Strengthening Scientific Capability

ECUADOR JAMAICA PANAMA

REGIONAL PROGRAM OF SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT
EXECUTIVE SECRETARIAT FOR EDUCATION, SCIENCE AND CULTURE
ORGANIZATION OF AMERICAN STATES

In collaboration with:
OFFICE OF THE SCIENCE ADVISOR
AGENCY FOR INTERNATIONAL DEVELOPMENT

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Cover:
First prize - winning exhibit at the Ecuador Science Fair.

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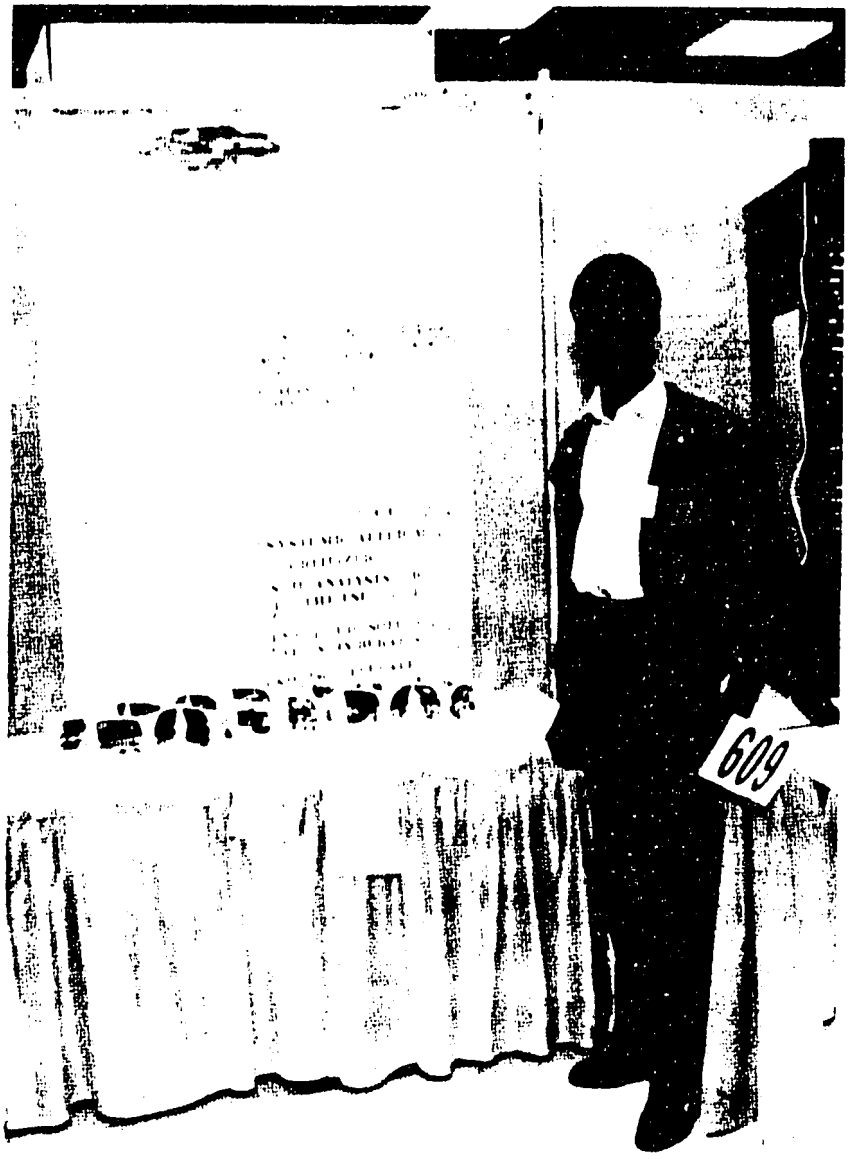

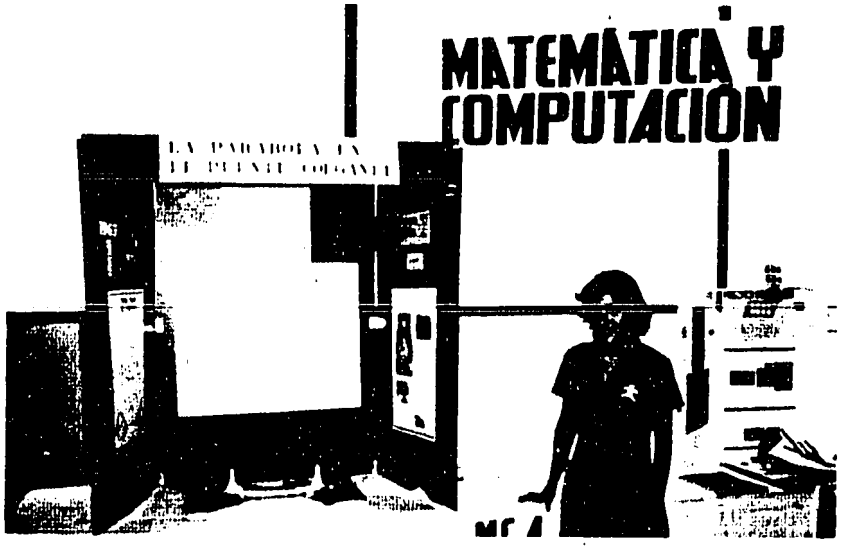

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Ackowledgements:

The concept of science fairs to interest young people in careers in science and technology was supported from its onset by many persons, some of whom had been participants in fairs of this nature when they were youngsters.

Particular recognition is due to the Hon. J. William Middendorf II, Ambassador of the United States to the Organization of American States and to Ms. Margarita Riva Geoghegan, Alternative Representative, Bureau of Inter-American Affairs. In the U.S. Agency for International Development, Dr. Howard Minners, Director of the Office of the Science Advisor of AID, and Drs. Irvin Asher and John Daly deserve special thanks for their understanding and continuing support.

Science Service, Inc. of Washington, represented by Dr. Edward Sherbourne and Mrs. Dorothy Scheiver, provided valuable insight into the organization and management of science fairs; served as judges in the Jamaica fair; and contributed substantially to the warm reception provided the Jamaican and Panamanian representatives at the International Science and Engineering Fair in Albuquerque, New Mexico.

The list of persons in the field who enthusiastically organized these events and coordinated the fairs is numerous, but special thanks is due in Panama to Dra. Susana de Torrijos, Minister of Education, Argelis de Vargas, and Franklin Vergara of the Ministry of Education and their staff, as well as to Alberto Miori of the OAS Office in Panama.

In Jamaica, the guiding spirit of the fairs was Vilma McClellan of the Jamaica Association of Science Teachers and Patrick Healy, Director of the OAS Office.

Dr. Carlos Borja of the Ministry of Education of Ecuador, together with Dr. Angel Matovelli, Oscar Aguirre, and Roberto Pozzo of CONACYT and Gabriel Ospina, Director of the OAS office, organized an event which can well serve as a model for other countries.

Dr. Franklin Chang of NASA, whose transition from a high school student in Costa Rica to a NASA astronaut serves as an example to the students of the countries where the fairs were held, gave wilingly of his time and energy for all these three events. We are grateful to him and to NASA for their support.

The General Secretariat of the Organization of American States, through the area of Education, Science and Culture, organized and managed the project as a cooperative effort between the departments. Special thanks and gratitude are due to Dr. Gloria Loyola-Black of the Department of Culture and to Dr. Pedro Turina of the Department of Education for their skill, patience and participation.

The Department of Scientific and Technological Affairs is most grateful to the students and teachers of these three countries who ably demonstrated that innovation and enthusiasm in the youth of OAS member states is the key to future hemispheric development.

Vladimir Yackovlev **David Black**

Regional Program of Scientific
and Technological Development
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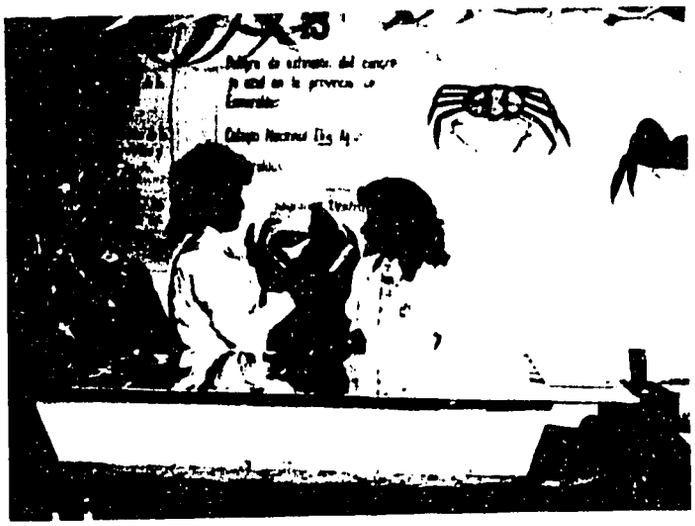

