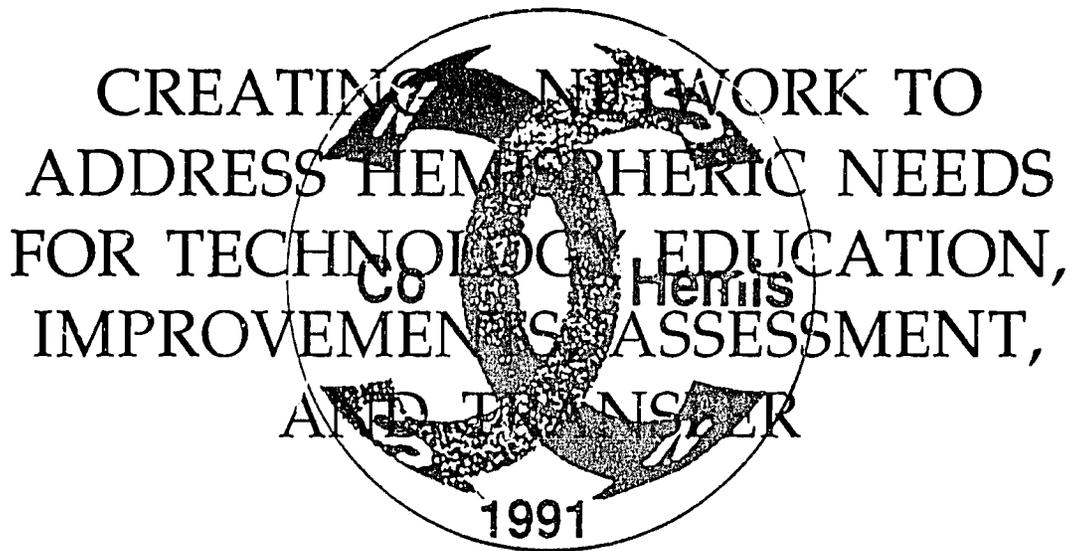
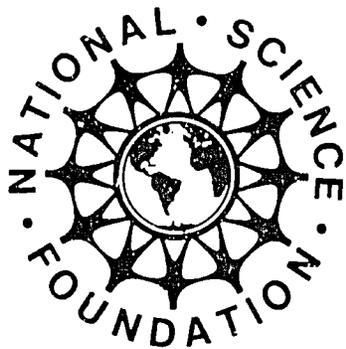


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CoHemis 1991-93 Report -- Two Years of Fruitful NSF-UPR Initiatives



Center for Hemispherical Cooperation
 in Research and Education
 in Engineering and Applied Science
 (CoHemis)



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University of Puerto Rico, Mayagüez Campus

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SUMMARY

The CoHemis Center completed two years of existence with partial NSF sponsorship. This support, heavily complemented with funds, personnel, and facilities provided by the University of Puerto Rico (UPR), enabled a newborn Center to carry on significant activities, submit proposals for future initiatives, network with US and Latin American universities and research centers that actively pursue hemispheric cooperation, expand its agenda for improving its service to the hemisphere, and become the *de facto* arm of the University for implementing North-South links and activities related with technology. Continued UPR funding, together with the collaboration of cooperating institutions and NSF sponsorship of specific activities, have permitted the CoHemis Center to carry on and increase its level of service beyond NSF institutional funding. The government of Puerto Rico has been backing the Center's activities since its creation through two different administrations.

CoHemis was founded in November, 1991 at the UPR Mayaguez Campus (UPRM) by delegates from thirteen countries of the Americas under the sponsorship of the National Science Foundation and with the participation of representatives from the US State Department and the Organization of American States. Its mission is to facilitate, support, and conduct collaborative applied research, technology assessment, and human resources development programs to serve the needs of the Americas with the participation of engineers and scientists from the different countries of the hemisphere.

In 1992 CoHemis began to form a consortium of institutions to make the Center more effective and attractive. The CoHemis Consortium is a set of bilateral agreements of each member with UPRM for implementing the above mission. Sandia and Los Alamos National Laboratories, Universidad Simon Bolivar (Venezuela), Colorado State University, Georgia Tech, and the University of Florida (Gainesville) have joined this Consortium. The Universidad de Chile and Universidad Nacional Autonoma de Mexico, as well as Oak Ridge National Laboratories, are about to join. Five other Latin American institutions have been invited. This network, with its hub in Puerto Rico, constitutes a unique pool of resources actively pursuing North-South collaboration in technology.

The externally-sponsored research and assessment activity, continued education programs, and international workshops and conferences produced by the CoHemis Center and its Consortium result in many forms of benefits for the Americas. The subjects treated, such as energy, environment, science and technology policy, and Technology Assessment, are vital for all countries in the Americas. The Center has been successfully leveraging its resources in several ways: through the Consortium; by collaborating with other UPR research centers and programs; and by resorting to agencies in PR, US, and international sources, such as INDUNIV, USAID, OAS, and PNUMA. Aware that Technology Assessment, Monitoring, and Forecasting (TA) is an indispensable decision-support tool which is presently sub-utilized in Puerto Rico and Latin America, CoHemis is initiating TA activities in Puerto Rico to eventually extend them to the Caribbean and Latin America.

The international profile which the UPR Mayaguez Campus derives from CoHemis activities will multiply the hemispheric demand for UPRM's graduate programs. This increased demand will sustain doctoral programs and top research in engineering and applied science that could not be justified for the scale of Puerto Rico alone and which will also benefit the rest of the hemisphere. This will boost Puerto Rican high-tech competitiveness and enhance and expand US minority graduate education in science and engineering. The graduate assistantships for Latin American and Caribbean countries and the participation of their joint researchers and professionals in CoHemis research and training activities will promote sustainable development and enhance the human resources of the region. This Center's excellent 2.5-year record demonstrates its flexibility, efficiency, and effectiveness for attaining these goals.

