard parts are easy to transport and an order for a large number of identical sections can often be made at advantageous prices in a competitive market. For bridges, the welded metal pieces may be assembled by bolts; for the smallest openings, culverts of corrugated metal or concrete are now available. The use of concrete spans, either reinforced concrete arch, prestressed concrete slabs or girders, or post tensioned prestressed concrete arches, may be considered in cost comparisons with steel spans. If treated timber is available, a timber trestle span makes a good structure from the standpoint of long life and economical maintenance.

(7) Maintenance. Although developing countries have abundant manpower, the crossing of uninhabited areas or the increase of

traffic on a single track will often require mechanical equipment in order to improve quality of service and reduce maintenance time during periods of interrupted traffic. The use of mechanical devices, for example, will allow a rapid re-establishment of traffic in the event of derailment due to landslides or floods. In Africa, mobile gangs of some 20 workers service 35-40 miles of track travelling on a motor trolley with trailer. The degree of mechanization possible for any one country depends, of course, on many economic factors, including the number of skilled personnel available to operate and maintain such equipment.

E. Training. It was noted that in all phases of railway extension and improvement, shortages of trained personnel are widely encountered in the less developed countries. This is a major problem with no ready solution, but one that needs immediate attention if developing countries are to install and operate successfully the railway networks essential to their progress.

Comment of U.S. Section Coordinator: In all parts of the world, with few exceptions, the railways are operating at a deficit. Many rail systems are in a state of deterioration, their costs are high, and their traffic is increasingly vulnerable to competing carriers. The questions in numerous countries are to what extent existing rail plants should be modernized, what rail facilities are going to be necessary to accommodate growing industrialization, what abandonments are desirable to adjust to growing competition, what changes should be made in rate policies to assure a more economic basis for the allocation of traffic, what regulations should govern railway competitors, and what further trends in air, road, and pipeline transport should be anticipated?

Specialized Session

Inland Water Transport and Coastal Shipping

Officers

Chairman—Mr. P.C. Omtvedt (Norway)
Rapporteur—Prof. A. Lederer (Belgium)

U.S. Participants

Dr. P.R. Carlson
Mr. R.B. Keating (U.N. Discussion
Leader)
Mr. C.D. Roach
Mr. A.L. Ryall
Mr. R.M. Whitton

1. The Chairman outlined some of the important considerations in inland water transport and coastal shipping. Major problems facing the developing countries in inland shipping are the development and maintenance of waterways, the installation and improvement of port facilities, and the provision and modernization of shipping. The increase in international maritime traffic in recent years also calls for improvement of seaport facilities and development of merchant shipping in many less developed countries. Inasmuch as the principal rationale of any transportation development is to reduce the economic distance between the shipper and consignee, a developing country must (1) carefully assess its present transportation system as a whole, (2) determine what transport extensions or improvements are warranted by the economic prospects of the country, and (3) establish priorities for the incremental development of the integrated system. An example cited for priority consideration was the lack of adequate deep draft berths in many harbors which results in high freight costs occasioned by the heavy demurrage of ocean-going ships having to wait for loading or unloading.

2. The remarks of the discussion leaders may be summarized as follows:

A. Dr. Freiesleben (Federal Republic of Germany) catalogued the advantages of navigational aids to inland and coastal shipping. He recommended that the use of RADAR maps be expanded as rapidly as possible to include the coasts and harbors of less developed countries. The DECCA system also is used extensively for navigation and mapping. He suggested that the experience of engineers in the problems of channel silting be made available to all through some international mechanism (Note: It is believed that this function is provided by the Permanent International Association of Navigation Congresses, Brussels, Belgium).

B. Dr. Quraishy (Pakistan) stated that in many less developed areas rivers are still the main avenues of commerce between coastal areas and their hinterlands. In 1959-60, 8 million tons of cargo were moved on the inland waterways of Pakistan; in 1960, some 14 million passengers were transported by river craft. Over 1,000 river landing sites are now in operation in East Pakistan. The greatest problems to efficient river transport, however, derive from the seasonal monsoon period from June to September when the rivers are flooded, followed by the dry season when the rivers sink to shallow depths. An extensive dredging program is now being carried out along with a detailed mapping effort over 155 miles of inland waterways.

C. Mr. Keating (U.S.A.) drew attention to the potentialities for achieving cost as well as time reductions through the use of interchangeable freight containers, including refrigerated units for perishable goods, and possible applications of special transport vehicles in port areas and inland waterways. He pointed out that while the use of containers may be considered as a labor saving device, its importance to less developed areas

lies in the fact that it is a capital saving device as well. Some advantages attributed to the use of containers were economies of the unit load or consolidation of small loads, elimination of a great deal of paperwork, almost entire elimination of pilferage, lower damage claims, expedited door-to-door pickup and delivery, and elimination of multiple handling of cargo. Turning to the subject of unconventional ships or vehicles, he then described the technical characteristics and possible applications of the hovercraft (ground effect machine) and hydrofoil ship in less developed areas. Both vehicles are capable of speeds greatly in excess of the conventional train, river craft, or oceangoing ship. Speeds of 70 to 200 knots are attainable for the hovercraft, and 45 to 100 knots for the hydrofoil. Hovercraft can operate independent of terminal facilities and could provide for fast movement of technical personnel and cargo in areas subject to flood, along shallow or unbridgeable rivers, or over railways, roads, or graded tracks. The use of hydrofoils may offer certain advantages in short-run passenger or cargo runs on inland waterways or along coastal areas between towns or cities. They also may be well suited to transportation between less developed or mountainous areas where airports are difficult to build. He concluded with a brief statement on the new tools of systems analyses, conceptual mathematical models and computer applications, and suggested that these advanced analytic techniques offer substantial promise of extending the abilities of planners to analyze and evaluate relevant data in the transportation field.

3. Following the oral presentations, Professor Lederer (Belgium) stressed the advantages of the push-tow technique for river barge traffic in place of the older pull or side-tow methods still used in many areas. The savings occur in reduction of manpower

and economy in vessel construction and fuel. It was pointed out, however, that push-tow will not give the best results in all circumstances. On rivers or canals subject to changing shoals or with narrow locks or tight curves, it may be found that pull-tow using a powered cargo carrier as the propulsion unit will give the better economic results, and will not be subjected to delays where tows have to be rearranged to negotiate difficult stretches. In some cases it may be found advantageous to use a combination of both methods on a waterway with changing topographical features. Further economies in barge operation are possible if night operation can be achieved, but this requires improved navigational aids, channel markings, and radio communications.

4. Professor Mosterman (Netherlands) mentioned that as a result of the 1961 Conference on Inland Vessels for Southeast Asia, the Netherlands Government decided to design two of the six river craft recommended at the meeting. Laboratory work, drafting, and engineering have been completed and the plans and specifications are offered to any interested country. He then briefly mentioned the use of radioactive tracer elements to determine the migration of sand in shallow waters, and suggested that much more could be learned about sand migration and alteration of harbors through experiments with hydraulic models.

5. Mr. Best (U.K.) spoke of a recent development called the DRACONE that could be filled with petroleum products, fresh water or other oils and towed behind a vessel. Described as a long, flexible, rubber container, capable of withstanding the abrasive action of sunlight and seawater, the Dracone could be used for the carriage of liquids whose specific gravity is at least 2 percent less than that of the surrounding water. With

its comparatively lower operating and maintenance costs combined with ease of mobility, safety and resistance to shock the Dracone may present an attractive alternative mode of transport in areas where conventional bulk carrying vessels would not be economical or could not be employed. A recent example of the Dracone's use was to supply 51,000 cubic meters of fresh water over a six-month period to some Greek islands. Another operational experience took place in the Bay of Fundy in Canada where fishing vessels towed about 15,000 cubic meters of hydrocarbons in a six-month period, which resulted in a 50 percent reduction in costs when compared with fuel carried in drums.

6. Mr. Roach (U.S.A.) emphasized that hovercraft and hydrofoils depend on dynamic lift rather than buoyancy, and thus purchase ability at a rather high price. He felt that effective control of the hovercraft would take almost as much power as that required to support the craft. Consequently, the role of hovercraft and hydrofoils would be of interest only in a few selected locations, and primarily for passenger transport. He also mentioned recent developments in shrouded propellers suitable for use on push-tow boats where efficiencies of 53 percent can be attained at towing speeds as compared with 38 percent for the normal, open screw propeller.

7. The Chairman raised the question of the implications of increased mechanization in the maritime field for port development planning in emerging countries. Ocean transportation is by its very nature international and decisions made in this area by the industrialized countries affect directly the levels of expenditures made in port design, cargo handling equipment, and organization by the less developed nations. The trend towards unconventional type of merchant ships (e.g., roll-on/roll-off vessels, con-

tainer ships, large liquid or drybulk carrying vessels, etc.) has brought in its train a need for specialized loading and discharging facilities at the ports such ships serve. The situation is further complicated by the fact that European piers are fitted with cargo cranes so that it is not necessary for a ship to use its own gear, while in the United States there are few pier cranes. Additionally, in those areas where riverborne traffic plays a significant part in the local economy, it has become necessary to provide river ports with handling equipment of a similar design but on a smaller scale to that used in seaports. The complexity of the problem calls for international consultation to (1) determine the degree of mechanization required by less developed countries with a surplus of low cost labor, and (2) the economic and technical accommodation possible on the part of advanced maritime nations to less than optimal conditions in less developed country ports and harbors.

8. Also mentioned was the problem of control of marine plant life which infests many African inland waterways. The proliferation of the water hyacinth plant, for example, has seriously impeded navigation in certain river areas. International research cooperation is sought on this particular problem by the FAO.

Comments of U.S. Section Coordinator: The major issues discussed in this session may be summarized as follows:

(a) The potentials of river transport in less developed regions could be appreciably enlarged by improving channels, navigational aids, port facilities, river craft, and port administration and operation.

(b) In view of the relatively low cost of water transport a rather high priority should

be given to the extension of inland water-borne commerce within the framework of integrated transport policy and development plans.

(c) The increase in worldwide ocean-borne commerce accompanied by technical advances in ship design and cargo handling equipment have created urgent pressures for improvement of port facilities in many less developed countries. In many countries, new ports have to be built. In other, the connections between ports and the hinterland must be expanded to cope with present and projected traffic requirements. Of critical importance in port planning is the degree of mechanization required in labor-rich but capital-poor countries to meet the demands of modern merchant fleet operations.

(d) The frequent trans-shipment of cargo in less developed areas where the transport network is incomplete is a major cause of breakage, pilferage, delay and excessive cost. The interchangeable freight container is a promising possibility for an increase in transport efficiency and economy. The costs and savings of making the shift to container movement for both industrial and agricultural traffic should be investigated for selected countries and groups of countries.

Specialized Session

Air Transport and Specialized Uses of Aircraft in Less Developed Areas

Officers

Chairman—Mr. M.L. Bonte (France)
Rapporteur—Mr. D.C.A. Rendel (U.K.)
Secretary—Mr. G.B. Young (ICAO)

U.S. Participants

Dr. P.R. Carlson
Mr. R.B. Keating
Dr. M. Mead

Mr. M. Meyerson
Mr. W. Owen
Mr. C.D. Roach
Mr. A.L. Ryall
Mr. R.M. Whitton

1. The Chairman opened the meeting by stressing that the transport of men and materials was one of the essential human activities. Although he wished to avoid making a sharp distinction between a less developed or more developed country, he felt that an assessment of a country's degree of development could be based on its ability to move people and goods easily and efficiently.

2. The Secretary of the Session, Mr. Young, outlined some of the tasks which aviation could perform in less developed areas ranging from aerial surveys for roads, railways, agriculture, natural resources, to ambulance and medical service, assistance in construction of public works, and carriage of freight and passengers. In view of the complex nature of air operations, he stressed the need for highly qualified personnel in aviation, and suggested that international cooperation might provide a number of regional training centers to meet urgent requirements for skilled personnel. Referring to the paper presented by Mr. Furniss (U.K.) at the General Session, he felt that there may be need for a whole series of aircraft specifically adapted to the problems of less developed areas.

3. The remarks of the discussion leaders may be summarized as follows;

A. Mr. Jodeau (France) classified air transportation into three categories:

(1) High density, long distance international air traffic between metropolitan centers of developing countries and the rest of the world. This service is adequately provided by existing aircraft.

(2) Inter-regional air traffic of medium density and range connecting centers within the country or adjacent countries, a requirement that can be met by present aircraft types.

(3) Small scale, low density air traffic of limited range required for internal operations in less developed areas. This need has not yet been fulfilled satisfactorily by existing aircraft and presents a most pressing problem for developing countries.

At present, the small airlines are using the DC3 which is becoming uneconomical to operate due to old age, increased maintenance costs, and difficulty of obtaining spare parts. Bearing in mind present day construction costs and the fact that the aircraft industry has tended to concentrate on high performance aircraft, he considered it unlikely that an early replacement for the DC3 could be obtained. The need for a similar design philosophy is apparent, however, to produce a simple, rugged and economical aircraft suitable for employment by relatively unsophisticated personnel under less than optimal operating conditions. Questions that should be studied are the number of passengers the plane should carry, whether freight carrying, mixed, or convertible from one role to another; the performance required, whether high or low speed; and supporting ground facilities, navigational aids, and runways.

B. Mr. Tata (India) emphasized the need for less developed countries to avoid heavy investments in air transport merely for prestige purposes. It is very important that money allocated to develop air transport be used to serve the economic and internal needs of a country. In many less developed areas, the airplane plays a fundamental role in accelerating investments which would be held up owing to an absence or insufficiency of surface transport. In some cases the air-

plane is the only existing means of transport, the most rapid, or the most immediately available. He advised developing countries to purchase simple, reliable aircraft that demand a minimum of ground equipment and highly skilled technicians. It had to be borne in mind, however, that safety was of paramount importance in aviation and well trained personnel were required to operate and maintain aircraft. In those developing countries where both civil and military aviation exist, it was thought that a close relation between the two sectors would permit economies in training and the use of ground support facilities.

C. Mr. El Hakim (U.A.R.) underscored the problems of training in a field where rapid technological progress continually introduces new and more complex equipment. He proposed that regional aviation training centers be established where students from a number of countries within a geographical area could be brought together in an integrated training program. An example cited was the United Arab Republic Aviation Training Center near Cairo which has first class equipment (simulators, audio-visual aids, etc.) and welcomes all students regardless of race, creed or country.

4. The first part of the general discussion that followed was centered on the problems of training with a wide range of viewpoints expressed. Some speakers considered that the difficulties of training qualified personnel in less developed countries made it essential to use the simplest aircraft and equipment available. Other speakers felt that the international character and technically advanced nature of aviation demanded a broad, integrated, training approach at all levels to ensure not only efficient use of complex equipment, but also the inculcation of a real sense of responsibility and operational discipline.

5. Dr. Margaret Mead (U.S.A.) pointed out that in establishing aviation training centers, special attention should be given to the historically developed capacities of different national and cultural groups. The cultural base for such characteristics as precision, accuracy, punctuality, interest in machinery, ability to work in team situations, or assume responsibility for the lives of others, differ from one culture to another. In New Guinea, for example, it is possible to find very primitive peoples living only a short distance apart who show marked contrasts in their historically developed abilities to handle time, space, and numbers, varying from people who only count to 20 to people who handle numbers up to 40,000 without any method of record keeping. Although very different training will be needed for people with different historical traditions, it would be a mistake to perpetuate the type of training in which tasks were divided up into very minute parts, and by repetition, individuals of limited educational background were drilled into performing them reliably. This is the sort of training that is necessary for people with limited intelligence, but it is a mistake to equate limited education or experience with limited intelligence. If an individual is to advance, he must grasp not one simple operation, but the general principles underlying the whole. She found a striking demonstration of the ability of people to move from the stone age to a capacity to handle electronic equipment responsibly and well in a study she made of a South Sea Island people. Because the aircraft industry demands such extraordinarily high standards of technical and moral responsibility, it is likely that regional centers of training might be more suitable for training ground and flight personnel than local or national centers. The presence of members of several cultural or national groups together in a new

setting would prevent the dominance of inappropriate old attitudes of, for example, fatalism or procrastination, and make it easier to set up the appropriate ethos of profound responsibility for the safety of travelers by air.

6. The last part of the discussion was on the subject of transport planning, equipment and material. It was pointed out that a replacement for the DC3 built to the same specifications would never be acceptable to the modern day operator or regulating authorities; the need was for a number of different and probably more specialized aircraft to suit particular applications. Great emphasis was placed on financing the purchase of new aircraft since the DC3 had been obtained in most cases at very little cost. There was a general consensus that a simple, rugged, reliable, inexpensive airplane, an "aerial jeep," would be very valuable in less developed areas. It was generally agreed that it should be a 15-passenger vehicle that could be readily converted to cargo carrying. Speed was not considered to be important—150 to 200 miles per hour was regarded as ample. On the other hand, great significance was attached to versatility of role, the design and construction of simplified air strips, and ease of maintenance with a minimum of ground handling facilities to provide rapid turn-around. It was noted that the use of multiple wheel landing gear and low pressure tires would minimize the need for hard surface landing strips and consequently lower the cost of constructing runways. In addition to these points, reduction of first costs and facilities for financing purchase were considered to be of first importance. This consensus does not imply that a single aircraft could be designed to meet the varying conditions encountered in all developing countries. Different capacity requirements, route structures, levels of available technical skills, and other factors

will dictate various alternatives in aircraft design.

7. Dr. Carlson (U.S.A.) stressed that in areas where surface transportation networks are not well developed, air transport can be applied advantageously not only to move cargo and passengers but also in direct carriage of perishable farm produce. In the United States, for example, contract trucking on a highway costs about \$.04 per ton mile, but a good two-lane highway for truck operation will cost from \$100,000 to \$400,000 per mile to construct depending on the nature of the terrain and the number and size of bridges that are required. Although a dirt road would cost considerably less to build, truck operation costs on an unpaved road surface are approximately double those on a highway due to increased fuel and maintenance, and reduced speed. On unimproved roads, the costs may soar to four times those of highway truck operations. Thus, when the extra road distance over airline distance is considered, the truck becomes inferior to air transport at all but the least distances in areas where no paved highways exist. Another comparison that should be considered is that five or six passengers plus their baggage and seating can be carried in place of a ton of cargo at a cost of the order of \$.02 per passenger mile, a figure which is approximately equivalent to that of low-cost bus transportation. Of particular interest in cargo feeder operations up to 500 miles are the advantages offered by advanced rotary wing aircraft that would permit direct origin to destination service without the necessity of trans-shipment to trucks or other transport media. An interesting aircraft described was the Hybrid Helicopter which would employ two-bladed helicopter rotors for vertical take-off from unprepared sites, but then shift to conventional wings and airplane engines for

forward flight. The operating costs for such an aircraft would be much less than those of a conventional helicopter because its cruise efficiency would approach that of a fixed wing airplane. Additionally, maintenance costs would be reduced because the rotating machinery would operate only a small fraction of the time. With proper financial support, advanced helicopters of this type could be made available in quantity production within five years.

8. Dr. Richards (Liberia) related the initial steps taken in Liberia to increase mobility and accessibility to all parts of the country through the building of 60 airstrips for light aircraft and 15 fields for DC3s. Once the airstrips were completed, the local village people were then encouraged to build roads to the airstrips and to other villages in order to facilitate the movement of heavy equipment. These roads are not usable in unfavorable weather, but a satisfactory transport system evolved from the combination of aircraft to meet most of the immediate needs with surface transport of heavy materials during favorable weather.

9. The Chairman concluded the meeting by commenting on the scarcity of reliable statistical data upon which to base major decisions in the air transport field. More information is urgently needed on the uses to which aircraft can be put in less developed areas, the market demand for such services, the cost and performance of transport systems, training requirements, types and number of aircraft, and the critical relationships of air transport to other transport modes in the development process. He felt that the importance to emerging countries of developing a national transport policy within the framework of overall economic planning could not be overemphasized.

Comments of U.S. Section Coordinator: The major issues discussed may be summarized as follows:

(a) There are many examples of the capacity of the airplane to meet urgent needs for transport in areas of difficult terrain and poor surface transportation. Yet aircraft have thus far been used more for international passenger operations than for the types of regional and local service that might assist development in the early stages. Consequently, the economics of air transport and the political and social aspects of a highly developed air system need to be analyzed in relation to the goals of selected development programs. The great distances, sparse population, and poor surface transport of the African continent make this a logical geographic area to concentrate on.

(b) Air transport economics should be queried from the standpoint of the long run costs of alternative transport media, and with total production and distribution costs in view. The possibilities of accomplishing the necessary research and development to yield air vehicles more closely geared to the special needs of developing countries is of especial interest.

(c) It was generally recognized that the urgent needs of less developed countries for qualified pilots and technicians are barely met, and all of the development projects in aviation depend ultimately upon what solution can be found for the training of personnel. Each country has been forced to set up a training school, sometimes in cooperation with a university and often with the aid of the United Nations Special Fund, the ICAO, or other countries. But training is long and the best specialists are often assigned as instructors and not to immediate productive work. It was thought that certain measures could be taken to solve this problem within

the framework of international aid and cooperation.

Specialized Session

New Techniques in the Transport of Fuels and Perishable Goods

Officers

Chairman—Mr. M. Mohtadi (Iran)

Rapporteur—Mr. A. Assouline (Morocco)

U.S. Participants

Mr. J.L. Burke

Dr. P.R. Carlson

Mr. E.H. Holmes

Mr. R.B. Keating

Mr. H. Perry

Mr. C.D. Roach

Mr. A.L. Ryall (U.N. Discussion Leader)

Mr. R.M. Whitton

1. The Chairman opened the session by remarking that two important aspects of transportation would be discussed. The first of these would be the transport of minerals and fuels by pipeline, followed by the different methods of maintaining temperature control of perishable goods during their transportation and storage, particularly in the tropics.

2. The first discussion leader, Mr. Durand (France), talked on the comparative costs and advantages of transport of petroleum products by pipeline. The heavy capital investment involved in the construction of pipelines is somewhat compensated by the relatively small labor requirements for operation. Operating costs, in turn, decrease as the diameter of the pipe is enlarged, and increase sharply with underutilization of capacity. In industrially advanced countries where transportation infrastructure is well developed, the costs of

transporting petroleum products by pipeline varies between .5 and 1 centimes per ton-kilometer, and the volume level at which new pipeline installation may be profitable lies between 500,000 and one million tons per year. Developing countries, however, generally lack adequate transport infrastructure which results in far higher transportation costs. Essentially, the economics of long distance pipeline transport depend on the existence of alternative competitive forms of transport. If a railway, for example, is already in existence and has surplus capacity, it would be difficult to justify the high capital cost of installing a pipeline. On the other hand, where transport facilities are at the saturation point, a pipeline may present an attractive economic alternative to that of increasing the capacity of the existing system.

3. The second discussion leader, Mr. Ryall (U.S.A.), spoke on the progress made in recent years in the application of refrigeration to the transport of perishable goods. In comparison with the ice-refrigerated railway car and highway van of twenty years ago which depended on convection currents for air circulation, we have progressed from forced air circulation by fans operated by diesel motors with thermostatic control of the air circulation through the ice bunker, to complete mechanical systems in which the compressor and blower are operated by diesel or butane engines with the temperature in the load compartment controlled thermostatically. Although refrigeration can be provided by the vaporization of such compressed gases as nitrogen or carbon dioxide, the production costs, containers, and transport required for these materials currently make them less promising than mechanical refrigeration systems powered by diesel or butane gas. The most interesting and promising recent development in the transport of per-

ishables is the containerized unit with built-in mechanical refrigeration systems. Designed to move on wheels over the highway, by rail on flat cars, or on the deck or in the hold of ships, these containers vary in size from about 1,000 to 2,500 cubic feet and provide controlled environments for the transportation of perishables. A recent experiment in which the U.S. Department of Agriculture participated involved the successful shipment of fresh grapefruit in a diesel-powered refrigerated van that moved through the media of truck, rail, and ship from Florida, U.S.A., to Basel, Switzerland, a transit time of only 19 days. Some obvious advantages of this method are (a) continuous refrigeration from origin to destination; (b) expedited door-to-door pickup and delivery; and (c) substantially reduced handling of the product. Another promising possibility mentioned were containers that could be hermetically sealed after loading. Semi-perishable commodities such as cereal grains, dried fruits and fish, milk powder, and cured meats, for example, could be pre-conditioned to the proper moisture or salt content and then sealed in containers with the chamber atmosphere replaced by an inert gas such as nitrogen or carbon dioxide. With this type of treatment many commodities could be transported thousands of miles by any mode of transport with complete protection from spoilage or attack by insects.

4. A general discussion then followed of the advantages of pipeline movement of fuels, coal, petroleum products, and natural gas over other forms of transport when capital and operating costs, distances to be covered, and volumes to be used are taken into account. A general conclusion was that the low-cost efficiency, reliability, versatility, and simplicity of the pipeline could provide a highly satisfactory alternative to expensive road and rail facilities in the

carriage of bulk materials when properly introduced into a country's transportation development program.

5. Mr. Burke (U.S.A.) outlined the particular characteristics of pipelines that should be of interest to economic planners in the less developed areas:

A. Pipelines can transport bulk materials in a relatively straight line across rugged terrain and are almost completely unaffected by climatic conditions. The long-life pipe installed in the ground requires very little maintenance and can provide year-round delivery without time-consuming and costly interruptions.

B. Since the pipe represents approximately 70 to 75 percent of the original cost of investment in a typical system, including its cost of installation, the annual operating charges are therefore quite predictable and present attractive inducements for long-term financing.

C. The relatively small nucleus of skilled personnel required for pipeline operation and maintenance plus the possibilities for training many of the employees during the design and construction phases are especially significant to the developing countries.

D. Cost comparisons with other forms of transportation reveal that the pipeline has the lowest cost or charge with the exception of large ocean tankers.

He also drew attention to the possibilities for transporting solids and semi-solids through pipelines. At the present time, iron and copper ores, coal, limestone, gilsonite, and paper mixtures are being moved successfully through pipes in liquid suspension. Finely ground minerals and grains also are being moved short distances in air-suspension mixtures. In the Canton of Valais, Switzerland, the pipeline transport of milk has solved an economic and handling problem.

Even the pipeline movement of commodities in sealed containers, although not as yet economical, has been successfully accomplished on a limited scale. Thus, continuing research on the movement of raw materials and finished products through pipelines offers increased possibilities for improved transport in the less developed countries.

6. Mr. Perry (U.S.A.) discussed the operation and maintenance of pipelines to carry a coal-water mixture. Cited as an example was the 108 mile, 10-inch diameter, coal-water slurry pipeline operating in the United States which has transported over 6 million tons of coal since 1958. He divided the handling of solid-liquid mixtures in pipelines into two separate technical problems. In the first, the solid materials are sufficiently fine so that the mixture can be moved using a piston pump. In the second, the particles are so large that the solid-liquid mixture can be brought to the pressure required only through the use of a centrifugal pump or lock hopper method. A number of experimental loops have been constructed to study the technical problems involved in the transport of larger size materials and successful results may have important commercial applications. For instance, it eventually may be possible in the hydraulic mining of coal to hoist the coal-water mixture hydraulically to the surface through pipes with continuing transport of the mixture by pipeline directly to the coal preparation plant. Once economically feasible, this method should reduce significantly the cost of transporting and utilizing coal for electric power generation. A recent U.S. study was mentioned which compares the cost of moving coal hydraulically in pipes with high voltage electric power transmission, conveyor belts, and rail and pneumatic transport. An essential prerequisite in the hydraulic transportation process is a large and constant water supply.

The cost of providing water plus the nature of the terrain over which the pipeline will be laid are major economic considerations.

7. Other technical points discussed included the economic alternatives involved in locating power plants near the mine and providing energy by nation-wide electric power grids rather than transporting the coal. The distribution of refined petroleum products—gasoline, fuel, lamp oil—by trucks or tank cars was also mentioned, with passing reference to the use of the Dracone system of inflatable containers on navigable waterways. Interest also was expressed in the possibilities of solidifying petroleum products for bulk transport and handling purposes.

8. In the discussion of the movement of perishable goods, Mr. de Rouvray (France) reviewed the progressive movement of refrigerated foodstuffs from the source of production to the consumer under a coordinated system to which the technician, the biologist, the economist, and financier all contribute. He enumerated the geographical and technical factors involved in the formulation of a plan to establish a chain of cold, and emphasized the need for adequately trained personnel in all states of its operation.

9. Mr. Anquez (France) mentioned the air transport of fresh beef over a distance of 1200 miles in Central Africa where it was not necessary to refrigerate the meat in flight. He emphasized, however, the need for refrigerated storage at both origin and destination as well as equipment for refrigerating the load compartment at stops in transit. He questioned the emphasis on mechanical refrigeration by pointing out that all rail refrigeration equipment in Europe is ice-refrigerated. The Chairman agreed with this point by stating that in his opinion mechanical refrigeration was undependable, but Mr. Ryall (U.S.A.) contended that in areas where refrigeration was just develop-

ing, there was no economical justification for going through the "ice stage" for the production and distribution of ice as compared with the direct application of mechanical refrigeration.

10. Other participants suggested that for temperate and subtropic areas the louvered ventilated railway vans used in Australia and South Africa may present advantages over the controlled temperature vehicles used almost exclusively in North America and Europe. Compared with refrigerated vans, ventilated vans are cheaper to construct and cost less to maintain and operate. Their main disadvantage is that produce temperatures are largely dependent on atmospheric temperatures whereas in refrigerated vans uniform low temperatures can be maintained independently of the weather.

11. A final point discussed was that of suitable protective packaging to cope with the numerous and varied stresses to which packages are subjected in transportation. A prior knowledge of the climatic conditions to which the goods will be subjected during transit is required, as well as the mechanical forces of vibration, rolling, pitching and crushing due to vehicle motion and cargo handling and storage operations. Temperature and atmospheric moisture conditions in particular will play a predominant role and their extreme limits should be known in order to provide adequate shipping protection.

Comments of U.S. Section Coordinator:

(1) In the less developed countries where power and transportation together constitute approximately half of the public capital investment programs, much of the available transport capacity is required for the movement of solid and liquid fuels. Coal, for example, is often the most important single

commodity moving on the railways. Possibilities for reducing this transport burden are offered through technological progress in the long-distance piping of a great variety of solid and semisolid materials. New capabilities for nation-wide electric power grids also provide a means of transporting power over long distances by wire.

(2) In the agricultural sector, the weight and peaking of transport demand for fast delivery of perishables to market may be minimized by new approaches to food preservation (refrigeration, salting, drying, irradiation, etc.) and storage. There is also considerable movement of waste materials, both agricultural and mineral, which could be eliminated by establishing processing centers at the source of production.

(3) Before modern technology can be applied wisely and effectively to reduce unnecessary transport, much more needs to be known about the economics of alternative transport methods, including not only comparative transport costs, but costs in the broader context of production and distribution.

Specialized Session

Specialized Training of Personnel in the

Field of Transportation and Communications

Officers

Chairman—Mr. D. Gonzalez Gomez (Mexico)

Rapporteur—Mr. M.A. Salam (U.A.R.)

U.S. Participants (Transportation)

Mr. E.H. Holmes

Mr. R.B. Keating

1. The Chairman in his introductory remarks noted that common factors in the transportation and communication industries were

their effect in overcoming distance, the heavy dependence of modern transportation on communications, and their mutual need for highly trained technicians to handle complex equipment. He emphasized the need for international collaboration in the training field both by means of bilateral agreements and through the international organizations, and recommended that consideration be given to the possibilities of establishing Regional Training Centers. As a basis for discussion, he suggested a division of the subject into two broad areas—firstly, the assessment of training needs and special problems of the two industries; and secondly, the methods most suitable for providing the necessary training.

2. Mr. Jowett (U.K.), in opening the discussion on the need for training in the transportation and telecommunications fields, suggested that an attempt should be made to assess training needs in quantitative terms. In this connection, he described the experience of the British Post Office in its training activities during the last 40 years, stating that some 7,000 trainees received courses of 1 to 8 weeks in length during an average year, with some 500 students attending various courses at any one time. In general, British experience has been that the ratio of training center staff to students was of the order of 1 to 2. He emphasized that the continuously developing nature of telecommunications requires administrators in the less developed countries who are aware of the amount of technical effort and resources which must be made available for telecommunication training. Some understanding of the magnitude of training effort required could be obtained from Conference Paper L.13 which stated that in a large scale telecommunication development program involving an expenditure of some \$15 million, provision for training absorbed approximately 3

percent of this figure per annum. He suggested that consideration should be given to the possibility of meeting training needs by building from the top downwards, i.e., by first training the most highly skilled technicians and engineers and using them, in turn, to develop training programs for personnel requiring lesser skills. In conclusion, he stressed the need for technical literature in the telecommunication field suitable for training purposes in the less developed areas.

3. Mr. Newstead (Australia) spoke of the interdependence of decisions in training and development, and questioned whether it was not wise in some cases to choose equipment needing small quantities of highly trained people in preference to less sophisticated equipment which would require larger numbers of less qualified people for its operation and maintenance.

4. Mr. Keating (U.S.A.) suggested that in addition to the training of operating personnel, attention should be given to educating transport planners, administrators, and research personnel to make better public investment decisions in the transport sector. Rather than model their educational programs after traditional curricula, universities in the less developed countries should devote their attention to the newer interdisciplinary approaches in order to deal more effectively with transport decisions in the context of over-all economic planning. The selection of students for training abroad, particularly those sent to U.S. educational institutions, needs to be reexamined in order to achieve a higher proportion of economists and technologists better equipped to choose among alternative transport investments.

5. In introducing the discussion on training methods, Mr. Scholz (Federal Republic of Germany) referred to the field of broadcasting as an example of the type of training which he considered necessary for

the expansion of transportation and communication services in the less developed countries. He pointed out that the introduction of public broadcasting services involved two separate, but complementary requirements; firstly, the need for a small number of transmitters, and secondly, a large number of receivers. Although the establishment of manufacturing facilities for transmitters in the developing countries did not appear feasible for reasons of economy and the lack of trained personnel, he suggested that the local production of receivers could be made profitable in view of the comparatively few skilled technicians and small amount of investment capital required. He suggested that the training of technicians needed to build receivers might be considered analogous to the problems faced in the early days of the radio industry where research scientists moved into the production field and became the instructors of the workmen producing the prototype receiver. These men, in turn, taught the essential techniques to other workers. By adopting similar procedures, a less developed country could develop a receiver output by making use of low cost standardized components and keeping production in parallel with the importation and installation of transmitting equipment. He concluded that similar systems of expanding the cadres of trained personnel from the top downwards could be applied to other training problems in the transportation and communications field.

6. Mr. Sarwate (I.T.U.) described his experiences in training radar technicians in India during the early days of radar development, and emphasized the advantages of regional or home country training programs. Students who remain in their local environment have fewer problems of adjustment or language differences to cope with, are exposed to more realistic training problems,

and complete their courses in less time than if sent abroad for similar training.

7. In the discussion on training methods, there was general agreement as to the desirability of establishing regional centers for primary or lower level training, with highly specialized training continuing to take place abroad.

Comment of U.S. Section Coordinator: The shortage of training facilities suggests that one way of making existing facilities serve a broader region is the provision of faster and cheaper access thereto. Likewise transportation improvement permits teaching personnel to cover wider geographic areas.

Informal Meeting

Transportation to Achieve Goals in Other Sectors

Officers:

Chairman—Mr. W. Owen (U.S.A.)
Science Secretary—Mr. L.T. Kelly (U.N.
Staff)

U.S. Participants:

Mr. J.L. Burke
Dr. P.R. Carlson
Prof. K.T. Healy
Mr. E.H. Holmes
Mr. R.B. Keating
Mr. W.A.W. Krebs
Dr. M. Mead
Mr. H. Perry
Mr. A.L. Ryall
Mr. E.K. Sandbach
Mr. E. Staley
Mr. K.P. Wang
Mr. R.M. Whitton

1. In opening the informal meeting, the Chairman remarked that the Conference ses-

sions on transportation had made it abundantly clear that there was general agreement on the importance of transport to economic development and its relationships to other sectors. It also was apparent that relatively few delegates from the less developed countries were attracted to these sessions, a failure that could be attributed to the advanced countries not having met their own transport problems sufficiently well to convince others of their ability to help. Progress was being made, however, and continuing efforts to exchange ideas and information would eventually lead to improved transport programs in less developed countries. In this total effort not only the economist and engineer are needed, but also the sociologist, psychologist, anthropologist and many others. He suggested the following topics to stimulate discussion:

- A. The social, political, and cultural aspects of improving transport;
- B. Transport to increase food and other agricultural output;
- C. Meeting the transport requirements of industry and mining;
- D. Communications as a substitute for transport in the early stage of development;
- E. The relation between energy resources and transport requirements;
- F. The advantages and disadvantages of alternative transport methods from the standpoint of resources required and impacts on the development process.

1. In the general discussion that followed, Dr. Margaret Mead (U.S.A.) stated that the principal difficulty in the planning of transportation would seem to be that planners have not taken into account human factors as well as economic, the possibilities of change and growth, and the need to make transportation systems as flexible as possible. We now have a considerable body of material on failures in transportation planning

to take into account work habits, types of family organization, and possible forms of migration. Such studies as those made in England of the visiting habits of the working class when they lived close together in slums, or of the methods of migration by riding short stretches without pay on trains in India provide us with small pieces of experience which should make model building possible. With modern computers a very large number of these factors could be taken into account and alternative courses of action worked out.

2. Mr. Alleyne (Trinidad & Tobago) warned against the planning and construction of expensive transport facilities in a piecemeal fashion. Mentioned was the railway system originally installed in Tobago for the transport of sugar that must now be scrapped since the inherited pattern is not flexible enough to meet present requirements. To guard against such indiscriminate building, comprehensive surveys of transport needs should be made within the context of national needs. A central bureau should be established to collect, collate and disseminate essential data among all involved sectors to permit transport development to proceed in a systematic manner.

3. Mr. Stoltenhoff (Federal Republic of Germany) asked that the less developed countries inform the advanced countries of the mistakes made in technical assistance in transport. He mentioned that special economic programs for assisting less developed areas were being initiated in West Germany and that the transport sector would be an integral part of these programs.

4. Dr. Carlson (U.S.A.) stated that there is no question that an airplane could be built with modern technology which could transport cargo at half the cost of a DC3. The type of aircraft needed, however, cannot

be produced at low cost except in large quantity, and aircraft manufacturers have no assurance that the availability of a low cost aircraft would generate a large demand. A key problem, therefore, was the lack of entrepreneurs in less developed areas with technological and managerial skills who are able to envisage the potentials of such an aircraft and initiate private enterprise for its finance and marketing.

5. Other points raised were the possibilities of installing small power stations in remote areas and attendant transport costs and problems; the use of computer technology in transport planning; and teaching innovations.

Comments of U.S. Section Coordinator: The main conclusions reached may be summarized as follows:

(a) In the transport sector one of the constant difficulties is the rapid rate of technological change and the effect of this change on the usefulness of previous investments. Today the less developed countries are more than ever subject to the possibilities of sudden obsolescence of transport investment due to further innovations.

(b) What is needed is a world-wide program of research and development aimed at the advance of understanding and the exchange of knowledge and information with respect to transportation and its role in development. Research in the social sciences is urgently needed as well as scientific and technical research. The task is to marshal the facts already available, to analyze the wealth of knowledge that experience has provided, and to stimulate applications of known technological advances to the solution of transport problems. It also is apparent that close ties should be established among national institutions concerned with development programs. The contributions of

the small number of people associated with these institutions who are actually engaged in transport research specifically related to less developed countries would be greatly enhanced by a broad exchange of information and close coordination of their activities.

(c) In the United States, the Agency for International Development has made a beginning by the support of a transportation research program concerned with the relation between transportation and the achievement

of higher levels of living. It was hoped that the United Nations, which at present lacks a central focal point for the collection and dissemination of information on the part that transportation plays in economic development, would take a fresh look at transportation in the development process and carefully examine the ways in which transport technology can be modified or adapted to meet the needs and problems of developing countries.

Section F: HEALTH AND NUTRITION

Summary

It is very difficult to give anything like a balanced appraisal of this Conference since at best each participant saw only a very small part of it, and his judgment is bound to be influenced by the biases and prejudices, as well as hopes and fears, with which he arrived. On the whole, it appears that the Conference has achieved the following objectives:

1. A number of people from the developed countries have learned more than they knew before about the conditions existing in the less developed countries and the quality and attitudes of personnel available to lead certain aspects of economic and technical improvement. One of the U.S. delegates who attended all of the sessions on health and nutrition, and who had had considerable experience in less developed countries, put it this way: "I got a much better picture of the economic setting in which the problems of health and nutrition occur and of the direct and indirect limitations this imposes. I also got a strong impression of the values and attitudes of the professional elite and some of the differences of opinion that divide them among themselves and from the general population of their countries. It seemed to me that there are problems here of maximal importance in the planning and programming of A.I.D. and that they deserve further exploration."