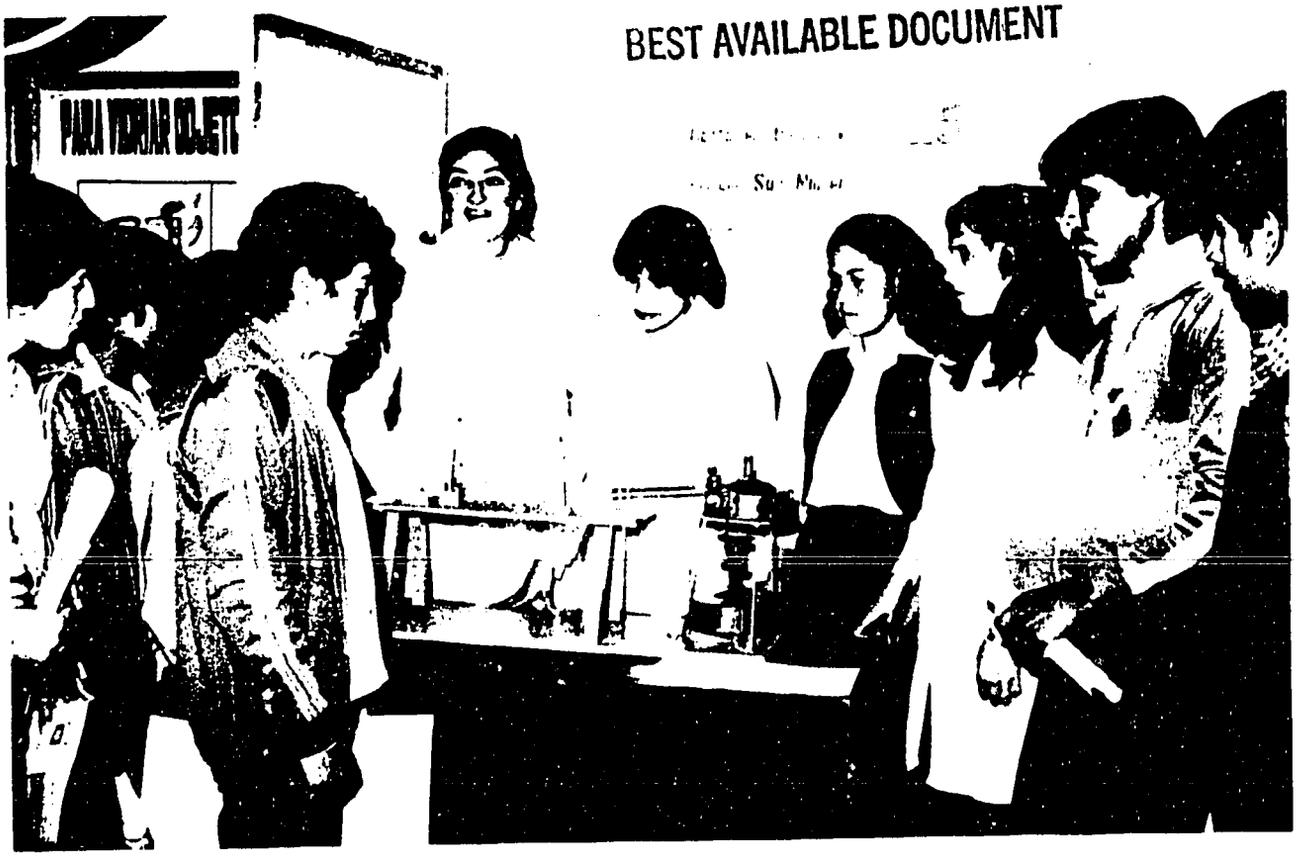

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STRENGTHENING SCIENTIFIC CAPABILITY

As long as a country must import its technology and expertise, it will continue to be dependent on outside resources and skills. Improving the quantity and caliber of persons trained in science and technology is a major factor to accelerate the development process.

The Regional Program of Scientific and Technological Development of the Organization of American States has as one of its priorities the necessity to encourage the development of future scientists and to stimulate interest in science in educational institutions in the Hemisphere.

The U.S Agency for International Development had identified this topic as a strategic area for its activities as well. in 1981, OAS specialists met with their counterparts at the Office of the Science Advisor of AID to explore avenues of possible collaboration in this field.

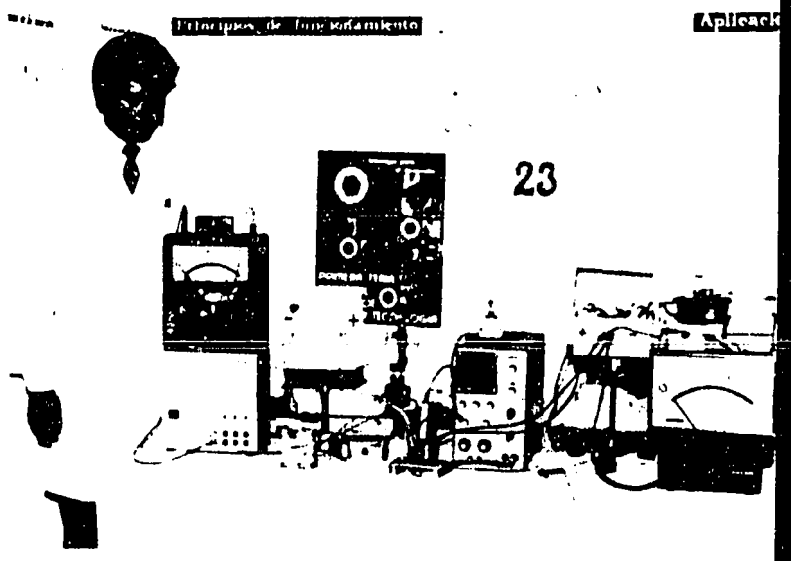
In discussing avenues to stimulate interest in science and technology in young people, the group noted the success the U.S. has had through science fairs to encourage high school students to pursue careers in science and technology.

With this concept in mind, OAS and AID specialists agreed that such an approach could prove valuable in OAS member countries to show not only students, but their teachers and the community, the impact science and technology could have on the country's future development. In addition they considered this project as an opportunity for countries to evaluate and upgrade their programs in science teaching.

As a result, the two agencies agreed to collaborate in a joint program to hold science fairs in three countries as a pilot effort. Panama, Jamaica and Ecuador were selected as representatives of Central America, the Caribbean and South America.

The first step was to contact Science Service of Washington, the organization which has held the International Science and Engineering Fair in the U.S. for more than forty years. With their cooperation, the OAS team representing the departments of Education, Science and Culture, developed guidelines for organization and management of science fairs which were presented to ministries of education in each of the participating countries.

The response was unanimously enthusiastic. Panama, the first country contacted, immediately designated a task force from the Ministry of Education to begin making arrangements for the fair. This group contacted schools and teachers across the country and held workshops on the organization of local and regional fairs.



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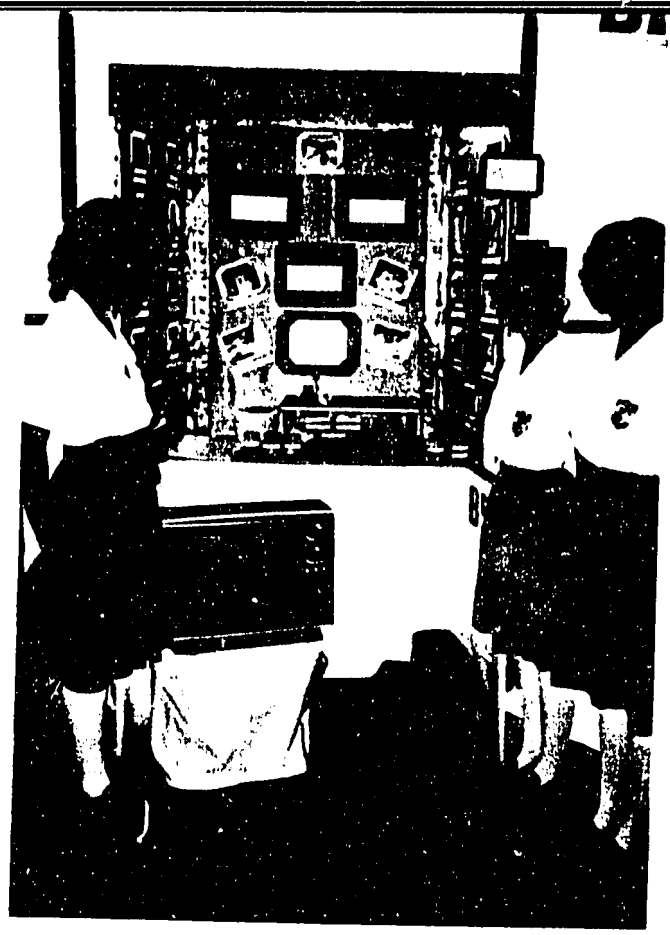
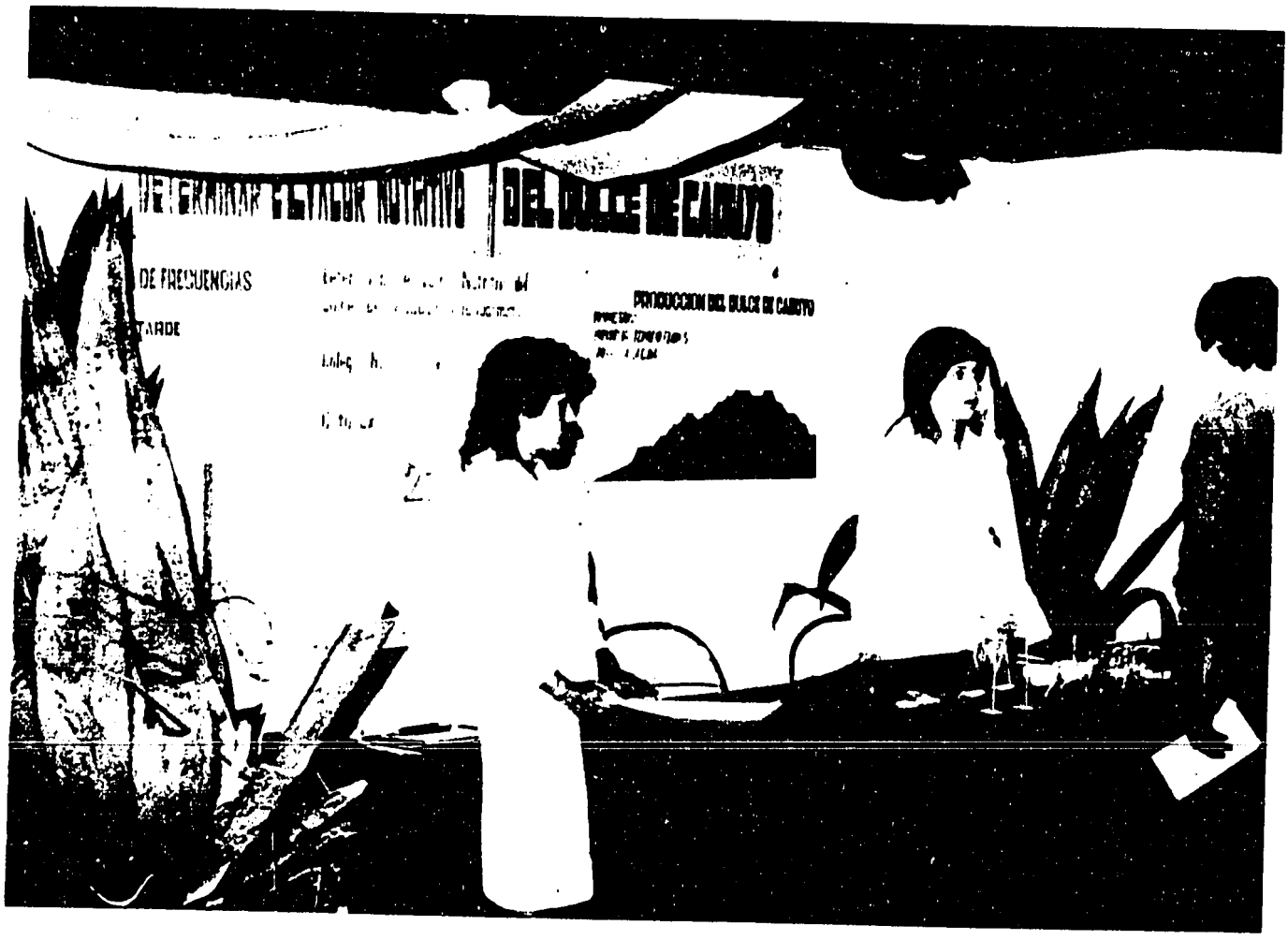
More than 3,000 students participated in these preliminary events, which were held in the fall of 1982. Winners from these competitions came to Panama City in November for the national fair. Some 75 groups of students representing all provinces of Panama, together with their teachers, participated in the national event.