INTRODUCTION

BACKGROUND: CREATION OF THE CENTER

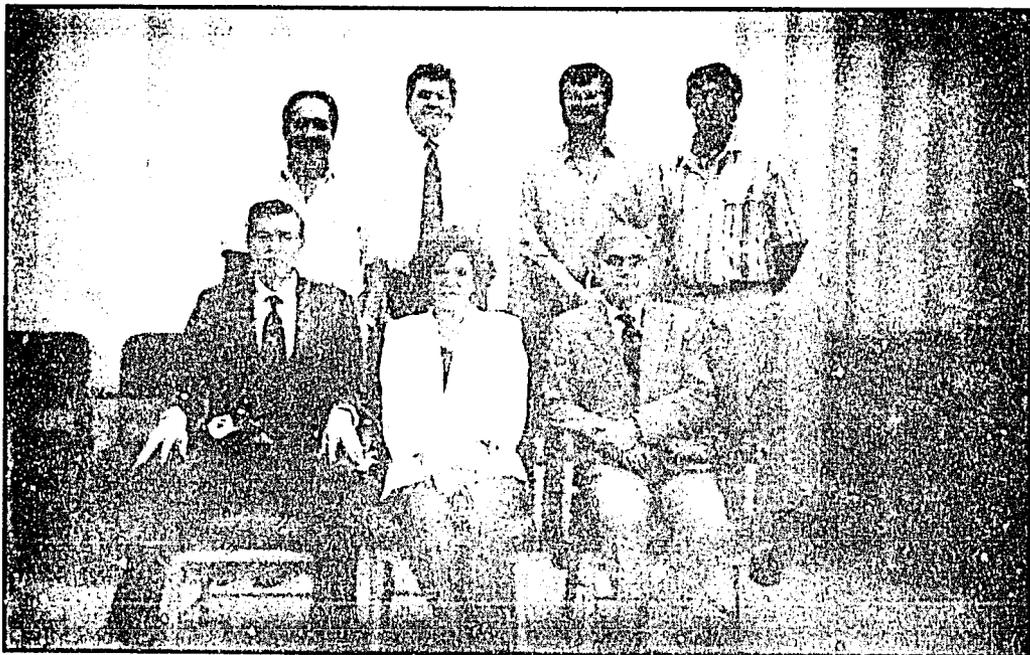
In February, 1991 the National Science Foundation's Large Structures and Building Systems Program (Engineering Division) granted \$99,939 to the University of Puerto Rico's Mayaguez Campus (UPRM) to organize a hemispheric conference for planning a center for promoting joint research activities in the Americas. The original grant to Dr. Luis Pumarada-O'Neill (Principal Investigator) and Dr. Carlos I. Pesquera (Co-PI) through Program Director Dr. John B. Scalzi covered a period of two years. It included follow-up activities such as a quarterly bilingual newsletter and writing proposals for funding the conference recommendations. The grant was later extended one more year until December 1993, and expanded by \$70,319 to cover student assistantships, simultaneous translation, travel, and bilingual proceedings.



The Principal Investigators of the CoHemis Conference, Dr. Carlos I. Pesquera (left) and Dr. Luis Pumarada (right), with Dr. John B. Scalzi, NSF Program Director for Large Structures and Building Systems. Dr. Pesquera is now the PR Secretary of Transportation and Public Works, but collaborates with the Center as an adviser.

The conference was held in Mayaguez on November, 1991. Most of the existing national research organizations in the Americas sent delegates and/or submitted papers. The US had participants from the academic, government and private sectors. North American research-sponsoring agencies, such as National Institute of Standard Technology (NIST), Department of Energy (DOE), Energy Environmental Protection Agency (EPA), and National Science and Engineering Research Center (NSERC-Canada), the US State Department, the

American Association for the Advancement of Science (AAAS), and the Scientific Division of the Organization of American States (OAS) also participated. The UN's Environmental Program for the Caribbean contributed some travel expenses. The participants from Puerto Rico came from UPRM, the UPR Central Administration, and Puerto Rico's Economic Development Administration. The Governor of Puerto Rico and the President of the University addressed the participants and supported the conference objectives. Several other key figures and organizations invited were not able to participate, but many of them sent letters backing the conference objectives. These included the United Nations Science and Technology Division, UNESCO, Congressman José Serrano, Hon. George Brown, Chairman of the House Committee for Science, Technology and Space Affairs, and Dr. Allan D. Bromley, Science and Technology Adviser to President Bush.



Participants in a Collemis meeting with Dr. Graciela Sosa, Collemis adviser and Director of Planning of Venezuela's CONICIT. Standing from left, Dr. Antonio Gonzalez, Director of the Civil Infrastructure Research Center, Dr. Jose Lopez, Dr. Jorge Velez Arocho and Dr. Carlos Pesquera, currently Secretary of Public Works of Puerto Rico. Seated from left, Dr. Luis Pumarada, Dr. Sosa and Dr. Leandro Rodriguez from Civil Engineering.

The participants' papers described the current situation of research and development activities and of advanced technological education in each country and suggested ways in which a multinational research center could help to increase the frequency and effectiveness of hemispheric cooperation in those fields. The funding agencies presented existing relevant research programs and offered suggestions on how to best use these opportunities. Following these, the participants were divided into groups which discussed different aspects of how a hemispheric research center could be most effective for the countries of the Americas. Each participant was shown those UPRM research and educational facilities which he was interested in.

In the final session, the delegates unanimously recommended the immediate creation at UPRM of a Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science. Its mission would be to facilitate, support, and conduct collaborative applied research and human resource development programs to serve the needs of the Americas with the participation of engineers and scientists from the different countries of the hemisphere. They also created a five-delegate advisory committee to assist in this mission.