2. Many of the delegates from the less developed countries felt that the Conference was in large measure an

exhibition by the developed countries for the benefit of the underdeveloped. Many compared themselves to window shoppers. They generally approved of this and felt it was their business to learn what was available and go home to think over what they might like to buy. Most commented very favorably on what the U.S. presented in the field of health and nutrition.

3. A certain, but perhaps smaller, proportion of the delegates from the less developed countries made new contacts which they can use later on in the technical and scientific development of their own countries.

4. It gave some perspective to a number of significant problems and relationships which merit serious attention in planning and programming aid:

a. Nutrition ranked as the number one problem in almost everybody's mind. This is not to depreciate the tremendous importance of the infectious diseases but rather to emphasize the degree to which the delegates from the less developed countries both in and outside the medical profession attached importance to improved nutrition. This interest and insistence was closely linked to aims and plans for agricultural development and to a lesser degree for industrialization.

b. This emphasis on nutrition is part of another wide area of interest, namely preventive medicine. Several

delegates from underdeveloped countries said that they could not afford "curative medicine" but ought to put all their effort for many years to come into preventive medicine.

c. Running counter to this in a curious way was another trend which might be called "professionalism" or "elitism." Thus, there is a heavy insistence on the importance (undeniable) of turning out new doctors but most of the training and orientation of these doctors seems to be in terms of curative medicine in hospitals and medical school centers. Coupled with this is the desire to obtain or maintain high standards. All of this could work out very well, but the way it is moving in many places seems to be toward a small coterie of highly trained physicians who will remain located, for the most part, in urban centers and who will devote themselves, in whole or in part, to private practice. Thus, for a very long time to come only a relatively small and selected part of the population will have adequate medical attention — and most of this on a curative rather than preventive basis. Numbers of people said flatly that public health programs would have to wait on the development of medical schools; that "sub-standard doctors" should not be developed; and that all health personnel who are not physicians should work under the immediate supervision of physicians.

d. It may be that the net effect of much of this is that long range planning is strangling the short range. A tremendous need at present is to bring immediate relief of ill-health by the innumerable means which are already plainly known. Without advocating "sub-standard doctors," a strategy and tactics

for attacking the health problems can be developed on far more original and imaginative lines than are now in evidence. This means breaking the operating tasks down into different components so that they can be done by people of normal intelligence after a short period of training. (McDermott's experiments with health visitors among the Navaho is an example of this approach.) One of the most evident features of almost every less developed country is a vast manpower which is relatively little employed. The advance of primary education is increasing the potential of this population, but often in a situation where there is no work as yet to which it can apply acquired skills derived from the formal education. In some countries, incidentally, this is a source of extreme dissatisfaction among the younger people and a contributing factor to delinquency in urban settings.

e. It seems evident that this problem needs careful study so that both long range and short range planning can be advanced simultaneously and so that the technical help now available can be made to reach those who need it. While underscoring the importance of planning and supervision by physicians, I do not think this means that all the activity connected with health surveys, the promotion of nutrition, health education, vaccination programs, etc., have to be postponed until after the building of medical schools, or have to be designed in terms of small teams acting under a doctor's eye. Other patterns are possible and need exploration and trying out. At the same time, it must be recognized that this is not the prevailing view of the medical people in many of the less developed areas, and that they would have to be persuaded with regard to such a

viewpoint. On the other hand, the non-medical leaders (political, economic and educational) might be well disposed to such a view.

f. Apropos of this, it is evident at present that the programs of education, agricultural development, community development and industrialization are going forward in many areas with a degree of independence from each other that is damaging to the whole process of development. Not only do they fail to reinforce each other where they could well do so, but they get in each other's way and compete for limited personnel and resources. Such an elementary proposition as that health is a major factor affecting manpower resources appeared foreign to the thinking of numbers of economists and "planificators." Enthusiasm for programing by means of computers seemed to be increasing these tendencies for separating functionally related matters, by encouraging people to incorporate in the program planning only those quantitative items which can be readily submitted to computers. Thus, one heard talk of including the number of workers available in the estimates but rejection of considering their working capacity no matter how much they might be ridden by malaria, malnutrition and other debilitating disorders.

g. The importance of being aware, in A.I.D. planning, of a difference in value and motivation that may exist between A.I.D. and the leaders of underdeveloped areas must not be overlooked. To A.I.D. personnel, especially in the health and nutrition group, a motivational factor of primary importance is altruism. In numbers of the underdeveloped countries the primary motivation is prestige. This is not to say that the U.S.A. is all

sweetness and light and that the leaders of underdeveloped countries are exemplars of selfishness. Obviously in both groups mixed motives occur. The fact remains, however, that the hierarchical traditions and civic values in many underdeveloped countries are quite different from the traditions of public health services. Failure to recognize this and that a hospital can be a symbol of prestige as much or more than an institution to help the sick can lead to working at cross purposes, disillusionment and bitterness. The point for us is to achieve understanding of how things are (not to blame or criticize), and then work forward from this basis.

General Session

Officers

Chairman - Professor Joseph Lukas
(Czechoslovakia)
Guest Speaker - Dr. Marcolino G. Candau
(Director General, WHO)
Secretary - Sir John Charles (WHO)

U.S. Participants

Dr. Walsh McDermott
Dr. Alexander H. Leighton
Dr. Hildres A. Poindexter
Dr. Leona Baumgartner
Dr. Robert S. Morison
Dr. John C. Snyder
Dr. Albert B. Sabin
Dr. Richard C. Arnold

Dr. Candau summarized the broad aspects of public health and nutrition. This set the stage for the discussions which were to follow throughout the week in the various specialized sessions. Dr. Candau pointed out that there were a certain number of diseases which seem

susceptible of complete or nearly complete eradication, giving as examples, smallpox and malaria. Others, he said, will always be with us. Diseases in this category are mental illness, old age, and so forth. He cited a number of statistics showing the widespread nature of such diseases as bilharzia, trachoma and filariasis. He presented a brief outline of what is needed to conquer these important plagues — primarily, large cadres of trained people and sufficient funds. He noted that efforts are underway to study the appropriate relationship of the public health budget to the over-all budget in countries with limited resources. He closed with the plea that health be regarded as an investment giving dividends in the way of a more energetic labor force as well as being an end in itself.

The scientific secretary, Sir John Charles, gave a brief presentation emphasizing the importance of health as evidenced by the fact that approximately 150 papers submitted to the Conference dealt with health matters.

Dr. Rene Dubos emphasized the fact that the major disease problems of the less developed countries were traceable to defects in environment, and to the general way of life of the people. Malnutrition, he felt, was one of the largest single causes of death in the world today. Dr. Dubos stressed that even though we do overcome malnutrition and infection we will not create a medical Utopia. We simply will get a new set of problems brought about by industrialization and the general change in community life which is an inevitable part of economic and industrial development.

Dr. Magalhaes de Silveira (Brazil) spoke of health as something that can be purchased if funds are available. It is

clear in this connection that rich nations are much better off than the poor nations in relation to health. He closed with some rather pointed remarks about the inadequacy of present arrangements for international aid.

Dr. J. Senecal (France) drew on his long experience in French-speaking West Africa to provide an excellent account of what needs to be done to improve the public health of certain less developed countries. He pointed out that the major problem is in the rural areas, that these areas above all need preventive measures and that it is not as easy as it looks to persuade people to adopt such preventive measures. He emphasized the need for integrating a health plan into the general plans for economic development and the need for encouraging cooperation between the several ministries dealing with the welfare of the people. Like many others in this meeting, he stressed the lack of properly trained personnel as a principal bottleneck to development.

Dr. A. H. Mousa (UAR) gave a brief account of the present state of our knowledge on certain important endemic diseases, especially bilharzia, hookworm, ascaris infection and malaria. Particularly noteworthy was his account of a large scale experiment in the control of bilharzia recently set up near Alexandria in cooperation with WHO and UNICEF.

Prof. Edozien (Nigeria) deplored the low status given to health by economic planners and hoped that this meeting might stimulate national and international agencies to give more attention to health matters. He also stressed the need for more trained personnel and pointed out that health needs vary rather sharply from region to region. In general, he

thought that the training of physicians should take place in the country where they are to be used and that overseas experience should be limited to a small group of highly selected persons who will need specific training in specialized areas.

Sir Harold Himsworth (UK) discussed the importance of research in less developed countries. Although at first sight basic research might be regarded as somewhat exotic, and perhaps unnecessary in an underdeveloped area, he felt that such attention was more than justified because: (1) all experience shows that knowledge discovered in one area of the world is not necessarily immediately applicable elsewhere; (2) the local people with scientific training are best able to uncover needs for new knowledge and to suggest ways for promoting it; (3) everyone agrees with the necessity for higher education in less developed countries and research is an inescapable part of higher education; and (4) the morale of any health service depends upon the presence of an active research group. He stressed the importance of cooperative research, giving as an illustration the current worldwide project for the study of biocardial infections.

Dr. Graschenkov (USSR) pointed out that many of the dangers to health which are historically associated with industrialization, and which were described by Dr. Dubos, are absent in the Soviet Union because of the planning to avoid contradictions. He showed somewhat of a misconception of the nature of private practice in that he referred to the profits made by large medical cooperatives, and warned the less developed countries specifically against adopting the private practice methods common in the Western countries.

Dr. Ali Hassan (UAR) disagreed a little with Dr. Dubos' view that we now have accurate scientific information on malnutrition and stressed the fact that many of our standard recommendations for intake of various food substances are based on rather shallow evidence.

Prof. de Castro (Brazil) again emphasized the importance of nutrition. He pointed to the fact that many characteristics which were thought in the old days to be racial in nature now turn out to be nutritional.

Dr. Widy-Wirski (Poland) gave a brief resume of Polish experience in developing medical services since the war. Doctors have increased 5 times in number and paramedical personnel by a factor of 10. Life expectancy for males is now 65 and females 67 years in the country at large. Prof. Bozovic expressed the view that health is the fundamental right of everybody regardless of race or religion and that no one has the right to endanger it in any way. He felt that an obligation of scientists is to explain the dangers of atomic bomb and biological warfare to governments and to the general public. Above all, scientific discoveries should not be kept secret but should be immediately available to everyone.

Dr. F. T. Sai (Ghana) emphasized that any new hospitals that might be established in less developed countries would have to take on as a regular task the training of much needed supporting personnel such as nurses, orderlies, laboratory technicians, etc. He pointed out that the ratio between infant mortality and total mortality is an important one that has been neglected in public health statistics. He suggested changing morbidity reports, since it is difficult in

many countries to identify the actual disease. It would therefore be more significant to give major symptoms rather than the disease itself. Later, this point was the subject of considerable discussion and the consensus was that diagnosis based upon symptoms would not be satisfactory for reporting methods. It was agreed, however, that symptomatology might be important in a short-term report to determine whether and where a new epidemic may be starting. An example of this might be the death of a number of individuals from acute diarrheal condition. A more detailed study could be initiated and the causative factor of the diarrheal condition could be determined.

Dr. Y. Cohen (Israel) suggested that less developed countries should not blindly imitate the health statistics and health laws of highly developed countries. Rather, they should develop a limited plan that would be more appropriate to their bio-statistical needs.

This meeting was well attended by the physicians from the less developed areas and by many others who were not physicians in the various national delegations.

Specialized Session

The Need for Various Categories of Health Personnel

Changing Responsibilities in Health Team

Officers

Chairman - Dr. A. F. Tuboku-Metzger
(Sierra Leone)

Rapporteur - Professor M. Prywes (Israel)

Session

Secretary - Dr. E. Grzegorzewski (WHO)

U.S. Participants

Dr. John C. Snyder

Dr. Albert Sabin

Dr. Robert S. Morison

Dr. Rene Dubos

Dr. Hildres A. Poindexter

Dr. Richard C. Arnold

Dr. James D. Weaver

The Chairman, in his opening remarks, drew a distinction between the developing nations on the one hand and the less developed nations on the other. He noted that the term "primitive" was not in the vocabulary of the United Nations yet it had been used frequently in the Conference. Stressing his conviction that the Conference should seek the establishment of internationally acceptable standards, he hoped that the patronizing attitude of some of the representatives of the more developed areas could be altered. He pointed to the brilliant records of some of the foreign students in competition with citizens of the host nations, argued that there should be no lowering of standards in any of the local institutions, but they must be refreshed intellectually by fellowships and other exchange programs.

The Session Secretary, Dr. Grzegorzewski, reviewed the scope of the problems of the session and called attention to the four questions which were circulated at the end of the Secretary General's report. He picked two aspects for particular emphasis: the need to keep pace with the rapid progress in science, on the one hand, and the rapid changes in society, on the other. He noted that an elastic administrative framework must be organized in the provision of health services. Health workers have the responsibility of establishing the place of public

health in their new communities at the same time that they are responsible for discharging the duties of the health services. He noted that training in the developed countries seldom prepares a doctor for the job of supervising auxiliary health personnel. Therefore, in his view, it is essential to include this as part of the training of doctors in the new nations. His final point was the need for coordination and adjustment to local situation. He urged that there be selection and application of basic elements from different patterns and that there be cooperation of foreign and local personnel in accomplishing the aims agreed upon.

Dr. Galabov (Bulgaria) discussed the pros and cons of emphasis on medical versus non-medical or para-medical personnel. He reviewed the accomplishments of Bulgaria and urged that the Conference adopt a recommendation for the training of health personnel now. He did not elaborate on this.

Dr. Prywes (Israel) noted that programs all remained theoretical unless they have highly trained health workers to carry them out. He launched into a review of progress in Israel with particular emphasis on the foreign students who have been brought to Israel for education and training in the health sciences. The numbers he cited were impressive and the clarity with which he presented his points made an impression on the audience. One of the ideas under development in Israel which attracted attention was the attendance at medical schools in other countries for the first two years, followed by return to the country of origin for clinical training in hospitals in their own country. He said this would be an improvement in that students would be away from home a shorter time and would receive clinical

instruction in their own culture and society. He spoke with enthusiasm for the tutorial system and the demonstration system which they have employed whereby they identify better students toward the end of the curriculum and engage them in teaching the first-year students on a demonstration basis.

Dr. Grashchenkov (USSR) read his paper which reviewed the four main historical stages of medical education in the USSR. Of principal interest was his assertion that progress was much more rapid when the decision had been made to separate medical faculties from their parent universities. He said this had also been done in the United States and with success. (No one challenged him on this in the discussion period.) At the end of his discussion he listed six general principles which are in use in the Soviet Union and which he advocated as desirable for the new nations.

Dr. Talaat (UAR) spoke on international cooperation in medical training. He spoke in general terms about the reasons why cooperation in medicine had promise for success whereas it might not in other fields of activity. He reviewed briefly some of the accomplishments in the United Arab Republic which he had listed in greater detail in his paper. Egypt had shared its medical personnel with other countries, he stated, despite their own serious shortages, and then told them about the number of foreign students receiving training at the present time in medical schools in the United Arab Republic. He closed his presentation with the question of how to increase the number of nurses and how to get on with the job of improving medical curricula.

Dr. Snyder spoke on the adaptation of the experience of teaching institutions in the advanced countries to the needs of the less developed countries. He made the following points: (1) at least one-third of the health budget of a low-income country should be invested in educating and training its own citizens in the fields of medicine and public health; (2) members of the faculties of new institutions should visit other areas to improve their competence as teachers and to keep their curricula attuned to the changing needs of the various societies which their students will serve; (3) young physicians and scientists must be motivated to enter the health profession in the less developed countries; (4) in planning the curricula of new health institutions in less developed countries, there are real dangers in imitating that of more advanced countries - it is important to emphasize those subjects which will equip graduates to deal effectively with the major problems they will face; (5) the emphasis must ultimately be on preventive rather than curative medicine.

The first person who spoke from the floor was Dr. Tesonen (Finland). He disagreed with some of the other speakers at the Conference. He believes that lower standards at the outset of a new health service and new health institutions was justified because of the great needs. He suggested that unskilled, untrained personnel could be enlisted and cited young girls who could be given occupations in various categories of health assistants.

Dr. Azevedo (Portugal) spoke at length on the general widespread crisis in science and technology stemming from the shortage of skilled personnel. He urged that there be more training courses of the sort which had been successfully

launched by the World Health Organization in malaria control.

Miss Carpenter (United Kingdom) reviewed concisely the problems in providing additional nurses, listing the three general classes of registered nurses, practical nurses, and nursing assistants, each of which she defined according to her own terminology.

Dr. Hans Freihofer (Switzerland) spoke briefly on the importance of dental health services.

Professor Attisso (Senegal) spoke rather sharply in criticizing some of the planners of the Conference. He said that not one paper from French-speaking sub-Saharan Africa had been selected for presentation to the Conference in this Section, and that his own paper had not been accepted. Consequently, he wished to make a few points as an informal speaker. The gist of his remarks was that anything that sounds inferior is automatically bad and that all efforts must be directed at attaining exactly the same level of instruction and same high standards now present in any French institution in France. He insisted that training should take place in Africa itself. He admitted that aid was needed, but that it should be in special directions such as provision of teaching personnel or the provision of special courses for graduates of African medical schools.

Professor Tock (United Kingdom) spoke of his experience in Nigeria and Hong Kong. He reviewed many of the points in the Secretary General's summary of the Conference Agenda and added his conviction that it was vital to train teachers in their own countries since many students had been thoroughly spoiled because they were sent abroad for training too early in their careers and came

to expect things they could not possibly have when they returned to their own countries.

Dr. Prince spoke of the activities in Ethiopia where the beginning of an educational program was implemented from the bottom up. He chose to speak of "the gondar" idea since the institute was located in that city in Ethiopia. Their program has been to develop three kinds of public health workers who will function together as a rural team without supervision. He noted that there are 48 operating health centers in Ethiopia and that they now have 27 Ethiopian physicians trained elsewhere. He contrasted this with 1954 when there was not a single Ethiopian physician. He regretted the fact that none of these 27 M.D.'s has gone into public health, but he feels that fault was the way they were trained and not their own responsibility. The remedy in his view is to train the physicians in Ethiopia and to begin public health instruction as early as the second year in medical school.

Dr. Senecal (France) reviewed in general some of the points of the Secretary's summary, but insisted that the decision as to how many fully-qualified medical personnel, as opposed to paramedical or auxiliary personnel, should be a political decision and left to the states themselves. He noted that the number of medical schools which should be built should conform realistically to the supply of qualified students emerging from high schools in the various areas.

Professor Motawi (UAR) commented that the Conference had neglected to consider the importance of pharmacy as a profession. He cited figures to illustrate what had been accomplished in

Egypt and hoped that this would be noted and followed in the new nations.

Miss Creelman (WHO) gave six requirements for increasing the number of competent nurses. These were: (1) adequate budgets — a hospital nursing school costs more to operate than the benefit derived by the hospital from the services of the student nurses; (2) supply of students — she noted that the nursing profession is now competing with many other vocations, particularly industries in many countries; (3) adequate teaching staff; (4) support of the medical profession itself; (5) adequate clinical facilities for training; (6) the curriculum which must include public health for all nurses regardless of their eventual careers. She said that the curriculum must emphasize practice and de-emphasize theory if it is to be successful for the new nations.

Dr. Shaker (Kuwait) spoke on the accomplishments in his country of 300,000 population. He recommended that there be a new international organization for science and technology.

Dr. Bozovic (Yugoslavia) reviewed the difficulties in developing health services in Yugoslavia, particularly in the period following the second World War.

Specialized Session

The Utilization of Science and Technology in the Organization and Administration of Health Services, with Special Reference to the Need for Vital and Health Statistics

Officers

Chairman - Professor F. Widy-Wirski (Poland).

Rapporteur-Prof. Armando Parodi
(Argentina)

U.S. Participants

Dr. Albert B. Sabin
Dr. Alexander H. Leighton
Dr. Hildres A. Poindexter
Dr. Robert S. Morison
Dr. C. P. Hutterer
Dr. Richard C. Arnold

The report of the Conference Secretary (Sir John Charles) emphasized the concern of many economic planners that premature and disproportionate development of health services may have a detrimental effect on economic development. He, therefore, asked that the discussion be concerned first of all with the following questions:

1. To what extent can health services impede economic development?
2. To what extent can health services accelerate economic development?
3. What is the economic value of a man with improved health?

He pointed out that these questions need to be elucidated by physicians with an interest in economic affairs and by economists with an understanding and interest in medical problems.

The Secretary then indicated that vital and health statistics are obviously necessary to supply the basic information on which to plan and build the necessary health services at various stages of development. He pointed out that the eleven submitted papers dealt with the organization of vital and health statistics in different countries, the methodology of health services, and various health indices.

Only three of the six listed discussion leaders presented communications.

Dr. J. Tesch (Netherlands) made the following points:

1. Neglect of problems of disease can have a deleterious effect on economic plans either by impeding it (e.g., building of the Panama Canal) or by creating new problems (e.g., man-made malaria and schistosomiasis following certain irrigation projects).

2. Physicians must first of all think of individuals suffering from disease and cannot be influenced in their attempts to alleviate suffering by potential future consequences.

3. There are many examples of economic benefits directly attributable to control of certain mass diseases such as malaria.

4. Investment in health services must be regarded not only as consumption of limited available resources but as an investment capable of yielding dividends.

5. Better tools are needed for measuring health status and of evaluating the health services.

Dr. F. T. Sai (Ghana) made the following points:

1. There must be a balance in the organization of health services – e.g., in the last ten years Ghana has spent a great deal of money for building hospitals and not enough on training the people to run them.

2. The needs of developing countries should not be measured by the criteria adopted for developed countries.

3. The problem of vital and health statistics is particularly difficult in dealing with highly illiterate populations and very limited trained health personnel (e.g., it is even difficult to establish the age of people).

4. It is necessary to devise special methods for populations at different

stages of development, e.g., reporting of illness by major symptoms rather than by specific diagnosis, which in most instances is impossible anyway, can be more helpful to the few available well-trained public health people in evaluating the disease problems in a given area.

5. Regional meetings of people concerned with similar problems in vital and health statistics would be very helpful.

Dr. Y. Cohen (Israel) made the following points:

1. The very purpose of UNCSAT is to deal with the means of providing for the increased populations which will inevitably result from the improved health facilities.

2. The basic needs in vital and health statistics are data on: births, deaths, maternal mortality, infant mortality, and mortality from infectious diseases.

3. Vital statistics, as a highly sophisticated science practiced in the developed countries, is not suitable for the less developed countries.

4. Reporting should be based on local usage where it is impossible to get doctors to certify the nature of mortality and morbidity. It is unwise for developing countries to emulate the morbidity statistics of the advanced countries, which with the exception of a few clean cut syndromes, have found to be inadequate and uninformative.

5. For more detailed information on certain infectious diseases in less developed areas, special surveys are most useful.

Subsequent to these presentations by the discussion leaders there was a great

deal of discussion from the floor. Professor K. Raska of Czechoslovakia stressed the point that developing countries should concentrate their limited resources on first determining what the major health problems are and then on meeting them, with special emphasis on those of importance to the plans for economic development of the country. Dr. W. P. D. Logan (Director of the Division of Health Statistics, WHO) stressed the point that data on births and deaths may not necessarily be the first information needed in a developing country. He also pointed out that reporting of communicable diseases need not and should not follow conventional western lines. According to Dr. Logan the types of statistical information needed vary with the country and the state of its development. The principal needs are (1) data on the major health problems as a basis for assigning priorities for action; (2) data on the available health services — hospitals, health centers, doctors, nurses, technicians, etc. — and how these services are being utilized; (3) data on nutritional status, housing, education and basic demographic information. Mr. K. T. de Graft-Johnson (Statistician, Census Office of Ghana) pointed out that sample surveys are only of short-term value, that retrospective inquiries are unreliable, and stressed the need for early registration of births and deaths as basic to any planning for education. Dr. J. Senecal (France) stressed the unreliability of statistics based on admissions to hospitals in French-speaking Africa. Dr. N. Scrimshaw (U.S.A.) pointed out how inadequate present statistics are in giving a picture of the tremendous role of malnutrition in the mortality of infants and children in less developed areas.

Specialized Session

Control of Communicable Diseases in the Light of Developments in Science and Technology

Part I

Officers

- Chairman - Dr. Marcel Roche
(Venezuela)
Rapporteur - Professor M. Attisso
(Senegal)
Secretary - Dr. P. M. Kaul (WHO)

U.S. Participants

- Dr. Albert Sabin
Dr. John Snyder
Dr. Hildres A. Poindexter
Dr. Rene Dubos
Dr. Richard C. Arnold
Dr. Charles P. Huttner
Dr. James D. Weaver

The Secretary, in presenting a summary of the papers contributed, noted the authors of the 47 papers generally have an optimistic attitude about prospects for achieving satisfactory control measures in the various countries. He cited successes in poliomyelitis and in smallpox eradication programs, but indicated that shortages of equipment and trained staff made progress slower than had been hoped. He touched upon malaria eradication and the progress toward this goal in much of the world. He said he hoped the Conference would help speed progress in eradication of diseases which are preventable and he urged that the attack upon communicable diseases should come from many directions at once rather than from a single sector.

He enumerated 5 or 6 causes of difficulties in accomplishing the goals - shortages of physicians and of other health experts such as parasitologists and paramedical personnel including health visitors; inadequate administrative structures for public health administration; the inadequacy of means of transport for health personnel; and the failure to follow through after a program has been launched. He felt that the universities in advanced countries should send their senior staff people for periods of from 2-5 years to aid the developing countries. The first discussion leader, Dr. Grashchenkov (USSR), spoke on malaria, smallpox, trachoma, and helminthiasis. In the discussion on malaria he emphasized that the campaign in the USSR had been financed by national funds and that treatment was offered free in various malaria control clinics which were set up throughout the country. He asserted that smallpox had been eradicated in 1936 from the USSR but that when re-introduced from India there had been a campaign of vaccination involving a million people in 2 weeks with thorough investigation of all contacts. The result was only 6 cases of secondary smallpox in Moscow. He stated that gamma globulin had been used with good results in the Moscow outbreak. On trachoma, he noted that a five-fold reduction in this disease in Byelorussia took place between the 1930s and the beginning of World War II. He attributed the rise after World War II to the Nazi invasion. No mention was made of the attempt to introduce a vaccine against trachoma in this area. The good results with sulfanilamide and with synomicine were cited. He also mentioned the campaign against poliomyelitis and gave credit to Dr. Sabin for the development of the vaccine which

had been used for approximately 100 million people in the Soviet Union.

Dr. Attia (UAR) reviewed very briefly the four papers on trachoma which had been presented to the Conference. He praised the World Health Organization and the U.S. Navy Medical Research Unit for their work in the UAR and commented favorably on the success of pilot projects and regional conferences sponsored by WHO. Citing the 1955 pilot project undertaken in Qalyub, Egypt, he noted the rapidity with which the eyes of children became positive between the end of the first month of life and the end of the 5th or 6th month of life, rising from 0 to 85% in that short interval. He attributed the rapid spread to the infants living together in the same household with two or more generations. Citing the recent work reported by Collier and Barrie Jones of London, in which a possible reservoir of congenital trachoma is discussed, he indicated concern that if such is the case there may be an important impact on mass vaccination campaigns or on treatment campaigns.

He expressed the view that complications have greatly decreased by treatment, and is pleased with the results of efforts to train housewives to administer treatment to the members of their households. The effort has been made to supply antibiotic ointments to all households for immediate use if eyes become red, particularly in the preseasonal period just before the expected onset of the bacterial infections of the conjunctiva.

Dr. Albert Sabin spoke on the control of fatal infantile diarrheal diseases and showed several slides emphasizing the principal points made in his paper. He stressed the responsibility which the

advanced countries must assume in assisting the low income countries in providing food for the undernourished and malnourished infants of the world. Science and technology have an important role in developing inexpensive protein and vitamin-rich palatable and acceptable milk substitutes with safe antibiotic or other bacterial static additives that will prevent the profuse growth of bacteria even under the most unhygienic conditions.

Dr. Lapeyssonnie (WHO) spoke on epidemic cerebrospinal meningitis in West Africa, particularly Nigeria. He reviewed the chaos before 1939, the stage of success with sulfanilimide treatment and indicated that the future should be concerned with the search for less expensive methods of combatting this disorder which can be a major public health problem in some parts of West Africa. He touched upon the possibility of developing specific immunization procedures and hoped that other scientific leads would be explored.

Dr. Mousa (UAR) discussed bilharziasis in children. He called attention to recent success in modifying the plan of treatment of children by prolonging the course up to four months and by giving the treatment on a weekly basis. This is accomplished by sending a physician once a week to the various schools where children are in need of treatment.

Dr. Fraga de Azevedo (Portugal) described the research program in Mozambique on prevention and control of bilharziasis. He commented that this disease is rising to the top of the list of important diseases on the continent of Africa and predicted that it would be even more important as new irrigation projects and hydro-electric projects were

launched in different parts of the continent. He stressed the fact that there was not enough knowledge with which to fight bilharziasis effectively.

Dr. V. Olguin (Argentina) spoke of the importance of Chagas disease in the Americas. He cited this disease as an endemic zoonosis in many regions and therefore one of economic importance with 35 million people exposed and approximately 7 million people infected. The insects which are capable of transmitting the disease are widespread throughout the continent and many wild animal reservoirs are known. He stated that the illness occurs chiefly in childhood and is marked by cardiac insufficiency with a 2-6% mortality. The transmitting insects, triatomas, are susceptible to certain insecticides and no resistance has been noted as yet. An effective program can be launched by health education, by insecticides, by improving the housing conditions and by improving the general social-economic status of the population.

The Chairman, Dr. Roche, commented on the importance of Chagas disease and on the need for further studies on the life cycle of the vector and on specific therapy for victims of the illness.

Dr. P. Ionesco (Rumania) asserted that "the Socialist regime in Rumania has liquidated the scourge of malaria in a very few years."

Dr. Bernard (France), Professor on the Faculty of Medicine of Paris, spoke on malaria in Madagascar. Based on results of a campaign there, he indicated it may be necessary for the less developed nations to choose among several different possible courses of action available to them and stressed the need

to fit the course chosen to the local African problems.

Professor Schneider (France) spoke on the use of drugs in the less developed areas, contrasting the situation in the USSR with that obtaining in the African countries with regard to malaria. He cited the use of drugs in kitchen salt in Brazil and that a wide distribution was accomplished over a large area by this means. On Dr. Sabin's suggestion that bacteriostatic drugs might be included in milk substitutes and other foodstuffs for the developing areas of the world, he said that this posed the problem of legality and also the problem of unforeseen consequences to heredity or reproductive ability much later in life. He added that drugs in foods do not maintain their stability during storage and that they may decrease in concentration or be changed in their uniform distribution through the foodstuffs. He also commented on the change in taste of food occasioned by the inclusion of drugs.

Dr. Nevin Scrimshaw pointed out that Professor John Gordon of the Harvard School of Public Health has emphasized that there is a weanling diarrhea which is a definite entity in certain parts of the world and represents a combination of nutritional imbalance and infection. He hoped that others would realize the importance of the disease at that stage of life.

Dr. Senecal (France) commented on Dr. Sabin's remarks about antibiotics in food and cited the case of a fatal staphylococcus infection after only three doses of antibiotics to a child. He felt that it would be difficult to distribute antibiotics in foodstuffs.

At this point, Dr. Sabin answered the critics of his suggestion by stressing

the fact that he had proposed bacteriostatic additives as a research problem and not as a means of therapy for infected children.

Professor Babudieri (Italy) spoke on the need for the continuation of trachoma control campaigns over long periods of time and pointed out some of the important aspects of a successful vaccine trial which had been stressed by the World Health Organization Third Expert Committee report.

Dr. Chadli (Tunis) reviewed the experience in Tunis of a program of health education conferences with the people in the villages in a campaign to instruct in the technique of self-treatment and so forth. He stressed the fact that aureomycin ointment had been made available without charge to several areas and that a treatment schedule of ten days to three weeks duration had produced a great drop in morbidity in the treated areas. In Tunisia two weeks in the autumn each year are now set aside for a trachoma treatment campaign.

Dr. Attia (UAR) again called attention to the idea of Dr. Perry Jones and Dr. Collier in London that there might be a congenital reservoir of trachoma. But Dr. Maxwell Lyons (United Kingdom), who is on the staff of the World Health Organization, pointed out that the work of Perry Jones and Collier was based on a very few cases in the London area which is not a region of high endemicity. He further pointed out that there is an enormous amount of epidemiological evidence against the importance of a congenital reservoir in epidemic trachoma. He then reviewed some of the results of mass campaigns and stressed the fact that success depends upon environmental

conditions as well as the epidemiological picture in the local area. Eradication is possible if standards of living can be elevated, but a sustained effort and high cost are involved. Where there is a high incidence of trachoma and great poverty, mass treatment campaigns have very little effect in reducing the incidence of the disease. He did point out that the risk of reinfection is relatively small after school age and that the scarring of trachoma can be largely averted by the treatment of school age children even in areas of high poverty. He cited, as an example, the results in Morocco where trachoma has been converted from a blinding to a non-blinding disease. He recounted the history of trachoma when it was introduced into Europe in the middle of the last century and noted that it slowly died out even before any specific treatment was discovered. Noting that trachoma seems to be getting less severe in the UAR and elsewhere, he concluded that even slight improvements in the environmental conditions may have a definite bearing on this trend.

Specialized Session

The Control of Communicable Diseases
in the Light of Developments in
Science and Technology

Part II

Officers

Chairman - Dr. Marcel Roche
(Venezuela)

Rapporteur - Professor Attesso
(Senegal)

Dr. Sabin was asked the previous day to speak on immunization programs

and he chose to discuss the place of vaccines in the public health programs of countries in various stages of development. He made the following points:

1. There are no vaccines for the enteric and respiratory infections which are the major causes of death in early childhood in the less developed countries,

2. The vaccines for diphtheria, pertussis, and tetanus, routinely used in countries with higher standards of living, can enter the picture only after the health services of a country have reached a relatively advanced stage of development.

3. We must not expect the praiseworthy attempts to eradicate smallpox to be fully effective until the health services of a country are sufficiently developed to maintain a continuing program of vaccination of the oncoming generations of children.

4. We cannot expect BCG vaccinations of only a portion of the child population to yield dramatic results in the elimination of tuberculosis.

5. Paralytic poliomyelitis has emerged as an increasingly important problem in developing countries of Asia, Africa and Latin America. The oral polio virus vaccine lends itself for mass use both for aborting or mitigating epidemics as well as for ongoing programs. It is necessary, however, that developing countries obtain not only vaccine for this purpose but also expert advice on how to use it most effectively.

6. The live measles virus vaccine of Enders, further attenuated by Dr. Anton Schwarz to permit its use without gamma globulin, will not lend itself for mass campaigns in less developed countries, because the fact that it has to be injected will limit its applicability even if large numbers of "jet guns" could be made

available for this purpose. It is hoped that further studies on the administration of measles vaccine by aerosol spray in the mouth may yield a potentially more useful product for less developed countries, where the need for a measles vaccine is great.

7. There is no immediate prospect for new respiratory virus vaccines that would be practical for mass administration in less developed countries.

Dr. B. Babudieri (Italy) warned that the establishment of new agricultural and industrial enterprises with the resulting movements of populations often result in special disease problems of both human beings and domestic animals. He recommended that wherever possible such new enterprises should be preceded by a study of the local zoonosis problems.

Dr. T. W. M. Cameron (Canada) gave a very fine talk on zoonosis, but made no reference to the special problems of applying available knowledge in less developed areas.

Dr. Mahler (WHO) gave a very good summary of the problems encountered in the attempted control of tuberculosis in less developed areas.

Dr. Marcel Roche (the Chairman) described interesting studies in his institute in Venezuela which showed that each hookworm removes about 0.03 ml. of blood per day, and that in many infested persons this can mean a loss of about 100 ml. of blood per day.

Dr. Thome (Chad) spoke about the effectiveness of spraying campaigns against trypanosomiasis in Africa and also zoonosis in French-speaking Africa.

Dr. Mirchamsy (Iran) spoke about the rabies problem in Iran, which led them to produce their own anti-rabies serum for use in conjunction with rabies vaccine.

Dr. Karel Raska (Czechoslovakia) told how importation of sheep from Rumania not only introduced Q fever in Czechoslovakia, but also established new natural foci where none had existed before.

General Vaucel (France) spoke of the experience with zoonosis in French-speaking Africa and stressed the importance of a good epidemiological service in such areas.

Dr. Bres (France) spoke of the recent yellow fever outbreaks in Ethiopia (about 3,000 cases) and in Leopoldville. He warned that yellow fever vaccination must not be overlooked when there are population movements in endemic areas.

Dr. Helms (Denmark) spoke of the anti-tuberculosis campaign in Greenland and of its tremendously high cost (\$19 per person).

Dr. Shaker (Kuwait) spoke of the excellent health facilities and health services that have been recently made available for the small population of Kuwait. Remarks from the audience indicated this was viewed as an example of what money and effort can achieve.

Dr. Bechelli (WHO) gave an excellent summary of the new epidemiologic knowledge of leprosy and the new types of management that are based on it—particularly the elimination of institutional care.

Dr. Cohen (Israel) spoke of the elimination of poliomyelitis from Israel with the aid of oral polio virus vaccine and made a plea for the "have" countries to help the "have not" countries with both vaccine and expert advice.

Dr. Corradetti (Italy) spoke of yellow fever and other zoonosis in Africa.

Dr. Jansens (Belgium) spoke of plague foci in Africa and their potential

international significance. He also expressed regret that many control and eradication programs of zoonosis have come to an end in certain areas after the countries gained their independence.

Dr. Senecal (France) spoke of the great problems posed in the attempts to eliminate hookworm disease.

Specialized Session

The Principles of Health Service Planning and the Development of the Health Program

Officers

- Chairman - Dr. P. Shurpick
(Ukrainian USSR)
- Rapporteur - Dr. W. R. Aykroyd
(U.K.)
- Secretary - Sir John Charles
(WHO)

U.S. Participants

- Dr. Leona Baumgartner
- Dr. Rene Dubos
- Dr. Albert Sabin
- Dr. John C. Snyder
- Dr. Robert S. Morison
- Dr. Hildres A. Poindexter
- Dr. Richard C. Arnold
- Dr. Charles P. Hutterer
- Dr. James D. Weaver

Dr. Costa (Brazil), discussion leader, pointed out that public health services must act strongly in areas of poverty because there is little money for curative medicine. Frequently, the masses in the less developed areas do not understand the value of preventive medicine because many of them have illnesses that require curative medicine. Obviously, a large amount of health education and demonstration procedures are necessary to show

these individuals that preventive medicine will solve many of their problems:

The developing nations need many physicians, and the training of a physician takes a long time and large amounts of money. The nationals of any country do not want second-class physicians, but are willing to accept specially trained health workers who can administer certain therapeutic procedures or render necessary care.

The diet, so important to the health of the people, is influenced by shortages of food, transportation problems, storage, and the selection of foods which may be based upon local customs. In addition, native foods or customs may produce a shortage of protein which is necessary for growth, for muscular development, and the maintenance of muscular strength, especially in the working population.

In many developing countries the population is young, and the bodies of the growing population require larger amounts of protein. In addition, the productive group — age 20 to 50 — requires larger amounts of protein, depending upon the type of physical activity. Therefore, there is a greater need for protein in these two groups, in addition to increased requirements for the total number of calories. The older age group does not require as much protein nor as many calories per day.

In public health programs the nutrition expert and economist should work together to solve the problems.

Dr. Hojer (Sweden), the discussion leader, speaking as a representative of a well-developed country which is surrounded by limitations of space and climatic factors, was concerned over the fact that family planning was not included on the agenda of the program. He brought

out that family planning is one essential part of any health program.

The development and acceptance of a health program requires the cooperation of all people in the community, and these individuals must understand what the health program is designed to accomplish. The school teachers should talk about health and present its various aspects. The community, regardless of size, should improve the stability of health services and should develop personnel counterparts of the visiting health consultants.

There should be a coordination of assistance programs to developing countries. This would involve the type of program and, more importantly, the personnel which would be assigned or would be working in the program.

Dr. Bakacs (Hungary), discussion leader, divided the communicable diseases into two types — the tropical and endemic type which could be treated by vaccines, drugs or other forms of medication, and diarrheal and respiratory diseases usually caused by viral infections which are complicated by many factors and must be treated with non-specific methods of therapy. In addition to these, there are acute hepatitis, the common cold, and dysentery, which should be considered as diseases resulting from poor sanitation measures and the like. He pointed out that one per cent, and usually no more than six per cent, of health funds are allocated for the broad field of sanitation, including water supply. This is totally inadequate in a developing country which must develop extensive systems for water supply, purification and distribution and another system for the collection and disposition of industrial and human wastes.