President Roberto de la Espriella opened the fair, together with the Minister of Education, the Rector of the National University, and other high-ranking government officials. He also declared the week as National Science Week in Panama.

A highlight for the students was the participation of Dr. Franklin Chang, a Costa Rican-American NASA astronaut. During the time of the fair, Dr. Chang gave talks before schools, professional associations and gave a detailed explanation of the space shuttle program to a standing-room-only audience of students at the fair.

Members of the OAS team from Washington also gave talks to students and teachers during the week on OAS activities in education, science and culture related to Panama's development programs.





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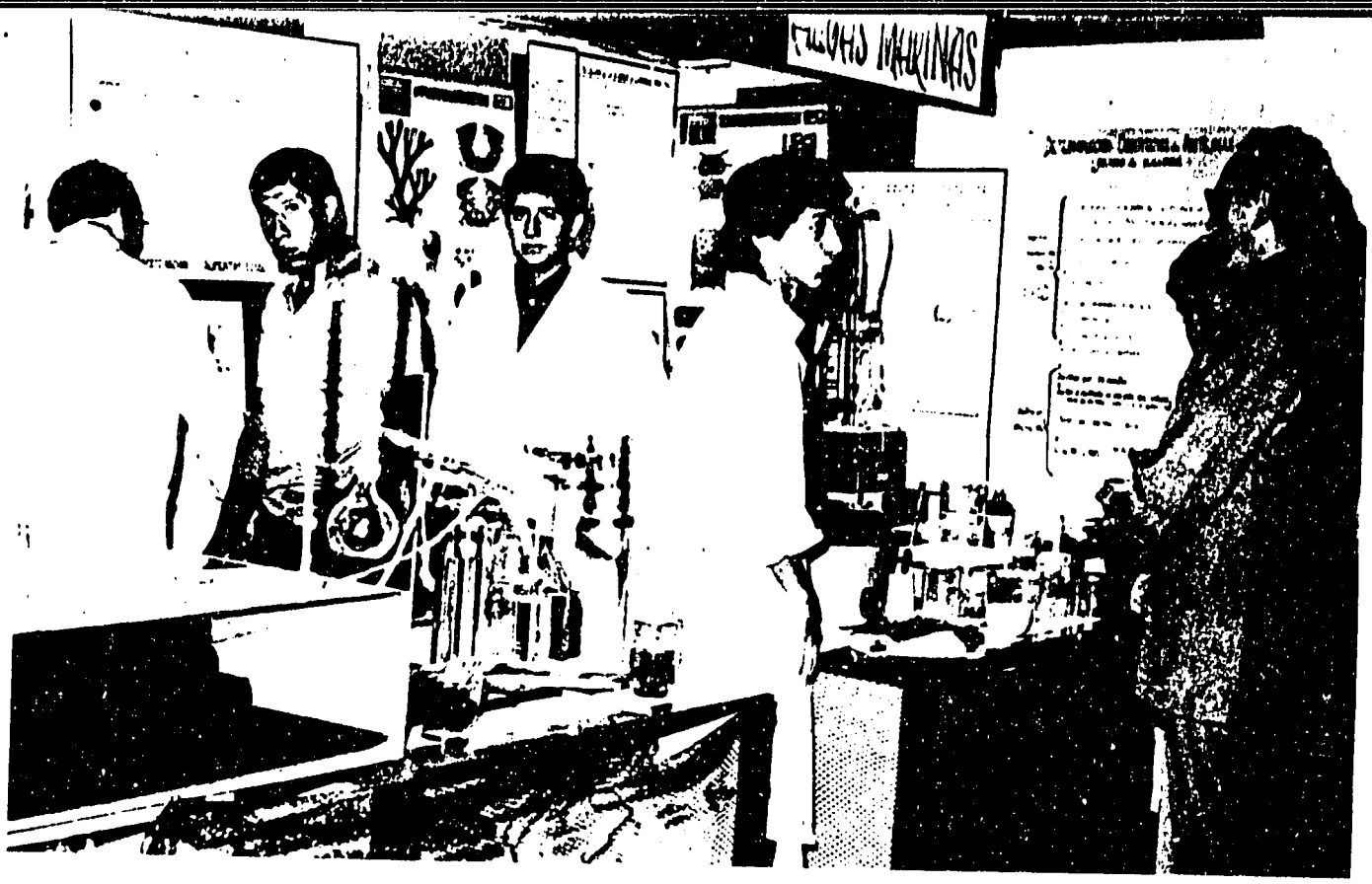

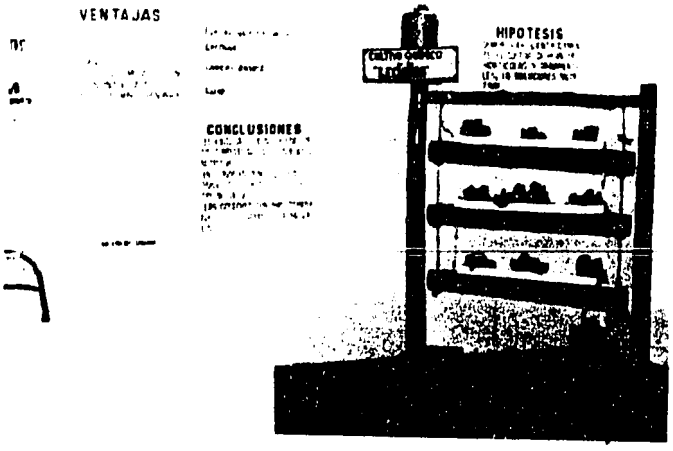

Competition was divided into six categories: chemistry, physics, mathematics and computers, environment and agriculture, biology and social sciences. A team of local judges selected winners in these six categories. Following this selection, the OAS group and Dr. Chang selected the grand prize winner.

Judging was difficult, for the students had put substantial time and energy into their exhibits. The judges were particularly impressed at the concern reflected in many of the exhibits for Panama's environment. One exhibit on industrial discharge of waste into a river caught the attention of the President, who took immediate action to have the practice stopped.

Finalists' projects included research on biogas production, hydro-meterology, and utilization of sugar cane as a source for paper production. One participant graphically proposed a railroad system for the entire country, computing rates of transport for trucks and buses vs. railroads, and determining where in the country transportation by road is not efficient.

The winning contestant was a young student from Santiago de Veraguas in the north of Panama, Artemio Gonzalez. His entry was a project designed to use the oil of the African palm for heating and cooking.

Each winner received a $3,000 scholarship, and his school received $2,000 in scientific equipment and a computer. Several U.S. business organizations also contributed. The U.S. Scientific Apparatus Manufacturers' Association helped solicit prizes of scientific equip-