The format recommended by the conference for the Center, which remains its a long term goal, is a multi-disciplinary, world class institution governed and partly supported by member countries, open to all nations and territories in the Western Hemisphere, with 75 rotating visiting researchers and 25 UPRM faculty resident researchers, and providing assistantships to 200 graduate students from different countries of the Americas who would be enrolled at UPRM. The center received mandates to: promote the participation of the least-developed countries, and to focus on projects that have a potential for short term benefits and development impacts for more than one country.

BENEFITS FOR THE US, PUERTO RICO AND THE HEMISPHERE

Global Competitiveness and Sustainable Development

CoHemis activities benefit the Americas in multiple ways. The Center enhances hemispheric human resources to achieve global competitiveness and sustainable development. It creates partnerships between institutions in the US and Latin America to foster integration and cooperation towards common goals. It will facilitate the region's eventual economic integration and the protection of its environment and natural resources. Its activities work as a training center in cultural diversity, global perspective, and interamerican relations for participants from both North and South.

The CoHemis Consortium provides a vehicle for universities, laboratories, and research centers from the Americas to establish contacts, exchanges, partnerships, and working relationships with each other. It is an opportunity for the institutions to complement their resources and enhance their personnel, and for individual researchers from Latin America and the Caribbean to achieve personal goals without having to resort to permanent migration.

Technology improvements help to break the vicious circle of underdevelopment. An advanced science and technology center, networking the most prestigious laboratories and universities in the US with their most important counterparts in the other countries of the Hemisphere, and promoting technology cooperation with all countries in the Americas with substantial US support will showcase a very favorable image of the US and its technology establishment. The Center provides an opportunity for US decision-makers to foster economic growth in Latin America and the Caribbean, which is essential to US interests in terms of trade and drug and immigration control, with funds being actually spent in a US territory.

Puerto Rico, due to its unique political, historic and cultural circumstances, can be the most effective vehicle for transferring US technology to Latin America and to make it work on behalf of the importing countries. CoHemis' joint applied research projects will allow Puerto Rican researchers to remain on the cutting edge of knowledge in precisely those fields which are of most interest to Latin America and the Caribbean. The Center's activities reinforce the efforts initiated by the government of Puerto Rico to stimulate the export of consulting services to Latin America and the Caribbean. Through the CoHemis Consortium, key US universities and national laboratories participate in these activities.

CoHemis conveys a positive image of Puerto Rico and fulfills the model of its being a bridge between the Americas. The conferences, research projects, and continued education

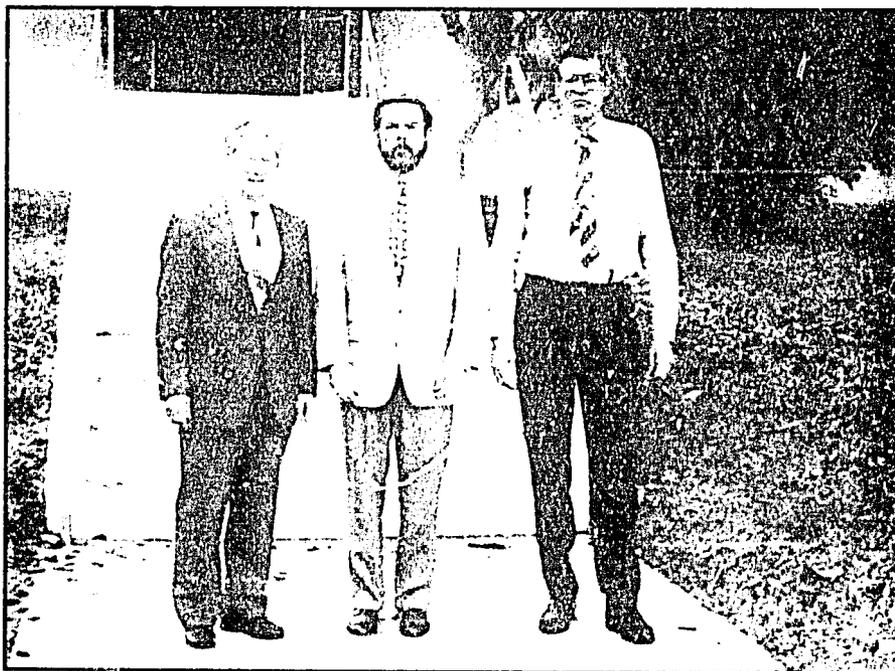
courses which the CoHemis Center stages in Puerto Rico will provide many growth opportunities for the Puerto Rican science and engineering community, as well as to the hemispheric participants.

CoHemis researchers will provide the best local, US and hemispheric expertise to Puerto Rican manufacturing and service industries. In addition, CoHemis collaborates with many other institutions in Puerto Rico, within and outside of the University, such as the PR State Department, PR Economic Development Administration, PR Department of Natural Resources, PR Planning Board, PR Telephone Company, PR Electric Power Authority, and The Economic Development Bank for PR. It promotes activities focused on enhancing important sectors of the economy of Puerto Rico: such as manufacturing, conference-tourism, resource management, and sustainable development.

Technology Assessment

Puerto Rico's science and engineering community has many years of experience in dealing with the US' strong environmental laws and regulations, within cultural, ecological, and socio-economic settings which are similar to most of Central America, South America and the Caribbean. UNITEC, CoHemis' division for technology assessment, forecasting and monitoring (TA), will enhance Puerto Rican expertise in this very important emerging decision-support field. UNITEC, the CoHemis Consortium, and the Puerto Rican context combine to make UPRM the ideal center to provide TA services and training for Latin America and the Caribbean.

World Bank and Interamerican Development Bank funds for TA will be increasing. UNITEC's TA services to Puerto Rican and Latin American entities will allow better decision-making in all economic sectors. US technology will be transferred more effectively, and the host countries will reap many more benefits from it.



Dr. Anthony Dvorak from Argonne National Laboratory, center, with Prof. Pablo Rodriguez, Acting Chancellor, and Dr. Luis Pumarada.