Dr. Fendall (United Kingdom), discussion leader, spoke of the organization of health services, allocating the groups into epidemiological services, policy and planning procedures, training of professional and auxiliary personnel, and services to people in the community.

The problems in the less developed areas are due to:

1. the lack of adequate resources and funds;
2. the lack of trained personnel and training facilities;
3. an ever-increasing growth of the population, which requires more and more services.

The training of personnel is hampered by lack of funds and lack of both personnel and physical facilities. Not only are there insufficient physicians for curative measures, but also there are not enough available for the establishment of teaching institutions. In addition, secondary school training is frequently not adequate to produce the right type of students for various professional schools. Rather than wait until there are enough physicians and other personnel to meet the health needs, and until there are enough funds to build the necessary health, sanitary and educational facilities, he recommended that certain problems of today may be met by rural health units. Intelligent individuals of the community may be trained to handle the acute infectious problems, using modern drugs and techniques under adequate supervision. The health units must have active participation of the public and, actually, this means participation by the family unit. The rural health units in less developed areas may be used effectively to integrate the short-term planning into the long-term development of what would be the pattern

that is generally observed in the advanced countries.

The main points made in the discussion that followed these presentations were:

1. Sanitary engineering in water supply and in waste disposal is a necessity in a developing community, the greater emphasis being placed upon this as more and more industry comes into being.

2. Health is a basic problem for a developing country. In a developing area, the health of the rural groups must be improved by the introduction of mass curative and prophylactic procedures, in addition to mass educational programs.

3. An investigator from the Federal Republic of Germany reported that in one of the less developed areas the incidence of positive VDRL tests for syphilis was reduced from 50 to 25 per cent in approximately 10 years. The incidence of scabies was reduced from 70 per cent of the population to 10 per cent. During the same interval the incidence of intestinal parasites showed no change because no sanitary changes were made in the environment. It should be pointed out that the positive VDRL test generally used in the diagnosis of syphilis was positive due to the presence of other treponemosis, i.e., yaws, rather than syphilis.

4. A speaker from Roumania pointed out that rapid economic development and social changes would bring about a marked improvement in the health policies worked out in the new general development plan. The results in Roumania are now giving high-quality medical care to all people. They had utilized and had integrated short-term, medium-range, and long-range plans into the development of new areas and in the revitalization of older communities.

5. The representative from Finland pointed out that hospital services should be brought close to the people, and in their country they have small 20-bed hospitals for smaller community units. In the district they would have 200-bed hospitals which would service patients referred from the smaller hospitals and, in addition, they have 600-bed hospitals located centrally which would be used as teaching institutions.

6. Dr. Peterson reported that the World Health Organization is expanding its activities in consultation and training. Consultants are now visiting and reaching more countries and, in addition, are going out into the rural areas of a country to see the problems that exist in the community. The training programs have been expanded by sending more students away for training, and also by developing training units to operate in the country. Expert committees will continue to study the problems and make necessary recommendations.

7. Congressman Weaver (U.S.) reported on the utilization of the Hill-Burton program in the United States which enables an interested community to seek constructive advice from a national source, to have the program reviewed by the State authority, and to secure funds from the Federal Government, which must be matched on a 2 to 1 basis, for the construction of a hospital, a health department, or a rehabilitation center.

8. Professor Senechal (France) pointed out that health centers should engage in preventive as well as curative medicine.

9. Dr. Cohen (Israel) listed priorities of problems which could be tackled in mass campaigns. For instance, in yaws, many individuals may be treated

by using a small dose of antibiotic, and those who fail to be cured may be retreated with a larger, adequate dose. In planning for a long-term work, consideration must be given to getting adequate manpower for all professional activities. Educational facilities and programs must be used to improve health standards so people will realize that public health is working actively for them.

10. Dr. Edozien (Nigeria) pointed out that in addition to doctors, nurses and other auxiliary personnel are badly needed. In Africa it is necessary to have them in order to provide the health services because there are so few practicing doctors available.

11. Dr. Bonn (Switzerland) pointed out the need for consideration in the field of dental health. In one of the less developed areas a study indicated after a period of development and change in social and nutritional standards, dental caries increased from 20% to 80%. In that part of Africa below the Sahara, excluding the more developed countries, there are approximately 210 million people with only 400 dentists to provide dental care. A serious health problem is sure to develop in this area.

12. Dr. Hussein (U.A.R.) reported that people in certain areas believe and have confidence in the physician doing curative medicine, but do not have confidence in the public health physician. Therefore, in their rural programs they would have their physicians alternate in both types of activities in order to build up an acceptance of public health physicians.

13. Dr. Leighton (U.S.) reported that mental health problems of the less developed areas frequently are not recognized, although those individuals who have

violent, acute symptoms are usually treated in some manner. It should be recognized that certain types become a liability to the community, especially those individuals who develop an anxiety neurosis or delinquency state, or a negative state in which they are unwilling to assume a productive role. These problems will become aggravated as industrial and social development takes place.

Specialized Session

The Role of Medical Research

Officers

Chairman - Dr. Robert Morison
(U.S.A.)

Rapporteur - Dr. J. F. McCreary
(Canada)

U.S. Participants

Dr. Rene Dubos

Dr. John C. Snyder

Dr. Alexander H. Leighton

Dr. Robert S. Morison

Dr. Richard C. Arnold

Dr. Hildrus A. Poindexter

Dr. Charles P. Hutterer

Dr. Parodi (Argentina) pointed out that a researcher must have a capacity for good and critical observation. The role of the general practitioner in the less developed areas could be very important in studying the epidemiology of infectious diseases: his clinical and general observations are necessary in the less developed areas to determine the causative factors of most of the infectious processes. Leads developed should be followed by laboratory studies and the complicated conditions should be studied further in research institutions.

Dr. McCreary (Canada) reported on the role of government in medical research. On a national basis, an advisory body should be appointed to serve as a research council free of political influence. The council is designed to promote research in various places with emphasis being placed upon quality of research projects and upon developing, through training programs, competent research technicians and investigators for the future. In this way the research departments of the universities would be strengthened, and other research units would receive support. The council should also seek support from non-governmental organizations such as the Ford Foundation, etc. The membership of the research council should be changed every four to five years to prevent the perpetuation of the same type of ideas. The council should support two types of research - intramural research, which is that conducted by government research workers, and research carried on by universities and other non-governmental institutions. It is important that both types of research be given the same type of evaluation procedures.

Professor Tesch (Netherlands) pointed out that in small countries with limited financial and personnel resources, research must make the choice early as to what they wish to do.

1. They must look for outstanding people who can do research.

2. The needs of the country must be studied and research devoted to problems of most serious importance.

3. The authorities must recognize the emerging new problems needing research and recognize and adopt new techniques quickly.

4. There should be cooperation between the developed and the developing countries in exchanging ideas, in training personnel, and the development of new procedures. This is particularly necessary in standardizing and evaluating technical developments or testing procedures.

Dr. Bovet (Italy) pointed out the need for a statistical inventory of problems needing research, with emphasis on short-term problems as well as those requiring longer periods of investigation.

Dr. Edozien (Nigeria) pointed out that the medical research council should be fused in action and cooperate with the national research council of the nation. This is necessary in order to integrate research in the various fields of science — biological, medical, and social. Research may be done anywhere, but generally it involves a personality. In some instances a research institution develops because of an outstanding researcher. Most research, however, will be conducted in previously-established research institutions.

Dr. Attisso (Senegal) stressed that the African pharmacopoeia must contain many drug resources, some of which may prove valuable in modern therapy. Research is needed in studying the various remedies which are advocated and have been used by the native healers for years.

Dr. Longo (Italy) stressed that international organizations can play an important role in training research workers in the development of research activities. He stressed that material assistance should be given to the fellows who have received training abroad and have returned home. This material assistance should include funds for setting up the laboratory, necessary equipment and supplies,

and funds for the training of technical assistants. Unless the trained researcher has a good laboratory and other material assistance, he will become discouraged and may either go into private practice or may return to the country where he was originally trained. This loss of trained personnel from the less developed areas flowing to the well-developed areas is a very serious problem and must be approached objectively by both involved countries.

Dr. Krosnachek (Czechoslovakia) pointed out that consideration should be given toward planned research and planned science programs, taking account of the fact that planning in advance may have a deleterious effect on the free-working or independent scientist. In a planned program the team work is most important, because everybody becomes a part of the team and becomes dependent on the team. If the direction is good, the team may produce very satisfactory results. An independent, or free-thinking research scientist may not be able to function effectively in a team environment because his views may differ from those of his superiors.

Dr. Burton (WHO) pointed out that the sociological aspects are very important and are often neglected to an alarming extent. A very effective remedy may work in a hospital, but would not work in a field environment because the people of the community do not have confidence in the new procedure. The adverse sociological aspects are observed also in a developed country; for instance, the problems encountered in the fluoridation of water in an educated society. There may be a few cranks who will lead a fight and there may be some serious-minded individuals who feel that the intrusion

of medicine or toxic materials, as the opponents of fluoridation call the chemical compound introduced into water supplies, is an invasion of their private and personal life.

Dr. Rachmilewitz (Israel) called for international cooperation in working on research problems that are of greatest national need and that deserve highest priority. As an example, he gave the collaboration between Rangoon, Burma and the Hebrew University in Jerusalem. It was found that folic acid deficiency was responsible for megaloblastic anemia.

Dr. Ionesco (Rumania) discussed the importance of developing specialized cadres that are adapted to and trained for research on local problems.

Dr. Dradjt (Indonesia) said that the shortage of equipment and personnel makes it desirable to keep all research within the universities. Indonesia has now a Ministry of Research with a Council for Medical Research, one for Agriculture, one for Industry, and one for Socio-Economics and Culture. The establishment of this Ministry has improved the environmental coordination of research.

Dr. Sai (Ghana) called for the establishment of training schools for technicians and mentioned the help received from the National Institutes of Health. He said that training is needed for making up medical records in hospitals and many other specialized tasks. He said that research institutes should assemble facts needed for the establishment of future medical schools.

Professor McCreary (Canada) suggested that research councils be established which should be (1) politically independent, (2) respected scientifically, (3) able to impress the government with the needs for research funds, (4) able to

obtain funds to support research in universities, (5) capable of approaching other agencies for funds. He called attention to two mistakes that should be avoided; (1) the personnel on advisory boards should be rotated every four years, and (2) governmental research, whether intramural or extramural, should be equally carefully described and repeatedly examined.

Professor Tesch (Netherlands) suggested that research councils should anticipate the problems of developing countries before they become serious problems. In that connection he suggested the need for applied epidemiology.

Professor Bovet (Italy) said that three things are particularly needed: (1) inventories of scientific facts (for instance, incidence of mental disease, congenital malformation, etc.), (2) short-term research, and (3) fundamental research.

Professor Edozien (Nigeria) suggested that medical research councils should be part of a national research council in order to economize resources. He advocated flexibility and suggested that all research does not necessarily have to be carried out in a university, that a good research man, if necessary, should be supported in his research efforts outside the university. He mentioned that the study of local problems would usually lead to findings with more than local significance.

Professor Vaucel (France) suggested that the national research council be responsible to the President of a Republic rather than be attached to a Ministry. He said that the collaboration advocated by Dr. Bovet was actually carried out by the Pasteur Institutes and that they constitute a good example of the fact that research still had to be carried on outside the universities. He advocated finally the establishment of a charter for

medical research that should be given to WHO.

Dr. Bosovitch (Yugoslavia) said that they have a problem of chronic epidemic nephritis. They decided to establish a research institute and collaborate on this project with Bulgaria.

Professor Chagas (Brazil) suggested that WHO should develop special training courses to teach various medical techniques and also bio-statistics.

Dr. Lewthwaite (United Kingdom) spoke about the development of technical cooperation which is working with the Rockefeller Foundation in Trinidad and Tebbe in West Africa. A new veterinary school is to be set up in Nairobi. He also mentioned the help given by NIH with the cholera laboratory in Dakar. At the Makerere College a six-year course was established to train medical technicians.

Specialized Session

Introduction of Pharmaceuticals: Problems of Cost and Quality

Officers

Chairman —Dr. Karl Evang (Norway)
Rapporteur—Dr. A. Heritier (Switzerland)
Secretaries—Dr. H. Hälbach
Dr. P. Blanc (WHO)

U.S. Participants

Dr. Hildres A. Poindexter
Dr. Richard C. Arnold

The content of the program and discussion were limited to the cost of drugs and quality controls. Problems related to toxicity, habit formation, technical research, etc., were not considered. This was a good session in that there was a frank discussion of the problem of transferring a pharmaceutical

industry to a less developed area and the problems of developing the necessary controls for the production of new medicinals.

Dr. Blanc (WHO) pointed out that many less developed areas import bulk quantities of pharmaceuticals and then package and label them for domestic use. Penicillin is an example. Production of new drugs should be started nationally in relation to technical developments, scientific personnel, and research facilities. Personnel may have to be trained first in other countries in manufacturing plants and research laboratories of the universities. Quality control studies of samples must be performed on material taken from the plant at various stages of manufacturing and from finished products obtained from the shelves in pharmacies. These studies should be made at frequent intervals. The exchange of information between countries is very important in studying new drugs. Excessive expenditure for drugs can be limited by reducing the total number of drugs available in a country to less than 2,000. Physicians can aid by cooperating in using those drugs which are in the regular channel and their attention should be focused on the drugs which are being used and those which have doubtful or less effective value should be deleted. There is need for appropriate legislation and regulations for all types of drugs.

Professor Babudieri (Italy) pointed out that developed productive facilities of the advanced countries can hardly be transferred to the less developed areas without overcoming many difficulties. Pharmaceutical industries have many operational units such as departments for synthesis of new compounds, highly specialized pharmacological research, developmental research laboratories, field testing programs and clinical research investigations. Many drugs are replaced in a few years by newer and more effective ones.

This has been noticeable in the antibiotic era. The less developed areas should enter the field of production on a modest scale; probably importing bulk quantities and packaging for domestic distribution. Next they could import partially completed compounds and finish the production of simpler compounds. They should develop control laboratories and make regulations governing the quality of preparations imported into the country and distributed within the country.

In tropical countries it is difficult to keep certain drugs from deteriorating. In these less developed areas the local necessities and requirements must be considered. Ointments are well accepted. Many drugs are distributed in the less developed areas by visiting personnel making daily or weekly visits. Some of these are the long acting drugs used for prophylaxis and treatment such as sulfones in leprosy and anti-malarial preparations. Clinical development of acute toxicity and accumulative effects must be studied when drugs are disturbed by visiting personnel. In this connection, WHO should promote an exchange of information on toxicity of various drugs.

Dr. Motawi (UAR) spoke on methods of price control and methods for starting small pharmaceutical industries. Many pharmaceutical products are being imported in various stages of processing by concerns in the UAR which then complete the manufacturing process and distribute the products. The aim is to give the best drugs at the lowest cost. A government agency imports drugs and distributes them on a low-profit basis. Local pharmacies are subjected to price control and this has resulted in a 25% reduction of cost.

The UAR has short-and long-range plans for developing manufacturing facilities for pharmaceutical production. They encourage foreign companies to join with local manufacturing units to produce drugs in UAR.

The technicians go abroad for training and return to develop training programs in the new plants. There are many Arabic compounds which are effective according to local usage and need research for further development. Certain animal products such as gelatin, cat gut, anti-sera vaccine, and blood products are produced by domestic facilities. Alcohol, acetic acid, aspirin, penicillin, the sulpha drugs, etc., are now made for domestic use and certain quantities are exported. The UAR plans to establish a national research institute for studying new drugs. The UN should have a consultative body to give technical assistance to less developed areas on drug production procedures.

Dr. Davis (UK) spoke on the problems of quality control for local industries. It takes 20 to 30 years to build a large pharmaceutical industry. A new industry should concentrate on a limited number of drugs, in some cases producing under license, drugs which have been developed elsewhere. Approximately 80% of the drugs used are patented. The remaining drugs are in the public domain and may be manufactured anywhere. Aspirin is a common example, but production must be exact and control must be maintained so that each tablet will contain the proper dosage and will not deteriorate on standing. In recent years there have been a number of "Me-too Drug Companies" which are manufacturing drugs that have been patented, or drugs which are related to patented compounds, but these companies frequently have a minimum of quality control and have spent very little on the development of the drug. They sell at cut-rate prices and frequently may sell an inferior product. In some instances the formulae may have been stolen from the originator.

Professor Attisso (Senegal) stressed that drugs occupy a special place in the role of health and nutrition of man. The cost price is simple. The drug when imported from

abroad sells at a price which is high in relation to the earned income of the French-speaking African. As a possible solution, he recommended processing in the local country but realized that this was not easy. He referred to the advertising costs and suggested that these should be reexamined to see if the price could be lowered. He also pointed out that advertising of drugs frequently caused natives of remote villages to ask for an exotic antibiotic which they really did not need.

He recognized that quality controls plus stability and effectiveness constitute major problems. He suggested that the small developing countries of French Black Africa cooperate and develop regional facilities for making, testing and distributing certain drugs. This could be accomplished with staff and equipment and supervision of operation by personnel furnished from the developed areas. He put in a plea for the developed areas to train technicians, to supply equipment, and to furnish financial support for the development of pharmaceutical industries in the less developed areas.

Professor Grashchenkov (USSR) took exception with Dr. Davis that a long period of time was necessary to build a pharmaceutical industry. These fears may scare some of the less developed areas from attempting to develop a new industry. The USSR has developed new drugs for mass therapy. These are economical, are produced under strict control, and are distributed free. The exotic new drugs will be made in the near future. He deplored the exporting of uncontrolled preparations to less developed areas. It is not necessary for new national pharmaceutical industries to go through the tedious process of development. It is possible to create the the most modern organization and to use local available materials and personnel for the non-supervisory technical forces. The new in-

dustry can use the WHO system of exchange of information on the making of drugs and their toxic effects. He suggested that less developed areas use an expert committee of WHO to help select the type of drugs needed for various diseases.

Dr. Martinez (Venezuela) reported on the development of a training program in chemistry and pharmacology and the establishment of a quality control laboratory for industrial laboratories. For many years his country had imported many drugs without quality control. The legislation requires complete documentation concerning quality and effectiveness of new drugs. He deplored excessive advertising of drugs. His country does not permit advertising over radio nor permit doctors or hospitals to be given free samples and believes these are important measures in reducing costs. He recommended that there be a UN seal of drugs which are to be sold or used for export purposes.

Professor Lukas (Czechoslovakia) pointed out that there are many drugs often quite similar but are marketed and claimed to have a better effect than a related compound. He agreed that there should be some form of WHO approval.

Dr. Clavero (Spain) stressed that the state should support new pharmaceutical industries. The people should be able to use the new drugs which are good without bearing the heavy costs of production. Reduction of unit cost price for imported drugs based on patents, monopolies, etc., should occur and an international agency should see that the drugs are sold at a reasonable price level. Local drugs produced in the country can be sold at a lower level of profit and further reductions may be made by lowering the profits of the distribution chains of the state. Also, he would control the use of drugs to the people that actually need the medication.

Dr. Castellanos (Mexico) reported on the adequate measures for controlling drugs, vaccines, and sera used in Mexico. The National Health Institute of Mexico has the responsibility for manufacturing and distributing free all products for the prevention and treatment of certain diseases.

Dr. Sadeki (Pakistan) pointed out that it was difficult to establish a new drug or to have a drug examined by the research facilities in a developed area. He believes that the method of drying, heating, treating with chemicals and so forth may actually destroy the active therapeutic principle such as an alkaloid of a plant. This process may result in a non-effective substance and it is attributed therefore that folklore medicine was wrong. It is a wonder that any new drug can be found by the present investigative processes.

A physician from Thailand reported that his country is dependent upon imported pharmaceuticals. A few simple drugs are manufactured from native raw materials. He put in a plea for the developed countries to assist in reducing prices and in maintaining quality control before allowing a drug to be exported to the less developed areas.

Dr. Evang (Norway) made the following suggestions: (1) limit the number of drugs to 1,500 or 2,000 preparations which will reduce the cost and simplify distribution; (2) enact legislation that will assure that the producer markets an acceptable product; (3) if the price is reasonable it would be welcome on the market, although in some instances a negotiated price would have to be determined; (4) since quality controls require a long period of time to develop in the biological and chemical laboratory, an intermediate step would be to require a certificate of these controls; (5) WHO has specifications for standards of biologicals and drugs which might be adopted in total or in part by a less

developed area; (6) no country or manufacturing organization should export a drug unless it is being used or approved for use by the host country.

Specialized Session

The Problem of Mental Disease in Less Developed Areas

Officers

Chairman — Dr. T. A. Lambo (Nigeria)
Rapporteur — Professor Eduardo Faraco (Brazil)
Secretary — Dr. L. Tigani El-Mahi (WHO)

U.S. Participants

Dr. Alexander H. Leighton (Discussion Leader)
Dr. Rene Dubos
Dr. Albert Sabin
Dr. John C. Snyder
Dr. Hildres A. Poindexter
Dr. Charles P. Hutterer
Dr. James D. Weaver
Dr. Richard C. Arnold

In opening the session, Chairman Lambo made four points:

1. It is untrue that mental disease is rare in underdeveloped countries;
2. The development of psychiatric services uncovers many instances of disorder not previously known;
3. The stresses of cultural change increase the prevalence of mental diseases;
4. The cause-and-effect factors that are involved in mental disease transcend the usual boundaries of medicine and interlink closely with economic and educational problems.

Dr. Tigani-El-Mahi (Secretary of the session) pointed out that many forms of

psychiatric treatment, both medical and non-medical and both past and current, have produced good therapeutic results. Many of these methods are based on entirely different ideas of cause. This suggested to him that the answer to the question of why therapy works is not given by any particular theory, but lies in the psychological relationship between therapist and patient. The confidence and belief of the patient in the therapist is the major factor.

Professor Eduardo Faraco (Rapporteur) agreed that the frequency of mental cases increases with development; he felt it crucial for research to identify the relative weight among the factors of heredity, organic disease, psychological experience, and social conditions.

Dr. Leighton, the first discussion leader, pointed out that mental illness is serious enough and widespread enough to less developed areas to constitute an important drag on development programs. There is evidence that between 15% and 20% of the population are affected and that this percentage tends to rise as the changes associated with development occur. The symptoms of mental illness — apathy, anxiety, hostility, depression, etc. — foster resistance to and rejection of many types of development programs — including health and nutrition programs — and refusal to cooperate or participate. To reduce these psychological states is, therefore, to increase the chance of success in development programs. The recent advances in treatment of mental illness have made it possible to do something. Medication, boarding out and village community therapeutic schemes of treatment can be used in designing low cost programs that can reach many times the number of patients that can be treated through the conventional hospital patterns.

Professor G. M. Carstaris (U.K. psychiatrist) felt that one of the world-wide problems in need of cleaning up was the cruel treatment of psychotic patients (e.g., beating and branding), due to the theory that the person was possessed of a devil that had to be driven out. He was skeptical of trying to use native healers in a health program, but at the same time felt one should not interfere with them until he had something better to offer. He then outlined the plans partially realized in Great Britain to reduce the number of cases in psychiatric hospitals through increasing community services and throwing more of the weight of care on communities. He mentioned particularly the conversion of the health visitors (developed in connection with tuberculosis) into mental health visitors. They are presently being retrained with short courses. At the end, he urged that one of the criteria for priority in public health planning be the availability of effective remedies, and suggested that a breakthrough was at hand in psychiatry.

(This paper linked well with the previous one, taking issue on one question — use of native healers — and reinforcing another — criteria for giving mental disease a place in public health programs, even though it is not a matter of saving lives.)

Mme. L. Petit of the Institute Pedagogique National (France) said that in developing areas there is an increase in behavior that is disturbing to family and society and that this is of concern not only to the psychiatrist, but also to the psychologist, the sociologist, and the educator. Such behavior is proportional to speed of development, and that rapid change is a menace to mental health. Taking an unnamed place in a desert area as a case, she described the process of rapid change producing social disintegration and then

psychological disturbances, as individuals struggled inadequately to adapt to an unknown and unstable world. Some people withdrew into passive isolation and the society was deprived of their participation, others turned aggressive and destructive to the society. Both of these trends put brakes on development. The point of her argument was not that of stopping development, but to raise the issue of how to accomplish development without all these noxious consequences. She felt this was a responsibility of the elite of developing countries, which they were not facing up to, and that there was very bad communication between the elite and the masses. She felt education designed so that it would be progressive and constant for all ages in both elite and masses was a central hope. "Education in its broadest sense" and "constantly renewed."

Dr. Rodrigo Fierro-Benitez (Ecuador physician) gave a digest of the working paper he had prepared for the meeting. He presented a very emotional and moving description of the cretins of the high Andes, and pled for the distribution of iodized salt.

Dr. Gilo Murragui (Ecuador economist) spoke from the floor, and reinforced the idea that social and political reform were the first steps required.

Dr. Maria Pfister (WHO psychiatrist) spoke of the need of training auxiliary personnel such as nurses, and designing community clinics so that much of the psychiatric care could be done by non-psychiatrists although under the general supervision of psychiatrists. (In this she was expressing aims which are much like those now being realized in community clinics in Britain and the Sudan.)

Charles Mertens de Wilmars (Holy See), a Belgian psychiatrist with long research experience in Katanga, said that cultural change does not always bring an increase

in mental disorder, and so a critical question is that of why this sometimes happens and sometimes not. On the basis of his work and that of Dr. LeBlanc in Katanga, he offered a psychological theory as an answer to this question and felt that it could be cast in a form that could be tested empirically. His theory was based on the observation that the first generation of those experiencing rapid change tend to a "schizoid" reaction, while those in the second generation developed psychoneurotic and psychosomatic disturbances.

Dr. Tigani-El-Mahi (WHO) stressed his confidence in the therapeutic effectiveness of many native forms of treatment. He thought that numbers of them fitted well with theories of the unconscious.

Mr. X. Kondakis (Greece) reported his concern with the mass movement from country to city which seems to be worldwide. He mentioned a study of young agricultural workers who had stayed in the country and another group which had moved to the city, and said that 25% of each were found to be suffering from mental illness. (These figures are almost identical with those obtained by the Cornell Group in rural Canada and in New York. This fact is striking enough to make one want to know about Mr. Kondaki's methods.) Qualitatively, however, there were major differences in the two groups, with those who remained in the country being much more "fragile" in personality make-up. On the whole, the stronger types move to the city. He felt the situation needed practical attention. On the one hand, there should be development of industrial psychiatry so that the problems of the in-migrating labor could be understood and handled. The problem of the less psychologically fit being left in the country is even more serious and deserves further

study and the development of plans to overcome it. Otherwise, agricultural productivity will suffer in the long run.

Prof. N. I. Grashchenkov (USSR physician) agreed that there was an increase in psychoneurosis, alcoholism, juvenile delinquency, etc. in different parts of the world. Some of this was no doubt on an hereditary basis and some on an organic basis, but he felt much of it was the result of psychological stress. He thought that fear of unemployment and fear of thermo-nuclear war were the major causal factors. He reviewed the psychiatric services offered in the USSR, saying they had one psychiatric bed per 10,000 and one psychiatrist for every 20,000 of population. They have numbers of outpatient clinics for people with psychoneuroses and offer social work help and even legal advice. He praised WHO for its reports, but took it to task for not giving enough importance to the casual effects of social environment on mental illness.

Dr. Gerardo Clavero (Spain) joined previous speakers in saying that when social development is quick, you get more mental disorder. This happens particularly when the change operates in such a way as to break down the nuclear family. The doctor engaged in community health services must be broad enough to have a strong sense of community requirements. Prevention should have top priority. The requirements of health and of social integration are more important than economic development. The latter should be geared to the former. Confining medicine to treatment in hospitals creates an explosive situation, because it means that a few people get virtually all of the medical attention.

Dr. Gaston Catellanos (Mexico) spoke for a strong mental health program that would be low cost and reach all of the popu-

lation. He described regional hospitals in Mexico that give free service and cut their costs by raising food with patient help. He thought that mental health work should go hand-in-hand with efforts to overcome malnutrition and infectious diseases.

Dr. Margaret Mead (USA) said that each culture had its own mental health resources and that there was danger that in the effort to modernize and imitate the developed countries, cultural resources would get lost. She warned against over-use of drugs creating "zombies" around the world and spoke in favor of giving due place to the social and psychological forms of treatment that may be indigenous in various cultures. She also said that much psychiatric work can be done by trained "listeners," who are not hard to train, and not expensive.

Dr. Lambo (Chairman) in concluding the meeting expressed the view that psychiatric diagnosis in West Africa should be conducted in such a way that it was not an imitation of European methods, but was based on what one actually saw and detected in Africa. "Our diagnostic methods and conclusions must be independent."

Comment

This meeting revealed that many people agree that rapid change increases mental disorders, and, at the same time, made it clear that it is time we stopped saying this and began to press, more earnestly, for action to find out how this comes about, and what can be done about it. A great deal of education and communication in many directions is needed, because the psychiatrist is relatively isolated from the public health people and from the rest of the medical profession generally. The medical profession, in turn, is inadequately informed on economic and educational plans and actions.

A second point is that long-range plans in many less developed areas tend to ignore short-term requirements. Plans for increasing the number of psychiatrists (after the number of medical schools have been increased) are all very well, but they will not start to pay off in the mental health field for generations. What is needed immediately are some working models of low cost psychiatric services, and some experience

in methods of prevention. Both might be done with selected personnel who get quite short training courses and can be geared into existing social and cultural contexts. If these models can be set up, then the next move is to establish some kind of evaluative research designed to show whether or not an improvement in mental health is being achieved, and if so, which approaches should be pursued on a larger scale.

Section G: SOCIAL PROBLEMS OF DEVELOPMENT AND URBANIZATION

Summary

Although many members of the United States delegation had had prior experiences in some of the less developed countries, the Conference afforded an opportunity for them to obtain a broader cross-sectional view on the problems of rural development, urbanization and industrialization.

There was no consensus among the conferees regarding the major problems to be faced. In some countries the focus was upon the rural sector, while in other countries the developments in the industrial sector were thought to pose the more serious problems. One of the major concerns emerging from the deliberations was the matter of priorities. Given the fact that there were not enough resources in the less developed countries for meeting their problems, and not sufficient affluence among the more developed countries for assisting with all of the problems, the question of priority loomed large.

The less developed countries appeared to develop a feeling that there was a sincerity on the part of the members of more developed nations for analyzing the problems faced by the less developed countries within a framework which would lead to a maximization of potential help.

There was agreement that standard research procedures employed in both the less developed and more developed countries had not yet unearthed a body of reliable knowledge which could be applied with confidence in particular cases. Each country presents peculiar background factors con-

nected with its cultural development and traditions which call for special adaptation of present day knowledge. This is not to deny the recurrent nature of social phenomena. Much of what is known from previous researches is relevant to the problems occurring in the less developed countries, e.g., migration, adaptation to town life, economic planning, etc. What is clearly indicated, however, is more intensive research which can relate the general body of knowledge already developed to the peculiar situations existing in particular countries.

There was sharp division of opinion as to the impact of present developments upon different sections of less developed countries. Some speakers viewed the agricultural sectors as presenting the greater problems while others viewed the problems of the urban community as the most serious ones. There also was disagreement regarding the degree to which the problems of these countries were being met. Some speakers, including Professor Doxiadis of Greece, felt that we had no relevant science of community planning which would help us through our present problems. Other speakers, including Professor Rao of India and representatives of the Soviet Bloc, were of the opinion that substantial progress was being made in village development and in meeting the problems arising from the pull of industrialization upon village life.

There was a general consensus that the problems of rural and urban life should be studied within a regional framework, but

there were some who were disposed to focus upon these problems separately. The viewpoint one accepts has implications for strategies devised to deal with the problem. When the problems of rural and urban areas are viewed as part of a common problem, less attention is given to attempts to limit migration or to establish intermediate stations for educating the rural inhabitant to urban ways of living prior to his taking up residence in an urban area. The major problem is seen as one of providing opportunities and other services in the urban areas which will allow for a new population balance or equilibrium within the region. Those who saw the problems of rural development as a distinctive problem, and who focused mainly upon this problem, as distinguished from those who espoused a regional framework, were inclined to make allegations that foreign capital investments in industry had an odious character and resulted in disruption of rural community life.

The Secretary did an excellent job in summarizing the major points of view expressed in the prepared papers for the meeting and in raising questions for discussion in each of the sessions.

The presentation of Professor Tumin of the United States delegation was vigorous and effective. Considerable attention was given to the presentations of Professor Rao of India and Mr. Landau of Israel, mainly because of their optimistic nature regarding developments in their respective countries. One of the most brilliant expositions of the problems of rural and urban development was given by Professor Papi of Italy, who served as chairman of the session on Rural Development. Among other things, he pointed to the inevitable nature of the social changes now occurring, of the interrelations of problems or urban and rural life, to the need of a more effective role of governments within

the less developed countries in meeting local problems, and to the impediments to rational consideration and treatment of the problems induced by politicians with self-interest concerns.

Many delegates from both the more developed and less developed countries thought the meetings were too large and would suggest that future meetings be held which would limit attendance to a smaller group of countries with somewhat similar problems. The suggestion was offered also that some continuing body should be developed to examine systematically problems of community change and the impact of technology in the less developed countries.

General Session

Social Problems of Development and Urbanization

Officers

Chairman — Prof. J. C. Edozien
(Nigeria)

Secretary — Mr. O. Yakas

U.S. Participants

Dr. Melvin Tumin

Dr. Margaret Mead

Introduction

1. In the General Session of Agenda Item G on "Social Problems of Development and Urbanization," there were four speakers for oral presentation and 17 were included in the Chairman's list and were allowed a period of five minutes each for interventions. Speakers from the countries represented were mainly sociologists or town planners/architects and no views on the problems were expressed by scientists of other disciplines, such as geographers, engineers and others, except for a few economists.

2. This is more significant when we consider that, from the papers submitted and the discussions held, it has been proved that social problems cannot be isolated from other problems, such as those of an economic, technological, political-administrative and cultural nature. It may be advisable to suggest that in any future conference of a similar nature, problems of development and urbanization should be examined by a panel of experts drawn mainly from the above mentioned disciplines in an integrated manner.

The Problems

3. Problems relating to development and urbanization were briefly mentioned by the Secretary of the Session and by the principal speakers who presented their papers orally.

4. There was unanimous agreement that the trend for people to move from the country towns to the urban centres and the development required by this trend and involved therein creates a universal problem of a complicated nature, including factors of economic, social, technological, political-administrative and cultural background.

5. Speakers did not agree, however, on two aspects of the problem:

(a) the size and severity of the consequences;

(b) which aspect of the problem merits the greatest attention.

6. Some of the speakers based their conclusions on figures supplied by demographers, who predict that by the end of this century the world population will have doubled and that in one century from now the world population will be approximately 24 billions. In addition to figures relating to population, in proportion to the total population, will be much greater and the income per capita will also have increased.

The consequences of these three factors may be of a very serious nature if the nations of the world are unaware of this situation and do not take the necessary steps to study all aspects of the problem and to devise policies and draw up programmes for a properly controlled and directed development.

7. There were, however, other speakers who did not appreciate the gravity of the facts based on demographic figures and they expressed the more optimistic view that humanity could face the problem, as it has been faced by other nations in the past. These speakers did not base their opinions on scientific data but on personal beliefs and convictions.

8. A few speakers gave greater emphasis to the social importance of all these problems and expressed the view that proper social planning should be the basic proposition in order to face the demographic implications of the phenomenon.

Nature of Proposals

9. The various speakers in this session did not restrict the scope to the problems mentioned but submitted proposals as to how these problems could be solved. These proposals can be summarized as follows:

(a) proposals related to specific forms of the problem;

(b) proposals made with regard to administration-organization to tackle the problem;

(c) proposals made with regard to the goal and objectives of the effort.

Specific Forms of the Problem

10. Proposals regarding the solution of social problems interested the majority of the speakers and this was probably due to the fact that this item of the agenda restricted the field to social problems of urbanization and development.

11. The proposals made by various speakers may be summarized as follows:

(a) co-operation of the people concerned is indispensable for the successful implementation of any programme;

(b) disparities between developed and developing countries should be slowly reduced and abolished;

(c) disparities between town and country, especially in the less developed countries, should be abolished;

(d) utilization of the human resources factor is essential and to this end proper social stratification should be achieved;

(e) the disparity between the sexes should disappear, in order to strengthen the concept of a family as the nucleus of social stability.

12. The economic problems relating to development and urbanization were stressed and the following conclusions were drawn:

(a) that there is a great need for agrarian reform in the less developed countries, as has been shown by examples in various other countries;

(b) there is a need for small industries to be established near the centres of primary production, in order to employ the surplus labour force from the rural areas and to build up a larger population in the rural settlements, which population should justify the establishment of the facilities and amenities already available in the towns.

13. The need for a hierarchy in the size of the settlements and the proper placements within the overall regional pattern was emphasized and this need was correlated to the establishment of services in the rural settlements, such as health buildings, educational buildings, recreational facilities, etc.

14. The need for the formulation of policies on matters relating to the huge problem of housing in the less developed

countries was stressed, although no intensive examination of this problem had been made by any of the speakers.

15. One of the speakers drew attention to the problems created by the production of the machine in our age. He said that measures should be taken in the less developed countries to avoid the complicated situation which has arisen in towns of the West due to an excess of motorized traffic.

Organization

16. The administration and organization of the necessary measures to solve problems relating to development and urbanization have been studied by many speakers. Some speakers confined themselves to specific countries or regions, while others referred to the broader international field.

17. One of the speakers emphasized that although there is technological knowledge available for the less developed countries, there is no science to deal with human settlements. He proposed, therefore, that humanity should create this missing science by using the knowledge and experience of other disciplines in the five broad circles of economics, social science, technological science, political and administrative sciences and cultural/aesthetic aspects. The purpose of this synthetic work will be the creation of human settlements, where people may live, work and enjoy themselves in happiness.

18. Another speaker expressed the view that science is international and that experience gained from the application of development in one country may be used in other countries. This viewpoint was queried by another speaker, who maintained that science can be of a national nature. It should, however, be mentioned that, in the papers submitted, it was emphasized that international experience and knowledge

should be applied to a specific country in adaptation with local conditions, which reflects the views expressed by both speakers.

19. In connection with this aspect, one of the speakers drew attention to the need for scientific personnel to study particular problems in specific areas. They should reside in the area and should assimilate local conditions and factors before submitting their proposals.

20. It seems that all the speakers were agreed that it is absolutely necessary for every country in the world to proceed with the preparation of a programme of development which will incorporate aspects of urbanization on a national basis. This programme should be followed by regional planning and community development in the towns, both to be incorporated within the overall national programme.

21. In other words, emphasis was given to the necessity for long and short term programmes, in terms of both space and time.

22. The problem of urban versus rural development was also discussed by several

speakers and it was more or less agreed that one could never be in contradiction with the other, provided that co-ordination existed between the various disciplines involved in the formation of the programme. One of the speakers emphasized that urban development should be used as a level for rural development.

23. The view was also expressed that there is a need for a central organization dealing with all matters of development in a country and that this organization should control both State and private enterprise.

Conclusion

24. From the discussions held, it is apparent that all are agreed that planning of settlements and programming development should be considered seriously in relation to the human factor. As one speaker quoted "Science has lost contact with society, when it should be a means of happiness for human beings."

25. It may be said that the overall trend in the speeches reveals an inclination towards the formulation of policies and adoption of principles which should lead in future to the creation of human settlements.

Chronological List of Speakers for Session G (General Session)

<u>Name</u>	<u>Delegation</u>	<u>Topic</u>
Professor R. Dumont	France	Social Disparities between Town and Country.
Dr. C. A. Doxiadis	Greece	Existics as a Tool for the Solution of Problems of Human Settlements.
Dr. K. Perczel	Hungry	Planned Development of Industrial and Agricultural Regions.
Professor M. Tumin	U.S.A.	Social Stratification and Social Mobility in the Development Process.