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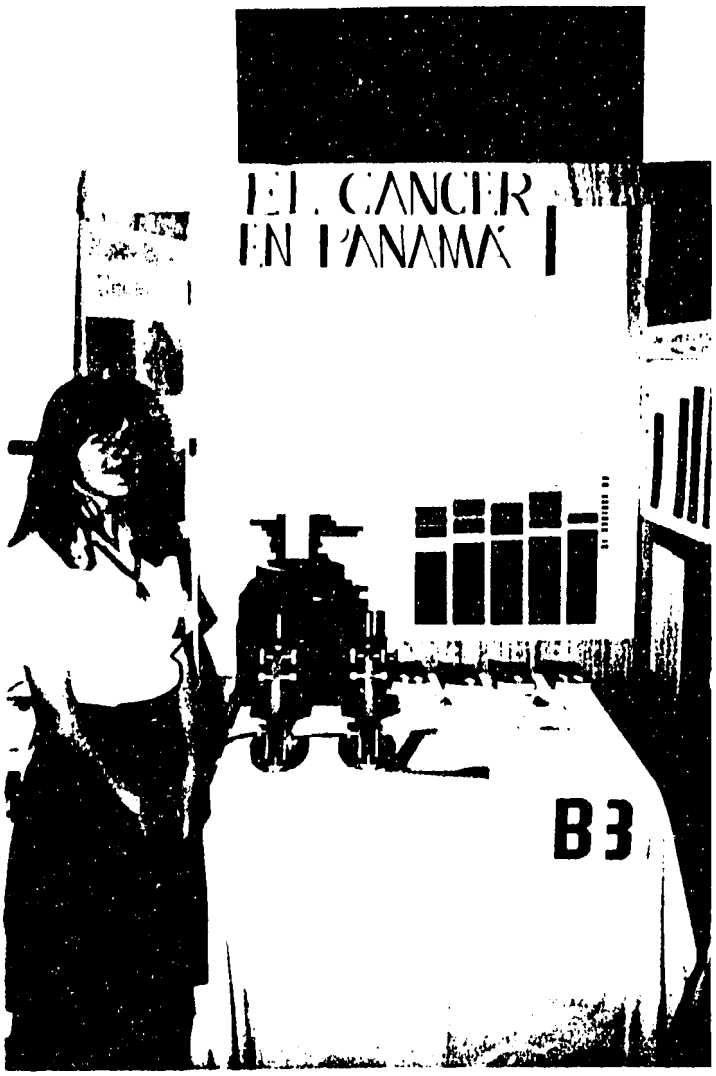
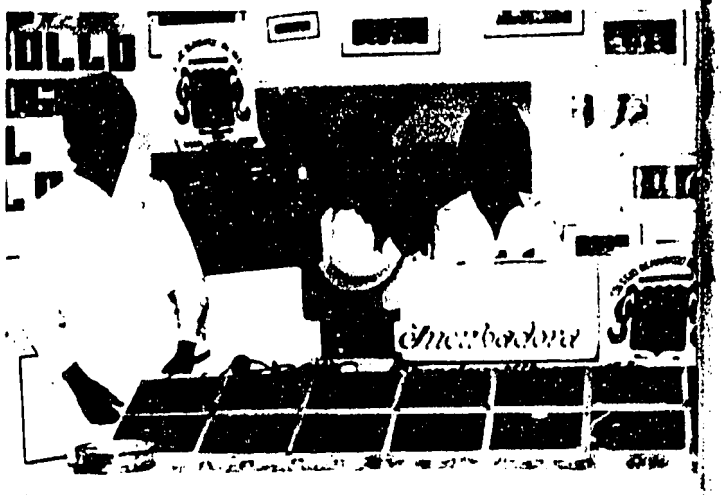
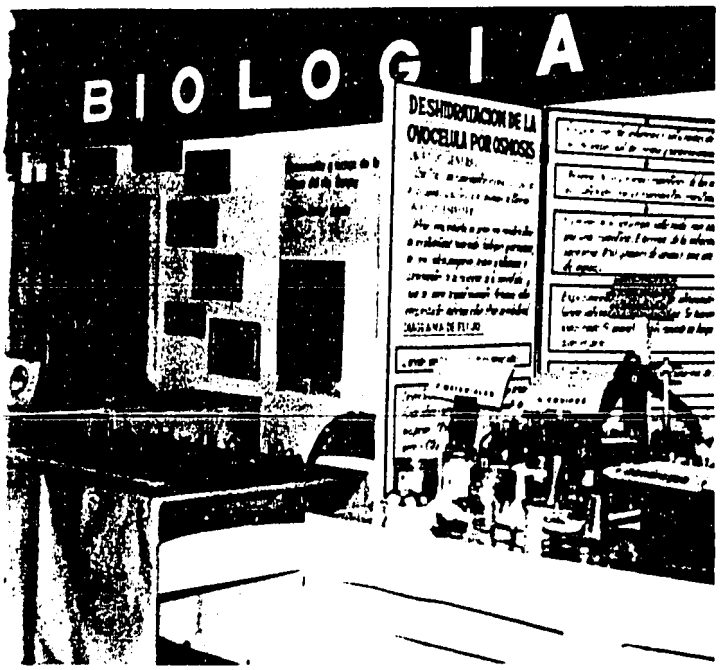


ment for the winners' schools. One New Jersey manufacturer donated equipment while another offered a substantial discount. McGraw-Hill Publishing Company, which had an exhibit at the fair, donated books to schools that participated. In addition, the winner and his teacher received a trip to participate in the International Science and Engineering Fair in Albuquerque, New Mexico, the following year.

Jamaica began its preparations for its fair in early 1982, with the Ministry of Education and the Jamaica Association of Science Teachers (JAST) coordinating all activities. For some years, JAST had been holding regional fairs, but had never obtained the resources to hold an event of this nature on a national level. With





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seed money available, JAST began organizing local and regional science fairs throughout Jamaica. The national competition was held in Kingston in April 1983. In addition to entries from secondary schools, students from elementary schools participated at their level. Unlike Panama, all exhibits were team efforts. Much emphasis in the exhibits was on problems facing the country, including preservation of natural resources, the environment, protection of endangered wildlife and recycling of scarce materials.

Local judges selected winners in the following categories: agricultural science, biology, chemistry, environmental science, general science and physics. From those six winners, an OAS team representing education, science and culture, together with representatives of Science Service and Dr. Chang, selected as the grand

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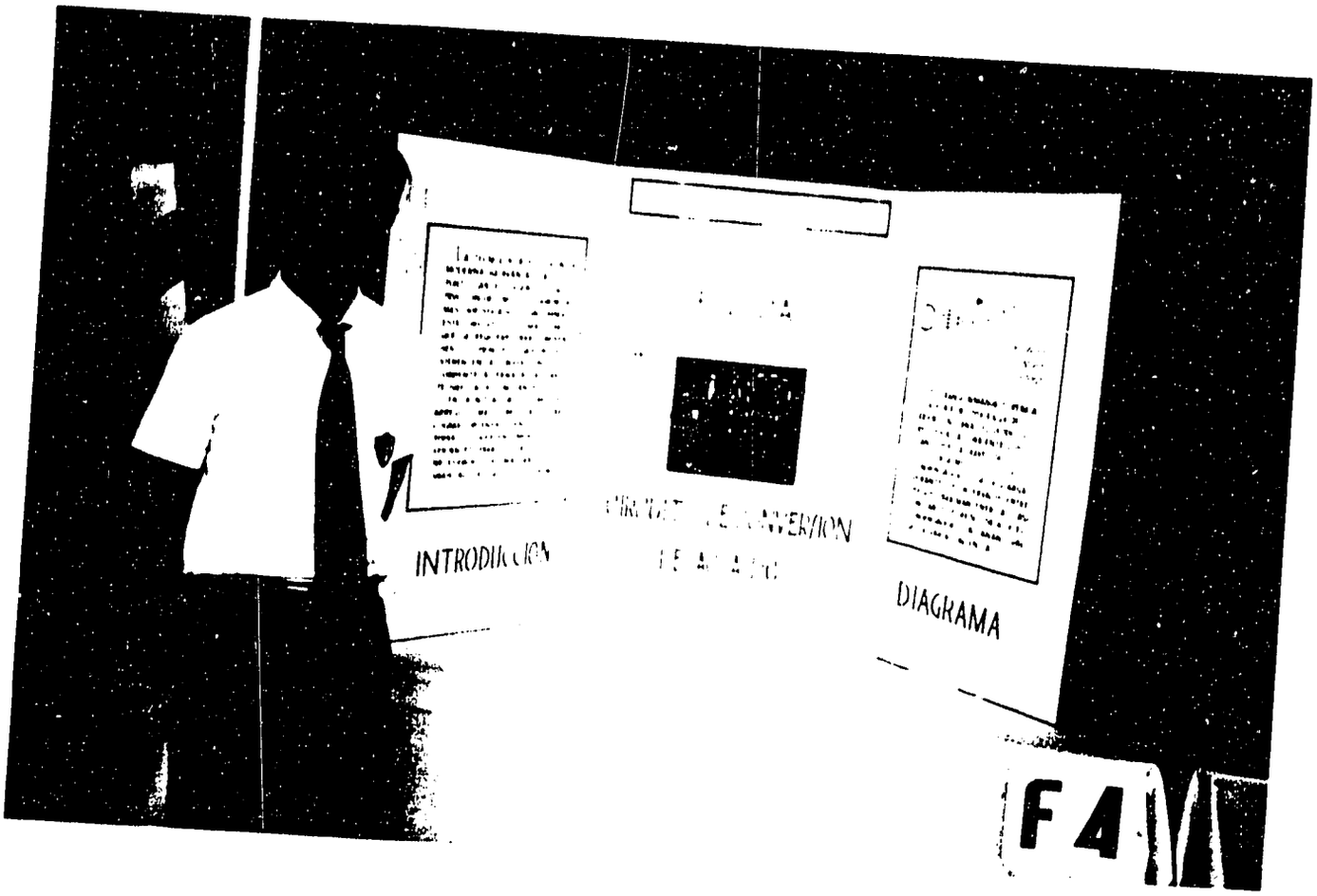

prize winner the project in biology from Oberlin High School, "Don't Fertilize the Shrimp."

Since this was a team effort, members of the group selected as its candidate Sadpha Bennett to represent Jamaica at the International Science and Engineering Fair in the U.S. As in the case of Panama, each winning group received scholarships and the schools they represented received prizes of scientific equipment.

In May 1983, Artemio Gonzalez, representing Panama, and Sadpha Bennett of Jamaica carried their country's flag in opening ceremonies at the International Science and Enginnering Fair in Albuquerque. For them and their teachers, it was an opportunity to meet with their peers from high schools across the United States, to see the ascent of seven hot-air ballons the opening day, and to visit science establishments in the Albuquerque area.