Education and training

Those UPRM students and professors who work in collaborative projects or participate in conferences with persons from Latin America and the Caribbean will acquire knowledge and contacts which will allow them and their respective countries to compete successfully in a global economy. These benefits for the University's Puerto Rican and hemispheric students will mostly be supported by outside sources, such as USAID, the Interamerican Development Bank, and the National Science Foundation.

An active, full-fledged CoHemis Center will be crucial to the development of UPRM doctoral programs and for increasing the number of Puerto Ricans holding Ph.Ds. in science and engineering. The research activity, continued education programs, graduate assistantships, and high hemispheric profile which UPRM will derive from CoHemis will provide a hemispheric scale to its Graduate School. This scale will enable UPRM to sustain doctoral programs which would not be feasible if they were to serve only the demand of Puerto Rico. The interests of the US, Puerto Rico and the other countries of the Americas go hand in hand in enhancing UPRM to become a "technological university of the Americas". These university's activities will enhance the quality and size of the pool of human resources which constitute Puerto Rico's and Latin America's scientific and engineering community, so crucial for economic development in this day and age.

SUMMARY OF ACHIEVEMENTS

With the leverage provided by additional UPR and UPRM funding, the hemispheric center has achieved important milestones during its first two and a half years. The **Appendixes** mention additional activities and further details. They provide copies of CoHemis publications, papers presented at international meetings, brochures used for CoHemis seminars, conferences and symposia, plus samples of press reports on the Center and its activities, letters of endorsement, and international requests for information.

CoHEMIS CONSORTIUM

The Center has formed a consortium of top-notch institutions to make CoHemis more effective for achieving its objectives and more attractive for researchers and graduate students. So far, Sandia and Los Alamos National Laboratories, Georgia Tech, Colorado State University (CSU), and the University of Florida (UF-Gainesville) have joined this consortium, while The Oak Ridge National Laboratory is in the process of doing so. With the consortium solidly established with prestigious US institutions, efforts are being made to extend it to Latin American universities. At the moment, Universidad Simon Bolivar, Universidad de Chile, and Universidad Nacional Autonoma de Mexico are in the process of joining the consortium, while invitations have been extended to five other prominent institutions in as many countries.

The Consortium consists of a set of bilateral agreements of each member with UPRM. Its mission is to support the goals of CoHemis through exchanges of faculty and students, provide assistantships to CoHemis doctoral students and fellowships to UPRM junior faculty, participate in and co-sponsor CoHemis activities, facilitate joint research by their faculty and students, and provide access to research facilities for CoHemis projects.

Consortium Activities:

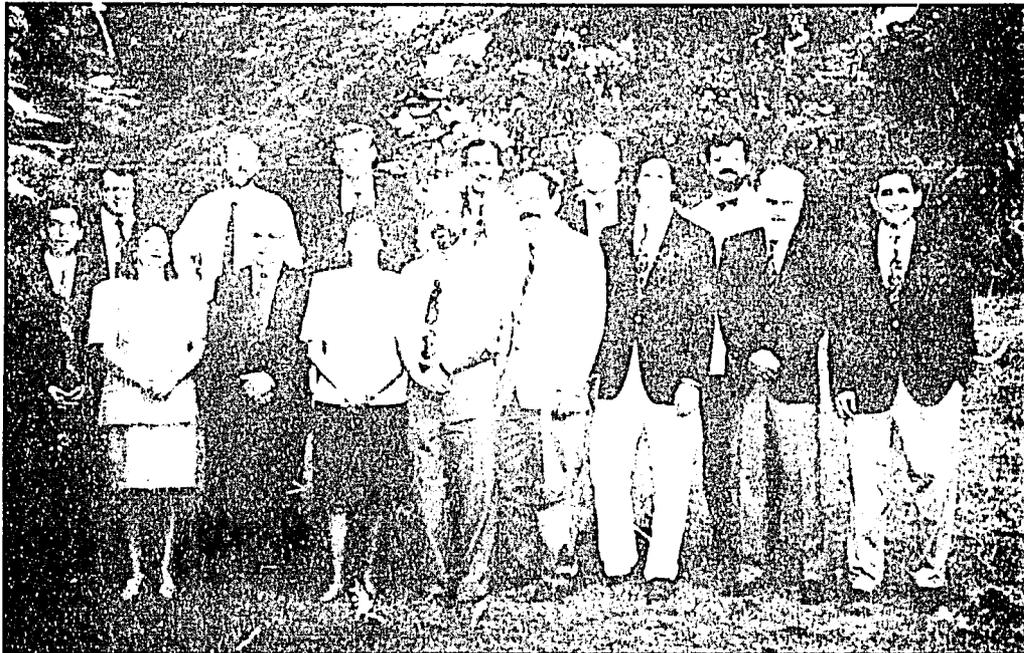
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| September 28-29, 1993 | <p>"Conference on Environmental and Energy Issues facing the Americas" (by Sandia NL)</p> <p>As a result, Sandia, UNITEC and the PR Electric Power Authority agreed to collaborate in a wind turbine project; two proposals on solar detoxification of liquid waste were submitted by UPRM and the University of Turabo, while still another is being prepared by Mexico and UPRM.</p> |
| March 17-18, 1994 | <p>"Seminar on Technical Assistance for Environmentally Conscious Manufacturing"</p> <p>(by Sandia NL, Los Alamos NL, and the National University of Mexico; for PR industry and the UPRM community)</p> <p>It covered, among others, the following topics: Low-residue Soldering, Waste Assessment of Manufacturing Processes, Manufacturing Process Optimization, Agile Manufacturing, and Decision Analysis for Process Safety.</p> |

RESEARCH AND RELATED ACTIVITIES

Proposals

The following proposals have been submitted directly by the Center:

- **"Hemispheric Conference on Technology Assessment, Monitoring, and Forecasting for Sustainable Development."** 1.5 years and \$99,007 (Tinker Foundation) 1992.
- **"Program for Generating and Facilitating Collaborative Research of Hemispheric Interest and for Enhancing Education in a Minority Institution in Engineering and Applied Science."** 1.5 years and \$99,007 (Tinker Foundation) 1992
- **"Conference-Workshop on the Repair and Rehabilitation of the Infrastructure of the Americas"**. One year and \$49,553 (NSF) 1993.
- **"A Workshop on Geo-environmental Issues Facing the Americas"**. Eight months and \$27,923 (NSF), plus \$20,000 authorized by the PR Industrial Development Co. 1993.
- **"Gulf/Caribbean Natural Disaster Assessment and Mitigation Conference and Workshop"**. 1.5 years and \$149,602 (NSF, FEMA, USGS). 1993.
- **"Enhancing Education in Ethics and Values for Business Science and Engineering Students"**. One year and \$128,361 (NSF) 1993.
- **"Funding the Integration of Puerto Rico's Science and Technology Community with the U.S. Research Establishment as a Bridge for Serving Hemispheric Needs"**. One year and \$99,648 (PR Industrial Incentives Committee) 1994.



Representatives from USA, Mexico, Chile, Colombia, and Puerto Rico at the "Conference on Environmental and Energy Issues Facing the Americas".

CoHemis Pilot Program for Joint Research

One of the five proposals selected out of the twelve submitted by UPRM researchers to CoHemis, and which were enhanced and submitted in 1992 to the **PR Science and Technology Board**, was approved to receive \$75,000 per year for three years.

Proposals submitted or in preparation as a result of CoHemis activities

"Solar Detoxification Pilot Plant" (submitted to DOE)

"An integrated hog/algae/fish production facility" (PR-Mexico, in preparation)

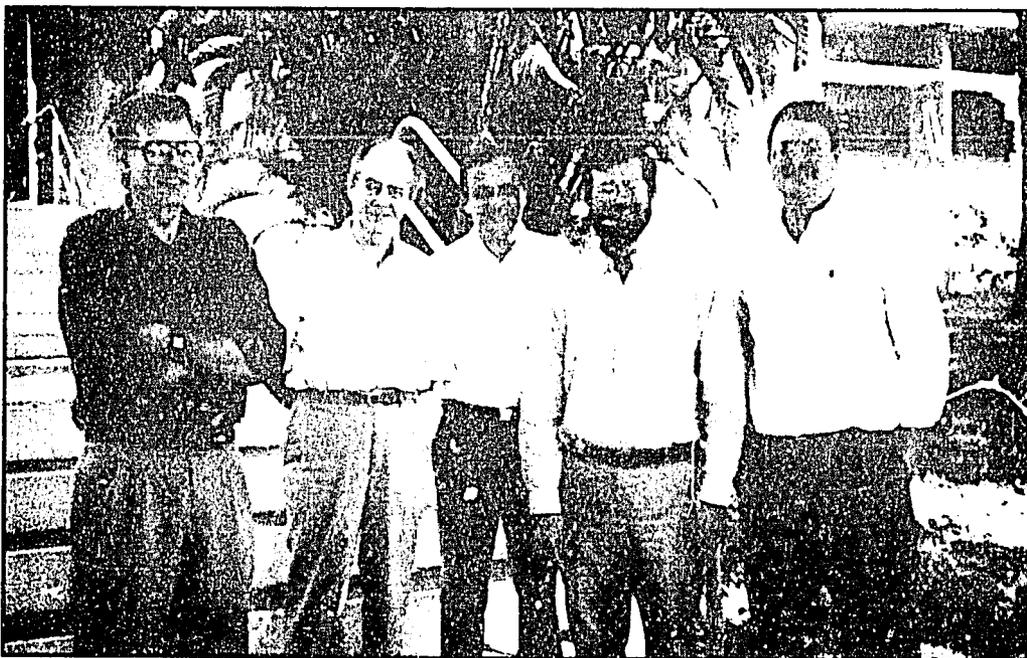
Several research equipment proposals have been submitted as part of an "alliance" created with Sandia and NASA-New Mexico through arrangements made by CoHemis.

Research internships

As a result of CoHemis activities and Consortium memorandums of understanding, several UPRM students and faculty members and several students will be working at Sandia and Oak Ridge NLs this Summer.

UNITEC

CoHemis is aware that *Technology Assessment, Monitoring, and Forecasting* (TA), an indispensable decision-support tool, is being sub-utilized in Puerto Rico and Latin America. The Center knows that Puerto Rico has a comparative advantage for exporting it because of its much longer experience with strong environmental regulations. Hence, it has been creating



Adolfo Korn, second from left, from the United Nations, met with UNITEC's Planning Team: Dr. Luis Pumarada, Dr. Leandro Colon, Dr. Jorge Velez Arocho and Dr. Eduardo Kicinski to discuss Technology Assessment Issues.

interest and enhancing capability for TA at UPRM, the only institution in Puerto Rico that possesses all the diverse types of expertise which TA requires. It is starting TA projects in Puerto Rico to eventually extend this activity to the Caribbean and Latin America.

CoHemis' efforts to provide Puerto Rico and UPRM with an active capability of doing technology assessment studies culminated in the creation of the UNITEC division of CoHemis. UNITEC is presently headed by Dr. Luis Pumarada as its Acting Director. Dr. Pumarada, an Urban Systems Planner, is teamed-up with Dr. Vélez-Arocho, a specialist in Statistics, Total Quality Management, and Strategic Planning, and Drs. Leandro Colón and Eduardo Kicinski from the Department of Economics.

Publications

Conference Proceedings: The papers, deliberations and conclusions of the 1991 event which resulted in the creation of CoHemis were produced in Spanish and English in a single volume. It constitutes an important document which describes the needs, deeds and capabilities of science and engineering research and education in most of Latin America: a most valuable resource for policy planning.