<u>Speakers</u>	<u>Name</u>	<u>Delegation</u>	<u>Topic</u>
1.	Mr. E. B. Ndem	Nigeria	Problems of rural development and urbanization in Nigeria.
2.	Professor V.R.K.V. Rao	India	Some reflections based on Indian experience. The place of small and large towns in urbanization and development.
3.	Dr. (Miss) Margaret Mead	U.S.A.	Social problems and changes which come from the development processes in both the country and the rapidly growing urban centres.
4.	Dr. B. G. Gafurov	U.S.S.R.	Correlation between urbanization, rural development and overall changes of social structure of a society.
5.	Mr. V. Eremias	Czechoslovakia	Relations between farming organization and rural development.
6.	Mr. W. H. Chinn	U.K.	Social problems of urbanization.
7.	Dr. A. N. Khalifa	U.A.R.	International co-operation in the matters of social research and in community development and urbanization.
8.	Dr. A.F. Toboku-Metzger	Sierra Leone	Remarks on the scope of Session G.
9.	Professor B. Shizendeb	Mongolian Peoples' Republic	Social problems of development and urbanization.
10.	Dr. R. Weirz	Israel	Social problems created by processes of rapid development.
11.	Professor L. Tonev	Bulgaria	Urbanization is a positive phenomenon, which requires measures of co-ordination, and which prevents consequences of an economic, social, town planning, etc. nature.
12.	Professor C. Murgescu	Rumania	Social problems involved in urbanization and development.

<u>Name</u>	<u>Delegation</u>	<u>Topic</u>
13. Professor A. Ciborowski	Poland	Future urbanization trends in the developing countries.
14. Mr. Y. Gurer	Turkey	How we can try to find solutions to the social problems created by development and urbanization in the developing countries.
15. Professor W. Nitisastro	Indonesia	Comments on some papers.
16. Rev. Father C. Mertens	Holy See	Demographic increase and urbanization.
17. Mr. J. Antoine	France	Aspects on the role of towns in the phase of development.

Specialized Session
(Section G)

Rural Development

Officers

Chairman – Mr. Vaclav Eremias
(Czechoslovakia)
Rapporteur – Mr. Khaled Ben Ammar
(Tunisia)

U.S. Participants

Dr. Allan Holmberg
Dr. Margaret Mead
Dr. A. T. Mosher
Dr. William Goode
Dr. Melvin Tumin
Dr. G. Franklin Edwards

1. The problems arising from rural development are of interest both to the developing and to the developed countries. However, most of the speakers considered the problems of rural development in the countries which make up one-third of the world.

2. The first problem raised was that of harmonization of rural development with general economic development. Most of the speakers expounded on the necessary coordination of rural expansion with development in other sectors of the economy. Some recalled that there were times in the recent past when this development in the developed countries was not controlled and humanized. Some speakers evoked the sudden, and often brutal, transfer of agricultural populations towards urban centers. Social problems were created as a result of these abrupt changes.

3. In order to avoid the recurrence of similar phenomena, most of the authors of papers, and some speakers, stressed the necessary intervention of the State to canalize the surplus agricultural population towards the city. They pointed out, in particular, that this control by the State is in keeping with respect for the human being and the free choice of a trade.

4. Some emphasized the necessary technical training of the peasant before integrating him in a modern industrial machine.

5. This prerequisite to development being harmonized and integrated between the different sectors, rural development can get started in the best conditions. In this respect, most of the speakers pointed out the predominant role of agriculture in rural development. Some even emphasized that for the new countries the agricultural aspect of rural development was of major importance. It is only at a later stage that rural development can acquire its full meaning and take on activities other than agriculture (small industries, services).

6. Faced with the predominance of agricultural problems in the process of rural development, some authors expressed doubt concerning the possibility of achieving complete evolution of the peasant society without a certain number of reforms being undertaken in the agrarian structures. Most of the authors stressed the inadequate character of the agrarian structures in many developing countries and recalled that the industrialized countries faced the same problem in the past.

7. The tribal system, or its most evolved form — feudal ownership — renders uncertain all progress in the rural world.

8. A few authors also underlined that structural reforms in certain countries must necessitate a regrouping of small property, generally parcelled out, in exploitable units viable technically and profitable economically.

9. This double aspect of structural reforms — limitation of latifundia and regrouping of small land parcels — must depend on the establishment of co-operative systems where the peasants can group their land and their technical assets. Substantial State aid is required if co-operation is to be realized in the agricultural sector.

10. Some speakers emphasized the importance of private family property as a

factor of rural development. This property would be incorporated in a system of social services which would permit the peasants to combine the free possession of their lands with the advantages of communal life. The advantages of communal development, which has been undertaken in many developing countries, were thus exposed. In view of certain setbacks, however, it is necessary to point out that this type of development must be associated with other specifically stated formulas and actions.

11. Once the structural reforms have been effected, the major obstacle in the way of rural development has been eliminated. In fact, most of the authors stress the fact that these reforms allow the peasant to become a landowner and, because of this, he becomes a dynamic element in development.

12. The case was cited of nomad populations, living on the edge of psychological misery, which not only became settled through agrarian reform, but above all were integrated into an economy of exchange where they became dynamic factors to production. These same authors assure us that the settling of the nomad tribes of Africa or Asia can be accomplished in the same way.

13. However, and it is an important factor which has been emphasized by most of the authors, all structural reform must be undertaken with the participation of the beneficiaries. In no instance should it be imposed from outside without any psychological preparation of the population.

14. Once the structures have been transformed, they are likely to spread the progress in the rural world. To arrive at this stage, a certain number of actions have been recommended.

15. The first area of State intervention must be the diffusion of instruction in the country. In fact, some authors have pointed

to the discrepancy in scholarship between the city and the country in the developing countries. The dissemination of education in the rural area must touch on all forms of general and technical instruction, particularly agricultural instruction. In this respect, certain authors specified that agricultural instruction must be suitable to the natural habitat and to the ground to which it is to be applied.

16. In addition, technical industrial instruction must be given to the peasants who are to be transferred to industrial activities. This point has been made evident in most of the countries which have to solve problems of converting agricultural labor in the secondary sector.

17. Second point: All of these steps have brought to light the need for diffusing health and sanitary measures in the rural areas. This aspect is all the more significant in view of the fact that socio-medical inquiries have shown a substantial disparity between the urban and rural areas in all countries, whether industrialized or developing.

18. Third point: A few authors have pointed out the advantage of assuring the woman a more important role in the rural society, a step which they consider to be equated with the acceleration of the development process in the country.

19. Fourth point: All of these measures cannot be put into operation by the peasants themselves. The State must take action for the rapid achievement of these objectives. State aid must assume several aspects:

(a) Technical assistance to the farmers in the form of vulgarization and experimentation, either on the land-parcel scale or the pilot-area level. In addition, the State should promote applied research in the agricultural sector and adapt this research to the regions and their cultures (crops).

(b) Financial assistance from the State for land tenure amelioration. This assistance is absolutely indispensable for the achievement and improvement of crop diversification programs. It is all the more important since in most of the countries dependence on one crop in turn makes the national economy dependent on the price fluctuations of the basic products.

20. Some have underlined the effect, in the long range, of certain investments in the agricultural sector and the important volume of these investments — a factor which necessitates a substantial State aid in this domain. This aid could take two forms: the first would consist of subsidies to the peasants for improvement works. The second must, through bank loans, be able to transform this aid to funds lost by the State. These loans would be of medium and long term, according to the nature of the operations undertaken.

21. Some authors pointed out the advantage of tying the subsidy and the bank loans to auto-financing, a formula which, according to them, would have the advantage of mobilizing peasant savings and guiding them towards collective investments.

22. The transformation of the structures, the modernization of agriculture, the extension of the industrial sector, present problems for the peasant society whose importance and seriousness have been emphasized by everyone.

23. In certain countries, which have experience in the matter, the destruction of agrarian structures, unsuitable, of course, to modern life but in which the rural society had existed for centuries, has not been without social tensions. For this reason, and in order to facilitate the adaptation of the peasants to the new conditions of life and work they have been proposed, a certain

number of social and political measures have been suggested.

24. First of all, these transformations must take place with the close and complete collaboration of the populations who must benefit from them. In this respect, several authors have emphasized the necessity of forming and informing the peasants, of showing them in a concrete and positive manner the advantages which must result for them.

25. In addition, new structures of existence must be prepared for the rural population. These structures must retain the fundamental basis of their traditions and adapt it to the conditions of modern life. This is work for the sociologist and the educator.

26. In addition, it is suggested by some authors that the new rural structures be a compromise between urban life and the dispersed rural habitat. The example was mentioned of the creation in certain countries of rural centers of a certain importance which would be on the boundary of city and rural life. In these centers, the agricultural activities would remain predominant with, as corollary, the implantation of small transformation industries and the development of social and education services.

27. The particular case has been raised of the surplus agricultural population which must pass over progressively to the industrial sector implanted in the big urban centers.

In addition to the professional training of the former peasants, some authors suggest the creation of modestly sized urban centers which would allow them to adapt rapidly to the conditions of industrial life while maintaining the common background of their traditions.

28. All the authors emphasized that the problem of adapting the rural population to an economy of exchange, in the rural or urban sector, was a question of a generation. In this respect, they pointed out that the total education of the countryside would later permit a better integration of the new generations in the economic life.

29. From these exchanges of views the conclusion can be drawn that the great dilemma caused by urbanization and rural exodus is only a moment in the evolution of the developing countries. The present antagonism will disappear in proportion to the integration of the rural world into a dynamic economy of exchange. We are therefore entitled to hope that this transformation of activities and rural way of life will take place in the most efficace manner in the developing countries, to the extent that they will know how to profit from the experiences of the past and where a body of planned measures will permit the harmonious development between the different sectors of the national economy to get under way.

Chronological List of Speakers for Session G.1 –
Rural Development

<u>Discussion Leaders</u>	<u>Delegation</u>	<u>Topic</u>
Dr. (Mrs.) T.A. Zhdanko	U.S.S.R.	Social results of the development in rural areas
Mr. A. R. Holmberg	U.S.A.	Organization of rural development
Mr. E. Barbaris	Italy	Problems of migration

<u>Name</u>	<u>Delegation</u>	<u>Topic</u>
<u>Speakers</u>		
1. Mr. K. Ben Ammar	Tunisia	Some problems of the rural development
2. Mr. Bolvio M. Rospide	Uruguay	Rural development in Uruguay
3. Mr. N. Kechawarz	Afghanistan	Development trends in Afghanistan
4. Dr. R. Weitz	Israel	The family farm unit as a basis of a new composite rural structure
5. Dr. S. Azimi	Iran	Land reform problems in Iran
6. Prof. E. H. J. Stoffels	Belgium	Agricultural development: Preliminary studies
7. Dr. Sh. Bira	Mongolia	Rural development in Mongolia
8. Prof. R. Dumond	France	Community development problems
9. Dr. J. D. N. Versluys	UNESCO	Problems of resistance to change in rural areas
10. Rev. Father C. Mertens	Holy See	Rural development
11. Mr. S. Serrats	Spain	Reasons for rural development and corrections
12. Dr. D. Iatridis	Greece	Rural development and problems experienced in the field
13. Dr. A. T. Mosher	U.S.A.	Rural development
14. Dr. G. G. Kotovsky	U.S.S.R.	Some problems of development
15. Mr. M. Balasaygun	Turkey	Integration and coordination of rural development
16. Mrs. B. Palvahova	U.S.S.R.	The agrarian reform in social development of rural areas

Specialized Session

Urbanization

Officers

Chairman – Dr. C. A. Doxiadis
(Greece)

Rapporteur – Mr. Yilmaz Guven (Turkey)

U.S. Participants

Dr. Hollis Peter
Dr. Allan Holmberg
Dr. Margaret Mead
Dr. Melvin Tumin
Dr. William Goode

Generally speaking, the discussions (introduced by the President, the Secretary of the Session and six discussion leaders and in which fifteen other speakers representing thirteen countries and one specialized Agency of the United Nations took part) dealt with the questions raised in the report of the Secretary-General of the Conference. These questions are grouped in this report as follows:

Trends

The discussions in the general session revealed that, on the basis of generally accepted demographic projections, a very rapid growth in the urban population must be expected from now until the end of the century. This population could well increase fourfold whereas world population will double. The growth of towns will affect particularly the developing countries.

It is probable, on the other hand, that this increase will be accompanied by a rise in living standards and consequently by an increase also of installations of all sorts (particularly mechanical) which will certainly add to the complexity of urban problems. The introductory statements brought

out the fact that the administrative, economic, technological or physical problems proceed generally from a deep seated inadaptability of existing structures and have important social repercussions affecting the life of town dwellers.

A number of speakers considered that the industrialization necessary for development also constitutes the basis of liberty for man, is essential for social progress and provides the possibilities of choice in all aspects. Others without minimizing the importance of industrialization, stressed the need to accompany it by appropriate psychosocial training.

Organization

Frequent insistence has been laid on the importance of less developed countries to avoid the errors committed in the past by the industrialized countries. In this respect, great emphasis was laid on the importance of plans being laid sufficiently in advance and their being based on interdisciplinary research. The formulation and carrying out of urbanization plans must take into account regional, social and economic perspectives and general national management plans. In the socialist countries, where compulsory planning is systematically applied, plans drawn up on the basis of local data are revised in accordance with regional and national requirements. In other countries, where planning is voluntary, this is considered no less indispensable; the plans must fulfill the following requirements:

a. Provide basic forecasts freely acceptable by the population concerned;

b. Allow, particularly, the establishment of a balanced network of towns of different dimensions, indicating possible choices for locating these towns (regional cities, development towns, new towns, service towns in rural areas).

c. Take into account and maintain constant coordination between all of the services involved in the preparation and execution of a plan and between all administrative and technical levels (local, regional, national), involved.

d. Ensure compliance with long-term directives and other adjustment according to changing requirements.

Plans thus conceived, whether they are compulsory or voluntary, must have as their aim the control of migratory movements by means of a gradual improvement in rural living standards and equalization of the conditions of urban life between different strata of the population, the relief of congestion of the central areas of big towns, which will permit a rational, geographical re-allocation to the periphery of the towns of economic activities, of housing, of industrial and other installations, of social services of all sorts. These plans must tend, in the final analysis, to a balanced distribution of the population as a whole over the entire national territory.

New forces in urban life

In raising the question of the optimum size of towns, it was recalled that at the 6th Congress of the International Union of Architects (Moscow 1958) it was considered that the appropriate size for towns, other than very large national capital cities should be a population varying from 200-500,000 inhabitants (for regional cities) and from 50-70,000 inhabitants (for new towns, whether they are satellite towns or not). In this context, it was considered that there could not be a ready-made formula applicable everywhere, but that optimum limits should be adapted to the needs of each country or region and established on the basis of interdisciplinary studies.

Emphasis was given to the particular importance of links and communications

between different housing areas, from villages up to big cities within the framework of rational plans. These links are essential for the growth of balanced social and economic development. As for the new towns, their location should be envisaged with care and they should preferably be sited in regions at present devoid of any towns sufficiently developed to serve as a basis for expansion.

A number of speakers underlined the importance of small rural towns constructed with a small capital outlay and with relatively low upkeep costs, designed to serve populations often deprived of social services. One speaker emphasized the importance in numerous towns (particularly in Africa) of altering as soon as possible, present defective urban structures resulting from the colonial systems. This should lead to the suppression of all racial and social segregation and to the harmonious fusion of the European quarters with traditional indigenous housing, of a temporary or even rural nature within the urban area. Public services must be relocated and shared between different areas in the most equitable manner.

In this respect, while it is impossible to hope for final solutions in the immediate future, owing to lack of adequate resources, it is necessary, at the same time, to utilize all possible construction methods (including self-help building assisted by public authorities on prepared terrain) and to prepare the population (recently urbanized or transplanted to new areas) by psychological, social and educational means for modern housing in order to avoid their abrupt uprooting and the spoliation or ill-use of the new habitations. Equally, insistence was laid on the need to safeguard monuments and to respect ancient site in remodelling a town or region. When dealing with satellite or isolated towns, an economic basis and social and cultural services must be

assured, so as to allow the great majority of the population to find there the means of organizing and maintaining a real community, and one which will largely satisfy their needs.

Administration

One speaker insisted on the urgent necessity of adapting administrative structures in order to enable them to answer the need of rapid urban development. In this transitional period the authorities must understand their new responsibilities, and this awareness must be translated into practice:

a. By a land policy which provides control of urban land and its allocation to industry, to housing and to collective social installations, taking into account conflicting needs.

b. By having a free hand and by avoiding speculation and social segregation. Municipalities should also have in mind the setting aside of large reserves of land necessary for development.

c. By the revision of municipal boundaries, in order to avoid conflicts of jurisdiction between neighbouring local authorities.

d. By a new division of responsibilities, allowing close coordination between the different municipal, regional and national authorities and within a narrower field of the bodies responsible for providing various urban public services.

e. By the active and informed participation of the inhabitants in the management of and in the preparation and execution of plans for their community.

These requirements will bring with them, in some cases, a strengthening of the powers, of the resources and of the personnel of local authorities, whilst in others, it will result in a voluntary limiting of their

responsibilities to the gain of the regional authorities, all strictly within the framework of overall national needs. Equal emphasis was laid on the importance of a close association of the social sciences, (demographic, geographic, sociological) with preliminary research and the preparation of plans.

The conflict between man and machine

A number of speakers underlined the dangers which are brought about by the increase in public and private means of transport and, in general, by mechanization in modern towns. These dangers are seen largely in air pollution, traffic congestion, the increase in accidents, (one of the chief causes of death or injury in large modern towns) and the conquest of urban space by the machine to the detriment of man. Although these problems already exist in a number of developing countries, it is an appropriate moment to take steps to reduce their present effects and to assess future needs as regards the parking and circulation of automobiles, so that they will hamper to the smallest degree the life of the community and its citizens.

Conclusions

The following conclusions were drawn by the President of the session from the discussions summarized above:

Urbanization is a natural, irreversible phenomenon, as is the industrialization which is necessary to development. We must not lose sight of the fact that at the beginning of this new era, as in the past, this development must have as its only aim the bringing about of the most favourable living conditions for man and, in the last analysis, for the greatest happiness of the greatest number. Man must remain master of the development and of the machines which are his

handiwork. This implies the forecasting and planning within a spatial framework, ever wider and wider, (from the town to the region, from the region to the nation, and from the nation to planning on an international scale).

This planning must take into account all local factors and be a synthesis of the different ethnical and historical elements, as well as economic, political, administrative, social and cultural factors. This also implies a constant effort, aiming at the gradual disappearance of the contrasts between the town and the country, and their different ways of life. But it must also be admitted that the establishment of a general method for the solution of the problems described above still remains, in many cases, embryonic.

It is, therefore, necessary to create or to develop, within a fusion of various already existing disciplines, a real science of housing, taking account of the considerable progress already made in this field, particularly since 1945 and with the aid of international organizations.

The present conference bears witness and this meeting has shown to a high degree a comprehension of the problems involved and a large measure of agreement on possible solutions, which are all, however, evolutionary and adaptable. Neither must the need be forgotten in applying this new science for the formulation of national policies, to create interdisciplinary teams called upon to work together, although each still retains his own identity, in the common endeavor: the creation of worthy habitations for mankind.

Combined Session

Rural Development and Urbanization

Officers

Chairman – Prof. F. U. Papi (Italy)

Rapporteur – Mr. Vaclav Oplustil
(Czechoslovakia)

U.S. Participants

Dr. Allan Holmberg
Dr. Harold Lasswell
Dr. Hollis Peter
Dr. G. Franklin Edwards

The reports presented by the President, the Secretary of the session and five discussion leaders and some 13 other speakers representing 10 countries and one specialized agency of the United Nations have thrown light on the interdependence of the problems of rural development and urbanization which were particularly stressed in the papers specially prepared for the session and by the report of the Secretary General of the Conference. Within the framework of the present report the questions discussed are grouped under the following headings:

Relation between rural migration and the conditions of urban life

The discussions showed that the movement of the rural population towards the towns is taking place at a rapid rate and greatly surpasses the average of the growth of the national population. On the other hand this exodus occurs most often from the country towards the large towns. Moreover, the capitals tend to monopolize a disproportionate share of the resources of the country, above all to the profit of certain privileged groups. In the absence of an overall plan it even happens that needed urban improvements provoke an increase in the arrival of migrants which threaten to overextend at the same time the possibilities of employment and urban services.

Pre-conditions for balanced development

If the migration towards the towns is generally due to economic and social

causes, the greater number of speakers considered that such causes are still largely unknown in detail owing to the lack of systematic research. It appears necessary to carry out before the formulation of plans or projects comparative studies organized in a relatively simple way (sample surveys specially adapted to local needs and means) but on a scale much greater than has been done up to now.

Several speakers emphasized the following pre-conditions for rural development:

(a) Reform of defective systems (share-cropping, usury, latifundia and minifundia, etc.),

(b) Preparation of the population for active participation in agrarian reforms,

(c) Integration of regional programs within the framework of the national plan.

A number of speakers emphasized the obstacles often imposed by traditional systems to development; they are particularly opposed to an increase in agricultural productivity and to the utilization of modern methods of organization and management. It is necessary, therefore, to distinguish between true traditions, which must be respected or transformed gradually from within, and superstitions which are created or maintained through ignorance.

Another obstacle to development, which seems to occur especially in Africa, is the ill-definement of national boundaries, resulting in inadequate means of transport and communications and which impede customary seasonal migrations and which further make difficult the arousing of interest of different countries in the execution of important large-scale projects (big dams, for example), which might lead to a redistribution of both rural and urban populations in two or more adjacent countries.

Examples of methods to correct social and economic inequalities between town and country

In India the method of integrated community development has been applied on a national scale as the principal means of improving rural living conditions. This method has increased productivity by about 50% in ten years in the regions concerned but has not improved social conditions. The disparities between town and village have widened as regards income and social and cultural services. It has been possible, however, to diversify the possibilities of employment and production in rural areas thanks chiefly to industrialization and the expansion of new towns in these areas; this leads to the hope that it will eventually become possible to relieve the congestion in the very large towns.

In some other countries (Bulgaria, Hungary, etc.) a policy of integrated regional planning based on micro-regions has been carried out. Inter-disciplinary studies have determined the optimum dimensions of rural service towns (Agro-towns) capable of receiving the minimum of services (housing and collective facilities). In some areas efforts have been made to re-group isolated farms into villages (in order to secure efficient collective services) within a complex comprising at the same time, apart from these villages, small agrarian towns and regional centres of 80 - 100,000 inhabitants. This last policy, which must be applied on a voluntary basis, will also have the effect of counterbalancing the attraction of the very large town. It is considered, however, that re-grouping or installation plans of this nature will require at least one generation to carry through successfully and it must be kept in mind that in developing countries due consideration

must be given to existing conditions and to the structure of society.

In Israel, and particularly in the case of a patriarchal population (Afro-asiatic in origin) the comparative advantages of proceeding by stages and making at least a provisional choice between encouraging small family holdings and the organization of collective management were considered within the framework of a long-term plan.

In all cases, a balanced and coordinated system between the various local, regional and national organs responsible for preparation and carrying out of the regional plan should be established.

Problems of assimilating rural people into town life

Emphasis has been laid on the need for prior indoctrination of populations of rural origin for their new living and working conditions. This instruction most obviously begin in the rural milieu before migration by means of an increase in social and educational services and by mass information media.

In the towns, efforts should be made by stages in order to avoid at any time the segregation of the newcomers which would constitute an obstacle to their assimilation. The following methods are considered to be of particular importance:

- the improvement of rural living conditions prior to migration (in the form of self-help housing construction),
- programmes of cheap housing construction close to sources of employment (on building plots already equipped),
- housing by stages:
 - i) collective lodgings in reception centres, hostels, etc.,
 - ii) individual lodgings in temporary housing,
 - iii) permanent lodgings in modern housing.

In all cases, the social and other installations of the housing areas must be made ready before or at least at the same time as the housing and the housing areas planned for a diversified population as much from the point of view of age groups and social groups.

Conclusions

Following the discussions summarized above, the President of the session drew the following conclusions:

a) Rural development and urbanization are both matters of urgent political and social importance and constitute permanent economic needs.

b) The problem of agricultural development must only be included within the framework of a general economic development process.

c) This development is complex because the structures of different sectors alter as do their dimensions in proportion to progress; progressive reduction of the primary sector to the gain of the other two.

d) For agriculture to develop it must industrialize and commercialize. The modification of the present structures could begin with action on the human element. It would then be possible to create the necessary infra-structures.

e) These discussions have helped to an understanding of the basic reasons for the lower profit accruing from agriculture attributable in particular to:

- the disproportion between production factors (excess of manpower),
- rural living and housing conditions,
- the exclusion of a great part of the rural population from the economic cycle,
- the lack of logic in a number of so-called "agrarian reforms," which are in actual fact public works programmes.

f) Resolute support should be given to structural reforms based on long-term directives, preliminary psycho-social and professional training for the elimination of the causes of inferiority in the rural sector, and the stabilization of markets and prices. Governments often propose obstacles to such reforms because they lack the courage to face up to long-term problems. They are often content with palliatives, half measures, protectionism, subsidies, public works, etc.

However, if rural revenue is increased by an over-all policy taking into account at the same time the economic and social problems or urbanization, the transfer of populations and their gradual distribution in the best interests of the country will take place naturally without the need to create an antithesis between the town and the country, which are two mutually complementary forms of life.

Chronological List of Speakers

<u>Name</u>	<u>Delegation</u>	<u>Subject</u>
<u>Discussion Leaders</u>		
Mr. V. K. R. V. Rao	India	Interdependence of town and country
Mr. H. de Frayssoux	France	Reception areas
Dr. R. Wetz	Israel	Organization of a rural urban continuum
Mrs. B. Palvanova	USSR	Questions involved in development
Mr. T. Edwards	United States	Research
<u>Speakers</u>		
Prof. L. Tonev	Bulgaria	Rural economic planning
Mr. M. Stern	France	Reception areas
Dr. A. A. Kamil	United Arab Republic	Regional cooperation in Africa
Dr. Gafurov	USSR	Conditions for development
Mr. Gurer	Turkey	Development of villages
Mr. C. Perczel	Hungary	Links between towns and villages
Dr. J. Versluya	UNESCO	The role of small villages
Mr. G. Blachere	France	Assisted self-help in building
Mr. A. Ciborowski	Poland	Pre-conditions
Mr. L. G. Ligutti	Holy See	Rural development
Mr. Polonskaya	USSR	Conditions for balanced development
Mr. M. de Oliviera	Portugal	Overall plans
Mr. A. Milton	Liberia	Traditions and development

Section H: ORGANIZATION, PLANNING AND PROGRAMMING FOR ECONOMIC DEVELOPMENT

Summary

A. Evaluation

The Conference discussions on the Organization, Planning and Programming of Economic Development were useful for both the U.S. and the less developed countries and contributed to the attainment of overall Conference objectives. It is also believed that the discussions will prove increasingly useful as follow-up actions are undertaken. These conclusions represent the consensus of the U.S. delegates who participated in the sessions on Agenda Item H, based not only on their informed opinion but on objective reactions from others.

Important for their own development was the perspective provided to the less developed countries of the whole range and complexity of the planning approaches available to them and of the independent achievements of other less developed countries, e.g., India and the UAR, in combining different elements from this collective planning experience.

The constructive level of discussion reached at the Conference between planners of varying ideologies and political approaches was one of the most valuable products of the Conference and a hopeful sign for future cooperation.

The usefulness of the Conference in the field of development planning may also be judged by the better understanding gained of the priority needs of the less developed countries, of significant work being done on pertinent problems, and of opportunities for furthering international cooperation.

As indicated by the summary of items for possible follow-up in section II, below, it is believed that the Conference was useful, judged on this basis also. For example, consensus was shown on the importance of particular research and interdisciplinary approaches in planning and on certain limitations on the use of econometrics in the less developed countries at this time. Consensus was also clear on the importance of implementation, together with reporting and evaluation. As Dr. Rahman said, the planning exercise is more important than the Plan, and implementation is more important than either. In other cases, however, Conference consensus, or even unanimity, did not seem to represent any significant advance. For example, the Conference discussions confirmed, but threw no new light on meeting, the basic and continuing concern of the less developed countries with stabilization of prices for primary commodities, markets for increased manufactures, more effective use of agricultural surpluses and other ways of dealing with the widening gap (which some delegates disputed) between the developing and industrialized countries.

Interest was shown in the use of electronic computers on a regional basis and in aerial photography for collection of planning data. Suggestions were made for the improvement of U.N. statistical schedules, for the publication of a "world catalog of development plans" and for establishing "a clearing house for crucial statistical relationships." The consensus, interest and suggestions

in the Conference discussions should influence the orientation of pertinent public and private programs and lead to follow-up work of different kinds.

Some of the planning work being done by France, UAR, India, the USSR and Eastern European countries, and the U.N. agencies, particularly in regional planning and in applying economic planning techniques to the social sectors, seemed of sufficient interest to justify follow-up study.

Apart from the "catalog" and "clearing house" suggestions, other opportunities for furthering international cooperation in the planning field are presented by requests received for the exchange of economic development publications of U.S. organizations with those of similar organizations in Poland and Czechoslovakia.

B. Items for Possible Follow-up

1. In both the Opening and Closing Plenary sessions, Professor Thacker (Conference President) suggested that a world brain trust or committee of wise men be formed to examine the development plans of the various countries and to review their progress. The committee would be composed of "great scientists and technologists" and the heads of the specialized agencies, and would be designed to overcome the presently uncoordinated planning among numerous agencies. This proposal was later endorsed by Mr. Sen, the FAO Director General, but because of questions of practicability, did not seem to arouse any positive statements from the development planners at the Conference, except from Mr. Yaftali of Afghanistan.

2. The periodic publication of a "world catalog of development plans" was informally suggested to members of the U.S. delegation by Dr. Rahman (UAR). He thought that some (unspecified) U.S. institution might be in the

best position to publish such a catalog which could contribute to the improvement of development planning generally. The initial approach for source material, he seemed to think, might be a simple questionnaire for basic descriptive information addressed to the countries concerned.

3. Dr. Sachs, who is Director of the Research Center of Less Developed Countries in Poland, indicated his interest in exchanging publications of his organization for the Development Research Digest and similar A.I.D. publications. Dr. Svennar of Czechoslovakia was also interested in exchange of publications on economic development with the U.S. but on a much broader basis.

Dr. Perloff offered to have publications on regional planning by U.S. research institutions sent to interested delegates from other countries and, in return, to receive similar materials from them. Mr. Leroux of France made a similar offer of regional research materials developed in that country.

4. Dr. Komar (USSR) referred to certain joint Indian-Russian studies on regional planning which are reported in a recent issue of the Indian Journal of Statistics. According to Mr. Borel (France), the first experiment is being made in Madagascar in the simultaneous formulation of national and regional development plans.

5. Professor Thacker made a plea that the question of markets for the developing countries be taken up in the forthcoming U.N. Conference on International Trade and Development. This was supported by Professor Vajda (Hungary) and Mr. Albertini (France) in the specialized sessions. The former said that since the instability of commodity prices was "cancelling out all benefits from external aid," U.N. assistance

in science and technology to the less developed countries should be extended to international trade.

6. The deteriorating terms of trade for the less developed countries, in both the long and short term, were referred to by Dr. Kollontai (USSR) and Mr. Gannage (Lebanon) who cited U.N. documents and other studies for this conclusion. On the other hand, Mr. Nsouli (also from Lebanon) cited OECD studies which reach opposite conclusions. The suggestion was made that the U.N. be asked to clarify this question of the widening of the gap between the less developed countries and the industrial nations.

7. Establishment of stabilization funds for prices of primary commodities were favored by Dr. Kollontai, Messrs. Ardant and Albertini, and Mr. Gannage as a short-run measure. The instability of commodity prices cancelled out all benefits from external aid, according to Professor Vajda. Mr. Nsouli and others pointed out that the long-term problem of surplus production could not be solved without crop diversification, other basic changes in agricultural production, markets for manufactures and the international trade approaches discussed by Dr. Kollontai and Mr. Hansen.

8. The need for improvements in U.N. statistical schedules for use in the less developed countries was presented by Mr. Moura (Portugal) and Mr. Bahroun (Tunisia). The former thought that much more work should be done on internal methods of aggregating and comparability of data, e.g., labor statistics, on foreign trade statistics and nomenclature problems, and on exchanging information with the socialist countries. Mr. Bahroun complained that U.N.'s system of national accounts for the less developed countries does not cover financial transactions and thus fails to

provide for an analysis of savings which is important for planning.

9. The compilation of "sets of crucial ratios" was suggested by Dr. Colm (U.S.). These could then be made available through a "clearing house for crucial statistical relationships" to statisticians trying to estimate aggregates in countries with inadequate original data. This seemed to be favorably received, with recognized cautions on the use of "synthetic" statistics.

10. The possibilities of aerial photography as one of the new techniques for data collection for development planning were outlined in a special paper prepared for Conference use by the U.S. delegates.

11. The usefulness of electronic computers for a number of different planning purposes was brought out in several sessions. Dr. Millikan (U.S.) pointed out that computers, by their speed of calculation, now make possible the presentation of the whole range of development alternatives to the people of a country, whatever its stage of development; and he invited a common effort to devise techniques for such multiple planning. A speaker from Belgium cited the difficulties of establishing statistical services, which cannot be left to private initiative, and urged the establishment of an international computer center.

In a similar vein, a speaker from France thought that simulation techniques have some educational significance in balancing economic models and social costs but that the computers required are so expensive, they might be most economically used on a regional basis for a number of countries. Mr. Gannage (Lebanon) was also in favor of developing simulation models and asked for information from the U.S. on the subject. Mr. Smit (FAO) thought the use of electronic computing equipment could help to meet the need of speedy methods to

process statistical data, also perhaps on a regional basis.

In the USSR, according to Dr. Podyachikh, analysis of accounts and other data is made centrally to assure rational use of electronic computers. All work on computers is carried out by the Central Statistical Board, along with the training of staff and maintenance of equipment.

Mr. Diebold, president of the Diebold Group, Inc. and a member of the U.S. delegation, stated in a press interview in Geneva that electronic computers can be useful to less developed countries by arraying all of the country's development possibilities through the process of simulation. It is erroneous to think that the less developed countries cannot supply the necessary personnel to service the computers. Through the use of other electronic devices, e.g., teaching machines, it is possible to train on the spot and in a minimum of time, capable teams to take up computer operations. (Such training, he said, might also be given to some university economists to convert them to this new activity.) The biggest obstacle to the use of computers in the less developed countries is lack of information. Before their introduction into developing countries could be contemplated, the responsible officials would have to be made aware of their advantages.

12. Dr. Fei (U.S.) discussed the need for providing guidelines for specialists in other fields, particularly for sectoral and project planning, so that human resource elements and other institutional factors can be brought into planning. Reference was made to a U.N. study on the possibility of applying economic planning techniques to social sectors — health, education, etc. The report to be made to the U.N. Social Commission on the subject will indicate areas for further research.

13. The use of oil royalties to promote economic development was proposed by Mr. Gannage (Lebanon) through distribution on a regional basis and the financing of an Arab Development Bank. He also urged that other foreign oil companies help the local economy by following the example of Aramco and shifting to "integrated investment," i.e., training, housing, and similar local investment.

14. Dr. Kochav (Israel) urged that methods be found to make available to the less developed countries the higher managerial and technical skills now concentrated in a limited number of firms, which represent a major bottleneck to industrial development. An illustration of the need for coordinating external aid to avoid waste was cited by Mr. Amagou (Assistant Director of Soils, Ivory Coast). In the case in question, a certain plan for palm tree development in the Ivory Coast was initiated with Common Market (EEC) financing. Subsequently a different plan was initiated under the U.S. A.I.D. program.

15. U.N. Secretary General U Thant, in his speech read by Mr. de Seynes, put as the first task that of scientific research on the problems of the less developed countries and identifying areas for new research. This was one point on which there appeared to be unanimous agreement in almost every Conference session. In the sessions on Agenda Item H, Dr. Rahman (UAR) urged provision for long-term research and Mr. Hansen (U.S.) suggested that each Plan "as a practical measure of implementation" set aside adequate resources for studies and research.

Mr. Nitisastro (Indonesia) also favored such provision in the Plan itself, specifically to develop simpler planning techniques. Mr. Mohamed (Sudan) believed such simplification essential because present

techniques were too academic and advanced for the less developed countries.

Mr. Vicinelli (Italy) thought that more information was needed on how national plans of other countries deal with internal regional allocation — the distribution of income question. Confrontation studies were also suggested to provide more information of the relative merits of emphasizing the public and private sectors.

The great need for autonomous bodies of interdisciplinary experts and research teams, especially for regional planning, was stressed by Mr. Borel (France). Dr. Sen (India), Dr. Leighton (U.S.A.) and other speakers emphasized the need to involve more specialists from the behavioral sciences and other subject matter fields in the planning process.

The establishment of research councils in connection with planning bodies was suggested by Dr. Rao (India) to provide the contributions of outside scholars on pertinent research problems. The council so established in India has produced a number of reports on research undertaken.

C. Participation by Less Developed Countries

Final figures were not made available by Conference officials stated at one point that while 21% of the delegates were from less developed countries, 47% of the scheduled speakers (those presenting their papers orally and discussion leaders) were from such countries. In the case of the "H" sessions, only 6 of the 30 scheduled speakers were from the less developed countries. The addition of the figures for "interventions," however, would bring the less developed country total to 41 of 132, of 31% of all of the speakers in the "H" sessions. The chairman of each of these sessions was encouraged to give precedence to speakers from the less developed coun-

tries. Moreover, the two informal discussion meetings arranged by the U.S. "H" delegates provided further opportunities for representatives of the less developed countries to be heard. At the first of these meetings 11 of the 26 attending were from less developed countries and at the second, 8 of 24.

Considering the overall limitations of the Conference, it is believed that the "H" sessions were reasonably well attended by less developed country delegates and that every opportunity to participate was given them. The most active less developed country participation came from India, Lebanon, Tunisia, UAR, Israel, and, to a somewhat lesser extent from Indonesia and Afghanistan. The most active individual participants from the less developed countries were Dr. S. R. Sen (India), Mr. Gannage and Mr. Nsouli (Lebanon), Mr. A. Bahroun (Tunisia), Dr. Rahman (UAR), and Dr. D. Kochav (Israel). Mr. Yaftali, Professor Nitisastro and Professor Orthaber were the spokesmen for Afghanistan, Indonesia and Yugoslavia, respectively, at the "H" Sessions. The sessions in which less developed country participation was most active were H.1 Part I on Aggregate and Sectoral Planning, H.3 on Implementation and H.2 on Organization Arrangements. The session in which it was least active was H.1 Part III on Statistics. This appeared to reflect the current basic preoccupations of less developed countries and the status of statistics as a professional field in those countries.

D. Selected Statements of Interest

I. Planning Concepts and Experience

Mr. Korobov (paper read by Dr. Braginsky) (USSR):

The USSR had tried out the mixed economic system and found it did not work.

The less developed countries should profit from this experience.

Dr. Kollontai (USSR):

The key question is how to increase, not distribute, existing production to secure proper proportions among sectors. Professor Galbraith's "Affluent Society" shows that the capitalist system cannot make such allocations properly.

Dr. Kalecki (Poland):

In the socialist economies, growth is limited by technological factors, whereas in mixed economies there are additional limiting factors. Some are institutional, e.g., peasant farming; private investment is erratic — important sectors may be neglected and other over-invested; and the poor are hit harder than the rich by taxation to finance economic development by public investment. (Professor Kalecki later gave a specially arranged evening public lecture on agricultural sector planning.)

Mr. Matejka (Czechoslovakia):

Professor Mason's views on centralization versus decentralization would support the position that decentralized economies will not necessarily develop more rapidly than the centralized. In Czechoslovakia, central planning has proved more effective and computer techniques are likely to strengthen the centralization trend generally. The larger the free market, the less efficient planning tends to be but the basic criterion is still: what enables the most efficient decision-making in the particular country.

Dr. Orthaber (Yugoslavia):

Centralized ("administrative") planning was used in Yugoslavia between 1947 and 1951 because of lack of trained personnel. But this was found to put a brake on private incentive so a shift was made in 1952 to decentralized ("enterprise") planning. Yugoslav experience indicates that governments should give up the exclusive right to make decisions after the first few years of planning. Otherwise, inflexible and monopolistic tendencies will develop in bureaucracy.

Dr. Sen (India):

Indian planning is most like that of France in the West and Yugoslavia in the East, except that India has a Federal structure and socialist objectives unlike France, and allows private ownership and a competitive market unlike Yugoslavia. India found it had to develop a highly decentralized planning system to permit wider participation. The only apparent general law is that of "marginal dissatisfaction" in resource allocation, but whether or not planning is a science yet, it should not remain an art to be practiced by a few. (The use of computers may add to this danger.) Broad interdisciplinary discussion is needed to develop a national consensus.

Mr. Cazes (France):

The distinction between imperative and indicative planning is academic. There are certain "force majeure" areas, like foreign trade and agriculture, where the State must step in. For the rest of the economy, French planning is largely indicative.