In the meantime, discussions had begun with the Ministry of Education and with CONACYT (The National Research Council) in Ecuador in early 1982 on organization of a science fair there. When the government took a detailed look at the status of science education in the country, they decided that a considerable amount of work was necessary before a fair could be held. During the remainder of 1982 and in 1983, these two local institutions developed a comprehensive curriculum for science teachers and held workshops in the

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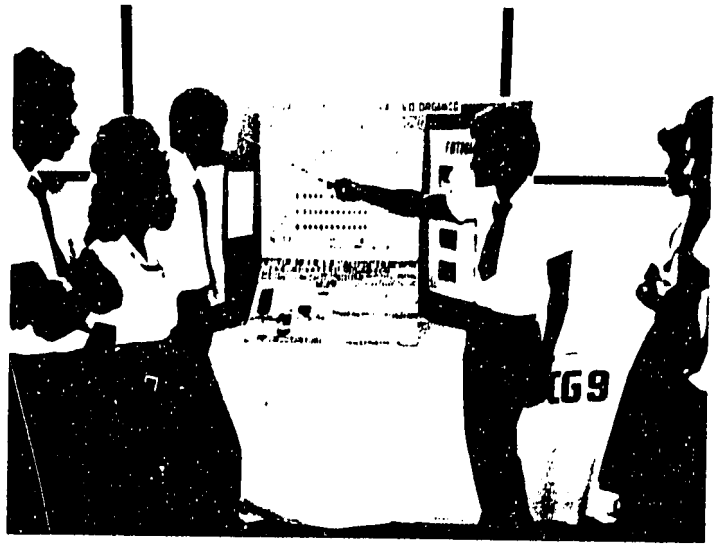
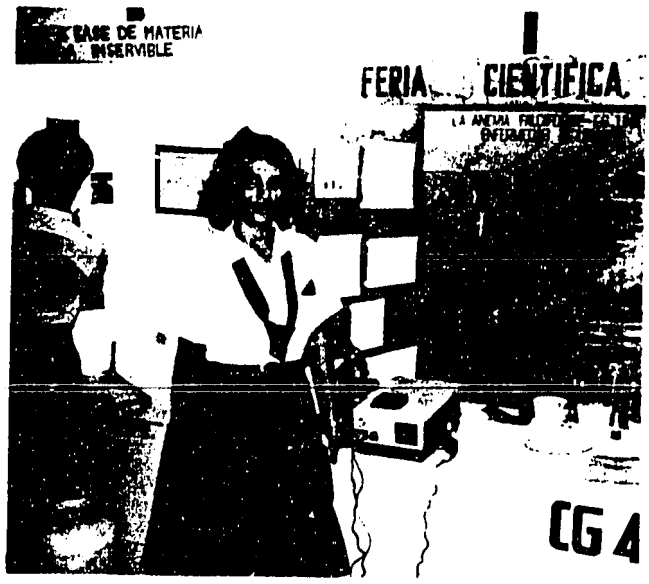
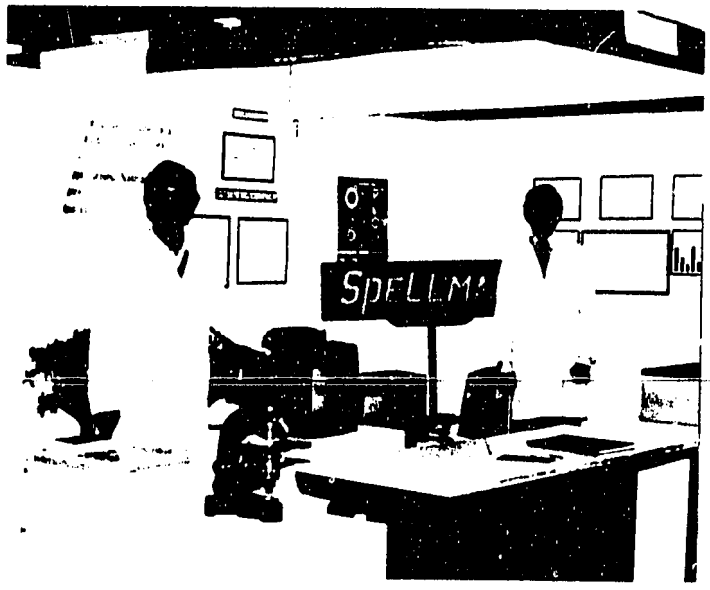
20 provinces of the country for approximately 1,800 science teachers. These courses covered science teaching and the organization and management of science fairs. Results of this effort were impressive.

Beginning in early 1984, fairs were held locally and then in the capital of each province. Estimates are that approximately 3,500 groups of students competed in these events. Regional fairs were held in Guayaquil for the coastal provinces and in Quito for students from the sierra in the spring of 1984. From these, 44 teams of students came to Quito the end of May to compete in the First National Youth Science Fair. Vice-President Roldós opened the fair, which was also attended by national leaders, including the Minister of Education and the Director of the National Science Council.

As in Panama and Jamaica, the star in the eyes of the students was Dr. Franklin Chang of NASA. Dr. Chang made it clear — in his native Spanish — that no goal in







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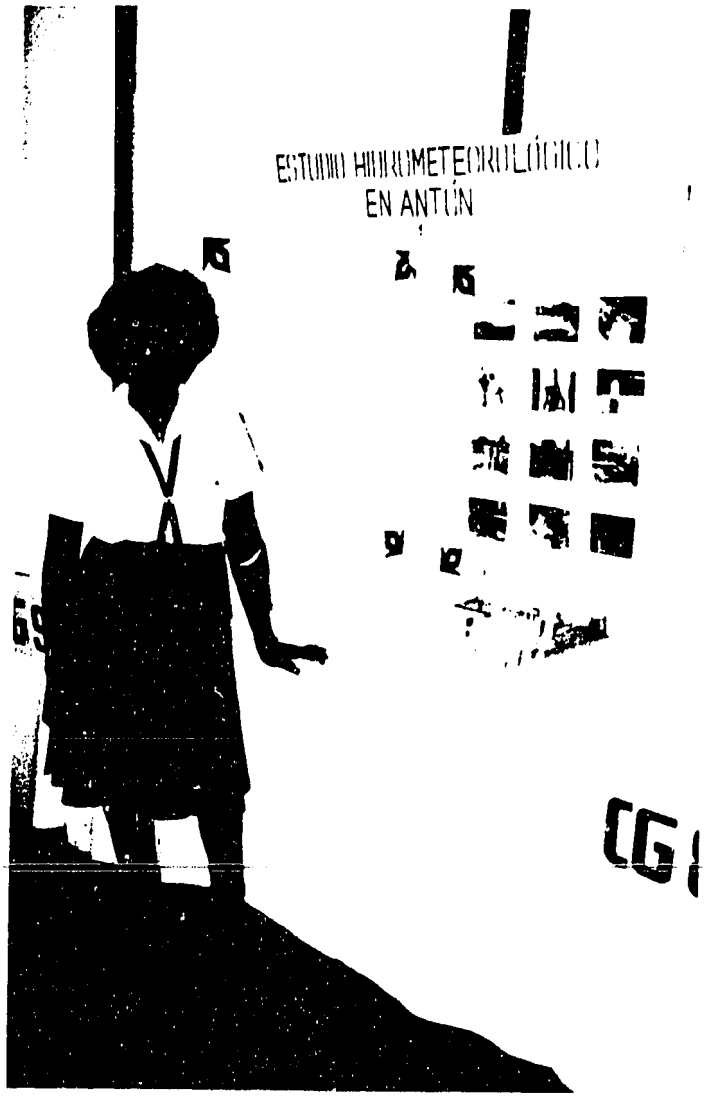
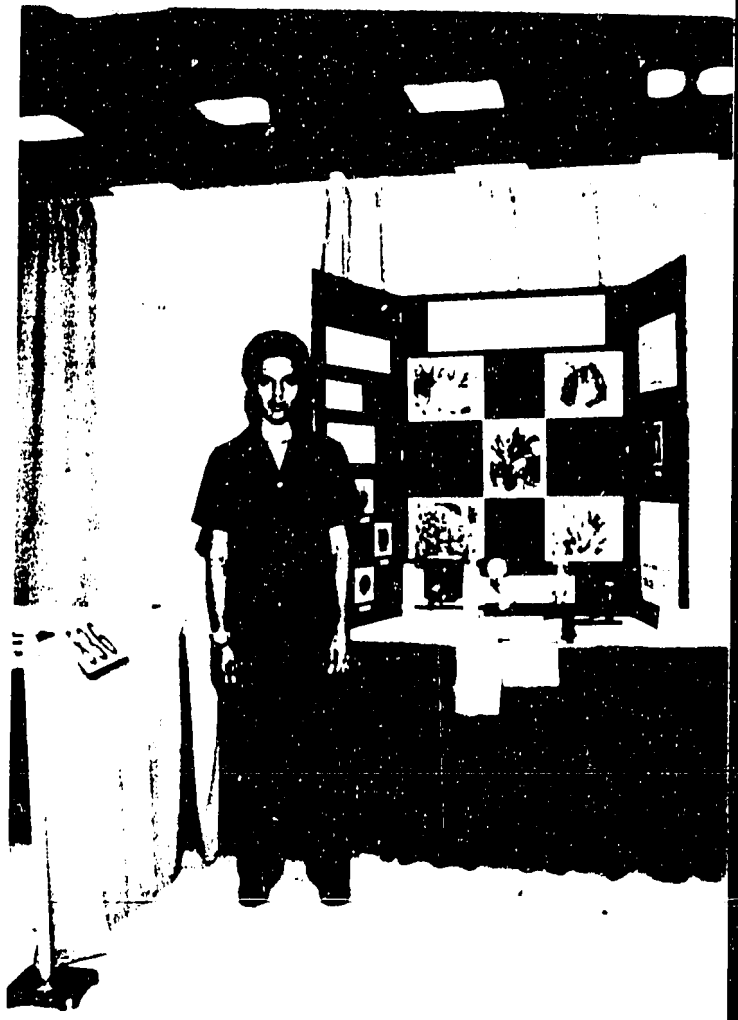
science was impossible to these students if they were willing to work hard enough. He himself had gone from a Costa Rican high school, much like theirs, through a Ph.D. at the Masachusetts Institute of Technology to achieve his lifelong ambition.