CoHemis...update: A newsletter which began as an update on conference preparations became a quarterly after the event. Produced in English and Spanish (*CoHemis...al día*), it keeps about 300 key persons and institutions in the Americas informed on the progress of the center. *CoHemis...update* relays information on opportunities for collaborative research and on relevant UPRM events and covers current issues.



Panelists on the "Panel on Science and Technology Policies for Economic Development": Richard P. Barke from Georgia Tech, Raul Placencia from Mexico, Manuel Gomez from UPR, Juan Woodroffe from PRIDCO, Jorge Velez Arocho and Luis Pumarada from CoHemis.

CONFERENCES, WORKSHOPS, AND SEMINARS ORGANIZED

April 27, 1993:	"Conference on Technology Assessment"
May 11, 1993:	"Conference on Exporting Technical Services to Latin America"
December 7, 1993	"Global Changes and their Impact in Science, Engineering,
February 10, 1994:	"Seminar on Global Industrial Trends and the Need for and Administration"
October 26, 1993	"Information Management Today and Tomorrow"
January 21, 1994:	"Workshop on Methodologies and Experiences in Technology Assessment" Interdisciplinary Education
February 10, 1994:	"Seminar on Global Industrial Trends and the Need for Interdisciplinary Education"
March 3, 1994	"Panel on Science and Technology Policies for Economic Development"
April 28-29, 1994	Oak Ridge National Laboratory Presentation: "Risk Management: Is it for you?"

COLLABORATIONS.

- Chicago and New York: "UPRM Program for Hispanic Students with Special Talent in Science and Mathematics"
- Collaboration in the initiation activity of the "Manufacturing Engineering Education Partnership" (March, 1994)
- Participation in the PRELECT/AHEAD network for increasing the quality and quantity of Hispanics in Science and Engineering in the US.
- National Institute for Standards and Technology (NIST): "First.." (1992), and "Third Caribbean Workshop on Metrology" (1994)

INTERNATIONAL ACTIVITIES

CoHemis has presented papers and represented UPR in the following international meetings:

- "UN Expert Group Meeting on Technology Assessment, Monitoring and Forecasting", Paris, January 21-24, 1993.
- "Regional Meeting of Engineering Centers for Graduate Studies and Research and Development", Caracas, December 13-14, 1993.

IATAFI: As a sequel of the UN-sponsored meeting above, CoHemis participated in the creation of the International Association of Technology Assessment and Forecasting Institutions (IATAFI), and was named to its Executive Committee.

REPADI: During the above UNESCO-sponsored meeting held in Caracas, CoHemis became a co-founder of REPADI, a network of programs for the enhancement of engineering in Latin America and the Caribbean. It is in charge of its continued education activities.

CoHemis' co-directors are members of the Steering Committee of the Mexican Institute for Sustainable Energy, Xalapa, Mexico.

CoHemis' co-director Jorge Vélez-Arocho has been named to represent CoHemis in the Editorial Board of the *International Journal of Environmentally Conscious Manufacturing*.

CoHemis' director Luis Pumarada is the Regional Chairperson for Latin America and the Caribbean in the **First World Congress on Intelligent Manufacturing Processes and Systems**, to be held at Puerto Rico in February, 1995.

PRESENT SCOPE:

CoHemis earns competitive external funds for specific activities such as workshops and joint research. For some of our activities we have had the co-sponsorship of entities such as Agency for International Development, Puerto Rico Industrial Development Company, Organization of American States, Xerox Corporation, Industry University Research Program (INDUNIV), UPR Resource Center for Science and Engineering. These cover the expenses and the man-hours dedicated to the specific activities being funded. The University has been supporting the Center's infrastructure and collaboration in routine activities. These include:

- Writing proposals for research, conferences, courses, etc. related to the Center's mission.
- Implementing the Consortium agreements: exchanges, joint research, etc.
- Publishing the *CoHemis.. update* bilingual quarterly newsletter.
- Keeping up-to-date on research priorities, hemispheric events and alliances, new issues in science and technology policy in the US, new trends in industry, infrastructure and environment, etc.
- Organizing and supporting timely activities, such as seminars, panels, and conferences to promote the export of technical services, technology transfer, enhancement of the PR science and engineering community, industry-university-government relations, etc.
- Planning future activities.
- Following up on requests for information from PR and abroad.
- Staying abreast of events, needs, trends, and new programs and developments related to Science and Technology in NSF, DOE, NIST, other countries, Interamerican Development Bank projects, etc. Communicating with industry, government, and academia in Puerto Rico, US, and the hemisphere to identify opportunities for CoHemis, the Consortium, and UPR. Identifying common collaboration areas among countries of the Americas, opportunities for joint research and other activities which may be facilitated through the CoHemis Consortium.
- Creating and implementing mutually beneficial bilateral agreements for UPR education, research, and technology transfer.
- Exploring new fields of action and growth strategies for CoHemis and the UPRM's R&D Center.
- Promoting the CoHemis concept and maintaining the Center's profile visible in hemispheric science and technology circles.
- Consolidating and expanding the UNITEC division and its activities.
- Collaborating with government agencies from the US and PR.
- Recruiting personnel for externally-funded proposals and projects.