Mr. Masse (France):

Most credit for the post-war growth of the French economy of 4½% per year should go to the energy and ingenuity of the French people although the Common Market also helped. The contributions of the Plan were that it made higher production goals possible; enabled achievement of a growth rate for which 2% more resources would otherwise have been required; and provided training in good economic and industrial citizenship. France is now trying to make its planning more democratic by making it for social and regional, as well as national economic, development. The political sector will also be associated more closely with planning in the future, by not waiting until the Plan is in final draft form but by first submitting the proposed principles of the Plan to Parliament. The Plan will also become more flexible as more variables are taken into account, e.g., new scientific and technological factors, and as France opens up its market to other countries.

Professor Mason:

Centralization versus decentralization is a fundamental problem in both socialist and capitalist economies. The problem raises questions of (a) information collection and analysis for policy decisions, (b) management, and (c) choice of incentives.

Since World War II the socialist countries have been moving toward greater decentralization and the capitalist countries in the opposite direction. Further movement in these directions would improve both systems but differences in institutions and stage of development will always make the optimal arrangements different in different countries.

The area in which progress has been most marked in central planning in the mixed

economies of the West is in aggregative planning and stabilization policy.

In the "mixed" less developed economies, planning has much scope for influencing the rate and direction of economic development but institutional factors will narrowly limit the rate at which capital formation can be increased. These factors, together with the private sector's competition with government for available investment funds and management ability, will affect the relationship between centralized and decentralized decision-making that is optimal in such societies.

Professor Papi (Italy):

Public industries must have production and investment targets. In the private sector however, the impact of the government is only through general government policy. In Italy, the government in fact places no real limits on the dynamics of the private sector and it is hoped that none will be imposed. We have heard much about economic miracles in Italy and Western Europe. If governments begin imposing such restrictions on the private sector in the name of planning, it is likely that the economic miracles of the past will be reversed.

Dr. Colm (U.S.):

The extent to which the view outlined by Prof. Papi is applicable to developing countries is questionable. The private sector can and should be included in the Plan in developing countries. For example, in some developing countries there is a large foreign sector involving foreign concessions and investment. It would be most useful in this situation if foreign enterprise would advise planners of their long-run programs, so that private plans could be taken into account

on such matters as projections of exports, imports and capital movements. It is not even so critical if foreign enterprises in fact change their announced plans, as they did in Chile, since the overall plan can make adjustments. It is important that the plan cover the whole picture so that the implications of changes can be seen and compensated for.

Indigenous private enterprise must be distinguished from the foreign private sector. There are certain links between the general plan and this sector which can be molded in such a way that they work in the direction of promoting the implementation and objectives of the overall plan. The announcement effect has repercussions on private enterprise; it gives some clues about future markets and the profitability of new investments. Development banks are another method which some countries have employed to link the government and the private sector. By this method the private sector can be influenced to conform with the overall development priorities specified in the Plan.

Despite speakers to the contrary, comprehensive planning is not useless in developing countries with mixed economies. At least tentative targets for investments can be worked out in cooperation with the enterprises. If these private sector targets are not reached, the planners should inform the politicians of the discrepancies and of possible alternative courses of action. These could include fiscal and credit measures, initial government investment, development banks and other devices to influence private decision-making. The methods of implementation will vary with the country's stage of development and the relative size of the public and private sectors. If socialism aims at a built-in market mechanism then the mixed economy aims at combining public

and private planning with the advantages of the market mechanism.

Dr. Millikan (U.S.):

What are the different implications for planning between countries which already have a more or less built-in growth momentum and underdeveloped countries where no momentum exists in the private sector? Where investment in the private sector depends on what happens in the public sector, and every investment decision depends on other investment decisions, the private sector is not likely to progress. In India, for example, many private decisions in large scale production would not have been made without the Plan.

(Prof. Papi later argued that Italy was a developing country and the view he outlined was therefore applicable to it. Drs. Colm and Millikan, he thought, were emphasizing structural not stabilization problems. The former are in fact the dominant ones and among them agriculture is the most important.)

Dr. Knall (FRG):

The communications problem in agriculture illustrates the impracticability of centralized planning in any large, complex society. The ideal set-up would be a network of coordinated planning units reaching down to the villages and feeding data to the central planning agency.

Dr. Kochav (Israel):

A central planning authority cannot, as is usually thought, best determine development priorities. It cannot really look ahead

beyond five years. Private entrepreneurs should be encouraged to draw up long-term plans. Central planners should avoid imbalance by exclusive emphasis on public infrastructure and should leave enough room for later industrial projects.

Dr. Walker (Australia):

Planning is not a panacea and private enterprise has the important role of a cushion against government errors. Planning is not a science but an art. (This was vigorously denied by Mr. Arakelian of Armenian SSR and Mr. Kollontai of the USSR who said that everything was decided scientifically in Soviet planning. Mr. Mateev of Bulgaria said that the Marxist pattern does not permit the type of consumption indulged in by private entrepreneurs and that the State can direct capital investment exactly where needed to influence the rate of growth. A French speaker and Mr. Bahroun of Tunisia, on the other hand, agreed with Dr. Walker, the latter holding that distribution of industry should be through the market mechanism.)

Mr. C. Taleb (Algeria):

With independence, Algeria is now superseding the five year plan adopted in 1958 which had neglected agriculture and made the Algerian economy complementary to that of France.

Dr. Puspongoro (Indonesia):

On the issue of private versus public ownership of the means of production, Indonesia rejects both systems and will work out its own.

Ambassador Oldini of Chile remarked in the closing session that the Conference

had concentrated on the problems of economic development in the least developed areas with a result that those countries that were partially developed were not given adequate attention.

2. Regional Planning

Dr. Komar (USSR):

Regional planning must be an organic part of national planning and the experience of the socialist countries shows that a powerful public sector or public ownership of the means of production is the fundamental basis. The task of regional planning is to determine more effective location of production. This must not be considered charity but as securing the necessary proportioning of production in the different regions to achieve the highest possible production results for the country as a whole. Leading sectors, production specialization, and other criteria of productivity should determine zones covering all activities, i.e., integrated, not sectoral areas. In the USSR, zoning was started after the revolution and 17 major integrated regions have now been established. Joint Indian - Russian studies have been undertaken on the subject of regional planning and are reported on in a recent issue of the Indian Journal of Statistics.

Professor Papi (Italy):

In a mixed economy, regional planning is possible only in the public sector but if government coordinates economic policies for balanced growth, e.g., production of public services, public works, and measures for increased equality among regions, the private sector can do a better job itself. As to regional planning in Italy, the objective under the program of Caisse du Midi of

reducing inequality between the South (Sicily, Sardinia) and the North has not been achieved. Although progress has been made in the South, the gap between it and the North has widened. Because of lack of coordination in the public sector, most of the special appropriations for the South were spent for equipment, etc., in the North. More progress would have been made if the government had started with schools and other programs to improve human resources in the South.

Mr. Borel (France):

The region for a development planning in the less developed countries is a "forecast." Regional plans should be a component of national plans and the first experiment is being made in Madagascar in devising the two simultaneously. The region is where the various economic and social factors can be best balanced but this requires autonomous bodies of interdisciplinary experts and research teams which are now badly lacking.

Reverend Leuret (Holy See):

Where data is lacking, the best method for the less developed country is to start with a dual inventory of requirements and resources in order to identify key regional development factors. As to regional development machinery, the less developed country should not stick to the old administrative formula of vertical ministry organization but a horizontal system should be followed to establish "a living network with the top and bottom effectively related."

Dr. Perloff (U.S.A.):

The two extremes of regional planning should be rejected. Government should

neither concentrate on the regions with the greatest potential in order to maximize use of limited developmental resources nor favor the backward regions in order to achieve greater equality among different regions. The task for regional planning is "to optimize overall returns by a careful and highly differentiated directing of investments in each of the regions." This requires new techniques of regional analysis and programming - regional accounts, for example, "to provide the key sub-national data in the same way that national accounts permit metering and projection of the main national aggregates." (Dr. Rao of India later expressed doubts of the desirability of regional accounts because of the irrational views that might be generated under a "sub-nation" concept.) Research efforts are now being made in the U.S. on this and other problems of regional analyses and planning and publications on these efforts could be sent to interested delegates from other countries and, in return, similar materials from them would be appreciated. (Mr. Leroux of France made a similar offer later of regional research materials developed in that country.)

Dr. Sen (India):

Regional planning is more difficult than national planning because conflict between balance and growth is sharpened, choice is narrowed, and political pressure is greater. Regional planning is commonly seen as a location problem but in the long run, a balance must be achieved between the technical, political and economic aspects. Initially, the regional plan should look 15 to 20 years ahead with principles of comparative advantage as the main criteria. In the short run, however, it may be necessary to provide special counter-balances. Regional planning must be an educative process

and the people must be brought in and told the whole future picture. The process of successive approximations is even more important in regional than in national planning.

Dr. Rao (India):

The Development Blocks in the community development program in India illustrate popular participation in regional planning. The important thing is that the people feel that the resources in their region are being utilized. Equality should be established in the resource utilization ratio in each region. Full regional equality, however, cannot be achieved; hence, the importance of resource transfers. Complete mobility of labor and capital within the country is essential for regional planning.

Dr. Weitz (Israel):

The planning team should live in the region and have policy-making and implementing, as well as planning authority. Otherwise, tragic clashes can occur between what is seen as possible on the spot and the overall pattern of development.

Mr. Nsouli (Lebanon):

His country is beginning regional planning this year on a decentralized basis in order to get broad popular participation. Multi-purpose teams are being organized and trained in a community development approach.

3. International Aspects of Planning

Dr. Ferrer (Argentina):

Multinational planning will become increasingly important as economic inte-

gration progresses, particularly in Latin America where traditional export patterns must be changed. Latin America must intensify its inter-regional trade but this will be difficult because, unlike the Common Market area, there is virtually no vertically integrated industry or intra-regional trade. A fundamental aspect of economic development in Latin America, therefore, is formulation of regional plans and coordination of national development plans.

Dr. Perloff (U.S.A.):

The problems of organizing multinational planning are formidable when there is no political organization for the purpose. Multi-national planning, however, can provide background for national plans and, in conjunction with Common Market arrangements, can be an important factor in regional economic integration.

Dr. Kollontai (USSR):

With respect to the external aspects of implementation, Dr. Aubrey's paper, U.N. documents and other studies evidence the typical trend of falling prices (and purchasing power) of the less developed countries. In 1961, African countries had a 8-10% import deficit. Stabilization funds and similar measures are proposed but the basic problem is to change the economic structure of the less developed countries so that they do not need to depend so much on exports but the line of least resistance keeps them in a mono-culture status. The less developed countries should force industrialization, importing capital goods for the purpose. This will mean a pinch in the short-run but will pay off in the long-run. These structural changes are closely related to questions of inter-regional dependency. Apart from regional Common

Markets, attention should be given to bilateral projects and long-term purchasing agreements.

Mr. Hansen (U.S.A.) replied to Dr. Kollantai, pointing out that it was not enough to tell the less developed countries to decrease their dependence on exports; they must still have a positive part in the international trade community. Similarly, it would be unsound for economic regional integration to have as its objective a series of regional autarkical arrangements. As to forcing industrial development, the question is whether it can be done and still preserve the values of the individual.)

Dr. Bognar (Hungary):

Opportunities for accumulation in the less developed countries are small because of the drain by foreign extractive and other industries. Foreign aid can never replace internal accumulation through the country's own efforts. International assistance should be integrated with the national development plan. Consumers' goods, as well as capital goods, are needed through international trade in order to build up infrastructure. The private sector cannot be relied on for the necessary accumulation because an adequate share of its savings cannot be obtained through taxation without discouraging industry.

Dr. Sachs (Poland):

A total or partial monopoly of foreign trade by the State is better than licensing because it improves the country's bargaining position, makes for internal mobility and

provides the best framework for subsidies. The red-tape of a licensing procedure is more to be feared than lack of managerial skills.

Mr. Gannage (Lebanon):

In both the long and short-run, terms of trade are unfavorable to the less developed countries. A stabilization fund would help immediately but long term solutions must come through the approaches suggested by Mr. Hansen and Mr. Kollantai.

(Mr. Ardant of France also believed that primary commodity prices could be stabilized through such a fund but Mr. Nsouli of Lebanon disagreed, saying that it could not solve the long-term problem of surplus production for which basic changes in production would be needed. Mr. Nsouli also disagreed with the statements of the deteriorating terms of trade for less developed countries, referring to OECD studies which reach opposite conclusions.)

Investment of foreign oil companies does not help the local economy. These companies should follow the example of Aramco and shift to "integrated investment," i.e., training, housing, and similar local investment. Oil royalties should be used to promote economic development. They should be distributed on a regional basis and used to finance an Arab Development Bank. (A later speaker from Saudi Arabia disagreed with this, saying that his country's oil revenues should be invested in that country.)

Mr. Albertini (France):

Transfers of agricultural surpluses must be taken into account in the less developed countries' long-term development plan. They

should not compete with local production of engender eating habits which cannot be maintained. Utilization as wages in kind on large-scale works programs must be carefully planned. Diversification of local crops is needed, as well as a stabilization fund for primary commodities, but provision must also be made for markets for less developed country manufactures.

Mr. Bahroun (Tunisia):

The practical circumstance of lack of domestic savings, not theory, is decisive. This circumstance is forcing extension of the public sector; and foreign aid, which is largely in the form of equipment, determines such choices as investment in agriculture vs. industry.

Mr. Hansen (U.S.A.):

Despite contrary view expressed, it is possible to use foreign trade projections in developing strategy of Plan if long-term view is taken of institutional approach in world markets. The body of free (or freer) trade will be enlarged with the help of commodity stabilization agreements and funds. With respect to foreign aid, there are conditions involved but these are technical not political. There is often lack of a strategy in the less developed countries for coordinating assistance from abroad so that effective selection may be made from the bewildering array of the good and bad offered. There is also lack of a strategy for the effective use of technical assistance and foreign investment. All these strategies must be made explicit and part of the Plan.

Mr. Brian Maurer (Norway):

Norway is spending 1% of its national income to aid the less developed countries

out of social considerations. Because the amount is small, it is all the more concerned with its effective use. A developed society is an industrialized society; the less developed countries must therefore become such societies. Planning must aim at improving the lot of the common man in order to prevent a permanent gap between an elite and the mass of the people.

Lord Casey (Australia):

Methods of providing aid should somehow be reformed so that the balance of payments problems of the countries providing such aid will not be affected.

4. Techniques

a. Econometric vs. Pragmatic Planning

Professor Pajestka (Poland):

Workable models do not yet exist to replace planning by stages but models can be used at each successive stage. The Chenery and Tinbergen models are useful in the first stage but at the next should take account of more variables such as distribution of income, use of labor, etc. Models of linear programming and similar complicated techniques widen the gap between the planner and political bodies, but they should not be abandoned because they can be used as auxiliary analytical tools for planning.

Dr. Sherif (UAR):

As Professor Pajestka stated, the method of planning in successive stages is still the most practical for the less developed countries because it takes non-quantifiable dimensions into account, is more intelligible to policy-makers, and relies on judgment in the absence of adequate data.

Mr. Cazes (France):

French experience shows that econometric models can be practicable. This method as well as that of successive approximations, however, had its own advantages in closing the gap between the planner and the policy-maker. The latter method is simpler to present but has the drawback of not giving a clear statement at the outset of the hypotheses used. Econometric models, on the other hand, can reduce the possibility of arbitrary decisions by stating alternatives at the outset for the policy-maker to choose from, but he cannot verify the mathematical equations and hence distrusts them.

Professor Kalecki (Poland):

Neither the method of successive approximation nor optimum programming can determine the rate of growth, which must remain a political decision. As a method of programming variants, however, there are great advantages in successive approximation in that it is more flexible and brings out more clearly the division of national income among population groups.

Professor Mason (U.S.A.):

Planning has two essentials: tracing out a set of expectations and central-decision-making on certain elements. The method of successive approximations is indispensable in this dialogue between the planner and the policy-maker, each of whom has much to learn from the other. The planner can learn of necessary restraints and the policy-maker, that all things are not possible. The fact that public expenditures in the U.S. represent one-third of the national income illustrates that even in the U.S. central authority is responsible for key decisions

Dr. Colm (U.S.A.):

The pragmatic method of planning must be relied upon rather than linear programming and other techniques which seek optimal programming. Mathematical methods are still useful, e.g., for checking consistency, and there should be continuing experiments with more sophisticated methods. If the less developed countries should now use mathematical methods as the basis for their plans, they would get unrealistic results and lose communication with the politicians and general public.

Informal Discussion Meeting with Less Developed Country and Soviet Bloc Delegates

(Feb. 11, 1963): The meeting, arranged by the "H" members of the U.S. Delegation, confirmed the consensus reflected in the above statements on the relative usefulness of econometrics versus the less sophisticated planning approaches. This consensus was that a judicious mixture of pragmatic planning should be emphasized by the less developed country in the beginning, with more sophisticated methods at later stages. Econometrics can provide insights but not the framework for the Plan. The latter is best produced through the method of successive approximations. Priorities can be built into this method and model building can also be an element.

b. Statistics

Dr. Podiachikh (USSR):

Every government must establish statistical services with enough authority to collect information from all enterprises and responsibility for reporting periodically to the government. In the USSR, the Central

Statistical Administration has all this authority and is responsible only to the government.

(1) Data must be based on a unified system to be uniform and reliable. In the USSR, all statistical activities must have the approval of the Central Statistical body. It devises guidance instructions but all censuses, sample surveys, etc., are then carried out by State statistical bodies.

(2) Full information on the pertinent indicators in the series established by the Central Statistical organization must also be supplied in order to meet all requirements of interpretation by the government.

(3) The current indicators must correspond to those used for planning. The statistical organization must be set up to check development at all stages for conformance to the Plan.

(4) Analysis of accounts and other data must be made centrally for rational use of electronic computers. In the USSR, the Central Statistical organization gets statistics directly from industrial enterprises, collective farms, etc. The data is then analyzed, compared, and submitted to the government. But it not only collects data, it also studies economic and social forces. All work on computers is carried out by the Central Statistical organization, as well as the training of staff, and the distribution and maintenance of computers.

(5) Attached to the Central Statistical organization is a special council of methodology with such leading economists as Ostroumov.

The USSR receives many visits from statisticians and sends many of its own statisticians to other countries. It is always happy to share its experience in organizing statistical services.

Mr. Moura (Portugal):

Difficulties are involved in adapting U.N. statistical schedules to local conditions. Planners must advocate economy in staffing and increased use of sampling may be one way to accomplish this. The planner's task would also be better done if all the statistical information collected in the country for both the public and private sectors were available in one place. Although the U.N. has done a lot in standardizing statistics, much more work is needed on internal methods of aggregating and comparability of data. Why, for example, are labor statistics still so inaccurate despite ILO's efforts? Intensified international cooperation is needed, including exchange on information with the socialist countries. Foreign trade statistics and nomenclature problems are of particular importance to the less developed countries.

Mr. Bertrand (UNESCO):

Socio-cultural, as well as economic, statistics are needed for planning and this is where UNESCO has contributed, particularly in educational fields, collecting data on an international basis through questionnaires. As of 1963, it will publish a yearbook. UNESCO has helped draft standards to improve international comparability. These standards were adopted in 1958 and since then UNESCO has held regional conferences and supplied technical assistance to promote their use. UNESCO has also established a new section on statistical analysis of human resource data.

Mr. Leroux (France):

Publications on results of French study to analyze economic accounts of French-speaking African states will be made

available to interested delegates. Purpose was to find relatively constant co-efficients that could be used in future planning.

Mr. Smit (FAO):

Agriculture census is important prerequisite to development planning because of large number of discrete units involved. The less developed countries cannot wait until their statistical services are sufficiently developed for a full-scale census but sample surveys will provide them with data needed immediately. Sampling checks will also confirm the accuracy of the data for the development planners. Speedy methods are needed to process the data and here the use of electronic equipment is very promising, perhaps on a regional basis. Mr. Smit doubts the usefulness of input-output tables for less developed countries because these countries are still subsistence economies and prices would have to be imputed.

Mr. Bahroun (Tunisia):

One of the difficulties in improving statistics in the less developed countries is that the statistician has lesser status than the planner and will not stay in the profession. Another difficulty is that U.N.'s "simplified" system of national accounts for the less developed countries short-circuits financial transactions and thus fails to provide an analysis of savings which is important for planning. With respect to input-output tables, the less developed countries must start by projecting parameters. In Tunisia, projections have been made with constant coefficients.

Mr. M. Franek (Czechoslovakia):

The relationships between indices may be more important than the indices them-

selves. It is important for planners and statisticians to devise systems to bring out those relationships.

Mr. Clague (U.S.A.):

Political bodies will favor comprehensive statistical projects only when some immediate need will be met, e.g., construction of cost of living indexes in the U.S. to help settle strikes and Federal salary scales. Statisticians should offer services in case of pressing public questions; they should begin with small projects but do them well; and they should report the results fast.

Professor Mahalanobis (India):

The Indian experience offers several suggestions. (a) The statistics must have a purpose. (b) The concept of permissible error should be recognized, i.e., the margin of uncertainty within which the decision would still be the same. (c) In order to avoid confusion between the validity of and the authority for statistics, monopolies should be avoided in the statistics field and cross-checks should be made with related statistical organizations. Input-output tables are not very useful now for the less developed countries because the purpose of economic development is to bring structural change about and every change makes a change in coefficients.

Dr. Colm (U.S.A.):

Two aspects of statistics for planning not covered in the discussion are:

(1) Aerial photography as one of the new techniques for data collection. (A special paper on this technique was made available to interested delegates.)

(2) Possible compilation of "sets of crucial ratios." These could be made available through a "clearing house for crucial statistical relationships" to statisticians trying to estimate aggregates in countries with inadequate original data.

c. Other

Dr. Millikan (U.S.A.):

A neglected objective of planning is the posing of social alternatives for democratic action much more clearly than has been done. Electronic computers make possible the achievement of this objective in all economies, whatever the stage of growth. A common effort should be made to devise good techniques for such multiple planning in order to present the community with the full range of alternatives available.

To clear up misunderstanding, H/87 (his paper) was not designed as defense of the price-market mechanism. Planning is important in the less developed countries because tastes are not yet fully elaborated. The central point of the paper was that planners should display the development alternatives that are available to the people.

Mr. Cazes (France):

It is difficult to establish criteria for social investment to assure coherence between different parts of the Plan. As Professor Tinbergen has pointed out, we cannot yet choose between a hospital and a school in the same way as we can between a dam and a steel mill.

Dr. Fei (U.S.A.):

We can now plan better than we can implement. The two should be brought into

closer relationship. We should be able to provide guidelines for technicians in other fields, particularly for sector and project planning, so that human resources elements, international technical assistance and other institutional factors can be brought into planning.

Dr. Leighton (U.S.A.):

The cases of two irrigation projects in Southwest U.S.A. were cited to illustrate the importance of the use of behavioral scientists in the early stages of planning to assure that the plans fit the values of the people involved.

5. Implementation

Dr. Kollontai (USSR):

Implementation in mixed economies in the less developed countries has special difficulties as compared to the socialist countries. It is uncertain that the private sector will do its share and in the desired sectors. Resources are wasted by entrepreneurs "over-implementing" in one sector and hampering development in another, depending on their own interests.

Professor Plotnikov (USSR):

The view that socialist planning is centralized without popular participation is misleading. In fact, what exists is "democratic centralism" under which centralization and decentralization are combined together with the cooperation of the workers. The view that private sector participation assures the best planning is also misleading. In fact, ownership of the means of production gives socialist planning an advantage in industrialization.

Professor Moldovan (Romania):

Valid results can only be obtained when the planners and implementers work together. The widest possible participation of specialists is called for but a single planning body is required to assure a single plan. In Romania, special bodies were established to coordinate all activities in particular fields such as agriculture, irrigation, etc.

Mr. Sachs (Poland):

Development involves overcoming simultaneously a number of socio-economic obstacles: low level of agriculture which hampers industrial development; poor infrastructure which blocks agricultural development; and the low rate of investment because of the low level of savings. Institutional factors are responsible for the low level of savings and other bottlenecks which the Plan must remove. The less developed countries should not delay in starting to plan, however simple the approach; and they should not worry about organizational details.

Dr. Muirragui (Ecuador):

The chief problem in the less developed countries is how to overcome resistance to structural reforms. Central, as well as local, governmental bodies reflect inadequate geographical and economic integration. In general projects are ambitious and resources are limited. More centralization is needed but the obstacle is the entrenched interests which profit from the dispersion of governmental authority.

Dr. Rahman (UAR):

The exercise of planning is more important than the Plan itself and the implementa-

tion of the Plan is even more important than the exercise. The Cairo models of Professor Frisch, for example, were not used in the Plan, but the planners benefited from just trying them. No method can eliminate the need for judgment in the Plan which must be a guide for immediate action. Failure in plan implementation may not be the fault of the Plan but of not recognizing non-economic factors.

The organizations for planning, for development, and for statistics should be kept separate. Sectoral planning at the Center should be divided into (a) units specializing in different sectors and (b) related aggregative functions. Provision should also be made for coordination with budget and other allocation organizations and for follow-up activity, evaluation, and long-term research.

The following are major problems of implementation:

(a) Inefficiency, both as to projects and targets. This is not only because of lack of time and information but also because the instruments of implementation are very rough and not used consistently. These problems can be traced back to technological and economic shortcomings. One of the major needs for more effective implementation is coordination to provide guidance to action.

(b) Foreign resources tend to be unspecified and indeterminate in advance. Implementation produces conflicts over what agencies will execute particular projects and this is compounded by problems of supplies of critical resources needed for carrying out projects.

(c) Project by project implementation involves problems of the lack of external economies for the several discrete projects. This implies that phasing is a critical but neglected aspect of implementation.

(d) The government may not be uniformly committed to the importance of realizing the Plan. Equally important are the attitudes of the society as a whole toward the declared Plan in determining the feasibility and success of execution.

Dr. Dorfman (ECLA):

It is important to distinguish public sector projects from private. In the former implementation is ultimately a matter of carrying out individual projects. In spite of their inclusion in the Plan, individual projects may not be given the necessary foreign exchange allocation; the expected supply of trained manpower may not be made available at the right stage. There may even be difficulties of the adequacy of local currency, as exemplified by the Brazilian hydro-electric project which was delayed because funds at the disposal of the Development Bank were in short-supply.

Phasing has also been shown by Latin American experience to be a serious problem in actual implementation of large scale projects. In the case of iron and steel, for example, one phase may get ahead of the others, causing delays in later phases. The problem here is that the sequencing of the components of the plans for a major project were not carefully worked out in advance.

Problems of implementation in the private sector tend to be generic. Many different groups may compete for critical factors in short-supply (agricultural vs. industrial production is one example). This results in lobbying for the adoption of policies favoring allocation and special concessions to particular sectors, a kind of struggle among sectors which interferes with overall implementation of the Plan.

Dr. Millikan (U.S.A.):

The discussion seems to have pointed up two major generalizations: (1) There may be implementation difficulties even though all relevant variables are included in the model but the numbers (values) are wrong. This kind of error is relatively easy to cope with.

(2) The model may have gone wrong because it is too limited in terms of the variety of variables included. This suggests that this is something we should all pay attention to as a research problem. More specifically, the emphasis on proper sequencing, leads and lags in planning, suggest one extension of our present planning techniques; plans with variables dated are important. Slippage of six months in one sector may be critical. Another important variable that has tended to be overlooked is the building in of human factors.

Mr. Hansen (U.S.A.):

Planning is essentially a matter of giving a broader perspective to real decisions that are being made. In many underdeveloped countries the real issue today concerns whether or not the required preconditions and stabilization decisions are being made within the context of a broad, prognosticative perspective.

A major focus of plan implementation in the developing countries should be fiscal and monetary measures consistent with the strategy of the development plan. The administrative processes of the ordinary budget, credit mechanisms and related financial policies are a major part of the process of planned development and the more closely the planners are involved in these processes, the greater are the prospects for effective implementation. The

consensus is that the broadest participation in the formulation of the plan is desirable but few suggestions have been made on how this can be accomplished. The plan must decentralize decision-making sufficiently "to permit the orderly and constructive coordination of national activities which will still leave open the maximum opportunity for individual choice." This calls for joint efforts by the planners and ministerial agencies to make the Plan a guide to the specific projects and institutional changes required, through performance budgeting procedures, project evaluation criteria and interdisciplinary review and evaluation mechanisms. The reporting, statistical and evaluation functions are under-rated. Decentralization of detailed planning and implementation decisions may increase the risk of administrative inefficiency but it is less risky than reliance on a central body to make such decisions. As a practical measure of implementation, each plan should set aside adequate resources for studies and research.

Professor Nitisastro (Indonesia):

Coordination of the different agencies carrying out parts of the Plan is a difficult problem. Should the Ministry of Planning or of Finance perform this function? There is also the danger that too much attention to coordination will delay or kill action. In any case, the assignment of responsibilities should be carefully delineated. As to the private sector, Mr. Nitisastro said that attention is usually confined to industry, whereas the problems of organization, administration and management in agriculture are more important, e.g., how to get the right amount of the right fertilizer to the right place at the right time.

Dean Bailey (U.S.A.):

Less (and more) developed countries could make their national planning more effective if two staff assistants were added to the Prime Minister's personal secretariat to help him "relate the recommendations of various planning agencies to each other and to the political concerns of the top political leaders." One of these assistants would be concerned with internal problems of priorities, coordination and evaluation; the other, with possible sources of external aid and of technological and other pertinent development elsewhere.

Professor Katz (U.S.A.):

Implementation problems are largely a matter of using partial analysis for a general problem. Implementation in fact should be integrated with plan formulation, i.e., planning should be a total process. Some of the implications are:

- (1) Political decisions makers should be involved in plan formulation.
- (2) The Plan should include provisions to induce change; incentives are important here.
- (3) The Plan should be designed to evoke participation at all levels in the society.

Implementation can become part of planning by building up a backlog of projects, by involving technicians in planning and by feed-back of project implementation results.

Mr. Jacob (France):

Factors needed for industrialization are (1) ideas on what industries to establish, e.g., what import-goods could be replaced by local manufactures; (2) entrepreneurs and skills, e.g., local handicrafts

were promoted for cottage industries in Madagascar, with a training and hire-purchase scheme; and (3) private capital needs to be assured of a favorable environment, e.g., political stability, protection of infant industries. In lieu of local stock exchange, a national investment company was established in Madagascar to channel savings.

Dr. Kochav (Israel):

Savings can be increased and channeled into constructive use in countries which have suffered long periods of inflation. Israel issued bonds with capital and interest tied to cost of living changes. This has now become the main instrument for savings and any fears of inflationary effects have been dispelled. Increase in level of income does not necessarily mean increase in savings. This is true at least in egalitarian Israel; it may be different for countries moving from subsistence levels. Domestic capital formation is not enough for developing countries. If each industrial state devoted at least 1% of GNP to aid less developed countries, a major breakthrough could be made. IDA for example is now short of funds. Capital is not enough, skills must be transferred from industrial economies on larger scale than at present. Less developed countries do all right in initial stages of industrialization but then run into bottlenecks, when higher managerial and technical skills are required. These skills are concentrated in a limited number of industrial firms and are not easily transferred. U.N. teams and other indirect approaches cannot meet this need.

A functional agency rather than the Planning Commission should be responsible for following development progress. The latter should be expected however, to provide guidance on current as well as long-term problems.

Dr. Posey (U.S.A.):

Trade unions can help both to increase total production through their pressure for efficiency and to achieve an equitable distribution of the production. In the less developed countries the trade union can contribute to more effective plant operation by providing a channel for consultation on issues affecting the worker, thus easing his adjustment from rural to urban - factory working patterns.

Informal Discussion Meeting with Less Developed Country and Soviet Bloc Delegates:

This showed following consensus: (a) it is the planning process that is valuable, not the plan; the important thing is whether good decisions are made; (b) planning is a matter of degree; the less developed country must start planning at whatever stage it is and work up; (c) the planner must point out to the politician what the consequences of different decisions may be; and (d) special project review organizations and other mechanisms need to be developed to strengthen project planning which is now the weakest planning area.

Dr. Knall (Federal Republic of Germany):

Program evaluation has received too little attention in view of its critical importance for testing the quality of the planning. Perhaps a new science is needed here but, in any case, responsibility for it should not be in the planners because they cannot admit mistakes. Evaluation has thus far been limited to community development and other social development programs, excluding economic development because of lack of the necessary tools. Any comprehensive evaluation of economic development

plans must be inter-disciplinary. Where quantitative measurements are still not possible, qualitative ones should be made at least. Evaluation determines the extent to which the original project has become a self-sustaining force.

Dr. Rao (India):

A Research Council was established for the Planning Commission in India which has already produced about 60 publications on the results of its research program. Similar arrangements should be made by planning bodies in other countries to obtain the contributions of outside scholars from the outset on pertinent research problems.

6. Planning Advisers

Dr. Knall (FRG):

Dean Bailey is justified in his criticism of dependence by the less developed countries on foreign advisers. In any case, these countries should institutionalize the place for these advisers and make definite arrangements for their communication channels and counterparts, and otherwise provide for their efficient use.

Dr. Muirragui (Ecuador):

Some years ago American experts who went to Latin America were totally unprepared to deal with the problems they confronted. More recently U.S. experts have been more effective, but continuing traditional mentality in Latin America is obstructive. There is a tendency for talent to leave home countries because of the lack of opportunity. Something should be done to repatriate those with training. Technicians from these countries should be used since the nationals tend to be more effective than foreigners.

Dr. Iatridis (Greece):

The following are suggested reasons why so much money and talent have produced so little in the way of planning results:

(a) inability of the planner to understand the political situation and the fact that planning changes the political power structure. The planner who ignores this cannot hope to succeed.

(b) The tendency to be satisfied with the mere creation of a plan without carrying it through to fruition. In part this is a matter of not having undertaken the socio-economic pre-conditions. Foreign experts in particular neglect this.

(c) Frequently, education is neglected. The necessary skills do not emerge to allow implementation.

(d) The Plan model tends to be made in isolation from real conditions, not being adapted to local culture or to the attitudes and behavior of the people. As a result the econometric predictions fail.

(e) The training of planners should emphasize these problem areas.

Mr. Hahn Been Lee (Korea):

Planning versus implementation might well be rephrased as expectations versus frustration. In its early stages, the Plan tends to be predominantly an ivory tower exercise, gradually the politician becomes infected and administrators are recruited to put loose conceptions into practice. The result is failure and frustration with all the participants blaming each other for the chaos.

As a solution, a bright and intuitive foreign expert should be induced to give a detached appraisal of the roles of the participants, and make recommendations on

gauging the tempo of planning to prevent frustration. This can best be done by a foreign advisor because he is beyond the local pressure described.

Research and training institutes can also be helpful in bringing planners down to earth, and inducing all participants in the process, particularly politicians, to be more realistic. This would relieve the otherwise mounting psychological pressures on the administrator. There also is a role for communicating to the public the complexity and time dimensions of planning.

Professor Widjojo Nitisastro (Indonesia):

A sovereign country cannot accept the concept of a foreign advisor playing God in the sense of attacking major social and physiological problems generated in the course of planning, nor even in the sense of making an overall evaluation of the development process. In any society, even where a stable government exists, there are sensitive matters which the government will be reluctant to share with foreigners. It is preferable, therefore, to use foreign experts as technicians in their own field, integrating this expertise into the existing planning body. More effective communication between experts and counterparts should be encouraged so that wider advice could be offered if solicited.

Dean Bailey (U.S.A.):

Foreign advisors are invited to discharge differing roles. Some are narrow,

e.g., specific engineering assignments; some are in the broader fields of general economic or statistical policy. Another kind of foreign advisor is becoming increasingly important, the kind who assists in providing administrative training for the civil servant. Here the purpose is to assist in inculcating the habit of approaching problems rationally. This is essentially training in "objectifying" problems which the administrator confronts, to make imponderables more explicit. The potential contributions include (a) a sense of administrative imagination, i.e., foreseeing problems to be coped with in the setting up of new organizations or institutions, and (b) making local peoples more sensitive to the problem of "consent-building." The key problem is finding incentives to induce people to do what is needed. To give orders which are not carried out is useless.

Mr. Bahroun (Tunisia):

The necessary dialogue with the politicians can be carried on better by local than by foreign planning advisors.

Dr. Sherif (U.A.R.):

The problem is no longer whether but how to plan. The current worldwide enthusiasm for planning may make for premature and hasty planning in the less developed countries. Five to 10 years is required to develop an infrastructure for planning — to train staff, assemble data, etc.

Section I: ORGANIZATION AND PLANNING OF SCIENTIFIC AND TECHNOLOGICAL POLICIES

Summary

A. Evaluation

The Conference afforded an opportunity for an exchange of views on questions of science policy planning and organization. The utility of the Conference itself is believed to differ greatly among the participating countries, according to the particular areas of competence and interest of their delegates. In the case of the U.S., with respect to Section I, the utility of the Conference dwindled as our delegation section diminished to zero (save only the Scientific Secretary) well before the I sessions had been completed. Consequently, U.S. effect upon the Conference deliberation weakened considerably as the Conference progressed and the less developed countries accordingly, increasingly, lost opportunity to convey their positions and problems to U.S. authorities. Another factor which probably impaired the utility of this section of the Conference, with respect both to the U.S. and the less developed countries, is that, with one exception, no U.S. author of a Conference paper was available to discuss that paper at the session in which it appeared on the agenda.

Although different conceptions of national science goals were expressed, even within single nations, there was common consent that scientific research and science education are fundamental to the national scientific revolution which must take place in each country. There was considerable diversity of view on the immediacy with

which science may contribute significantly to economic and social development, and differing conceptions of the degree to which scientific activities should be directed by controls toward pressing economic and social problems. There was consensus, however, either implicit or explicit, that science must not, and indeed cannot, be entirely bound by economic and social plans, nor should it be neglected by those plans. This consensus is best expressed by the proposition that plans are extrapolations of past experience, while science, either research or education, is the forerunner of the future. There was unanimity that scientists must play a greater role than in the past in the formulation of policies and plans, but an understandable difference of opinion between planners and scientists as to the degree of control over policies and plans which should be exercised by scientists (or conversely, the degree of freedom, coupled with support, to be enjoyed by the scientists). It is noteworthy that delegates from the less developed countries called for an expanded role for scientists not only in the formulation and implementation of policies and plans within developing countries, but also within assisting countries and agencies. The scientists from the less developed countries here implied the existence of a greater congruence of developmental opinion and activity among scientists of the more than less developed countries than between their own scientists and most

governmental bodies through which assistance is channeled. This implication raises a serious question concerning the "country request" for assistance and the scientific competence of its true point of origin. It also reveals dissatisfaction with the quality of implementation, whether or not the "request" was well conceived. One may conclude that in many cases less developed country scientists consider themselves better informed, through professional channels, on developments and activities serving the ends of less developed countries than are the staffs of technical cooperation agencies within their own governments. There is an evident sense of frustration among some scientists of less developed countries that assistance programs implemented by foreign agencies without adequate guidance from the scientific community serve to discredit the activities and recommendations of the indigenous scientists.

Advocacy of the development of indigenous scientific resources (primarily the formation of highly trained scientific personnel and the development of effective institutions) seemed often to be raised by scientists of the less developed countries in opposition to recommendations that less developed countries concentrate their efforts on the application of knowledge presently available among advanced countries. While there would seem to be no necessary conflict between these two positions, it is nevertheless apparent that a national policy or an assistance policy which gives emphasis to the latter precept could tend to impair accomplishment of the former. Conversely, only when emphasis has been given to the former can maximum return be expected in the adaptation of foreign knowledge. It seems clear that the less developed country scientists who rose to protest admonitions to apply foreign knowledge feel that there

exists a misunderstanding of the relationship between these two precepts and they wished that greater attention be given to the more fundamental of the two. It is a misunderstanding which they would hope to overcome through bringing scientists more directly into developmental planning and implementation. As expressed by Professor Leite Lopes of Brazil, less developed countries do not want just a transfer of knowledge—they want also the means to create knowledge.

Less developed countries were represented in the I sessions by a number of delegates somewhat larger proportionately than would be expected from the composition of the total number of Conference participants, though there was a relatively small core of less developed countries represented by active delegates. The latter group of delegates were more constant in their attendance than were the delegates of most other countries, advanced or developing.

B. Informal Recommendations by Conference Participants

1. Recommendations germane to international policy

a. Establishment of an international agency for science and technology.

This is a recommendation to which many speakers alluded, the main drive coming from delegates from Pakistan and the UAR. This agency is conceived not necessarily as being a new agency to be added to the group of specialized agencies, but it would be a strong, well-financed organization which could draw upon the scientific capabilities of the advanced countries for the conduct of programs to develop the capabilities of the less developed countries.

b. Establishment of special purpose international research and training institutes.