Prior to the opening of the three-day fair, local authorities had estimated that between 2,000 and 3,000 persons, principally from Quito, would visit the event. This estimate proved to be very much on the conservative side. By the second day of the fair, buses were arriving from villages and towns as far away as the borders of Colombia and Peru. Students had held raffles, worked, and saved to be able to charter transportation to see what their classmates were doing in Quito. Extra security and crowd control personnel had to be called out to handle the growing crowd. By the end of





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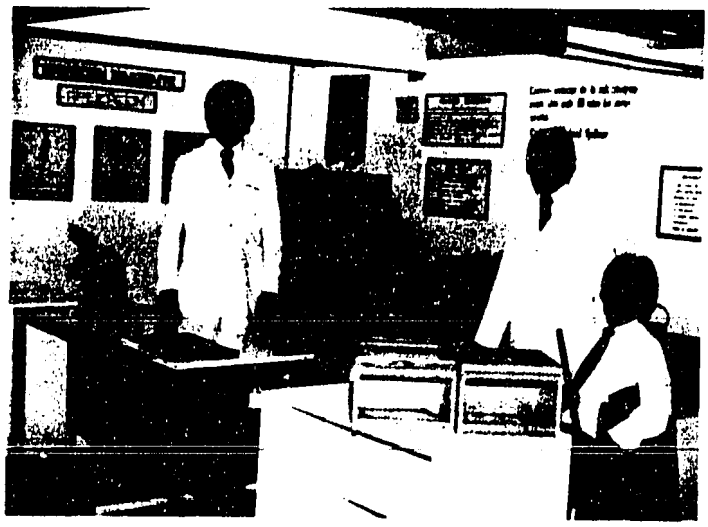

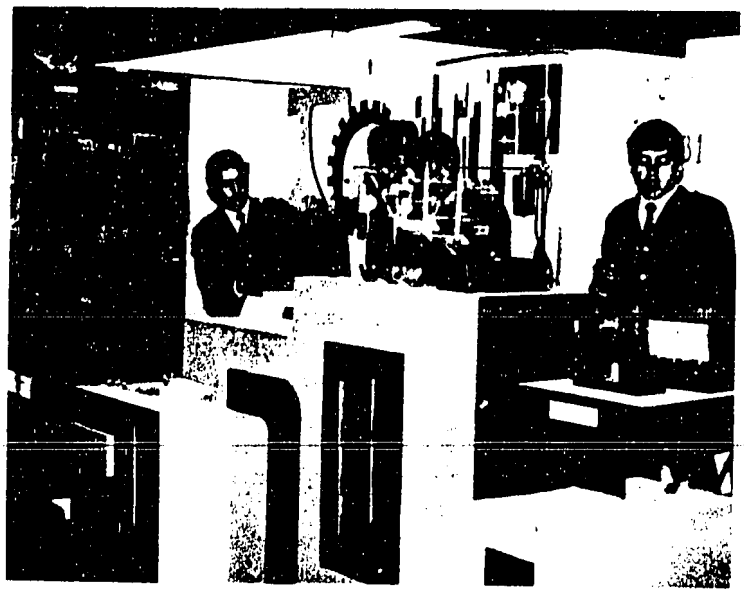

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the fair on Saturday, estimates were that more than 50,000 young people of Ecuador had come to Quito for the celebration.

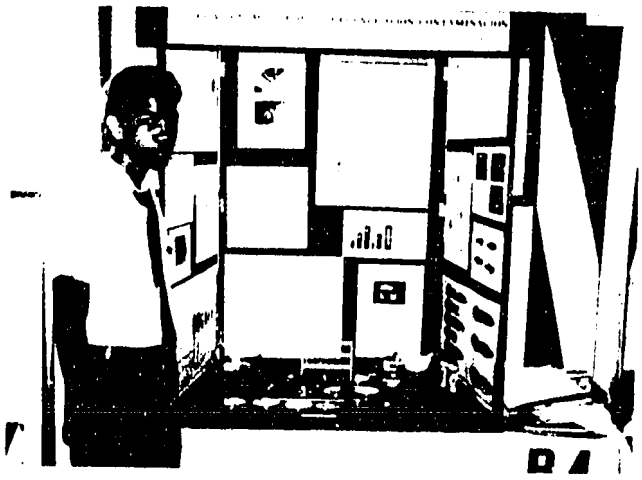
Five future teachers won the first prize in the Ecuadorian national science fair with a comprehensive approach to teaching physics in elementary schools. Hypothesizing that primary school science was inadequate, they confirmed the opinion through interviews with many school teachers. Then they set about improving the situation. Starting with the design of simple laboratory equipment that could be assembled from locally available materials, they developed a manual with 220 simple experiments to be conducted in the classroom to demonstrate the principles of physics to primary school children.

Winning school and provincial competitions, the young women ultimately won first place amoung 44 national finalists from the 20 provincial science fairs. The competition was strong. For example, a special prize was given to a team from the coastal province of Esmeraldas who investigated a blue crab faced with possible extinction. The students discovered through interviews that crabbers are using ever more destructive methods in meeting the demand for crabs, which are considered a delicacy in Ecuador. Through field work they demonstrated that the slow-maturing crabs were not likely to breed fast enough in the fast disappearing ecosytem in which they live to support the heavy crabbing demands. Other students won national prizes through experiments with the production and use of local species of amaranth which is a traditional source of food in Ecuador, but which has not been exploited by modern agriculture. Two teams of students from the Galapagos Islands participated in the fair. One group took honorable mention for their project in a study of pests which threaten the Galapagos' agricultural production. A total of 36 scholarships were awarded to winners, and scientific equipment was given to their schools.

The Next Steps

What exactly happened as a result of these three science fairs? What impact will they make on development in the region? What else can be done to strengthen the capability of schools, to develop qualified teachers, and to show students that science and technology is a career avenue that will benefit not only them but their country as well?

It is too early to give detailed answers to these questions, but certain results are clear. Some 100 students who had little hope of attending a university now have scholarships to assist them in their career development. Schools in these three countries have scientific equipment and facilities to show their students the world of



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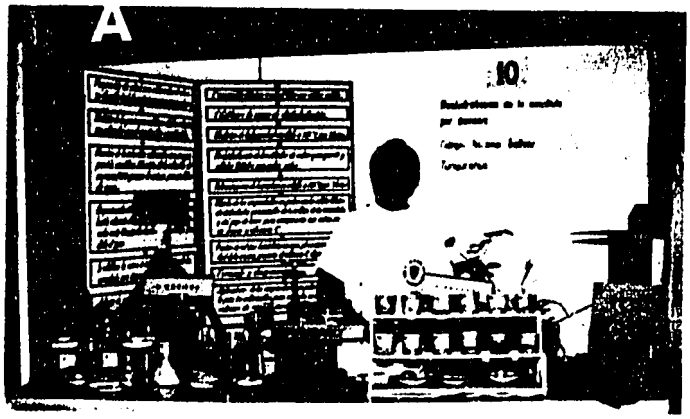

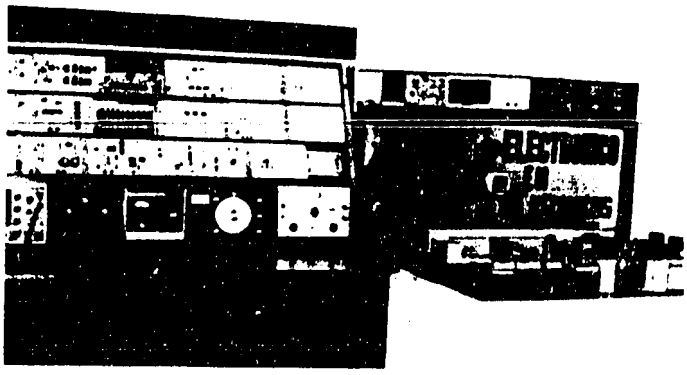

computers. But more important, nearly three hundred teams of students who competed in the three national fairs now know the satisfaction of establishing a scientific hypothesis, developing possible solutions, and then participating in a national fair. Already the countries in which these events took place are making plans on their own to continue the effort begun by the Organization of American States and the Agency for International Development.

Industry in these countries is also participating in development of future fairs, for leaders in the private sector realize that the high school students of today are tomorrow's scientists and engineers they will need in skilled positions. The more skilled people a country can produce in these fields, the less it will have to look outside for qualified specialists, and the sooner it can become self-sufficient.

Governments, too, have taken a new look to science teaching, at curriculum improvement, and are working to develop more and better qualified teachers in the area.