- **Arranging support for visiting researchers.**
- **Accomplishing a record that will attract funding sources for the Center's future programs and activities.**

The Center's tentative plans for the period between June, 1994 and June, 1995 include the following items:

- **Implement the second round of the CoHemis Joint Research Pilot Program.**
- **CoHemis Consortium Planning Meeting, June 16, 1994 with the participation of representatives of Colorado State University, University of Florida, Georgia Tech, Universidad Nacional Autonoma de Mexico, Sandia National Laboratories, and Universidad Simon Bolivar.**
- **Present the "CoHemis Consortium Workshop on Exporting Services to Support the Transfer of Renewable Energy Technologies" on June 17, as a pre-conference for the US Export Council for Renewable Energy Conference to be held in San Juan. To be co-sponsored by the US Economic Development Administration, PR Development Bank, US Small Business Administration, PR Planning Board, PR Department of Natural Resources, and Pan American Union of Engineering Associations (IAPADI).**
- **Visit of Dr. Oliver Headley to offer the conference on "Solar Research in the Caribbean". June 29, 1994.**
- **Collaborate in the organization of the Renewable Energy in the Americas Conference and Exhibition (REIA) that will be held in San Juan the week of June 26th to July 1st.**
- **Organize an "Emergency Task Force Meeting on the Shrimp Culture Crisis in Ecuador," co-sponsored by Oak Ridge National Laboratories, National University of Mexico, Ecuador, and UPRM's Sea Grant and the UPRM Marine Sciences Dept. (pending)**
- **Visit to Chicago and Washington. Visit Argonne National Laboratories, US Department of Commerce, NSF, and DOE. Contact Penn State and Virginia Polytechnic Universities. Meet with Congressmen to push a Federal budget line item for CoHemis; coordinate the UPRM Inner City High School Program with Chicago.**
- **"Conference-Workshop on the Repair and Rehabilitation of the Infrastructure of the Americas". Co-sponsored by NSF and UPRM's Civil Infrastructure Research Center. August 29-31.**
- **"Workshop on Geo-environmental Issues Facing the Americas". Co-sponsored by NSF, Georgia Tech's Center for Sustainable Technologies, PRIDCO, and UPRM's Civil Infrastructure Research Center. September 13-15.**
- **"Gulf/Caribbean Natural Disaster Assessment and Mitigation Conference and Workshop". This will bring top researchers from the region together with hazard managers to discuss priorities and collaboration, and will lay the groundwork for developing regional hazard mitigation programs in relation to hurricanes,**

earthquakes, volcanoes and resulting disasters such as floods, landslides, collapses and wind damage. Funds are being requested from NSF, USGS, FEMA, and other organizations. (Pending)

- UNITEC Technology Assessment Projects in Puerto Rico: Four potential projects for Technology Assessment and Forecasting have been identified with the PR Electric Power Authority and the PR Telephone Co. A "Master Contract" is being prepared for each public corporation as a prelude for presenting the proposals.

APPENDIXES:

APPENDIX 1: THE UNIVERSITY OF PUERTO RICO AT MAYAGUEZ

The University of Puerto Rico is a fully accredited US state university system. It awards more Ph.D.'s to minorities than any other US institution; the majority, however, are currently in the humanities and social sciences. The University is in the top fifteen US institutions in granting Bachelor Degrees to persons who eventually attain a Ph.D. degree.

The UPRM campus is a Land Grant, Space Grant, and Sea Grant institution, accredited by the Middle States Association of Colleges and Universities. It is the only university in Puerto Rico with engineering programs accredited by the US's Accreditation Board for Engineering and Technology (ABET). It offers graduate and undergraduate degrees in different branches of Engineering, Marine Sciences, Natural Sciences, Agricultural Sciences, and Business Administration. Its School of Engineering has the 12th largest undergraduate enrollment in the US; it selects its students among the island's top 3 to 5% college-bound high school graduates and produces about 16% of the nation's Hispanic-American engineers. Its percentage of women undergraduates is the highest of any school of engineering in the US. Its facilities have been improving to keep pace with the rapid growth of its research component.

About 80% of its science and engineering faculty are Hispanics, including 20% who are Latin Americans with excellent Ph.D. credentials. About 80% of the course lectures are delivered in Spanish, while the English textbooks are the same ones used in the best US colleges. The campus possesses an unique English-Spanish bilingual environment, and is able to conduct immersion programs in any of the two languages. With its relatively high proportion of LAC faculty and graduate students in science and engineering, UPRM is very strongly committed to hemispheric cooperation and collaboration. There are 166 LAC graduate students and 67 faculty members in the Campus' engineering and science (natural, agricultural and marine) departments. The total full time numbers are 480 and 389, respectively.

Programs such as Minority Research Centers of Excellence (MRCE), Experimental Project to Stimulate Competitive Research (EPSCoR), and Research Improvements in Minority Institutions (RIMI) have helped UPRM build centers of excellence in several science and engineering disciplines. UPRM also harbors the Civil Infrastructure Research Center, sponsored by NSF-EPSCoR, UPR, and the government of Puerto Rico. This center, which operates in the Department of Civil Engineering, contributes to support Puerto Rico's first doctoral engineering program. It sponsors research as well as activities such as workshops and seminars which will enhance the faculty and provide additional learning opportunities for the graduate and undergraduate students.

UPRM has a verifiable record of hemispherical cooperation initiatives and activities which goes back for decades. It has been successful in organizing several conferences which have had international participation. Some of these are:

- "Mitigation of Hazards due to Extreme Natural Events in America," Intn'l Conference and Workshop, Jan. 20-23, 1987.
- "Conference and Workshop on R-Processes (Repairing, Rehabilitation, Retrofitting, Renovation, Reconstruction) of America's Infrastructure", Jul. 18-22, 1989.

- "Six Month after Hugo-Preliminary Findings", National Conference, April 1990.
- "1992 NSF Structures, Geomechanics and Building Systems Grantees Conference", June 10-12, 1992.

APPENDIX 2: DEVELOPMENT OF THE CENTER

The Conference delegates outlined a one hundred-researcher, multidisciplinary center conducting competitive joint research and supporting about 200 graduate students at UPRM. This model remains our long term goal.

At present CoHemis organizes thematic workshops and conferences in key fields of engineering and applied science in order to promote and facilitate joint research responding to hemispheric needs. In those activities, researchers from different countries become familiar with each other's work, discuss research priorities, and form multinational teams to produce pre-proposals to address them. The Center also requests proposals for joint research from UPRM faculty. With the collaboration of the Consortium institutions, it provides follow-up to enhance those pre-proposals into solid, competitive proposals. The Center enhances and refers preproposals and proposals which include at least one investigator from a Consortium institution and which involve researchers from US/PR together with researchers from Latin America or the Caribbean.