This is another recommendation often made, sometimes directly related to the recommendation for an international agency. While these recommendations were usually made with reference to some particular field or sphere of research and training, they stem from the desire to promote establishment of centers of research and training of excellence, staffed by scientists from both advanced and developing countries. Two types of institutes may be distinguished:

(1) One type would be complementary to national facilities and would function as a research leader and center of advanced training.

(2) The other would be supplementary to national facilities, would be focussed upon a narrow specialty, and, for the region served, would probably provide all needed research and training (at all levels).

2. Recommendations germane to assistance policy

a. Three recommendations made by Dr. R. V. Garcia summarize and generalize the remarks of many speakers and authors, and serve to outline the foundation for the accomplishment of "the scientific revolution."

(1) Establishment in each country of an organ such as a national research council to make plans in consultation with the highest governmental levels.

(2) Assurance of scientific guidance in the implementation of policy.

(3) Establishment of modern universities, based on the fundamental sciences, to train people not only in the traditional professions but also as research scientists.

b. A repeated recommendation was that scientists themselves be accorded responsibility and authority for policy, planning, and disbursement of funds for scientific activity. Some speakers directed attention to the highest level of national policy (recommending scientist participation in top national policy groups); some to the several levels at which budgetary allocations are made (recommending a national coordinating or operating science body and/or scientist participation at highest levels of governmental agencies), some to the various levels at which budgetary allocations are received and divided (recommending semi-autonomous scientific agencies or institutions, directed by scientists), some to the levels at which funds are obligated and expended (recommending that decisions be made at the laboratory bench). Arguments in support of this recommendation may be synthesized to two:

(1) Given support and direction consonant with its potential contribution to scientific, economic, and social goals, and freed from irrelevant controls, scientific activity will move more rapidly toward realization of that potential; and

(2) Subject to the limitation of resources, the operation and financing of scientific activity must be governed by guidance and control which is compatible with the nature of the activity.

c. One participant (Dr. S. H. Zaheer, Director, Council of Scientific and Industrial Research, New Delhi, India), succinctly expressed the recommendation that developing countries must strive to reach as soon as possible the critical "take off point" below which the impact of science on development is imperceptible. Others tended to view the goal more abstractly (e.g., pursuit of indigenous excellence) or with greater particularity (e.g., development of

institutions accommodating a "critical mass" of personnel). It was generally agreed that the development and strengthening of the scientific activities of universities is basic to this goal since the concentration of scientific functions (i.e., research and teaching) is conducive to assembly of critical masses of personnel. Accordingly, many participants, (usually university people) repeatedly voiced the plea that care be taken not to divorce research from education in developing countries. Others (usually from CSIR's or comparable organizations), desiring to promote directed research and the application of research results, advocated the encouragement of separate and independent research institutes, but conceded that ideally they should be located close to universities and there should be close university-institute collaboration in both training and research activities. While there was no exposition of U.S. experience in joining within the university structure both academic and directed research, there was a marked tendency among U.S.-trained less developed country delegates to address the problem of promoting committed research and research application by university staff.

General Session

Officers

Chairman - Ambassador Jean Porquet
(Ivory Coast), Ambassador
to Switzerland
Rapporteur - None
Secretary - Dr. Rolando V. Garcia
(Argentina)

U.S. Participants

Dr. Max P. Millikan
Dr. S. Milton Nabrit
Dr. Ragnar Rollefson

Of the various sessions under Section I, the General Session may have been the least effective in meeting either U.S. or less developed country objectives. The session was bound by the predetermined formal procedure with the result that neither the program of oral presentations nor the ultimate slate of floor remarks (inscribed in advance) served to focus attention clearly on crucial issues. It did, however, establish differences of emphasis which were argued to the end.

Prof. Viktor Kovda (UNESCO) described the UNESCO Department of Natural Sciences (advocating budget increases for the Natural and Social Sciences Departments), then discussed factors for the assessment of the scientific and technical potential of a country (these factors deserve attention as a checklist for the formulation of developmental planning):

- (1) number of scientists and engineers expressed as a ratio to population (target: 1,000 per million);
- (2) number, equipment, and organization of national research institutes and laboratories;
- (3) presence of a national industry of instrumentation and scientific equipment;
- (4) presence of scientific libraries and documentary services;
- (5) volume and number of national scientific and technical publications;
- (6) mass literacy coupled with scientific general education;
- (7) non-reliance on foreign scientific and technical personnel;
- (8) existence of a system of regular measures and activities by the Government for the fulfillment of five-year or long-range plans for the development of science;
- (9) investment in R&D of a substantial portion of national income (target: one to five per cent).

He noted that differences among nations will always exist, but that equivalence of scientific stature should be sought. As a postscript, he mentioned the international mobility of scientists, particularly young scientists, which, according to UNESCO data, involves over 3,000 annually; and he raised the question of the need of developing countries for sophisticated science. He answered the question affirmatively, stating that scientific backwardness must be eradicated in two generations.

Mr. Frank G. Nicholls (Australia) stated that scientific and economic development would be hindered unless knowledge presently available among advanced countries is applied intensively, pursuant to effective measures implemented at the national level. He enumerated three such measures, in order of the time-lag required for their accomplishment:

- (a) establishment of documentation centers,
- (b) formation of a nucleus of high-level personnel,
- (c) development of experienced research leadership.

As a locus for the particular implementation of these three measures, research institutes were commended. These must be:

- (i) developed gradually (e.g., over a 30-year period),
- (ii) freed from arbitrary controls (i.e., directed by scientists, "decisions must be made at the bench"),
- (iii) closely associated with, but independent of, universities.

He closed with a recommendation for establishment in each country of a top level policy group with effective participation by scientists in both the formulation and implementation of national policy.

Dr. Max P. Millikan (U.S.) made the following main points in his remarks:

(a) the rate of technological change is such that persons trained in specific technologies are likely to become useless to their societies in a decade or so, even in less developed countries;

(b) scientific disciplines have come increasingly to penetrate each other's fields, leading to the desirability of developing interdisciplinary research centered around problem areas and often joining both natural and social sciences;

(c) judgments which hitherto have been essentially intuitive are increasingly becoming susceptible of scientific test;

(d) the application of science requires increasingly an innovative and manipulative spirit, not just in a small scientific elite, but broadly, through the whole population.

He drew four conclusions, expressed in terms of communication:

- (i) there must be close cooperation between those with interest and talent in the various branches of fundamental science and those with experience in and responsibility for practical administration;
- (ii) there must be new opportunities for interchange among the disciplines;
- (iii) there must be a continuing dialogue between the politician and the scientist;
- (iv) through the educational system, there must be established the basis for improved communication between the scientific fraternity, natural and social, and the bulk of the population.

Dr. Bohuslav Stamovsky (Czechoslovakia) reviewed the legislative and organizational structure of scientific activities in Czechoslovakia. The Academy of Sciences undertook the role of central coordinator in 1956, and 1962 produced the first long-range plan

for development through 1980. In the light of this plan, he suggested, Czechoslovak training programs have been ill-conceived.

Dr. Marcel Roche (Venezuela) made an idealistic plea for fundamental research in less developed countries on grounds that it is: (a) a cultural pursuit, (b) a mental hygiene, (c) a spiritual experience, (d) a spur to agile minds.

Prof. Vijayendra K.R.V. Rao (India) made six recommendations:

- (a) know the objectives of expenditures on scientific activities;
- (b) recognize the need for fundamental research;
- (c) associate research institutes with universities;
- (d) develop contact between users and producers of science and technology, i.e., establish extension services;
- (e) encourage industry to support research;
- (f) encourage provision of services by industrial consultants.

Prof. Ignacy Malecki (Poland) delineated six precepts for the planning of science.

- (a) government plans should concern themselves with general trends and with critical areas of development;
- (b) state coordination should be exercised only on the most important items;
- (c) provision should be made for flexible financing;
- (d) there should be coordination by scientists, engineers, and economists;
- (e) plans should be long-term, i.e., ten to fifteen years;
- (f) there should be consultation between the planning agency and the science academy.

Mr. Abba Eban (Israel) advocated pursuit of indigenous excellence rather than reliance on knowledge existing elsewhere. He

presented a battery of recommendations under the following four topics:

- (a) establishment of a national council for Research and Development;
- (b) survey of resources, i.e., agriculture and industry, as a prelude to a master plan;
- (c) training of cadres (noting that Israel is prepared to accommodate foreign graduate students);
- (d) strengthening of secondary education.

Specialized Session

Formulation of Research Policies and Programs

Officers

- Chairman—Prof. Raden Mas Soemantri (Indonesia), Vice President for Academic Affairs, Institute of Technology, Bandung
- Rapporteur—Mr. Jaakko Itoniemi (Finland), Secretary for International Development Aid
- Secretary—Dr. I.D. Rojanski (UNESCO)

U.S. Participant

Dr. Alan V. Astin

This session produced substantially greater interaction among participants than did the previous general session and established an atmosphere of a seminar of peers confronting common problems. The attendance from the less developed countries was good.

The substance of the discussion tended to remain at a rather abstract level to which many participants were unable to bring a background of active experience, but as discussion progressed there emerged a greater interpenetration of the abstract and the particular, though this was interrupted about

half-way through by the commencement elsewhere of an exceptional session which attracted a large proportion of the higher level participants of both advanced and developing countries.

Dr. Astin, in his remarks, drew upon the evolutionary developmental experience of many nations in identifying critical scientific services which newly-developing nations could not purposefully establish without incurring some of the problems confronted by advanced nations in reforming obsolescent practices. Dr. Astin was interrupted by a round of spontaneous applause (initiated by Prof. P. Auger of France and joined loudly by delegates from English-speaking less developed countries), when he gave special emphasis to adoption of the metric system.

The report prepared by the Secretary was an exceptionally well-balanced and penetrating analysis of the problems confronting policy-makers and of the principles governing their solution.

Prof. J. Leite-Lopez (Brazil) developed and justified the theme that the less developed countries do not want just a transfer of knowledge—they want also the means to create knowledge. He outlined the means required for this purpose, giving emphasis to the development of conditions serving to stimulate scientific initiative and creativity.

Dr. W. B. Lewis (Canada) discussed the philosophic aspects of the relationship between the scientist and the policy-maker or planner.

Prof. Franco Gatto (Italy) examined the relation between research and advanced learning, noting that they are inseparable

Prof. Remus Radulet (Romania) advocated the recognition within both pure and applied research of "fundamental research" (i.e., research of broad implication) and

"research in depth" (i.e., research of narrow implication).

Dr. N. Stutterheim (South Africa) developed the theme that research is an essential element in development, though its contributions may not be obvious or foreseeable in the short range. He dwelt upon the implications of this characteristic in terms of the planning of research for future development and in terms of the susceptibility of current problems to solution through application of existing knowledge.

Academician U. A. Arifov (U.S.S.R.) catalogued the achievements of socialist planning in the development and organization of scientific resources of Uzbekistan, and described the current Uzbek structure for central coordination of scientific activities.

Prof. Pierre Auger (France) commented on the themes that education must be comprehensive and that a research field, if entered, must be completely embraced. He was followed by a speaker from the U.K. who recommended that national planning be confined to critical areas and that narrow institutional specialization be avoided in recognition of the increasing trend toward hybrid (interdisciplinary) projects.

Dr. Michel Batisse (UNESCO) recommended for less developed countries emphasis upon natural resources research because this area comprises a greater proportion of the economies of less developed countries than of other countries and because such research is of a nature which requires that it be done locally.

Dr. Alan V. Astin (U.S.A.) noted that the first priority for scientific growth is the development of indigenous centers of competence; second priority is the provision of essential central scientific services. Among these, of crucial importance and wide effect

is an authoritative national center of standards and measurements.

Mr. D. Shimshoni (Israel) advocated special employment and administrative conditions for scientists, tailored to the character of scientific work.

Prof. P. C. Mahalanobis (India) pointed to creativity as the hallmark of a genuine national scientific community and noted that direct assistance to the best indigenous scientists is needed from the creative elements of the advanced countries through visiting professors or, preferably, visiting research teams.

Specialized Session

Special Problems of Scientific Policy Planning

Officers

Chairman — Dr. Salimuzzaman Siddiqui
(Pakistan), Chairman,
Council of Scientific and
Industrial Research,
Karachi

Rapporteur — Mr. Avacoum Branitchev
(Bulgaria), Economist,
Ministry of Foreign
Commerce

Secretary — Dr. I. D. Rojanski
(UNESCO)

Attendance at this session was sparse and dwindled from about 40 at the beginning to about 15 at the end. About 15 delegates from the less developed countries attended, 8 of whom participated actively and remained to the end.

The program called for discussion of rather practical details of policy planning, but the interest of less developed country delegates tended to remain at the more general level of the previous sessions.

Delegates from advanced countries tended to lecture enthusiastically, but few remained to hear remarks of less developed country delegates. The latter, on the other hand, were more interested in emphasizing previously discussed positions on the organizational structure of research activities (adherents of research institutes dominated the discussion in the absence of those who wished to emphasize research activities within universities). There was no active U.S. participation.

In selecting themes from agenda papers for discussion relevant to the topic of the session, the Secretary's report was adequate and objective. The session participants failed to confront squarely the issues involved, thus indicating by indirection a need for a more intensive examination and exchange of views among persons at least as well acquainted with the specific problems posed as were the agenda authors. To a limited degree, a few of these issues were discussed effectively in the "informal meetings" reported below.

Dr. Siddiqui, the Chairman, opened the meeting by outlining three topics to be discussed:

- (1) Specific problems of planning scientific efforts,
- (2) Utilization of research results,
- (3) International cooperation in science.

He noted that certain sectors of science lend themselves to planning more readily than others; e.g., survey and developmental work more readily than theoretical physics.

Dr. Rojanski (UNESCO), the Secretary, reviewed the various functionally-based alternatives for research organization and outlined various means conducive to the utilization of research results through rapid two-way flow of information:

- (1) publication of literature directed toward specific industries;

(2) provision of lectures, courses, etc., to lift the scientific level of key personnel;

(3) stimulation of direct and continued personal contact between research workers and industrial personnel;

(4) initiation by research workers of pilot works for industrial activities;

(5) encouragement of contracts between research laboratories and industry;

(6) establishment of liaison units to "sell" research to industry and to communicate industrial and other practical problems to research workers;

(7) attention by research laboratories to short-range plans, in pursuit of which research work can demonstrate its practical utility at an early date;

(8) encouragement of a system of patents and royalties not only to stimulate innovation and invention, but also to retain control of new devices and techniques in order to assure their efficient application;

(9) establishment and development of extension services.

He noted the essential need of newly-emerging nations for international cooperation in restructuring inherited scientific organization and building scientific resources, emphasized the need for full indigenous scientific participation in assistance projects, and advocated regional surveys and other joint projects by less developed countries with support from international organizations. He reiterated the precept that national scientific strength cannot be imported from abroad.

Dr. Ignacy Malecki (Poland), the first discussion leader, stated that national institutes must be independent of universities since universities have the primary function of teaching and are organized on classical disciplinary lines while research is increasingly cross-disciplinary. He discussed three types of research institute organization:

(a) uni-functional laboratories, often heritages of specific interest, of colonial commerce, have an important role in economic development and may become important regional centers;

(b) specialized institutes connected with key problems, e.g., medical laboratories, building research institutes; etc.;

(c) multi-functional institutes with broad scope of capability and activity.

These institutes, of whichever type, must possess the following characteristics:

(i) There must be a "critical mass" of personnel;

(ii) They must serve as a focal point of activity in their field and of information concerning their lines of research;

(iii) They must serve to link basic with applied research.

Prof. Athos Silveira Ramos (Brazil), the next discussion leader, stated that all countries must have a central body concerned with scientific research:

(a) to coordinate research;

(b) to stimulate research;

(c) to cooperate with universities in the development of scientists;

(d) to introduce and develop documentation services;

(e) to promote contacts with industry;

(f) to supply scientific attaches to the diplomatic corps.

He reported that the Brazilian National Research Council has five scientific research institutes and briefly described the Amazon Valley Scientific Research Institute, which is concerned with the development of the Amazon Basin.

Academician V. F. Kuprievich (Byelorussian S.S.R.) emphasized the introduction into production of the achievements of science and the use of new methods of production in developing countries. National institutes,

he said, must be established even where there is a shortage of scientists and teachers. These institutes must train scientific cadres both for research and for teaching and must be foci for cooperative work among neighboring countries. Their tasks must be "topical," i.e., based on the requirements of the national economy, and they must include research "on order" from industry. He recommended development of some means of promoting optimum utilization of scientific achievements in and by a developing country. In this connection, he noted that it is often easier to analyze a problem *de novo* than to survey the vast patent and other literature, and suggested initiation by the U.N. of a publication to disseminate selected new achievements of science judged significant to problems of developing countries.

Dr. S. H. Zaheer (India) said that developing countries must strive to reach as soon as possible the critical "take-off" point below which the impact of science on development is imperceptible. He suggested inquiry into the reasons why international cooperation in science is less effective among ECAFE countries than among EEC countries.

Mr. E. Martindale (United Kingdom) discussed three topics:

- (a) Cooperation between individuals within and across national boundaries;
- (b) Communication in terms of strong libraries and technical information services;
- (c) Coordination in terms of a common denominator of interests among laboratories of possibly highly diverse activities; e.g.:
 - (i) research equipment,
 - (ii) research material,
 - (iii) research techniques.

Prof. Ing. Simion Taigar (Romania) advocated ministerial institutes based on

Soviet-style branches of production, e.g., machine building, state farms, etc.

Mr. Jaakko Itoniemi (Finland) discussed limitations in economic planning and the application of research results:

- (a) scientific feasibility of the project;
- (b) economic feasibility of the introduction of applications;
- (c) social acceptability of products or techniques developed through research.

Prof. J. Leite Lopes (Brazil) referred to the presence in developing countries of foreign-owned industries which may be most valuable for economic development and may also spur education in order to obtain manpower, but seldom promote local or indigenous research. He urged that means be found to induce such industries to contribute to national research in order to indigenous personnel may be associated with the application of research results.

Dr. Alan H. Ward (Ghana) cited certain failures from which lessons might be drawn:

- (a) The former West African Cocoa Institute has curtailed its regional responsibilities and in consequence has lost personnel, its present staff is below the critical mass;
- (b) In anticipation of education of an adequate number of personnel, an accelerator laboratory was established, but the planned number of personnel did not materialize, with the result that the laboratory has preempted scientists from other areas.

Sr. Raul Luis Cardon (Argentina) outlined three objectives for a national research council:

- (a) training of personnel,
- (b) promotion of application of research,
- (c) assurance of the provision of special services such as documentation, patent literature, etc.

Dr. Makaminan Makagiansar (Indonesia) noted that science administrators deal

largely in the area of social matters and that many are developed from a social science background. He urged that scholarly attention be given to study of the field of science administration and advocated formation of an association of such administrators with publication of professional literature. He recommended that other countries follow Indonesians' example in allowing its science administrators one day off per week for personal research projects.

Dr. W. B. Lewis (Canada) urged that adequate consideration be given to the need for information retrieval personnel, i.e., librarians and documents officers, technical information officers, patent search personnel, etc.

Informal Meeting

Some Practical Problems of Starting Scientific Research in New Countries

Officers

Chairman — Mr. Frank G. Nicholls
(Australia)

U.S. Participants

Dr. Roger Revelle
Dr. S. Milton Nabrit
Mr. Robert F. Hull

The meetings were skillfully chaired by Mr. Nicholls who succeeded in adhering to the agenda and assuring that each topic was examined to the satisfaction of all participants. These two meetings were probably the most useful to less developed country participants. Attendance was small by design, probably about 80 in total, but not more than 60 at any one time, and it dropped finally to about 25. Delegates from less developed countries (including those in the middle ranges) constituted a majority

of the attendance at any one time and accounted for about 80 per cent of the consistently active participants. The meetings were thus virtually a symposium among delegates from countries of the lower and middle stages of development.

There were no presentations as such. As each agenda topic was introduced, the Chairman invited delegates from less developed countries to state briefly the related problems of concern to them. The floor was then opened to all the comment on these problems. The topics discussed were the following:

a. Organization of national research institutes; aspects of vital importance.

It was the consensus that these institutes must not be bound by usual governmental administrative procedures. There must be flexibility in the selection, assignment, and development of personnel. The institute must control and directly disburse its funds and must not be dependent upon the usual governmental systems of procurement, maintenance, and services.

b. Training and selection of research personnel.

Discussion on this topic developed into an examination of the problems of identifying and encouraging individual research competence. Essentially, senior personnel must seek out research potential in junior personnel and provide continuing guidance with increasing opportunity for independence of research work, without imposing or being restricted by arbitrary requirements or artificial barriers.

c. Salaries

After adhering to the principle that salaries of research staff must be competitive with other employment, speakers on this

topic typically ascribed greater importance to three other inducements:

(1) Professional recognition; i.e., opportunity to work at a full professional level with support adequate to accomplish tasks meriting recognition among the individual's professional peers at home and abroad.

(2) Social stature; i.e., broad social and cultural recognition should accrue to the contributions and position of the scientist.

(3) Conditions of work; i.e., there must be provided the necessary working conditions in the form of literature, facilities, equipment, research materials, access to peers elsewhere, etc.

d. Programs of research for national research institutes: selection and priorities.

This topic was given only general treatment, in which two factors were considered to be jointly determining:

(1) local problems
(2) availability of research competence in fields appropriate to these problems.

e. Relationship between national research institutes and universities and other research institutes.

In this discussion, the idea of "critical mass" was emphasized. Research institutes should preferably be established near universities, where there could be considerable interaction among researchers and where junior staff could take advantage of university lectures, symposia, and relevant research activities while university graduate

students could undertake research work at the institutes.

f. Connection between national research institutes on the one hand and, on the other, government departments, agriculture, and industry.

This topic was discussed in the context of assuring application of research results. It was unanimously agreed that there must be a two-way exchange between the research institutes and these other departments or sectors. Most participants seemed to feel that this two-way exchange had not been established in developing countries and that there are numerous barriers which must be overcome. It seemed generally agreed that research workers must take the initiative in:

(1) identifying (discovering) problems confronting "production" which seem to the research workers to be susceptible to solution through research;

(2) prosecution of research work on these problems at the initiative and, if necessary, at the expense of the institute; and

(3) demonstration of research results through initiation by the laboratory of pilot industrial or other application.

g. Role of national research institutes in over-all national development planning.

Here it was concluded that national planning must be accomplished by teams of scientists and economists. The scientist-participants emphasized that initiative by the scientists themselves is required.

Section J: INTERNATIONAL COOPERATION AND PROBLEMS OF TRANSFER AND ADAPTATION

Summary

Evaluation

1. The subject of how to stimulate and guide change, while central to the application of science and technology, was inadequately treated in both the prepared papers and in the Conference discussions. (Several U.S., Belgian, Dutch and French papers were the only ones directed to this subject.) There was mention of the need for planning, the development of human resources, and more effective transfer of knowledge at almost every session of the Conference. But there was little progress made in describing and agreeing on patterns for doing these things, possible sequences of actions, and conditions for creating effective transfer and adaptation. This was reflected in presentations which were either at the most general level or simply identified the many problems of transfer of technology, without much attempt to be analytical or to get down to specific cases as models. The representations of the more developed countries revealed the primitive stage of their knowledge with respect to the transfer and adaptation process, as did those of the less developed countries. Moreover, there was almost no opportunity for an exchange of views between those persons concerned with international technical cooperation and transfer in particular fields (e.g., agriculture, industry, mineral development), and those concerned with problems of transfer and adaptation as a subject in itself; consequently, examples or information on specific patterns of effective transfer tech-

niques and systems from these subject fields were not readily available.

2. The need for definitive objectives in programs of international cooperation and transfer of knowledge was stressed enough to make it clear that these programs have not always been, but must be planned as integral parts of each nation's total development plans. There was also general recognition that the establishment of priorities in the development program would have to be reflected in a similar ordering of priorities in programs of international cooperation and exchange, something which is too seldom done.

3. There was repeated mention of lack of coordination among the programs for international cooperation and transfer, and this was felt more keenly and expressed more strongly by the representatives of the less developed countries than of other countries.

4. The evaluation of past and existing programs of international cooperation and exchange was revealed as being at best sketchy and haphazard. National and multi-lateral agencies, and the more developed countries themselves, have not accepted responsibility for making a systematic effort to evaluate the reasons for success or failure of their cooperative programs. Not one case of failure was discussed and analyzed at the Conference and the more developed country representatives could say little about how they had used their "storehouse of knowledge and experience" to improve current programs. In this respect, the discussion was much too polite.

5. The representatives of the less developed countries participated relatively more actively in these specialized sessions than in most other subject area sessions. This reflects their deep concern over how technology of any kind can be transferred, adapted to local conditions, and applied. They spoke with great assurance on what many of them flatly stated was the key issue of the Conference and what they had come to hear about.

6. The early sessions on transfer and adaptation, in common with many other sessions, seemed devoted largely to a display of wares and techniques available from the more developed countries. The initial attitude of the representatives of the less developed countries was largely one of learning what they could get from abroad. During the Conference, however, there was a noticeable and healthy shift toward greater recognition by the less developed country participants that bringing about desired change was primarily their own responsibility, and would have to result largely from their own efforts. This sobering realization was an important outcome of the Conference. It was reflected in discussions of how developing countries need to organize and develop their own capabilities—in terms of trained personnel, institutional structures and budgets—in order to facilitate the flow of development knowledge from abroad and to its own citizenry. It was also reflected in comments by representatives of less developed countries that a waste of foreign assistance—through lack of proper planning, coordination or implementation—was just as serious as wasting a country's own funds and resources.

Areas Meriting Future Attention

1. Many less developed countries have their shortage of skilled manpower accentuated

because of the loss of their professional and highly trained personnel to the more developed countries. This comes about because many of those sent abroad for training do not return, while others emigrate to the better working environments in the more developed countries, which also have a demand for highly skilled manpower. This is a problem in many fields of training, and so serious that there has been in some less developed countries a net loss of high-level manpower in spite of training programs.

2. The attention of educators and government administrators has been focussed on primary education or college-level training. Inadequate attention has been given to the many "middle-level skills" and training for them to provide the sub-professional, vocational and trade education which is urgently needed in most less developed countries.

3. The kinds of international exchange programs in existence do not always reflect the priorities within the total development program of the country. This has meant devoting scarce educational and training resources to low priority needs, and a redundancy of highly trained (and dissatisfied) personnel in some fields.

4. A major research effort is necessary to pull together and to integrate existing knowledge about the process of change, to reveal differences in existing theory and practice, and to test promising leads. Such a research effort can provide the basis for improved training, operating procedures, and policy formulation.

5. Evaluation is still a much neglected area, but should be thought of primarily as a method of learning, and as a means for administrative control. Objective evaluation as a constant process, can be a powerful tool for program improvement when linked with research.

6. Considerable lip service throughout the Conference was given to the importance of human resources, both as the principal means for achieving development and as the object of such development. In the context of these sessions, this stimulated frequent references to "the need for taking into account the local social and cultural factor in programs of transfer and adaptation of technology." Nevertheless there was little said about how these should be taken into account. It is not enough to agree that each situation is different; it is still necessary to discuss the range of strategies and techniques for taking local culture into account, and how they can be carried out in action programs.

7. Means for making technical materials readily available world-wide, and to the less developed countries in their own languages, need further exploration. There were unresolved problems of the high cost of translation and publication, copyright policy, and the separation of useful technology from misleading advertising.

Recommendations (informally suggested by delegates at the Conference)

1. That suitable types of training and facilities be established to focus on training in the transfer of technology. This should provide training in communication theory and techniques, analysis of local cultures, and study of the ways in which attitudinal or other sociopsychological obstacles to technological improvement can be overcome.

2. That there should be set up an improved system of coordinating the "external" agencies which offer help and services to developing countries. This would reduce competition and "project-hunting," reduce duplication of efforts, and clarify sources of assistance to the less developed countries.

3. That each country should establish a mechanism, either an institution or a system for coordinating external assistance.

4. That country programs of international exchange and training be geared to national development plans which would include specifications and priorities for local as well as foreign training. It was also recommended that plans for international exchange programs should be developed by cooperative study groups which include representatives from countries which will be expected to provide training.

5. That private industry be encouraged to expand its own programs of training in management, particularly in small industries, and in trade skills needed within developing countries.

6. That special attention be given to transfer of technical knowledge and to research in tropical areas where so many of the less developed countries lie, and which have received less study than temperate climate regions more typical of the industrialized nations.

7. That some kind of clearing house function be established to help inform developing countries of new technological developments, transfer techniques and new programs. A majority of less developed country representatives at these sessions expressed a preference for bilateral programs of technical assistance and implementation of action programs, however.

8. That either a new international organization or an improved multilateral system concerned with the stability of prices of raw materials moving in international trade be set up. While this is not strictly a problem of applying technology, it illustrates two important facts: one is that the problems of science and technology cannot be isolated from those of international institutional arrangements and markets in the development

process; the other is that fluctuations in commodity prices have greater economic impact on many countries than the amounts of foreign aid they receive.

9. That the bilateral and the multi-lateral assisting agencies systematically analyze their own experience in international exchange programs and the transfer of knowledge for development, studying their failures as well as their successes, as a basis for improving future programs. More importantly, that research and evaluation be built into current and future programs, so that the scientific method underlying the development of new science and technology can also be used for improving the transfer and application of such knowledge.

10. That universities and research centers be drawn into the research and evaluation effort both to provide the necessary skills immediately needed by less developed countries and assisting agencies in formulating plans and testing improved programs of transfer and application of technology, and to help scientists and "appliers" in the less developed countries.

General Session

Officers

Chairman—Amb. Emilio Calderon Puig
(Mexico)

Secretary—Mr. Stephen Awokoya (Nigeria)

U.S. Participants

Mr. Frank M. Coffin

Dr. Margaret Mead

1. The meeting was opened with the expression of general views that private investment in developing countries should not confer special privileges on investors, that labor could be made a source of capital when properly used, that international trade should not be made to operate against the interest

of primary producers, that the resources of the international bank should be more accessible to underdeveloped countries and that follow-up action should be undertaken after the Conference to prevent frustration among the underdeveloped countries of the world.

2. The Secretary-General's Report was then introduced. Attention was drawn to the necessity of basing international cooperation on the needs of underdeveloped countries in the major fields of planning, manpower, agricultural and industrial development. Problems facing underdeveloped countries as well as advanced nations in the field of international cooperation were also surveyed. On the one hand, underdeveloped countries experienced a resistance to scientific change and a dearth of trained manpower; on the other, advanced nations had to live with the competition between the great powers, astronomical military expenditures, the dominance of atomic research, the demands of foreign trade, and the scarcity of scientific and technological manpower for peaceful purposes. All these situations affected the pattern, magnitude and effectiveness of international cooperation. The channels of foreign aid and the mechanism of its administration also involved a body of problems which required progressive attention. The subjects of the four special sections dealing with factors facilitating technological changes, international scientific cooperation, coordination of technical assistance with national development programs and scientific documentation were also outlined. The primary problem of international cooperation was the avoidance of a thermonuclear war. In addition, international and regional plans must be formulated on the basis of world population becoming 6,280 millions in 2000 A.D. and necessitating serious problems of food, shelter, health, clothing, transport, communication, industry,

trade, defense, government and administration. The most opportune moment for laying the foundation of international effort was, therefore, the beginning of the Development Decade.

3. Oral presentations were made by delegates from France, Spain, United Kingdom, United States of America and Union of Soviet Socialist Republics. Sixteen other speakers participated in the debate from the floor. The following points emerged from the debate.

4. As regards Planning, several speakers stressed the fact that the government and the people must collaborate in formulating development plans if maximum cooperation was to be achieved. The advanced nations and the developing nations must have a common objective and work together, otherwise success might not be achieved and mutual charges of intervention or ingratitude might follow. Advanced nations could assist in planning scientific and engineering institutions, in setting up research laboratories, and in building industrial plants and standardization centers. For industrial planning to be realistic, it must be based on an inventory of natural resources.

5. In the field of Manpower Development, various speakers emphasized the importance of investment in education. Although studies in the ancient universities had helped in the past, new national and regional universities must be opened in order to deal with larger numbers and adopt modern methods of instruction. Training centers should also be opened to train skilled workers, technicians, scientists, engineers and technologists. Training in research techniques should be fostered and not await the achievement of universal primary education and an extensive facility for secondary and

higher education. Such research establishments should be located in developing countries in order to quicken the rate of their development. The capital and recurrent costs should be distributed between the participating governments on an equitable formula. Further, many speakers laid stress on the fact that industrial development depended on the training of national cadres, consequently every effort should be made to give scholarships to students from underdeveloped countries to study in advanced countries. A note of caution was sounded in regard to regional universities as regards the language of instruction and the acceptability of qualifications acquired in such institutions. The view was also strongly expressed that technical assistance officers engaged on specific industrial or agricultural projects should not regard the training of local substitutes as of secondary importance, but give primary significance to such schemes and even ensure that further training was given in industrial plants in advanced countries.

6. The establishment of bibliographical and documentation centers was also emphasized by a number of speakers. It was felt that these centers should adopt an international decimal system in the classification of scientific documents. They should centralize their activities in the initial stages before expanding into specialized fields. After collecting and collating scientific and technological documentation, they should distribute them to educational institutions, industrial establishments, and research centers.

7. A number of speakers differed from some of the views expressed in the Secretary-General's Report. One speaker could not agree with the statement that the existence of mankind was being challenged by the exponential growth of science and technology, but felt that the present advance would lead

to the flowering of mankind. Various speakers hoped that general and complete disarmament would increase the scale of international cooperation by releasing funds and scientists for peaceful pursuits. A few speakers felt that there was no need to establish any new international agency to look after science, technology and industry, and that if all technical assistance activities were unified, the major need for coordination would be satisfied. Another speaker stated that international cooperation was not being taken seriously in underdeveloped countries because the magnitude was small and the man-in-the-street knew less of it than of some schemes of bilateral assistance. It was suggested that more information should be given to school children and the general public about United Nations work.

Comments of a general nature were made by many speakers. It was said that technical assistance was a two-way traffic from which both donor and receiver profited. A comprehensive approach should be adopted in technical assistance and effort should not be concentrated on science and technology alone, but on the social sciences as well. It was stated that culture, unlike technology, could not be transferred but adapted. Under present day circumstances, it would be necessary to call into play a new sociology which could deal not only with modern science and technology, but also with the cultures of emerging nations. Further, modern technical assistance called for a new type of professionalism characterized with a catholic interest in planning and people, and with ability to implement, evaluate and coordinate programs.

9. As regards political issues, practically every speaker stressed the importance of real partnership and genuine cooperation in which the sovereignty of the participating nations were scrupulously re-

spected. Some felt that undue economic and financial advantage at the expense of the underdeveloped nations must not be sought. Every effort must be taken to avoid any interference with the domestic affairs of the underdeveloped country. For this reason, the greatest care must be taken in selecting technical assistance officers. Fear was also expressed about attaching political, economic and military conditions to technical assistance.

10. While agreeing that the economic objectives of development plans must be promoted by technical assistance, several speakers pointed out that the regional economic commissions in underdeveloped countries must play an increased role in the economic development of their areas. It was felt by some that there was too much overlapping in the United Nations family, that many programs involved considerable administrative expense, and that if a lot of delay was avoided through development of responsibilities to economic commission, substantial gain would result, and efficiency and effectiveness would increase. In addition, experts from underdeveloped countries should increasingly be associated with United Nations work. Fear was also expressed about the unwisdom of adopting an outdated technology in a technical assistance program, as it would make more difficult the attempt to narrow the technological gap separating developing nations from the advanced. There was considerable agreement among speakers that a great deal of development could be effected through joint programs of researches between countries at the same level of development and in the same geographical areas. Advanced nations could assist in drawing up an inventory of natural resources and many joint programs of industrial development and research could be promoted. Research institutions like CERN

and DUBNA were results of such intergovernmental collaborations. Such centers could tackle not only applied but also fundamental research. Of considerable economic significance was the tendency to limit financial assistance to major industrial projects of a monopolistic character. One speaker felt that such a practice would eventually cause tension as it was a form of neo-colonialism. Besides, unless high-level manpower were trained and made available, large-scale industrial plants would not promote permanent development and improve the social life of the people.

11. Many speakers stated that in the field of commodity trade, underdeveloped countries suffered exceedingly, losing through trade much more than they gained in aid. They hoped that the imbalance would soon be rectified through international action.

12. The need for a new international agency devoted to science, technology and industry was emphasized by a number of speakers. Considerable importance was also attached to the immediate role which regional intergovernmental bodies could play what assistance from the United Nations family could do to such intergovernmental organizations. Some speakers gave examples of fields in which such cooperation could prove successful. Those fields included power, university development, natural resources survey, technological research, regional transport and telecommunications network, agricultural and medical research, cartographical, hydrological and meteorological services.

13. The significance of national physical laboratories in the industrial development of a country was emphasized especially as regards its establishment of legal standards of weights and measures, and the physical measurement of such things as noise and radiation. From a central laboratory

thus established, specialized ones could branch out into other fields of science. International cooperation could usefully serve these purposes.

Chronological List of Speakers for Session J General

1. H.E. Mr. Emilio Calderon Puig, Mexico
2. Mr. Stephen Awokoya, Nigeria
3. Prof. F. Laugier, France
4. Prof. J.M.O. Navascues, Spain
5. Dr. I. Romanov, U.S.S.R.
6. Sir Gordon Sutherland, U.K.
7. Mr. F.M. Coffin, U.S.A.
8. Dr. P. Lazar, Hungary
9. Acad. E. Kamenov, Bulgaria
10. H.E. Mr. Paonan Cheng, China
11. H.E. Mr. M. Bartur, Israel
12. Dr. S. Siddiqi, Pakistan
13. Dr. M. Makagiansar, Indonesia
14. Mr. M. Mohtadi, Iran
15. Mr. C.S. Christian, Australia
16. Dr. S.A. Huzayyin, U.A.R.
17. Dr. Margaret Mead, U.S.A.
18. Mr. C. Chappuis, Switzerland
19. Mr. M.G. Ferreira, Portugal
20. Mr. V. Stan, Romania
21. M.J. Stojković, Yugoslavia
22. Mr. E. Gannage, Lebanon

Specialized Session

Methods for Stimulating Technological
Change

Officers

- Chairman—Acad. V.F. Kuprievich (Byelorussian SSR)
Rapporteur—Prof. M. Destanne de Bernis (France)
Secretary—Stephen O. Awokoya, Nigeria

U.S. Participants

Dr. Harold Lasswell
Dr. Hollis Peter
Dr. Allan Holmberg
Dr. Franklin Edwards

The report of the Secretary-General suggests that during the discussion on "methods for stimulating technological change," three groups of problems should be considered:

1. The obstacles in the way of technological change
2. The factors facilitating this change
3. The strategy of stimulating this change.

In fact, the discussion was oriented around two large themes: (a) the obstacles in the way of technological change, and (b) the means for bringing about this change, among which due consideration should be given to international cooperation.

(a) The obstacles in the way of technological change

Each of the speakers recalled the obstacles enumerated in the report of the Secretary-General (cultural, political, economic, social, administrative, financial, etc....). But four specific obstacles were emphasized:

(1) Imperialism, even disguised as neo-colonialism, constitutes a means for the rich countries to brake the technological development of the newly independent countries;

(2) Nepotism, which prevails in certain young countries and which requires that certain positions are given to the sons of governors or other leaders, thus neglecting the better talent;

(3) Social obstacles, which were singled out for special attention: many speakers pointed out the relationship between technological changes and social changes, although not inscribed on the agenda (one speaker emphasized that certain technological changes

were possible without modifying the cultural level). The psychological and social resistances arising from a respect for tradition were underlined (which resulted in educational priority being stressed).

It was also pointed out, particularly in the field of medicine, that it was indispensable to take into account the specific social conditions which one wants to change by technological innovation.

Finally, the modification of social structures by agrarian reform, which means adaptation of these structures to productive forces and introduction of the rural population to progress, has been presented as a prerequisite to all technological change.

(4) Political obstacles were not overlooked. While independence is a powerful stimulus to social and technological change, it is still necessary that the political groups in power (landowners, export-import merchants) or other dominant groups are not opposed to the social reforms indispensable to scientific and technological progress. It is necessary to determine the forces favorable to change and gain their support. The elements opposed to progress must be overcome.

Now a consideration of the second group of questions is in order—the means for bringing about change.