The effort and the money contributed by OAS and

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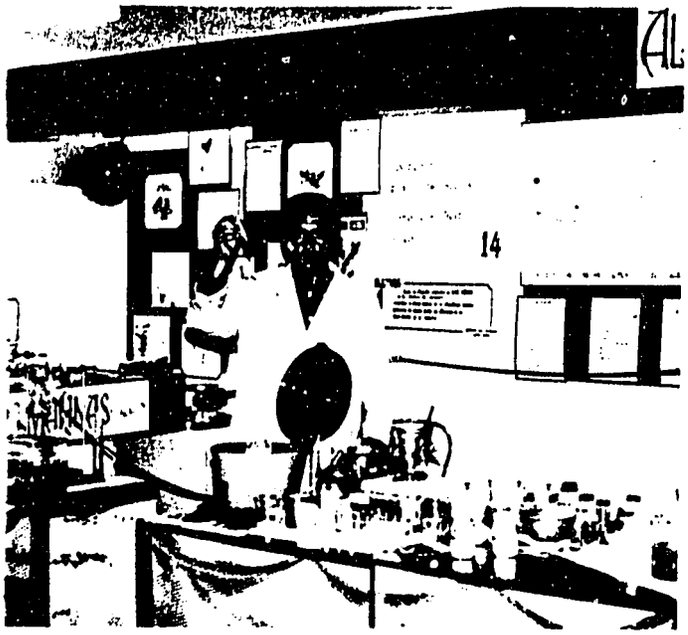
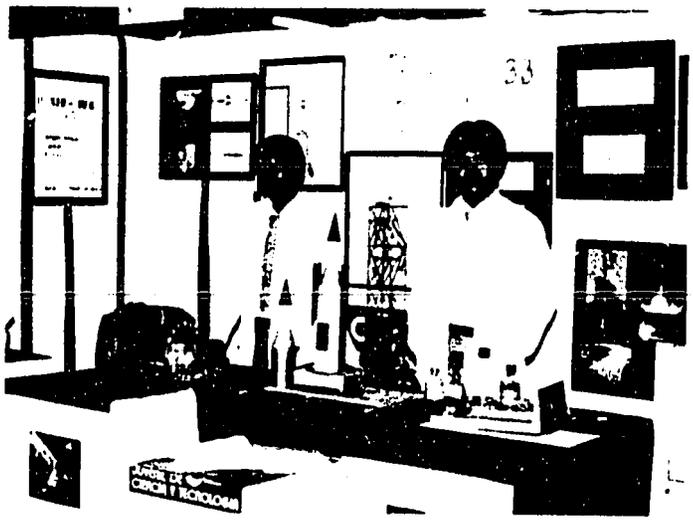
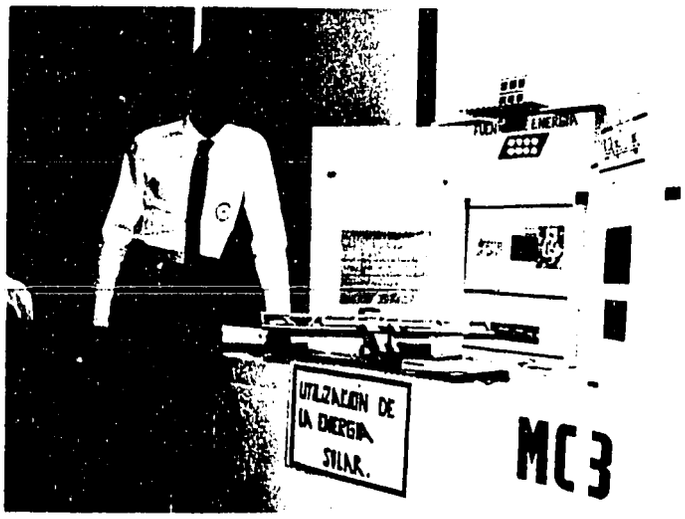
AID have had a considerable multiplying effort as well. Ecuador estimates that its government provided nearly a third of a million dollars in holding workshops and preparing materials. Panama and Jamaica have placed continuation of the fairs on a priority level.

Other countries have taken notice of the fairs as well. There is now interest in holding a regional fair for the Caribbean Basin, and another for all countries of the South America continent.

More than anything, however, the science fairs have







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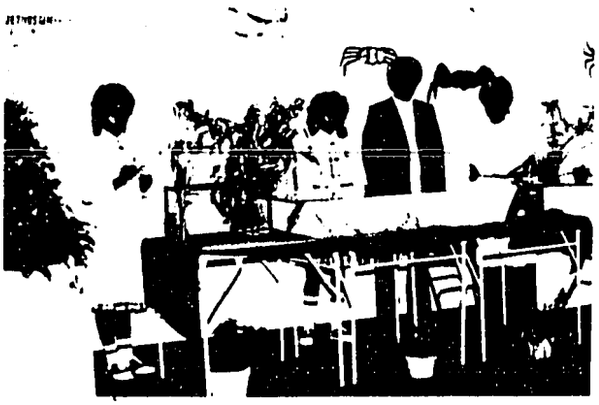
stimulated enthusiam in a generation of high school students and should improve teaching in high schools. Perhaps the most important value of science for development is its experimental approach to understanding the world — an approach all too often lost in lecture and textbook-based teaching.

Students have had the opportunity to deal with problems they face in the development of their country — problems which as future professionals they will have a strengthened capacity to solve.



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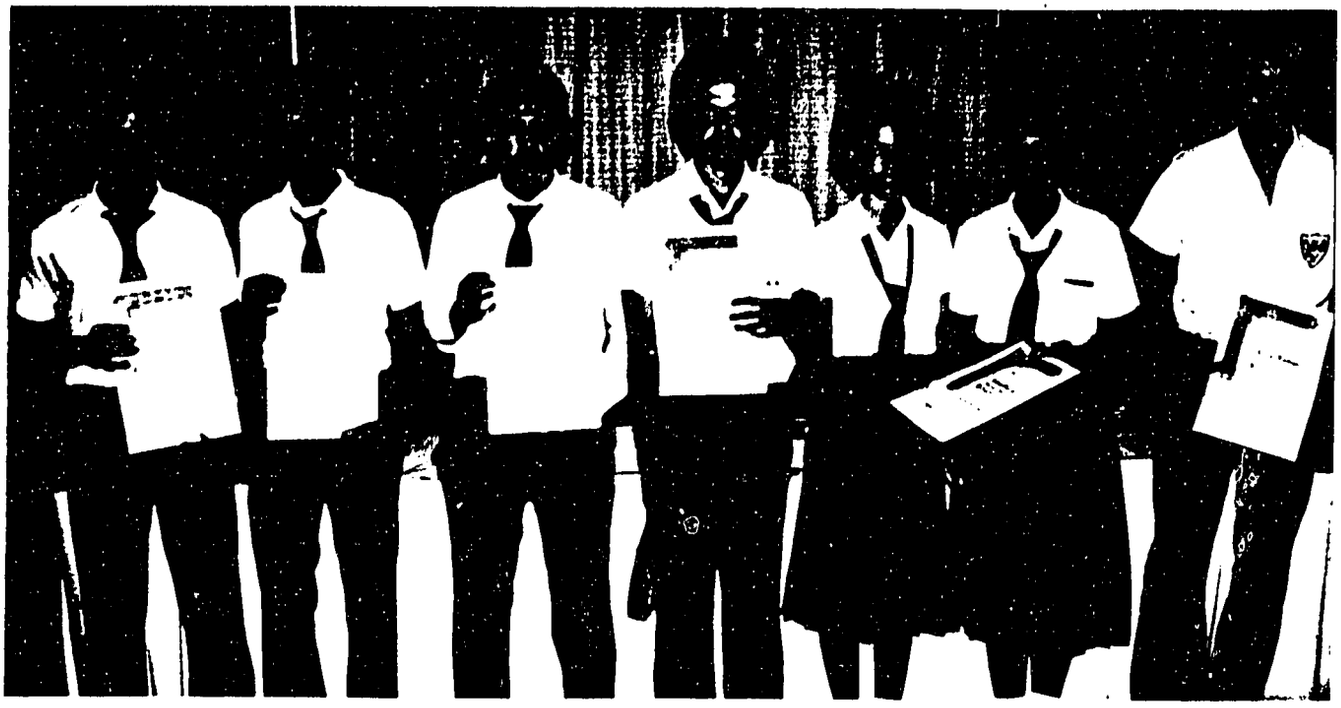
Awards Ceremony



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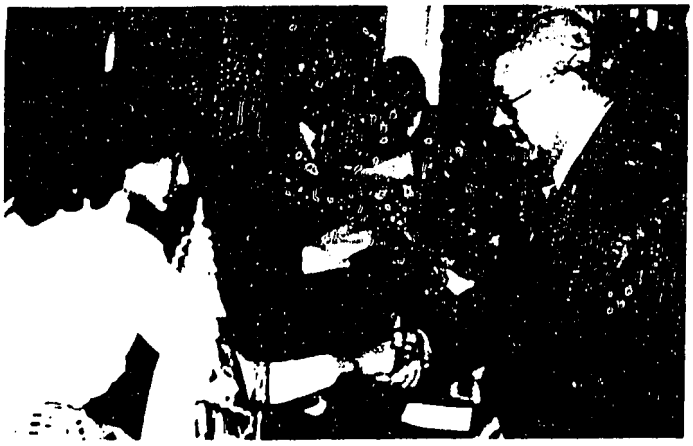

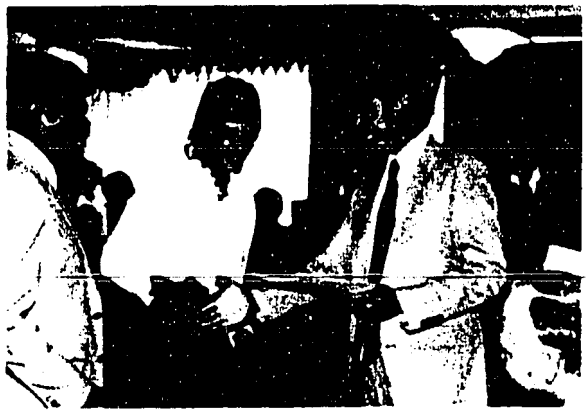

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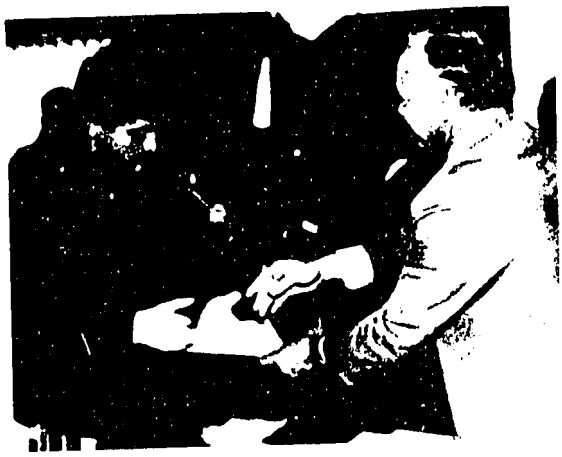

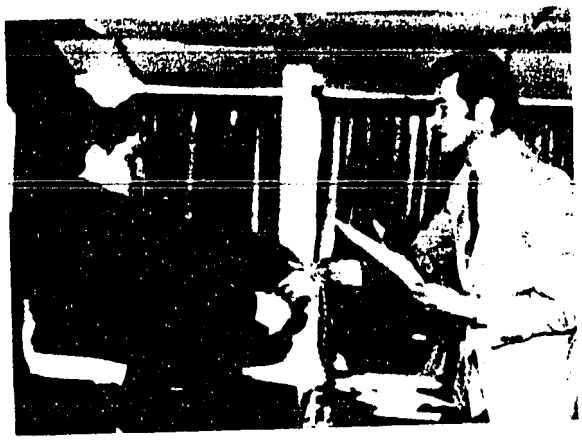

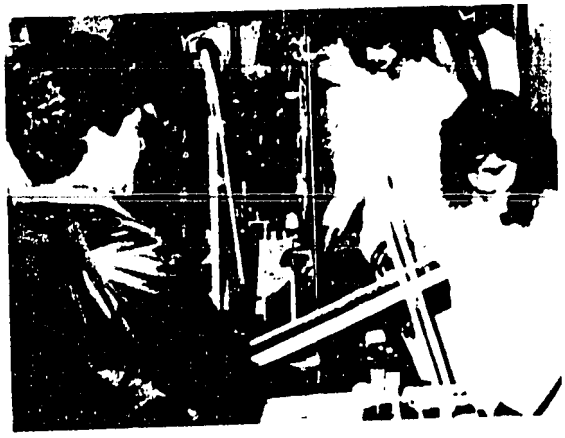

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Members of Organizing Committees and Visitors

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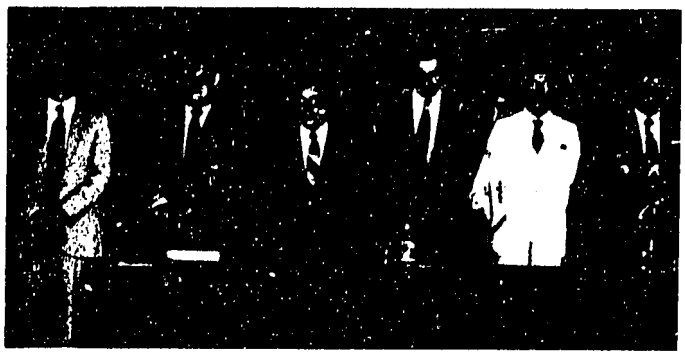

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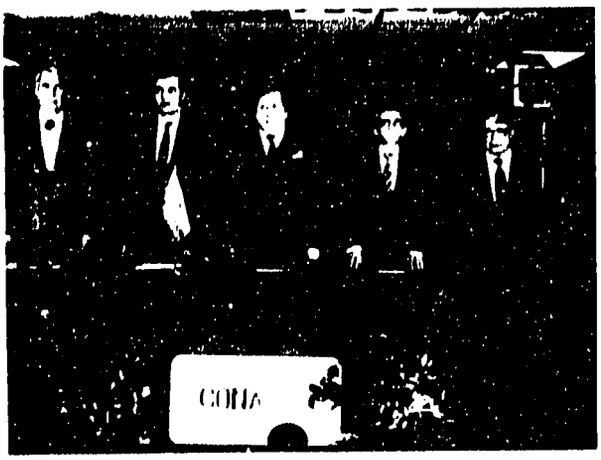

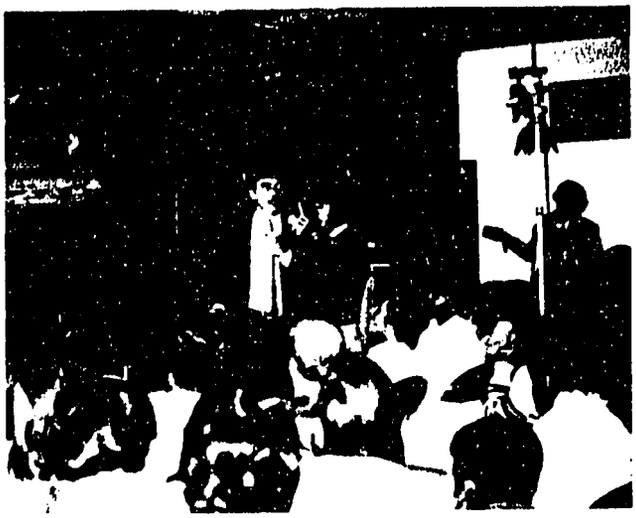

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THE ORGANIZATION OF AMERICAN STATES

The purposes of the Organization of American States (OAS) are to strengthen the peace and security of the Hemisphere; to prevent possible causes of difficulties and to ensure the pacific settlement of disputes that may arise among the member states; to provide for common action on the part of those states in the event of aggression; to seek the solution of political, juridical, and economic problems that may arise among them; and to promote, by cooperative action, their economic, social, and cultural development.

To achieve these objectives, the OAS acts through the General Assembly; the Meeting of Consultation of Ministers of Foreign Affairs; the three Councils (the Permanent Council, the Inter-American Economic and Social Council, and the Inter-American Council for Education, Science, and Culture); the Inter-American Juridical Committee; the Inter-American Commission on Human Rights; the General Secretariat; the Specialized Conferences; and the Specialized Organizations.

The General Assembly holds regular sessions once a year and special sessions when circumstances warrant. The Meeting of Consultation is convened to consider urgent matters of common interest and to serve as Organ of Consultation in the application of the Inter-American Treaty of Reciprocal Assistance (known as the Rio Treaty), which is the main instrument for joint action in the event of aggression. The Permanent Council takes cognizance of matters referred to it by the General Assembly or the Meeting of Consultation and carries out the decisions of both when their implementation has not been assigned to any other body; monitors the maintenance of friendly relations among the member states and the observance of the standards governing General Secretariat operations; and, in certain instances specified in the Charter of the Organization, acts provisionally as Organ of Consultation under the Rio Treaty. The other two Councils, each of which has a Permanent Executive Committee, organize inter-American action in their areas and hold regular meetings once a year. The General Secretariat is the central, permanent organ of the OAS. The headquarters of both the Permanent Council and the General Secretariat is in Washington, D.C.

The Organization of American States is the oldest regional society of nations in the world, dating back to the First International Conference of American States, held in Washington, D.C., which on April 14, 1890, established the International Union of American Republics. When the United Nations was established, the OAS joined it as a regional organization. The Charter governing the OAS was signed in Bogotá in 1948 and amended by the Protocol of Buenos Aires, which entered into force in February 1970. Today the OAS is made up of thirty-two member states.

MEMBER STATES: **Antigua and Barbuda, Argentina, The Bahamas,** *(Commonwealth of)*, **Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica,** *(Commonwealth of)*, **Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Christopher and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States, Uruguay, Venezuela.**

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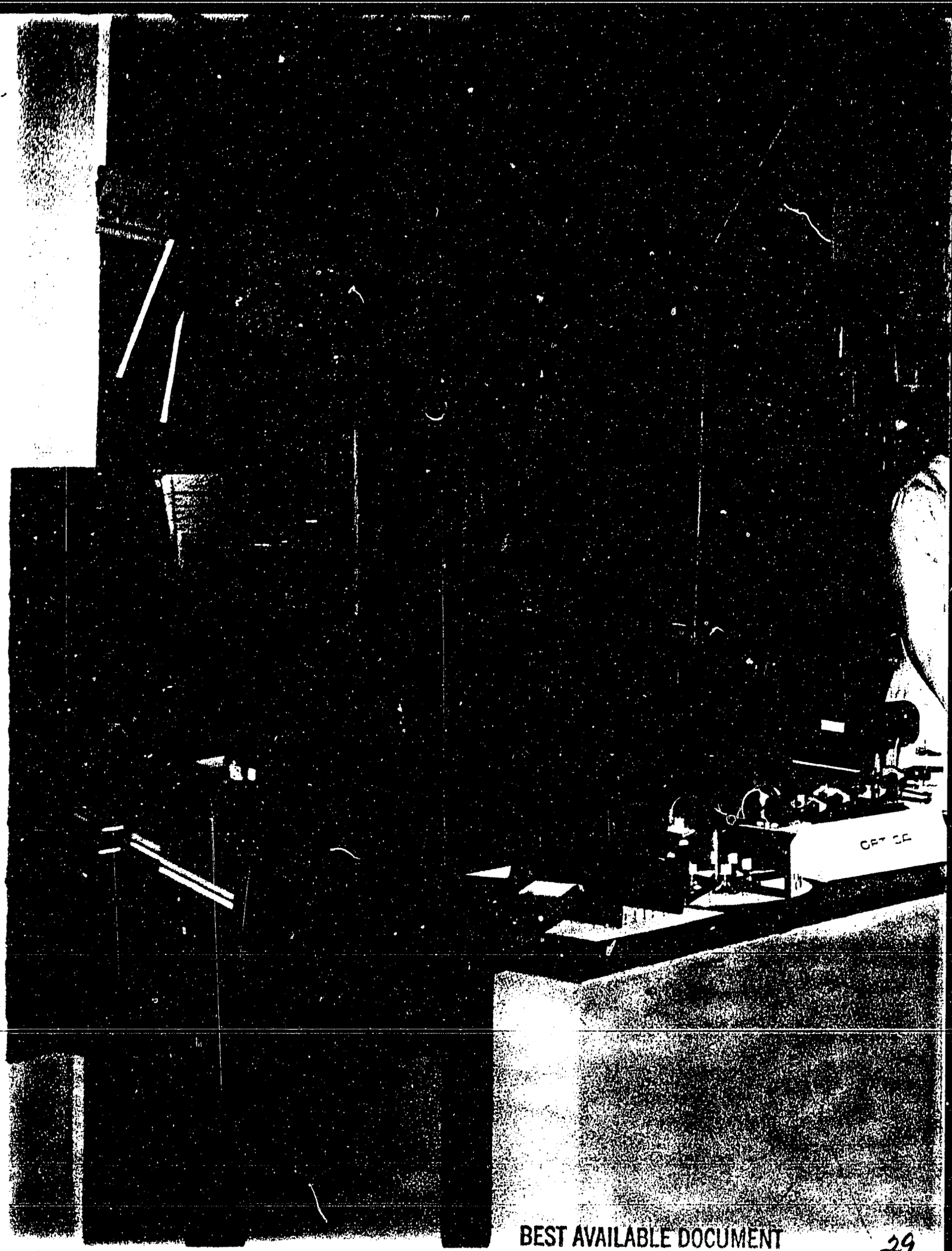

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