(b) Methods for achieving technological change

With the exception of one speaker who was apprehensive over the errors committed by the underdeveloped countries, many speakers emphasized the opportunity offered to the underdeveloped countries to be able to avoid the mistakes made in the past by the countries which are today developed. It was also pointed out that the latter had to develop by their own efforts while the former were in a position to benefit by the assistance of the developed countries. In addition, the process of independence makes for

the achievement of political maturity much more quickly.

At this point, all the observations made can be regrouped under three main headings:

1. The importance of educational methods and scientific research

Of course, technological progress could be imported (with a certain amount of filtering), but this could be dangerous and lead to real dependence. It would be better to have the level of technological achievement determined by the extent of scientific knowledge.

By the same token, it would be possible to send all students abroad for training, but it is important that they are educated in their own country. The students who go abroad to study must form the future professional crops of the nation.

As for education at the base, if one speaker has expressed his apprehension over the mounting costs of education, several others have emphasized the urgency of widespread education and one of them spoke of a priority for education.

Pedagogical methods were also discussed: it is not only a question of a change in technique, but of a change in learning methods. Perhaps it is necessary to resort to special textbooks; on the other hand, care must be exercised regarding "accelerated programs."

The importance of this major problem—training the future generation—cannot be overemphasized.

2. The role of the State

The role of the State has been stressed many times before. It goes without saying that it is responsible for providing educational facilities. But it must also:

Coordinate and organize scientific research (Specific experiments such as the one of the Republic of Uzbekistan which has been described);

Ensure a close link between the plan for agrarian reform and the industry which must supply the basic material for technological development in agriculture;

Plan the economic and technological development of the entire nation;

Organize the active participation of youth.

3. The role of international cooperation

International cooperation is indispensable if the underdeveloped countries are to benefit from the best technological achievements. To this end, it is necessary that each one agrees to speak in discussion while developing his own concepts.

The international organizations are doing their part (UNESCO) has plans for the study of social communication in two different cultures; reference has been made to the desire of 31 countries for an International Organization of Science and Technology) in addition to the assistance of the developed countries which, it has been emphasized, should be unconditional.

Finally, no one has forgotten that all this is possible only when there is peace between nations.

List of Speakers

1. Discussion Leaders

Mr. Malavolta (Brazil)
Academician Arifov (U.S.S.R.)
Mr. A.A. Sabet (U.A.R.)
Professor Dr. J. Van Baal (Netherlands)
Mr. G.H. McLaughlin (U.K.)
Dr. H. Peter (U.S.A.)

2. Speakers from the floor

Dr. Drago Baum (Yugoslavia)
Dr. R. Maxwell (U.K.)
Dr. Versluys (UNESCO)
Professor G. Destanne de Bemis
(France)

Mr. A.R. N'Diaye (Senegal)
Dr. L. Ligutti (Vatican)
Professor H.D. Kay (U.K.)
Dr. J. Burton (W.H.O.)
Academician Zhavoronkov (U.S.S.R.)
Mr. A.A. Sabet (U.A.R.)
Mr. Sumintawikarta (Indonesia)
Dr. Sene (Senegal)

Specialized Session

Scientific and Technological Documentation,
including the Problems of
Language and Terminology

Officers

Chairman—Prof. Vincente Gomez Aranda
(Spain)
Rapporteur—Sir Thomas Scrivenor (U.K.)

U.S. Participants

Dr. Harold Lasswell

1. The session discussed the documentation of scientific and technological information and its dissemination to the less developed areas, including problems of translation and terminology.

2. The subject fell under three main heads:

1. The process of disseminating information;
2. Problems of organizing scientific documentation services; and
3. The organization of national documentation centers.

3. With regard to (1), it was agreed that communication was largely a sociological and educational problem. The question of language was naturally involved. The need was stressed for the use of local languages for communicating information at the lower technological levels, particularly in industry. At the higher levels the medium of com-

munication should be one of the recognized scientific lingua franca. At that level it would in many cases be necessary to develop and establish appropriate terminology. There was some difference of opinion as to whether this was the proper task for linguists or for scientists. But it was agreed that once the terminology had been worked out, its adoption should be general.

4. Ideally, a documentation service should be comprehensive and active. The role of the less developed areas would be passive to begin with. But it was desirable that they should play an active part as soon as possible, mainly by contributing in suitable form the results of their own research. A documentation service should be active in the sense of making itself well-known. Many potential users were unaware of the scope and even the existence of such services; and it was important that individuals and institutions that might benefit from the use of such services should be fully informed of their existence. The principal vehicle for the dissemination of scientific information was the abstract journal; and the informative abstract was likely to remain the most important source for less developed areas unless or until major library facilities could be built up. There was a particular need for information about industrial engineering products, which at present was restricted almost entirely to manufacturers' advertisements.

5. The production of abstract journals raised a special problem of translation. Those countries that used one of the working languages of the United Nations Specialized Agencies enjoyed an advantage over others. Extensive translations into some of the other major languages would help the countries directly concerned; but they would be of no wider interest; they would be very expensive; and they would raise problems of terminology in an acute form. The publication of original

work in one of the principal world languages, accompanied by an abstract in at least two others, would permit earlier dissemination of information.

6. With regard to (2), no documentation service could operate efficiently without adequate library facilities and adequate trained staff. Any country, of course, would have to make its own internal arrangements for the dissemination of information, but this was not the same thing as setting up a documentation service aiming to cover world literature on a branch or branches of science. Such coverage could be achieved only with the help of massive library facilities. The Commonwealth Agricultural Bureaus were established nearly 35 years ago to provide an information service in the agricultural sciences. The countries of the Commonwealth were satisfied that a single cooperative service would be both cheaper and more efficient than a number of national services. The field covered was large, although there were others larger, and to achieve something like world coverage, it was necessary to scan 80,000 papers a year in 30 - 40 different languages at a cost of about half a million pounds. The cost would be very much greater but for existing library facilities in universities, research institutes and national libraries. Without such facilities, documentation on such a scale would be impossible. The most important problem was not the multiplication of documentation services, but the coordination and rationalization of the numerous existing ones. The United Nations Educational, Scientific and Cultural Organization (UNESCO), International Federation of Documentation (FID), International Council of Scientific Unions (ICSU), and other bodies were already carrying out extensive surveys of abstracting services with a view to eliminating unnecessary duplication. At the request of ECOSOC (Economic

and Social Council), UNESCO had embarked on a survey that would take 8 - 10 years. A number of working parties would be appointed in 1963 to examine all aspects of documentation, including primary publications, abstracting journals, problems of terminology and mechanical storage and retrieval. Organizations interested in these matters would be invited to be represented on these working groups. UNESCO has already assisted in the establishment of national documentation centers in many countries; these were national in the geographical sense; in operation, they were more regional in character insofar as their services and the scope of information dissemination were concerned.

7. At the seminar in Cairo, October 1962, organized by UNESCO, the participants unanimously agreed that the Arab League, UNESCO, and the United Arab Republic consider the question of converting the National Documentation Center of the United Arab Republic into a regional center for the Arab countries and Africa. This proposal is being examined but no decision has yet been reached.

8. The question of copyright was raised and it was suggested that UNESCO should take up the problem of the infringement of the authors' rights in such matters as translations, copying, etc.

9. With regard to (3), the documentation centers were by function not only international but also in many cases interdisciplinary and inter-lingual. International cooperation was scattered and in need of coordination. The main problem concerning national documentation centers, apart from the problem of library facilities, was the provision of trained staff. Both linguists and scientists were needed; and for some time to come, in the less developed areas, it was likely that the first call on the skills of the scientists would be for the more immediate

requirements of research and of applied science. In the meantime, existing documentation services were available, and in some cases were also in a position to provide advisory and identification services.

10. In establishing a national documentation center in less developed areas, there were 4 major requirements:

1. Timing of its establishment and the definition of the scope of its services in relation to research organizations in the area;
2. Training facilities, whether local or abroad, for personnel;
3. Finance—the cost was likely to be substantial and to begin with, it might be advantageous to simplify the scope and character of the information service for purely budgetary reasons;
4. The availability of a standard accepted terminology, and the early compilation of multilingual glossaries to be revised as and when necessary.

Chronological List of Speakers

1. Mr. J. Parga Nina	Brazil
2. Dr. P.R. Brygoo	France
3. Dr. S.H. Zaheer	India
4. Acad. S.U. Umarov	U.S.S.R.
5. Dr. H.D. Lasswell	U.S.A.
6. Sir Thomas Scrivenor	U.K.
7. Mr. P. Paillat	France
8. Mr. D.A. Lara	Spain
9. Dr. J.B. Cuyvers	Belgium
10. Mr. A.A. Sabet	U.A.R.
11. Mr. C. Chappuis	Switzerland
12. Mr. A. Perez-Vitoria	U.N.E.S.C.O.
13. Mr. A. Grahl-Madsen	Norway
14. Miss I. Leitch	U.K.

Specialized Session

Technical Exchange and Technical Cooperation Programs: Their Coordination with National Development Policies

Officers

Chairman—Dr. E.R. Walker (Australia)
 Rapporteur—Mr. Andres Lara-Saenz
 (Spain)

U.S. Participants

Dr. Allan Holmberg
 Dr. Harold Lasswell
 Dr. Hollis Peter

One of the characteristics of this Session was the liveliness and interest of the statements made by the delegates. After the five Discussion Leaders had spoken, as many as 18 delegates, the list of whom will be found attached to this Report, took the floor.

On the whole, the delegates' remarks fell into two categories: the ones dealt with their experience on the subject of technical assistance itself and spoke of the difficulties involved in a spirit of constructive criticism, while the others discussed principles and ideas, mainly in reply to the questions formulated in the Report of the Secretary-General of the Conference for this Session. Since the criticisms were confined mainly to pointing out deficiencies which should not have occurred, we thought it better, to avoid repetition and gain in clarity and concision, to group them together so as to constitute parts of the replies to the general questions formulated for the Session.

We will, therefore, repeat the questions, and give in reply what we have picked out from each of the statements as particularly concerning them.

1. What must underdeveloped nations do to promote technical assistance?

Let us begin by noting that the majority agreed that it would be better if technical assistance were called technical cooperation, as the term had more direct reference to the real spirit which should preside over the scheme. Under-development was a world-wide evil affecting us all, and to the abolition of which all countries should contribute.

The general opinion was that the first thing to be obtained was a concrete idea of requirements. These should be clearly defined and form part of a plan so that priorities might be established and overlapping avoided. In some cases the countries would be in a situation to make their own plans; in others it would be necessary to have the assistance of foreign experts.

In any case, it was considered wise to institutionalize planning in the applicant countries for two reasons: to facilitate the integration of the plan (independently of the pressure groups in the country) and, on the other hand, to simplify relations with abroad.

On the question of priorities, there was a marked preference for those projects with economic results, especially in agriculture, where production surpluses could facilitate the financing of new schemes.

Where possible it was a very good idea to designate the country, institution and, in addition, the persons most suited for the cooperation plan.

Special attention should be given to the availability of a suitable human potential not for planning and taking part in a cooperation scheme, but also to give it continuity, permanence and subsequent encouragement. This point was so important that it was in itself alone one of the main items to be met by the countries taking part in International Cooperation: the selection of the personnel to pass on knowledge and techniques covered by the technical cooperation schemes being of the utmost importance.

2. What should advanced nations do, bilaterally and multilaterally?

Before going on to the facts of bilateral or multilateral action, let us run over the general ideas expressed on the position of these countries in relation to technical cooperation.

Cooperation was a two-way problem and on the one side as on the other, had to do with individuals.

There had, therefore, to be mutual understanding. For this it was necessary to know the society and the culture; national traditions, philosophy and the fundamental objectives of the country concerned; to understand its difficulties and respect its institutions, avoiding all interference in internal political matters.

Keeping these ideas in mind, let us group together the functions required of the advanced countries: (a) preparation of programs; (b) selection of experts; (c) execution.

(a) Preparation of programs

This should be carried out wherever possible in close cooperation with local experts. It would be very helpful if countries could state their potentialities and availabilities for assistance, both economic and in equipment and personnel.

Objectives should be determined with care and the functions of the experts laid down in each case. Preparation time should be reduced to the minimum so that plans should not become out-of-date.

Planning should be flexible. Results are more effective and encouraging when solving concrete problems.

It was advisable to balance economic availabilities, avoiding excessive salaries which could adversely affect equipment and material.

(b) Selection of experts

Apart from their qualifications, they must be persons inspired with the purpose of

their mission. They should be neither rigid nor dogmatic, but capable of adapting to local conditions. They should identify with the aims and ideals of the assisted country. It was not a question of theoreticians but of men of action and experience and the time they spent in the assisted country should bring it gains both in the work done and in the instruction imparted to local collaborators. Those seeking to make their position into a permanent post should be avoided and in many cases it would be wise to choose young men who had the advantage of being more adaptable, stronger in health and better able to work with young colleagues.

(c) Execution

Planning should be capable of adaptation to some extent to developments, and complete rigidity should be avoided, the suggestions of local assistants being accepted so that real working teams could be formed.

Special attention should be given to continuity in planning and its progress should not depend exclusively on the presence of the expert. Where convenient, arrangements should be made for visits at regular intervals for checking and advising on the development of the plan.

As to whether bi- or multi-lateral agreements were better, experience had shown that in general bilateral agreements were more effective, though the multi-lateral system provided for more opportunities.

3. What responsibility must be assumed by the regional economic commission of the United Nations in the under-developed areas and how must their relations be governed as regards all the agencies of the technical assistance?

All recognized the important role these commissions could play, both for cooperating in the preparation of plans, the selection of experts and in making economic estimates, for either party.

On the other hand, they could facilitate the information of inter-governmental organizations between the countries requiring technical cooperation.

4. How can the United Nations family improve its technical assistance program to be of greater benefit for the under-developed countries?

The agencies of the United Nations could assist in channelling the demands by the most appropriate channel and help many countries that failed to obtain assistance through lack of preparation in presenting their requirements in a clear form and through the proper channel. This was due in part to the diversity of the agencies and assistance schemes of the United Nations which brought up once more the question of overlapping and the demarcation of competencies.

In general, the agencies should act with rapidity on applications and be more flexible in their contacts with countries.

5. Is the world ready for the full implications of international scientific diplomacy? If so, what practical steps must be taken to create it?

In general, this point was barely touched on and those that did, agreed that the term was inappropriate. In its place, some proposed the creation of a High Commissariat of the United Nations, in accordance with Article 22 of the Charter.

6. How are the financial implications of the United Nations Development Decade to be met? What sacrifices must be made by all the nations in the world to achieve its objectives?

There was no direct answer to this question and it can only be said that from the statements made, it was clear there was a marked interest in contributing to solving the problem of under-development.

7. What organizational machinery must be created within the United Nations family

to make information on sources of aid reach the under-developed countries that need them?

It was almost unanimously agreed that before setting up any other organization, it would be better to make use of what already exists. Some suggested the creation of a "clearing house" to receive all the requests for assistance and pass them on to the agency dealing with each category.

8. How is the United Nations to be strengthened to cope with its ever-increasing responsibilities?

This question, like the three previous ones, was hardly touched by the delegates, not only because it was a question of innovation, but also because it was more a matter for governments than for delegates, most of whom were technical experts.

Chronological List of Speakers

1. Mr. Awokoya Nigeria
2. Mr. Eichler Federal Republic of
 Germany
3. Mr. Loken Ghana
4. Mr. D'Alesandro Italy
5. Mr. Peter U.S.A.
6. Mr. Del Carril Argentina
7. Mr. Sabet U.A.R.
8. Mr. Baum Yugoslavia
9. Mr. Elliot UNESCO
10. Mr. Lefebvre Belgium
11. Mr. Hosbayer Mongolia
12. Mr. Harburger Israel
13. Mr. Tshilumba Congo (Leopoldville)
14. Mr. Nicholls Australia
15. Mr. Amagou Ivory Coast
16. Mr. Sene Senegal
17. Mr. Manyeza Ruanda
18. Mr. Grahl-Madsen Norway
19. Mr. Ramalanjaona Madagascar
20. Mr. Keating U.S.A.
21. Mr. Gomez Aranda Spain

22. Mr. Quik Netherlands
23. Mr. Real Switzerland
24. Mr. Lara Spain

Specialized Session

International Scientific Cooperation

Officers

Chairman—Academician Evgeni Kamenov
(Bulgaria)

Rapporteur—Mr. Raul Cardon (Argentina)

U.S. Participants

Dr. Harold Lasswell
Dr. Harrison Brown

Academician Kamenov (Bulgaria) in a short opening speech, brought out vividly the importance of the subject to be discussed, pointing out that the question of international scientific cooperation lay at the very heart of the Conference and that its aim was to achieve a broader and more effective scientific cooperation between the nations for the benefit of the countries in the process of development. For the latter countries, scientific and technological cooperation was of vital importance. Cooperation in this field was, in general, more necessary every day, in virtue of the growing importance of the role of science in the life of contemporary society, the scope of research and the magnitude of the resources it required as well as the strength of the economic and cultural links between the different countries.

Academician Kamenov also pointed out the essential conditions for the development of this international cooperation, viz.:

1. That aid to a country in the process of development should be made with the aim of contributing to its scientific and economic progress and speeding up its general rate of development;

2. That this cooperation should contribute to the political and economic independence of the assisted country;

3. That it should be given at the present level of science and technology.

Dr. A. de Shalit, the Secretary of the Session, on his part, made a critical appraisal of the various aspects of international cooperation and put forward a number of observations on its later evolution. Analyzing the various forms of scientific cooperation, from the point of view of its content, he distinguished between: (a) the exchange and sharing of information and knowledge made through publications, international meetings and personal exchanges (journeys, missions of foreign experts, etc.); (b) the coordination of scientific and technological work which might arise out of the complexity of the problem to be investigated, the high costs involved, or other factors; (c) cooperation which consisted in the transfer of funds to the so-called "International Development Plan" which he preferred to the usual expression of "external aid," since it gave an international character to scientific and technological development, the progress of which, in whatever part of the world it took place, was for the advantage of all. He remarked also that it was essential that any aid from abroad should not involve obligations for the assisted countries which would result in heavy charges.

Lord Casey (Australia, Vice-Chairman of the Conference), Mr. M. J. Agoshkov (U.S.S.R.) and Professor Harrison Brown (U.S.A.) acted as Discussion Leaders and the 13 speakers on the Chairman's list, whose names will be found attached to the present Report, took part in the subsequent debate.

These speakers dealt with the various forms of international cooperation: bilateral, regional and multilateral, intergovernmental

and non-governmental, recognizing the value of all of these within their own sphere and in relation with one or the other category of objectives. Fear, however, was expressed that the proliferation of international organizations might lead to overlapping and duplication of work, while on the other hand, there might remain particular sectors for which scientific cooperation and technological assistance would be valuable, which were not provided for by any specific institution. To avoid these risks, various speakers urged the need of ensuring proper coordination between the existing organizations in the field: it was also said it would be useful if an international organization, e.g., UNO or UNESCO, kept an inventory of existing organizations and gave information about their organization, the assistance they could give and other aspects.

In this connection, it was suggested that for the purpose of organizing this coordination, a new international agency should be set up with branches in a number of different countries: the proposer suggested that the agency should be a subsidiary organ of the General Assembly of the United Nations, under the terms of Article 22 of the Charter. The new agency would have the task of channelling applications and offers of assistance, keeping a register and giving information on requirements and availabilities, coordinating efforts without monopolizing them, acting as a documentation center, etc.

However, the view was also expressed that the existence of a large number of organizations was, in spite of the risk of overlapping, a good thing, since it diminished the effect of failures and errors which inevitably occurred. That was to say, that the omissions and mistakes of one organization could be corrected in practice by the work of another.

In the discussion on the international organizations for scientific and technological cooperation, the importance of the non-governmental organizations and those of a regional character was pointed out. With regard to the former, the work of which, it was felt, was insufficiently appreciated and realized—the work of ICSU and the Scientific Unions which were its members, and its special committees (SCAR, SCOR, COSPAR) were given special mention. It was under its auspices that the International Geophysical Year had been and the forthcoming International Year of the Calm Sun was being organized; it had called together a large number of scientific congresses which enabled the scientists of the whole world to become personally acquainted. Mention was also made of the programs of very wide scope which were being worked out in the ICSU and also in UNESCO and other specialized organizations and which could have a profound effect on the developing countries (international programs in biology, the sciences of the atmosphere, and the International Hydrological Decade).

Cooperation on a regional basis was considered particularly advantageous for the developing countries as it brought together their human and natural resources in a common and coordinated effort within the boundaries of a geographical area (if not also a cultural and ethnical one), integrated them and made possible substantial advances in a relatively short time. On this point, it was shown that it was better to make use of an already existing national institution as the basis of any international scientific cooperative undertaking. It could be made with success provided the institution had reached the necessary degree of maturity, was known for the scientific work it had already carried out and for the number of high level research workers which it possessed and which guar-

anteed its capacity to maintain a satisfactory level of original production by its own efforts. The advantages of this method consisted in avoiding the expenditure of effort necessary when an institution was created ex novo and in offering the possibility of abandoning a scheme of cooperation when this did not give the results expected from it.

Various speakers brought out the importance of international cooperation in and for the African Continent. The existence of a number of organizations, both bi- and multi-lateral or created by an individual Power (CCTA, OAMCE, ORSTOM, ORANA, Association of African Geological Services, etc.) was mentioned: these bodies had over a number of past decades, carried out very good work studying the various aspects of conditions in Africa, and accumulating valuable material. The need of coordinating their work was urged and the desire to see it develop still further with the support of other organizations, particularly the United Nations.

The special conditions in the African Continent and in tropical countries in general (climate, flora, geology and society) were also discussed, and it was pointed out that they formed a complex within which the natural interactions of cause and effect were much more complicated than in other parts of the globe: at the same time, for reasons of ecology and evolution, the facts of underdevelopment were exceptionally important. All this necessarily implied that scientific investigation in these regions had to adopt special types of method and organization and, in particular, the scientists who were going to work in them, required special training. This was a point that should be taken into consideration when drawing up schemes of international assistance.

Several examples of international scientific and technological cooperation in Latin

America were mentioned, such as the regional centers under the auspices of UNESCO (for Physics in Rio de Janeiro; Mathematics in Buenos Aires, etc.) and the movement started last January (meeting in Bogota called by the OEA) for associating the technological institutions in this part of the New World.

As was only to be expected, the discussion concentrated on the situation in the less advanced countries, the development of which could be very much speeded up by international cooperation in the field of science and technology. In this connection, the Soviet delegate attributed great importance to the experience gained in the Republics of the Soviet Union where they had seen the transformation of practically illiterate and unlettered peoples who had now been incorporated into a modern way of life, and in which science and technology were being applied and cultivated in a large number of institutes, faculties and academies.

On the other side, it was pointed out as essential for the effectiveness of external aid that the assisted country should give some guarantees: an appreciation of the importance of science and technology for development on the part of the authorities and civil servants, etc.; understanding of the mechanism of technical assistance; some degree of internal stability; a plan of scientific and technological development that bore some relation to the economic and general planning of the country. And it was repeatedly emphasized that in the logical order of priorities in these countries, particular attention should be given to studies on the existence and use of their natural resources.

The idea of proceeding to the creation of a new international organization for the purpose of giving assistance in particular in the field of technology was put forward by some of the delegates in this as in other sessions of the Conference. A Resolution of the

Cairo Conference on Economic Development was referred to as a precedent, and it was suggested that the new agency should fill the gaps to be found in the framework of international scientific and technological organizations; it was urged that the resources applied to this object should be increased. On the other side, reserves were expressed on the advisability and viability of this scheme and the existence of programs like that of the United Nations Special Fund, the Extended Program of Technical Assistance of the same Organization, and the work being carried out by UNESCO, the World Health Organization and other already existing international organizations was mentioned.

From all the statements, it became quite clear that it was hoped a vigorous impulse would be given to international scientific and technological cooperation in the conviction that it would contribute to the development of the less advanced countries and also to the establishment of better relations between the peoples and a better understanding between mankind.

Chronological List of Speakers

1. Rt. Hon. Lord Casey	Australia
2. I. Agoshkov	U.S.S.R.
3. Prof. Harrison Brown	U.S.A.
4. Luiz Cintra do Prado	Brazil
5. Mustapha Chine	Tunis
6. Adel Sabet	U.A.R.
7. Etienne Bernard	Belgium
8. Raul Luis Cardon	Argentina
9. Simon Pereira-Barrete	Senegal
10. Vasile Malinschi	Rumania
11. Oliverio Phillips	Colombia
12. Atle Grahl-Madsen	Norway
13. Maurice Bayeu	France
14. Alan Elliott	UNESCO
15. Kangre Langlo	WHO
16. Pierre Legoux	France

Section K: TRAINING OF SCIENTIFIC AND TECHNICAL PERSONNEL .

Summary

The topic "Training of Scientific and Technical Personnel" was established as a key-note and major theme of the Conference in the addresses at the second plenary session on the opening day. All but three of these speakers gave high usually primary, priority within national science policy to science education. Lord Casey of Australia expressed as a major point that national science policy should provide for a national science organization with major concern for forming scientific manpower. Dr. Marechal of France (substituting for Auger) expressed as a major recommendation for less developed countries the immediate initiation of training for a scientific elite. Dr. Bhabha of India said that the most important asset of advanced countries is the pool of trained manpower and that such training should be the first priority for developing countries. Dr. Blackett of the United Kingdom advocated that developing countries give high priority to the production of scientific manpower; he recommended that less developed countries must plan in the educational, technological, and social spheres since science will contribute to national goals only in the presence of such comprehensive consideration. Dr. Houssay of Argentina expressed as essential that funds be at the disposal of scientists themselves, not politicians or bureaucrats; he advocated that highest priority be given to the training of scientific manpower, he expressed himself forcefully on points considered in detail in the U.S. papers on science in general education; and

he focussed attention on the necessity to provide teachers of highest caliber. Dr. Wiesner of the United States gave attention to the educational objectives and programs of educational development which are pursued in the U.S. by NSF and NDEA. Mr. Frank Coffin, Deputy Administrator, A.I.D., also spoke of the tremendous importance to developing countries of educational programs stressing science. He commented that A.I.D. and its predecessor agencies had for many years supported education and training. He emphasized the necessity of making the planning for educational development an integral part of planning for overall economic development.

The necessity for increased amounts and quality of data relating to manpower resources and future needs for trained personnel was discussed. International assistance was recommended for the purpose of making surveys and forecasts in planning educational programs. Such projects, it was suggested, could most expeditiously be undertaken on a regional basis following the example of the OECD Mediterranean Regional Project.

There was a general consensus on the need for a literate population with understanding of science and technology. This point was given greatest emphasis by African delegates, who added that the science content of general education must be even greater in their countries than would be reasonable elsewhere because of the dearth of technological exposure in the present

African culture. While giving recognition to the need for "science literacy", most delegates from other countries expressed the objective of educating (as distinguished from training) the population to operate and develop a technological economy.

Persons immediately concerned with education at the primary and secondary levels seemed not to be well represented except as planners; consequently, the kinds of programs and projects directed particularly to this level tended to be discussed in quantitative rather than qualitative terms: problems of survey and assessment were raised and coupled with the need for training teachers in greater numbers. Both planners and scholars joined in giving recognition to the need for technician training but, unexpectedly, the less developed country delegates did not pursue this topic with the anticipated intensity.

Possibly because of the numbers of scholars in the delegations, great attention was given to post-secondary and higher education and the necessity for adequate, effective, and modern preparatory secondary education. It appeared to be a general consensus among scholars, with the possible exception of African delegates, that secondary education in preparation for university and other post-secondary science-based training constituted a major deficiency in present educational systems and a major gap in current educational development programs. Whereas the administrators of public education addressed themselves almost entirely to the quantitative problems of secondary education, which were a matter of concern also to the scientists, the latter typically were critical of the suitability of most present secondary science education as failing to reflect the content, concepts, and attitudes of modern science. African delegates, however, tended to be less troubled by this shortcoming of

secondary science education than with the problems of adapting texts and teaching aids to African conditions while maintaining scholastic standards effective in the metropolitan countries.

Significant recommendations and issues discussed include the following:

a. Mr. Rene Maheu, UNESCO Director General, recommended:

1. a major program within UNESCO to combat illiteracy, and
2. an International Institute for Educational Planning.

b. Dr. A. Shoeb (United Arab Republic), recommended establishment of international institutes in which scientists of advanced and developing countries would cooperate in research on critical development problems.

c. Dr. Mustafa Nuri Parlar (Turkey), recommended strengthening and expansion of science and science education activities in UNESCO.

d. Speakers who addressed the problem of manpower planning almost universally found need for greater amounts of manpower data and for the collection and reporting of data in a form more applicable to manpower planning problems than is typically available at present. All planning recommendations, except those by Soviet delegates, advocated that manpower plans be long-range and of a rather general and flexible character, and that their implementation be largely by indirect means; advocacy of specific plans and direct means was reserved for critical areas and short-term goals.

e. Giving expression to an underlying discontent with the character of present science instruction in general education, there were numerous recommendations for the conduct of educational research and development projects to provide:

1. greater and better exposure to science for students at all levels of

- general and technical education;
2. revision of curricula and production of new syllabi, texts, and teaching aids to present wholly modern science content, concepts, and attitudes through methods and topics suited to local conditions;
 3. strengthening and modernization of the teachers' understanding and presentation of science;
 4. application of recent findings in educational psychology and of new developments in educational technology.

f. There was consensus that the crucial figure in educational development programs is the teacher. Almost all speakers advocated production of greater numbers of teachers with greater training in science. A few directed attention primarily to pre-service training, but many emphasized needs for in-service training and retraining.

g. With respect to technical school training, there was agreement that this level of personnel is important to economic development and that greater numbers of technicians are needed, but there was little other consensus on the issues. While recommending that technician training must not be too narrow and that it must include practical experience, speakers failed to reach an area of agreement on:

1. the extent of theoretical and social (e.g., managerial, humanistic) education to be provided;
2. the relative desirability of short-term training based on complete general education as opposed to long-term training with general education included and slanted toward the area of specialization;
3. the breadth of occupational competence to be imparted to students;
4. the relative desirability that technician training be designed as ter-

minal education⁹ or as a channel providing substantial access to higher education.

h. Higher education was also a topic which drew divergent views, but these represented primarily differences in emphasis. There was substantial agreement on objectives and means of attainment, though alternative means often received lively debate. The majority of active participants seemed generally in agreement on the following points:

1. Indigenous institutions must be developed for undergraduate training to produce the cadres needed by the country. Where specialized faculty competence is lacking, foreign professors should be brought in to conduct specialized training and assist in the development of faculty competence.
2. While teaching is the primary purpose of universities in less developed countries, the development and maintenance of faculty competence requires the conduct of research activities.
3. While research activities should be oriented largely toward indigenous problems, latitude for discretionary research must be provided in order to strengthen and encourage faculty competence.
4. Research components must comprise a "critical mass" of personnel in order to promote research vigor and creativity.

General Session

Officers

Chairman—Dr. J.W.T. Spinks (Canada),
President, University of Saskatchewan

Rapporteur—None
Secretary—Dr. Rolando V. Garcia
(Argentina)

U.S. Participants

Mr. Frank Coffin
Mr. Ream
Dr. Ralph Tyler

The interest of delegates in this session may be judged by the time required (two full Conference periods) to accommodate those who wished to speak, as well as by the emphasis given to the theme of this session in the addresses at the second plenary session on the opening day of the Conference. The first period served to expose various views and positions, the second to refine these views and define areas of common concern. Despite differences in detail and in emphasis among countries in different stages of development, there was a substantial area of agreement that fundamental and, in some cases, massive restructuring and development must occur in the educational systems of most countries, with equivalent radical changes in the objectives and mechanisms of assistance programs and organizations.

As each level of education was discussed there was universally revealed a dissatisfaction with its existing form, content, and, in many instances, the extent to which its output met national quantitative needs. While advanced countries were not notably responsive to recommendations which would lead to a significant and substantial pooling of assistance resources, less developed countries' advocacy of stronger and expanded international assistance organizations, and their favorable regard for cooperative projects (e.g., OECD Mediterranean Regional Project), revealed a readiness on the part of less developed countries to pool their needs along with their own resources. This readi-

ness, which was more typical of scientists than governmental administrators, should probably be regarded in the context of the unanimous less developed countries' advocacy (more strongly expressed by scientists than administrators) that scientists play an expanded and more direct role in the formulation and implementation of policies and plans not only within developing countries, but also within assisting countries and agencies. There is underlying recognition among less developed country scientists that individual less developed countries in most cases cannot assemble the right distribution of highly qualified persons in adequate number to mount a suitably broad and deep attack on fundamental and pressing educational problems, with or without assistance from advanced countries or international agencies. Less developed country scientists appeared to recognize that individual advanced countries cannot spare an adequate number of experts of high quality and the appropriate distribution of competence to engage in essentially duplicative assistance projects to individual less developed countries. It is apparent that the problems faced by assisting countries and agencies in recruiting personnel for assistance substantially increased by capitalizing upon the readiness of less developed country scientists to join together in regional projects attacking shared problems.

Mr. Rene Maheu (UNESCO) discussed two fundamental conditions for development: "education in science," and "technology plus planning." He commended a UNESCO proposal for a new literacy program and a UNESCO plan for establishment of an International Institute for Educational Planning. He gave special attention to the deficiencies of universities:

1. technical and professional training is based on deficient secondary education;

2. universities of traditional structure give inadequate support to the science faculty; and

3. training abroad, though necessary, creates difficulties for the returning trainee.

He finds certain defects in the teaching of science in less developed countries:

a. emphasis on practicality interferes with the spirit of science;

b. insufficient emphasis is given to experimental methods owing to lack of equipment and teachers; and

c. teaching is technologically underdeveloped. In this connection he recommended three corrective measures:

i. team teaching and provision of assistants for teachers;

ii. increase use of, and development of improved, audiovisual aids; and

iii. initiation and expansion of teacher-training programs.

Mr. A. Babs Fafunwa (Nigeria), directed attention to three age groups and advocated establishment of a national service (comparable to a military draft, but requiring only part-time work) to implement his recommendations for the two older groups:

a. 6-12 years: primary school with three-part curriculum—science (comprising 50% of curriculum time), civics with health, and reading with writing;

b. 18-30 years: after-hours courses of trade training for literates and literacy training for illiterates;

c. 30-50 years: literacy training for the purpose of providing a literate home environment for children.

He referred to the current revolution in science teaching, but did not follow through with ideas for implementation in less developed countries.

Prof. Isaias Raw (Brazil), reported the evolution of a scientist-initiated, UNESCO-supported project for strengthening the sci-

entific experience of secondary school students. Initiated as a project to provide out-of-school "enrichment" through home science study and work by individual students, it proceeded to the development of materials and equipment (and the provision of scientific guidance in their use) for teacher-initiated extracurricular school activities under teacher supervision. Now, after teacher-initiated recommendations to school and ministry authorities, it is developing courses, materials and equipment for introduction into school curricula and is conducting teacher-retraining programs. Dr. Raw acknowledged the value to his projects of the examples and accumulated experience afforded by U.S. domestic projects of similar nature and purpose (see U.S. paper K/88 by Bowen C. Dees, "Programs for the Improvement of Secondary School Education in Science and Mathematics").

Prof. B. Schwartz (France), related the modifications in engineering training at his university (Nancy) which reduced the amount of training oriented to a specific technical job, increased the social studies content, and introduced social "practical work" in an industrial environment. He argued that engineers and other higher education graduates exercise employment functions which are largely managerial, and that these functions are best conceived as training of subordinate personnel through direction. Citing the U.S. World War II program of "Training Within Industry," he concluded that engineering and other managerial personnel in fact conduct adult education and should receive preparation for this function in their own training.

Prof. S.V. Rumiantsev (USSR), delivered comments on teaching problems and the function of higher education, related the evolution of Soviet higher education from the ad hoc faculties of Red Professors of post-civil war times to the present Soviet practice of

standard national curricula and the "combination of theory and practice," and glowingly described the Patrice Lumumba University.

Prof. M. Raziuddin Siddiqi (Pakistan), pointed out that:

- a. half-baked products are not the answer for less developed countries;
- b. specialization too early and too narrow is self-defeating;
- c. intensive effort by less developed countries must be made to create training opportunities at home because foreign opportunities are few and training abroad is not suited to conditions at home.

Prof. Raden Mas Soemantri (Indonesia), stated that a major problem in Indonesia is the acute shortage of engineers. He remarked that it is the function of engineering training to provide solid knowledge rather than existing technology. In the Indonesian situation, however, "general engineers" are impractical—the solution is to train engineers with a sound background, prepared for their jobs.

Mr. A. Chadli (Tunisia), advocated that there be a close relationship between teaching and research in higher educational institutions and that secondary education give solid training in science.

Dr. Albert V. Baex (UNESCO), reported a UNESCO project to encourage university scientists to participate in pilot educational development projects for the purpose of developing:

- a. teaching based upon encouragement of experimentation by students;
- b. self-instruction;
- c. short single-concept films;
- d. television teaching of science, supplementary to classroom teaching.

Specialized Session

Specialized Programming for Training at Higher Technical Institutes and Universities

Officers

Chairman—Academician Nikolai M. Zhavoronkov (U.S.S.R.)

Rapporteur—Dr. Elias Gannage (Lebanon)

Secretary—Prof. F.G. Torto (Ghana)

This session, perhaps more than any other in the K section, was marked by the high degree of personal interest and involvement of less developed country delegates. Participation by delegates from advanced countries tended to be either perfunctory or uncritically enthusiastic in describing the merit of a particular activity in which the speaker's own institution was engaged. U.S. attendance was nominal and participation was nil. In this circumstance, the primary value of the session lay in the illumination of the common nature of less developed country problems at the level of higher education as visualized by those who daily live with those problems, and in the substantial unanimity of sentiment among the less developed country speakers on the principles and measures requisite to the development of vigorous and effective institutions and programs of higher education. Diversity of view among less developed country delegates was revealed to be primarily a matter of emphasis, usually reconcilable, contrasting with the unreconcilable views expressed in the session on technician training. Arising out of points agreed upon, however, there were numerous unresolved questions.

Chairman Zhavoronkov opened the session with the theme that the new age requires scientists and engineers whose education is never ending. He was followed by Dr. Torto,

who outlined the problems to be discussed as follows:

1. Institutional specialization vs. breadth;
2. Training specialization vs. fundamental education;
3. Training of staff, participation of faculty in research;
4. faculty exchanges and training abroad;
5. facilities and equipment.

Prof. Viktor Leinz (Brazil), the first discussion leader, noted that in geology, both in field work and in research, Brazil had found equally unsatisfactory the utilization of foreign personnel, training abroad of Brazilian students and conversion of Brazilians from related fields. In 1956, new courses were initiated in Brazil with fundamental instruction given by indigenous professors, specialized instruction by visiting professors. In developing a cadre of indigenous research and teaching personnel, there is need for specialized advanced training abroad, but there is greater and more urgent need for foreign experts to work locally with faculty and faculty candidates. U.S. Point Four is helpful, but hard currency support is virtually essential to operate effectively. In each case, suitable arrangements must be made to minimize language problems posed by instructors and texts.

Prof. Antonin Bohac (Czechoslovakia), the next discussion leader, spoke primarily on the training of faculty for technical schools and of other contributions and assistance which staff of higher educational institutions can provide to technician training.

Prof. Rachel Shalon (Israel), then addressed the following themes:

- a. Engineering training must be conducted in contact with research activities, including activities in the basic sciences;

therefore, engineering training must be incorporated into universities rather than being conducted in separate technical institutes.

- b. In developing countries, professional faculties similar to the traditional European-style are needed since local industry is immature and cannot provide advanced specialized on-the-job training as U.S. industry can. She noted that her institution has established professional faculties, though the first two years of training are common for all engineering students.

- c. In developing countries, students need contact with industrial practitioners as well as with research workers.

- d. It is undesirable to separate research from teaching establishments.

Dr. S.A. Huzayyin (United Arab Republic), directed his remarks to two aspects of universities: structure and function. With respect to structure, he emphasized that universities must be self-governing and must operate in an atmosphere of academic freedom. He advocated that universities be organized by department rather than by faculty since this structure is more conducive to academic freedom, more encouraging to professional development and enterprise, and more economical (effecting a 30% saving in building and a 10% saving in staff). With respect to function, he made three points:

- a. The university is first of all responsible for the formation of responsible citizen leaders; in a developing country, therefore, teaching rather than research is a primary function. He indicated that developing countries should give more attention in their engineering curriculum to humanistic training for the total information of the individual. Noting that less developed countries cannot depend on training abroad, he advised that each should strive to provide for its students at least a first degree at home, but should exploit foreign opportunities for advanced

training as intensively as possible in order to develop indigenous high level professionals rapidly.

b. A second function, even in the least developed countries, is research. Probably, developing countries should place greater emphasis on applied research than is common elsewhere.

c. A third function visualized for university personnel in developing countries is the assumption of greater responsibility in national planning and policy than may be needed in advanced countries.

Prof. S. Mackey (United Kingdom), conceived of engineering training as now overlapping the social and humanitarian sciences to an even greater extent than the basic physical sciences. With respect to assistance activities, he advocated "sister university" relationships and commented that recurrent short-term transfers of faculty over an extended period may be preferable to long-term exchanges and quite possibly cheaper in comparison with results.

(Note: The following statements are drawn not only from remarks at this session but also from remarks made at an informal dinner given by the U.S. delegation at which the host was Dr. Roger Revelle.)

Dr. Mustafa Nuri Parlar (Turkey), raised the following questions:

a. How can the training of high-level scientists be accelerated?

b. In addition to concentration in a specific field of specialization, what other elements should be introduced into the educational process in order that the trained scientists and engineers may display the optimum degree of social responsibility?

c. Are there new methods developed for higher and advanced training so that it would be possible for university faculty to bring the trainee more readily and more surely to the threshold of creative science?

d. Must all of the faculty of a university be research workers as well as teachers; if so, how can we find lecturers for supplementary subjects and how can we give hope of promotion to those whose prime responsibility is routine teaching?

e. Should newly-established universities adhere to the traditional course structure, or should they install the core course structure following the MIT pattern?

f. Should all national universities be standardized and uniform or should they be diverse and different?

g. To what degree should universities concern themselves with applied research?

h. Should universities concern themselves with problems of secondary education?

He then made the following suggestions;

i. New universities should pursue research work immediately by taking local problems as much as possible into consideration.

ii. Teaching and research teams should be organized with experts from foreign countries and with local experts. Whenever possible, the experts from advanced countries should bring to the developing country their associated research students to form a strong and complete team to work cooperatively at all levels with the local team in teaching, establishing new laboratories, and developing research work; and to inculcate by example a fruitful attitude and approach to team research among their local counterparts. The foreign experts should normally remain in the local university for two years or more.

iii. The activities of UNESCO in science and science education should be strengthened and expanded.

Prof. Raden Mas Soemantri (Indonesia), reported favorably on the role played by American universities in helping to establish medical and engineering schools in Indonesia. Apparently, virtually all indigenous faculty have been assembled during this period. Dr. Soemantri emphasized the desirability of continuing "sister university" relationships between American and Indonesian institutions.

Dr. Rolando V. Garcia (Argentina), criticized the hierarchical character of traditional universities which encourages aloofness from critical national problems and in which personal development to full scientific stature and independent professional responsibility for teaching and research is virtually precluded by the position of the chair professor until the incumbent retires or dies. The vigorous individual of superior talent is seldom content with this situation and tends to seek employment elsewhere. Some university scientists, recognizing the repressive effects of this university structure, but powerless to change it, have succeeded in establishing research institutes completely independent from the universities, but staffed largely by faculty members. This proliferation of independent institutes cannot be considered as a satisfactory solution, but appears essential under present circumstances to hold talented personnel and assemble a "critical mass" at (though not within) the main universities. Competing for this talent is a proliferation of provincial universities, established for purposes of local prestige, and offering attractive part-time faculty positions, but without support adequate to provide acceptable training or research in science. Another deficiency of many less developed country universities, which dilutes the efforts of faculty scientists, is the size of the student body (excessively large in relation to the facilities and staff available)

and the poor preparation of the students. He advocates the establishment of much more rigorous admission standards than prevail at present.

Prof. J. Leite Lopes (Brazil), addressed the problem of developing competent faculty members. He gave considerable emphasis to the need to send promising students to other national or foreign institutions to undertake training in preparation for local faculty positions. Even undergraduates may be sent abroad in order to build faculty if existing faculty competence in the given field is lacking or unsatisfactory. Students of any level should preferably be sent to other national or regional centers of excellence if at all possible, rather than to the U.S. or Europe, since the conditions found at these centers will be more comparable to conditions at the home institution and since student interchange will promote future professional interchange. While specialized advanced training in the U.S. and Europe will continue to be needed, incomplete advantage is now taken of regional centers of excellence simply because a U.S. or European degree is more highly regarded by the trainee and, often, by his local sponsors. The most effective way of building faculty competence has been found to be through securing a visiting professor who will work with local faculty and students for a year and then return to his home institution accompanied by a student or two for further advanced training essential to the local faculty.

Prof. Isaias Raw (Brazil), like Prof. Gracia, found urgent need for improving the working conditions and incentives of the university scientist through measures to provide opportunity and support for devotion of full-time effort to the combined task of teaching and research. He regretted that many less developed country scientists found these conditions only abroad, primarily in the U.S.,

and that there was consequently an excessive tendency to work abroad for extended periods, sometimes permanently. He concurred that the visiting professor is the most effective means of developing faculty competence, but indicated that recurrent short-term visits were more feasible and very likely more effective than single visits of one year or more. Finally, he turned attention to the new university at Brasilia which he expects to be well-supported and developed to avoid the errors of traditionally-structured universities. Forward-looking Brazilian scientists are advocating that it incorporate the departmental system; that it emphasize research and graduate teaching; that it afford opportunity, freedom, and support for young faculty members; and that it adhere to high standards for admission and graduation of students.

Specialized Session

Specialized Training in Technical Schools and Means of Accelerating Formation of Scientific and Technological Cadres

Officers

Chairman—Dr. Tsung-Han, (China), Commissioner, Commission on Rural Reconsruction, Taipei

Rapporteur—Dr. Ewan Clague, (U.S.A.), Commissioner, Bureau of Labor Statistics, Department of Labor, Washington, D.C.

Secretary—Prof. F.G. Torto (Chana)

U.S. Participants

Dr. Harry C. Kelly

Dr. Alexander H. Leighton

Dr. Will M. Myers

This session illuminated fundamental differences of opinion. It refined, but did

not resolve, the issues of the topic. There was little homogeneity of view either within or among nations. The differences seemed to stem largely from differing concepts of the characteristics desired to be possessed by technicians. (E.g., the view that technicians should be trained to be fully competent to do a narrowly-defined job with only managerial direction on the objectives to be achieved, as opposed to the view that they should be trained to acquire the capability to become competent with additional training in new and unfamiliar lines of work, possibly changing over a period of time.) Presumably, participants came away from this session with the sense that the qualities desired in the end product of any particular type of technician training must be defined in given instances, and a training system designed to produce those qualities. If participants had not previously been aware that there are at least two sides to the question of technician training, they will perhaps henceforth be cautious in accepting dogmatic assertions on the desirability of one type of training as compared with another.

Assistance projects involving technician training and directed particularly and solely to the production of technicians competent to function in a specific job may come to be regarded in some quarters as departing from the long-term interests of the host country. Conversely, assistance programs for the strengthening of general education, consistently with the dominant sentiment at the Conference, will provide an essential framework for the development of technical schools either in parallel or in series with secondary schools of general education.

The subject of technician training would seem to be interwoven with fundamental misunderstanding. In the first place, statements of different speakers apparently in agreement on any one of the main points were found to

be in disagreement as each speaker developed his thoughts. Secondly, contrary to a preconception that less developed countries are intensely and urgently interested in strengthening technician training, the remarks of less developed country delegates on the desired nature of indigenous technician training were markedly more detached than, for example, the remarks of the same delegates on strengthening and expanding indigenous general science education. Even their remarks on the accessibility to their nationals of appropriate technician training abroad gave evidence of greater concern. In the latter context, it may be noted that there was a general consensus among less developed country delegates that training abroad was to be reserved for candidates with completed basic general qualifications—but it was noted that such persons may be overage and over-qualified for many European forms of technician training. Thus, despite the differing views on the optimum nature of indigenous technician training exhibited by the delegates of both developing and advanced countries, the less developed country delegates demonstrated considerable sophistication with respect to the problems of rapid development by giving emphasis to long-term indigenous needs coupled with short-term needs for foreign assistance.

Secretary's report emphasized:

1. the necessity for curricula to counter non-technological environment;
2. assurance of the elements of general education within technical schools;
3. necessity for sound practical instruction, particularly in view of lack of manual dexterity in many less developed countries;
4. lack of facilities for practical training in non-technological economies;
5. shortage of teachers, posing a need for training and retraining (conversion);

6. consideration of desirability for opportunity for technical school graduates to continue to university.

Prof. Dr. L.J. Mostertman (Netherlands), commented on the importance of middle-level specialized personnel and the need to include good general education in their training, not only for its contribution to their technical employment, but also because they form the middle class of population which produces the next generation of university students. He cited a common deficiency of technical schools as being structured in the fashion of higher schools. He noted that work problems arise if a technician who has been trained under one set of conditions (e.g., Europe) works with an engineer trained under another (e.g., U.S.). He advocated that in certain highly specialized fields (e.g., aerial photogrammetry) there should probably be only a few centers of training across the world and that these centers should give both higher and technician training.

Prof. Bela Langyel (Hungary), advocated that technicians be trained not only in practical technology, but also in theory, management, and the humanities. He indicated that the needs of the less developed countries for technicians are different from those of the more advanced countries and noted that foreign training is not satisfactory unless domestic plants are closely comparable to those in which practical work is conducted. He recited the Hungarian achievement of increasing the cadre of indigenous technicians from 12,000 immediately post-war to 60,000 at present.

Prof. S.V. Rumiantsev (U.S.S.R.), recounted the achievements of the Soviet Union in producing middle-level specialized personnel.

Dr. Harry C. Kelly proposed recognition of national responsibility to inform young people of career opportunities, to aid young

people to discover their own talents, and to assure high quality training. He described the U.S. structure of technical training as follows:

- a. in high school: extracurricular activities such 4-H Club, Science Club, Engineering Club, Plant visits;
- b. post high school: technical schools;
- c. extension services.

Citing instructional competence as the critical factor in technician training, he identified three aspects that need national attention:

- i. teacher training and retraining,
- ii. textual material, and
- iii. laboratory apparatus and materials.

Joint Specialized Session (Sections B and K)

Forecasting Requirements and Priorities of
Numbers and types of Scientists and
Technologists

Officers

- Chairman—Prof. L. Massart (Belgium)
- Rapporteur—Dr. Lucien Piche (Canada),
Vice Rector, University of
Montreal
- Secretary—Mrs. A. Beguin

U.S. Participants

- Dr. Frederick H. Harbison
- Dr. Howard W. Johnson
- Dr. Harry C. Kelly
- Dr. Charles V. Kidd

The most notable aspect of this session was that the speakers departed considerably from any strict construction of the topic and, in the words of one speaker, moved from consideration of manpower assessment and forecasting to manpower planning, to educational planning. Participants gave attention to that approach to planning which recognizes the implicit deficiencies and shortcomings of

planning practices. While it was unanimously agreed that better data are needed (more thorough and more relevant) in less developed countries and also in most advanced countries, the theme generally subscribed was that planning should deal with priorities over broad fields and with incentives in broad and particular fields. Even though manpower planning is inescapably a responsibility of national units, it was evident that exploitation of multinational experience through regional cooperation is highly beneficial.

The level and type of manpower considered in this section represents a small but highly critical element of the national labor force. A long lead time is required to produce such people, and their skills are likely to become obsolescent rapidly if training (and retraining) is not farsighted. This segment of the working population comprises people who exhibit a high degree of mobility, both occupationally and geographically. The problems attending assessment, forecasting, and planning for this category of talent tend to differ greatly from the problems associated with other components of a national labor force, but to be analogous between developing and advanced countries. Furthermore, the problems tend to be essentially comparable among less developed countries in a given region. The study of these problems is a highly specialized field, in which there are very few experts. Consequently, there are strong reasons for favoring regional projects with international cooperation in attacking these problems.

Dr. B.I. Braginsky (U.S.S.R.), placed the topic of the session in the context of a system of total planning and advised the less developed countries to adopt a system of manpower planning comparable in detail and complexity to that used in the Soviet Union. From the perspective of this objective, he

cited the deficiencies in data and methods which needed correction abroad. These deficiencies are both quantitative (broader coverage is needed) and qualitative (greater detail of specialization is needed). He related the extensive coverage of U.S.S.R. statistical data and the great detail of Soviet sampling. He commented that this practice occupies many trained people, but that such efforts should be made more widely. The greatest difficulty of forecasting and assessment occurs in industry and scientific research because the volume of work and the workload are difficult to forecast. Three methods were recommended, in order of increasing accuracy:

- a. Method of coefficients of saturation, n per M of population or of workers.
- b. n per (gross) unit of input or output on the basis of past or foreign experience.
- c. n per number of employees in comparison with a "standard prototype plant."

Dr. Frederick Harbison, stated that the purpose of assessment is not the exercise in itself, but is instead a means of getting on with the job. Analysis includes determination of the need for formal training in order to establish educational priorities. Employers must be considered not just consumers of trained manpower, but also producers of experienced manpower. Consideration must be given to incentives. In summary, manpower assessment is a matter of common sense, not statistics, and must be undertaken in consideration of three factors:

- a. education,
- b. on-the-job experience, and
- c. incentives.

Prof. Alves Martins (Portugal), described a case of international cooperation in research on manpower: the OECD Mediterranean Regional Project, involving Greece, Yugoslavia, Italy, Spain, and Portugal. This project is to produce a set of policy recom-

mendations to the several governments for educational development through 1975. The tasks of the project are:

- a. To estimate the supply of, and demand for, graduates, teachers, classrooms, and facilities, as related to geographic distribution;
- b. To make a qualitative assessment of current education;
- c. To determine needs for new educational programs;
- d. To estimate costs of anticipated and recommended programs; and
- e. To establish a timetable for achievement.

Three of the governments have assigned to this project a governmental organization, one has assigned an academic institute, one has assigned a private consulting organization. These groups have examined data and studies from other areas as well as from the region involved; have determined the most essential and feasible forms of data and studies; and, through sampling, conversion, and other means, have produced compatible data and methods which facilitate cooperative work and lead to mutually beneficial results which would otherwise be impossible. The lesson, as expressed by the speaker, is that the solution of national problems is easier when the task is shared.

Dr. Milos Macura (Yugoslavia), based his comments on his professional experience in Africa and Asia. He seemed less concerned than most socialist planners with the data and techniques of assessment and forecasting. He seemed to be pleading for planners to exercise the highest degree of responsibility in anticipating the human and social consequences of their planning.

Dr. R.D. Loken (Ghana), gave a brief resume of his paper, relating the manpower problems of Ghana and the determination of goals. He emphasized that planning must

give great attention to the human factor and that manpower recommendations should concentrate on the establishment of priorities and differential incentives.

Dr. J. Timar (Hungary), advocated full, thorough, and complex planning, as did Braginsky.

A French delegate warned that economic forecasting is not only difficult, but also dangerous, since errors affect individuals. He endorsed Harbison's recommendation that specialized training be deferred to short-term courses following basic general education.

Dr. Shimshoni (Israel), said that individuals should be trained for flexibility, that general education should be accompanied by practice, and that educational opportunity should be made available to greater numbers.

A French delegate stated the conditions for the integration of educational with economic plans:

1. Statistical data must combine level and type of education (currently available only in U.S. statistics, according to the speaker); and
2. The efficiency of education must be assessed.

A Tunisian delegate citing the Mediterranean Regional Project (as described by Martins, see above), called for "some international organ" to sponsor a similar project for Tunisia, Algeria, Morocco.

Dr. Charles V. Kidd discussed the high international mobility of scientists and possible measures to decrease losses by less developed countries.

Mr. Erwin S. Solomon (UNESCO), remarked on the evolution of the discussion in this session from manpower assessment to manpower planning, to educational planning. He reviewed UNESCO projects in educational planning and stressed the importance of secondary education.

A Korean delegate described a survey of Korean skilled manpower, in which greatest need found was for technicians.

Dr. Howard Johnson found need for continuing dialogue between curriculum workers and employers.

Specialized Session

Scope and Place of Science and Technology in General Education: Specific New Approaches to Educational Programming in Primary and Secondary Education

Officers

Chairman—Prof. M. Raziuddin Siddiqui
(Pakistan)

Rapporteur—Prof. Isaias Raw (Brazil)

Secretary—Dr. Rolando V. Garcia
(Argentina)

U.S. Participants

Dr. S. Milton Nabrit

The extent of interest in this session was amply demonstrated by the volume of attendance and participation by less developed country delegates. Attendance by delegates of advanced countries was thin and diminished as the session progressed. Few delegates from either group of countries combined in themselves science training with active involvement in general education. Discussion was consequently less incisive than in most other sessions. There seemed, in short, no generally recognized foundation upon which a dialogue could be constructed between the representatives of science and the representatives of public education. A few delegates were aware that not only a dialogue, but also active working collaboration between these two groups is under way in the United States, but U.S. personnel involved in this collaboration were not among the delegation on this date.

The session rapporteur, Dr. Isaias Raw, did not participate in the discussion of this session, but privately deplored the lack of communication between scientists and public education authorities, particularly in less developed countries, but elsewhere as well. He characterized the introduction into less developed countries of obsolete science teaching materials through assistance programs as "a completely lost effort and even pernicious." His remarks demonstrate a need for greater involvement of less developed country scientists in the development of science training in general education, as well as more effective scientific guidance in the implementation of assistance programs.

In his introduction, the Chairman raised four questions to be discussed.

1. Revision of courses in the light of the latest scientific discoveries and concepts and in the light of knowledge gained through recent research into learning;

2. Determination of the desired extent and content of syllabi;

3. Opportunity for the diversion or progression of students from general to technical education;

4. Provision of scientific equipment.

The Secretary, Dr. Garcia, emphasized:

1. Universal primary education with science included from the beginning;

2. Great attention to the accomplishment of a thorough revolution in science curricula and teaching methodology;

3. Retraining of teachers.

Capitan de Fragata Ascencio Carlos Lara (Argentina), gave first attention to consideration of preparation in general education for certain specialities, such as operational research and computer programming, which he felt should be encouraged and promoted in less developed countries. He then discussed the various advantages and disadvantages of specialization vs. flexibility.

Finally, he recommended that educators and planners give adequate attention to each of four essential factors:

- a. the student,
- b. the content of courses,
- c. the method of teaching,
- d. the training of teachers.

Prof. Francis A. Kufuor (Ghana), advocated that minimum standards of education at each level be established and enforced. He recommended measures to assure a flow of students from the primary and secondary levels prepared to undertake higher scientific studies. He stated that each country must have its own scientific revolution and that this requires a radical revolution in science education involving:

- a. teachers,
- b. syllabi, and
- c. equipment and teaching aids.

Giving particular emphasis to teachers, he noted that they require greater scientific knowledge and that there should be continual projects for upgrading and updating. He advised that the first task of a national revolution in science education is to collect what is already known and adapt it to local conditions. He advocated establishment of the following: science centers in urban areas; mobile science units to serve rural areas; extracurricular activities in all schools, i.e., science clubs, museums, etc.

Prof. Carlo A. Cavalli (Italy), described the reform in Italy for the schooling of children of ages 11 through 14, i.e., just beyond universal general schooling. Heretofore, a mature choice of occupational studies was required at an early age. At present, a new unitary school provides opportunity for continuation. He recommended that greater attention be given now to the first few years of science education.

Academician Nikolai M. Zhavoronkov (U.S.S.R.), advised that the development of

the content of education must be done by persons indigenous to the countries themselves. He recited the development of the Soviet educational system, emphasizing the establishment and maintenance of national standards of level. He admonished that the central figure in educational development is the teacher.

Mr. Z.M. Karmi (Kuwait), stated that national education in Kuwait commenced in 1945, at which time syllabi and teachers were borrowed from other Arab countries. In 1961, an indigenous syllabus was introduced after development largely by indigenous teachers. There were three aims of this revision:

- a. harmony was sought with the local environment;
- b. substance was brought within the experience of local students;
- c. the guiding principle was to interest the student in science.

Mr. Peadar P. Mageoin (Ireland), recommended comprehensive national programs for educational upgrading and development. As a most complete exposition of such national programs, he referred to U.S. paper K/88 by Bowen C. Dees, "Programs for the Improvement of Secondary School Education in Science and Mathematics."

Dr. Alan H. Ward (Ghana), related the activities in Ghana of a society of secondary teachers which, by default of the Ministry of Education, has for eight years dealt with:

- a. curricula revision;
- b. examination reform;
- c. development of teaching syllabus and guide;
- d. conduct at the University of specialized advanced courses for sixth form students (final two years of secondary school).

He commented that the "excellent" course materials of the U.S. Physical Science Study Committee had been experimented with by indigenous teachers and that a conclusion had been reached that foreign materials could not be bodily imported into the existing local educational system.

Dr. Mustafa Nuri Parlar (Turkey), urged that rural areas be provided with consolidated school systems to which pupils would be transported rather than with inadequate schools in each village. He stated that industrialization plans must provide for education and not pirate or preempt teaching competence from the schools to industry and that schools must not be expanded beyond the limits of availability of competent teachers.

Dr. Albert V. Baez (UNESCO), stated that the crucial problem in educational development is the training of teachers. This problem is one on which UNESCO concentrates. He outlined a proposed UNESCO pilot projects which would give emphasis to the training of teachers and would encourage the development of programmed learning, teaching aids, and television instruction.

Section L: COMMUNICATIONS

Summary

In the course of the sessions on communications much useful information was exchanged. The U.S. delegates felt they learned much about the needs and problems specific to the less developed areas. Their personal involvement and individual contacts with persons from the less developed countries were of tangible value.

The representatives of the less developed countries likewise appeared to have gained much from the meetings. A good many less developed countries have a more realistic view of communications satellites and are more aware of the limitations of advanced U.S. telecommunications research for application to less developed country problems. The potential of radio and television for in-school and community educational purposes in support of national development goals is also better understood as a result of the Conference. Representatives of more than 30 less developed countries attended and took part in discussions. The number of participants was enhanced by the fact that a committee of the International Telecommunications Union completed its sessions while the Conference was in session and a number of these people were accredited as delegates by their home governments.

Altogether these exchanges contributed to an appreciation of the mutuality of interest between the more and the less developed countries and should provide a sounder base for assistance in development activities. Among the noteworthy points discussed were:

1. The problem of low cost radio reception.

Most countries have adequate transmission facilities, but the lack of low-cost receivers limits radio effectiveness. Great interest was exhibited in the announcement, made during the Conference by the International Telecommunications Union, of the promulgation of specifications for low-cost family and community receivers. There is a strong feeling that a large percentage of these receivers should be assembled in the countries where they are used.

2. Problems of cutting the cost and extending the range of television reception.

The United Arab Republic reported growing success in the local assembly of television sets. Many countries exhibited interest in any developments which might make it possible for them to get greater coverage and use of television.

3. Several countries made proposals for more effective exchange of instructional materials for use on radio and television.

4. There was general interest in regional research and development specifically aimed at solving immediate problems. One recommendation was that surplus measuring devices and other research instruments which are no longer required in the advanced countries might be made available to less developed country telecommunications administrations or colleges and universities to permit the pursuit of many types of valuable applied research.

5. The UAR was strong in expressing acute annoyance with the developed countries' use of such a large percentage of the short wave broadcasting band. This feeling focuses sharply on the U.S. and the USSR.

6. The less developed countries placed strong emphasis on the need for more training in the countries or the regions, with only advanced training reserved for locations outside the regions. There was a clear need demonstrated for better training methods.

7. There was great interest in communications satellites with an over-expectation of the degree to which they might meet country communications problems. There was a good deal of support for a system of international management of communications satellites with a guarantee of equal access to their use. Even after strenuous efforts on the part of the U.S. delegation to put the matter into proper focus, it is likely that some delegates still hold exaggerated expectations of what satellites can accomplish.

8. A number of the less developed countries favored a wider pooling of resources from the advanced countries so that financial assistance for electronic communications in education and community development might be achieved.

9. There was interest in the cost of education conducted by a television-centered system such as the U.S. is developing in American Samoa, as compared to the cost of similar education by conventional methods. There will be continuing interest in the results of the Samoan project.

10. There was a widespread opinion that the less developed countries are not getting adequate information about new scientific and technical advances in the telecommunications field. Such reporting, in language that can be understood by lay generalists,

decision makers, and the intelligent public is almost nonexistent. The lack of such technical information hampers the countries in the complicated choices they have to make between the various possible solutions to their telecommunications problems.

The principal misconceptions and conflicting ideas that arose during the discussions, in order of probable importance to the less developed countries were:

1. The conflict over the use of high frequency band radio by the advanced countries. Views in this area are most intense in Africa and were presented repeatedly by the United Arab Republic.

2. Misconceptions about the usefulness and probable methods for the control of communication satellites is widespread. This area of thinking linked up with a fairly strong movement within the less developed country delegations supporting a separate body for scientific and technological development in the U.N. complex. The Director General of the ITU was particularly strong in supporting the idea that an international body should control the communication satellites.

3. An abiding problem of the Conference was that many people think of radio and television primarily as commercial entertainment and propaganda rather than as tools for education.

Mr. Salah Amer (UAR) covered the problems of planning networks; the question of their support, commercial vs. non-commercial vs. a mixed system; need for regional technical research; need for international assistance; need for a permanent body in U.N. to assist science and technology in developing countries; and he drew strong attention to the over-crowding of the high frequency radio broadcast band. In the special sessions, he reported on the UAR experience in the local assembly of television sets with concomitant training problems.

2. Prof. F.G. Torto (Ghana), a member of the UNCAST Secretariat, was particularly pointed in his discussion of the need for greater coordination and a better flow of technical information.

3. Mr. G.C. Gross (Secretary General of the ITU), made a strong plea for the international control of communications satellites and presented what the ITU is doing to assist the less developed countries.

4. Dr. Gerald F. Winfield pointed out the ways in which the new communications and educational technology could be harnessed to improve the rate at which social and economic development problems can be attacked and solved.

5. Mr. Rex Keating (UNESCO) reported on the announcement of new specifications for low cost radio receivers and outlined UNESCO estimates of the world wide need for these receivers, placing it at 400,000,000 sets.

6. Mr. G.W. Phillips (United Kingdom) reported on experiences with wired radio reception in Nigeria.

7. Mr. E.R. Dawes (Australia) presented information about Australian experience in the use of radio for the education of a considerable number of children in Australia's isolated rural areas.

8. Mr. Leonard Jaffe explained the limitations of space satellites and indicated the general direction in which policy towards their development and use might go.

9. Mr. T.F. Rogers discussed research on telecommunications problems in the U.S. and related them to the problems of the less developed areas principally by showing that most of this research is so advanced as not to be immediately useful to the less developed countries.

10. Mr. Newton Minow emphasized the importance of audience research and stressed the need for improving ways to make instruc-

tional radio and television materials available more effectively.

11. Dr. Vernon Bronson presented the way in which television can be used as the core of an educational system.

Informal recommendations that emerged from the discussions include the following:

1. That regional research efforts be made to solve operating telecommunications problems of individual countries.

2. That surplus research equipment be made available by the advanced countries to institutions and groups in the less developed countries that could put them to use in research on immediate problems.

3. There needs to be a better exchange of simplified science and technical literature in the whole communications field.

4. There needs to be much international cooperation in getting the large numbers of low cost radio receivers made that are needed in the less developed countries.

5. There needs to be a better system for the exchange of educational materials for use on radio and television.

6. There needs to be more information on the research results and experiences with the new educational technology in forms that are useful to the less developed countries.

General Session

Officers

Chairman—Professor Shigenori Hamada
(Japan)

Secretary—Shoukoy Abaza (UAR)

U.S. Participants

Vernon Bronson

O. Myers

Leonard Jaffe

T.F. Rogers

Gerald F. Winfield

George W. Wood

E.W. Allen

After opening remarks by the chairman and an oral presentation of the Secretary-General's report by the session secretary, Mr. G.C. Gross, Secretary-General of the International Telecommunication Union (ITU) reviewed the work of ITU in providing technical assistance and planning and indicated willingness to assume a larger role in matters of development of communication systems particularly satellite systems. He noted the launch of SYNCOM and said that international coordination and planning of satellite systems should be under U.N. aegis and envisioned a new organization which would work with ITU.

Dr. G.F. Winfield made an oral presentation of the paper which he had co-authored with Schramm for UNESCO. He emphasized the importance of low cost radio and TV receivers and cited the efficacy of the TV medium as an instrument of instruction. Many countries cannot afford to take advantage of the new media yet, he said.

Mr. S. Amer (UAR) made an excellent oral presentation in which he underscored the Winfield-Schramm paper and commented on the following points:

- a. the significance of the language chosen for broadcasting in countries where there is more than one language in use;
- b. support of the system (commercial or non-commercial);
- c. choice of technical facilities and equipment to fit local circumstances;
- d. need for international assistance;
- e. need for a permanent body to assist countries in the development process.

Mr. Jaffe (USA) talked about the feasibility of using artificial earth satellites for effecting long distance communication, in terms of the paper submitted by him.

The successful demonstration of the feasibility of using artificial satellites such

as Telestar and Relay has raised great enthusiasm on the part of many nations. Plans are being generated and technical consideration necessary to the allocation of radio frequencies by the CCIR of the ITU have been referred to. The most important perimeter in determining economic viability of the communication satellite system is the useful life of the satellite itself i.e. from two to ten years. It will be several years before we shall realize the establishment of operational systems which, technically speaking, must be used with all other techniques to provide the best solution for a particular local problem.

The satellite systems are a new technology and have no history behind them. We must be careful at this time to allow this new technology to mature and should not expect or plan the infant systems to have the sophistication of an adult.

Mr. Rogers (USA) made brief comments relating in particular to research in communications. The bulk of the present research in the United States is addressed naturally to the solution of problems which it faces, in its present state of development, necessarily extremely advanced.

An important observation is that probably relatively few of them are of immediate importance, or even perhaps keen interest, on the part of those concerned with the development of communication in the lesser developed countries. Basic applied research, at least in communications, is very expensive. We are faced with a most difficult problem when we ask how more developed countries might help lesser developed countries in communication research. Of course, lesser developed countries can do much by initiating careful quantitative studies of their own problems to the extent their means permit, particularly problems of regional concern and

ones, the study of which may take full advantage of analytical and experimental techniques already developed elsewhere; for example, problems of concern in the proper use of UHF and microwave communications, study of local radio meteorological conditions, especially atmospheric refractive index profile, and their influence on line of sight and tropospheric scatter paths; the study of influence of local terrain features and influence of local precipitation and foliage conditions on microwave attenuation; local sources of radio noise and present and potential sources of radio wave interference. It appears, frankly, difficult at this time to make many generally useful observations. Certainly, however, it appears necessary that the fundamental and scientific technical problems peculiar to the lesser developed countries must be much more clearly and widely understood and appreciated by individual research workers and research institutions in the more developed countries.

Specialized Session

Communications as a Tool of Education
to Meet the Specific Problems of Developing
Countries' Educational Services

Officers

Chairman—Dr. Albert Daguerre (Senegal)

U.S. Participants

Mr. Vernon Bronson

Mr. Newton Minow

Mr. Edward W. Allen, Jr.

Mr. Gerald F. Winfield

1. Mr. Vernon Bronson (USA), made a presentation of the concepts of educational technology and the ways in which such technology can serve the needs of the less developed countries. He elaborated on the

organization and costs of educational TV during the open discussion.

Mr. Minow (USA) suggested, and several other speakers supported, the need for further expanding the exchange of teaching materials for use through radio and television.

Professor F. G. Torto (UNCAST Staff) from Ghana made several points on how to help less developed countries.

a. Provide less developed countries with full information about the research and operating experience of the developed countries in the use of educational technology.

b. Find and collaborate with the specific institutions and individuals in the less developed countries that are experimenting with educational technology so as to improve and strengthen their results.

c. Organize the resources offered by many assisting countries in a more systematic and cooperative manner so that efforts are in concert and are additive and not duplicative or in competition as is frequently the case now.

Professor Filippo Neri, Director, Television Educational Service, RAIV, Rome, gave an account of how the full capabilities of TV is being used for literacy and adult education in Italy.

Mr. E. R. Dawes, Vice Chairman, Australian Broadcasting Commission, made a presentation on the use of radio for education as proved out by experience in that country. Throughout the discussion he ably supported the value, low cost and educational usefulness of radio.

Delegates from both Israel and Morocco emphasized the necessity and the difficulty of training teachers to use the new technology. They also suggested the need to begin with simple things first.

There is need to complete the development of a transistorized TV receiver for educational use in areas where line current is not available, and for further work on simple, inexpensive and reliable means of charging batteries for powering school and community TV receivers. This can reduce the cost and extend the range of TV reception.

Turkey raised the problem of availability of foreign exchange as a major problem in the introduction of educational TV.

There was widespread interest in the costing of education by TV as it would be revealed by the construction of economic models of school systems based on conventional methods and on a TV-centered system of instruction. Such models should be constructed as a means of forecasting comparative costs.

Experience of Egypt in the local assembly of TV receivers would be instructive as a means of determining how much the cost of TV reception might be reduced by local assembly and direct use or scale to institutions or communities.

Specialized Session

Problems Involved in the Development of National and International Telecommunications Networks

Officers

Chairman -- Dr. C. F. Boyce (South Africa)

Rapporteur -- Mr. J. H. Merriman (United Kingdom)

U.S. Participants

Mr. Embreck
Mr. Oscar Meyers
Mr. T. F. Rogers
Mr. Gerald Winfield

Mr. George Wood
Mr. Edward Allen

The problems were discussed under four headings: (a) Planning -- including assessment of priorities among projects requiring attention and evaluation of social and economic requirements. Both short and long term planning needed and provision for integration into international networks. Short term needs cannot always wait for overall network planning and for the training of planning and manufacturing personnel. Financing of system is possible through industry and advanced governments if stability of investment and trained maintenance and operating personnel are assured. Postal data and population growth are useful for traffic estimates for less developed countries. (b) Switching technique should be suited to needs of country. Manual and simple automatic systems require many semi-skilled workers while complex automatic systems require fewer but highly skilled workers. Fully automatic systems easier to interconnect for direct dialling, but standardized signalling is needed. (c) Transmission methods should be suited to needs of country. Specific cost studies needed to evaluate. Again standards, particularly baseband and signalling, are required for interconnection. (d) Standardization, listed as a separate subject, was referred to as an essential by many speakers during first three subjects. Availability of CCIR and CCITT standards stressed.

Specialized Session

Telecommunication in Specialized Fields

Officers

Chairman -- Mr. J. Briend (France, Ingemeur eu Chef des

Telecommunications
who was substituted at
the last minute for
Mr. M. Ponte (France)

Rapporteur – Professor Michael
Anastassiadis (Greece),
Universite d' Athens

U.S. Participants

Mr. T. F. Rogers
Mr. Leonard Jaffe
Mr. Robert Keating
Mr. Oscar Myers

Though there was a useful exchange of views on a number of diverse topics, few representatives of less developed countries were in the audience and fewer took part in the rather limited discussion.

There appears to be a continuing need for dissemination of information on the present highly experimental status of satellite communication systems; what such systems may eventually do and not do; what the U.S. policy is likely to be toward sharing such systems with other countries.

Mr. Jaffe emphasized that satellite systems will be justified economically on the basis of additional telephone needs, not TV, and that despite the obvious need for coordination at international levels on many aspects of satellite systems it was premature to try to organize a global system at this time.

Mr. Rogers described recent technical developments which provide an alternative way of overcoming the line-of-sight limitations of microwaves. He reviewed some of the elements of tropospheric scatter systems and suggested that installation of such systems might be an effective way of preparing for satellite systems.

Mr. K. R. K. Iyengar (India) questioned whether adequate information on the in-

creasingly wide range of new techniques really reached the developing countries to the extent desirable. He asked for articles written in a simple, easily understood manner which could be printed or reprinted in suitable Indian journals. In response, Mr. Chapius offered the texts of seminars held periodically by ITU. Mr. Wood (U.S.) after the session, privately offered to look into the matter in the U.S.

Specialized Session

Training of Personnel in the Field of
Transportation and Communications

Officers

Chairman – Mr. D. Gonzalez Gomez
(Mexico)

U.S. Participants

Mr. Oscar Myers
Mr. Robert Keating
Dr. Gerald F. Winfield

Summary

There was an exchange of some useful information on training experience and facilities, but because (a) this session was an afterthought, and no papers on training as such for these specialized areas were written, the material for this session consisted of bits and pieces in papers on other subjects and, (b) almost none of the people present were actually trainers, the discussion remained at a rather high level of generality. Moreover, few representatives of the less developed countries were present and they took only a minor part in the discussion. However, the need to realistically appraise the urgency of special training for personnel in transportation and communications was stressed and the need for this training to be specially tailored to the needs of the actual

operations and to be practical was widely agreed upon and stressed.

The principal points made were:

1. Need for most of training in these fields to be in the country and is ongoing programs.

2. Difficulties of recruiting for training abroad.

3. Problem of providing the right mix of theoretical and practical elements in the training process.

4. The existence of the middle man-power gap and its seriousness.

5. Need to recognize the length of the lead times required to produce the required skill levels where the rather complex equipment of transportation and communications is concerned.

6. The desirability of having regional training centers.

7. Can the need for training be expressed quantitatively as a percentage of the cost of a project or ongoing operation?

8. The continuing need for the preparation of technical training literature.

9. Need to examine the case for the desirability of building training from the top down.

10. Relative merits of a labor-intensive program with much training at low levels of personnel vs. a capital-intensive program with the requirements for training fewer people to much higher levels was raised as alternate choices in planning for telecommunications systems.

The whole area of specialized training where fairly large numbers of specialized skills are required needs examination and appraisal. There was little in this discussion to indicate that the more efficient modern training methods that can shorten training time and raise theoretical and practical achievement are being used very widely. (A.I.D. could well set up a study

of this matter and generate a resource for helping introduce more effective methods. The U.S. military have developed many effective training methods which could well be used in this connection.)

Selected Presentations

1. Mr. L. W. Masson (ITU), Secretary of the Session, gave a good opening summary raising most of the important questions that require consideration.

2. Mr. S. K. S. Jowett (U.K.) and Mr. J. Lamarche (France) reported on how the British Post Office and a radio school near Paris conduct their training programs.

3. Dr. Ladis Kosma (Hungary) made an extensive argument for students from less developed countries to come to East European countries because those countries are more like the less developed countries since they are not yet fully developed. He argued that they could teach in the widely known European languages and so not force the students to learn difficult East European languages.

4. Professor Ing. Stjepan Han (Yugoslavia) made a brief statement supporting the use of programmed teaching for auto-instruction in the training of personnel.

5. Two India representatives from the ITU told of radar training in India during World War II and described how that work was continued and expanded for the teaching of electronics after the war.

Specialized Session

Unification and Expansion through Telecommunications

Officers

Chairman - Mr. T. F. Rogers (USA),
Associate Division
Head, Lincoln Laboratory,
Massachusetts
Institute of Technology

Rapporteur – Mr. Alberto Aspina
(Colombia)

U.S. Participants

Mr. E. W. Allen, Jr.
Mr. Newton Minow

Summary

There was more informal discussion in this session than most sessions due primarily to the efforts of the Chairman. There was good participation by representatives of the less developed countries and the substance of the discussion would indicate that both the U.S. and the less developed countries learned a great deal about techniques, needs, and Conference personalities.

Two topics dominated the discussion: the urgent need for tremendous numbers (about 400 million) of low cost radio receivers and the problems of serving low density vs. high density population areas. In addition, the question of manufacturing radio and TV sets nationally as opposed to importing them was raised.

The matter of frequencies arose again. The high frequency spectrum which is most useful to the less developed countries is highly overcrowded and the developed countries such as the U.S. with its powerful stations operating in foreign countries receive most of the blame. From statements made by representatives of the ITU present, that body considers the solution of the problem to be mainly political.

Selected Presentations

Mr. G. W. Phillips (UK) gave an interesting and clear account of 8 years of experience in Nigeria where a wired broadcasting system has been set up and subscribers are charged a very nominal fee for installation and service.

Mr. Salah Amer (UAR) related some of the experience gained by the UAR in introducing TV. The UAR imports the necessary components and assembles the TV sets themselves. Amer indicated that in part this was made possible through the use of printed circuits. He also commented that profits from the manufacturing end were used to help defray the broadcasting service. He ended his statement with a plea for the establishment of regional research centers. Eighteen African nations had joined to form a union which might eventually do research of particular interest to the region. He invited assistance and cooperation from international bodies and other countries.

Mr. Keating (UNESCO) stated that ITU had now approved two sets of specifications for low cost radio receivers and that funds were being made available for the conduct of a survey to determine how such receivers could best be produced in southeast Asia. He said that advantage would be taken of the experience of the UAR and India in producing receivers, with 1 receiver per every 5 individuals as a goal. He said the additional needs had been estimated at 45 million for Africa, 333 million for Asia and 22 million for Latin America.

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United Nations Conference on the Application of
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