It also conducts seminars and workshops in Puerto Rico and collaborates with institutions from Puerto Rico as well as from the US, Canada, Latin America and the Caribbean. It is presently UPRM's main outreach branch in technology.

CoHemis Consortium

In 1992 CoHemis began to form a consortium of US institutions which could make the Center more effective for achieving its objectives and more attractive for researchers and graduate students. So far, Sandia and Los Alamos National Laboratories, Georgia Tech, Colorado State University (CSU), and the University of Florida (UF-Gainesville) have joined this consortium, while Georgia Tech, Argonne and Oak Ridge National Laboratories are in the process of doing so. With the consortium solidly established with US institutions, efforts were begun to extend it to Latin American universities. At the moment, Universidad Simon Bolivar and Universidad Nacional Autonoma de Mexico are in the process of joining the consortium, while invitations have been extended to five other prominent institutions.

The Consortium is actually a set of bilateral agreements of each member with UPRM. Its mission is to support the goals of CoHemis through exchanges of faculty and students, provide assistantships to CoHemis doctoral students and fellowships to UPRM junior faculty participate and co-sponsor CoHemis activities, facilitate joint research by their faculty and students, and provide access to research facilities to CoHemis projects.

CoHemis has conducted joint activities so far with CSU, Georgia Tech, Universidad Nacional Autonoma de Mexico, and the Los Alamos and Sandia National Laboratories. The first joint activity was held in May, 1992 as CSU provided a speaker for a CoHemis' seminar on the export of technical services to Latin America. The others are described below, under 1993-94.

UNITEC

In order to provide Puerto Rico and UPRM with an active capability of doing technology assessment studies, the Center has created a division, called UNITEC, for conducting TA studies with the collaboration of the Consortium.

To enhance UNITEC's management and TA capacity and to provide input on the best way to enter the international assessments market, CoHemis and the UPRM Global Awareness Program brought Dr. Adolfo Korn to Mayaguez. Dr. Korn, a retired UN official and an expert in technology management and promotion, met with UNITEC's management and recommended that CoHemis hold a hemispheric conference on TA in Mayaguez to launch UPRM and Puerto Rico as providers. This event will provide UNITEC and Puerto Rico the

opportunity to contribute to US technology transfers to Latin America and the Caribbean through TA studies. This conference should take place at a moment when UNITEC is able to present at least preliminary results of TA projects in Puerto Rico.

UNITEC is preparing a proposal to the NSF Science, Society and Technology Division for organizing such a hemispheric conference-workshop on TA. This will create an awareness of the necessity of TA and of the capability of the CoHemis Consortium to conduct collaborative studies which at the same time build endogenous capabilities in the countries of the hemisphere. A pre-proposal for funding this same activity was submitted to Miami's North-South Center in March, 1993. At present, UNITEC is also preparing four TA pre-proposals at the request of the PR Electrical Power Authority and the PR Telephone Company. For the past year, CoHemis has been enhancing human resources at UPRM and networking its capabilities for supporting TA studies. These activities are reported below, under 1993-94. Funds for a data bank, developing case studies from the projects (to be used in a future course on TA), and for exporting TA services to Latin America will be sought as soon as the projects have begun.

CoHemis Advisers

In order to provide feedback and guidance, a five-delegate Advisory Committee was formed by the Conference. It included the delegates from Venezuela, Mexico, Argentina, Trinidad & Tobago, and Canada. The last two were substituted after the first two years by the delegates from Costa Rica and Chile. A meeting of the Advisory Committee and the CoHemis Center's co-directors was held in Washington, DC in April 1992.

Later on, in order to facilitate the support offered by many prominent persons who visualized the potential of the CoHemis concept and offered enthusiastic support, CoHemis began to name individual advisers. By the end of the 1992, the body of advisers had grown to include eleven renowned individuals: Alberto Pignotti of *Siderca*, Argentina; Rafael Bras, Chairman of MIT's Civil Engineering Department; Wayne Clough, Dean of Engineering at Virginia Polytechnic Institute; Manuel Hernandez-Avila, Director of PR's Sea Grant Program; Ignacio Rodriguez-Iturbe, renowned hydrologist at Venezuela's Universidad Simon Bolivar; Walter Rodriguez, Head of Engineering Graphics at Georgia Tech; Harvey Bernstein, President of the Civil Engineering Research Foundation; Carlos Nones-Sucre, Chief of the Science and Technology Branch of the Division of Science, Technology, Energy, Environmental and Natural Resources of the UN; Louis Marcini-Vega, Professor at Florida Tech; Manuel Gomez, Director of the UPR's Resource Center for Science and Engineering; and Carlos I. Pesquera, Puerto Rico's Secretary of Transportation and Public Works and founding co-director of CoHemis. The individual advisers have been collaborating with constructive criticism and suggestions with respect to proposals and drafts, referring preproposals for evaluation, searching for funding, and in other ways.

Some of the original advisers were substituted at the end of their two-year term by: Nestor Ortiz, Director of the Nuclear Energy Technology Division of Sandia National Laboratories; Sherry Oaks, Professor at Colorado State University and Co-Director of its Latin American Science and Technology Cooperation Center; Emir Macari, 1992 Presidential Faculty Fellow and Professor at Georgia Tech; Gary Williams of Argonne National Laboratories; and Bruce Baner Johnson, from the University of São Paulo, Brazil.

Collaboration With Other Programs

The CoHemis Center has been collaborating with other UPRM programs. For the UPRM Global Awareness Program it has identified or co-sponsored invited speakers: the UN's Adolfo Korn; Vladimir Yackovlev, Coordinator of the Petroleos de Venezuela Educational Programs for Corporate Executives and former head of OAS' Science and Technology Division; and Raul Placencia, Education Coordinator of the Ministry of Social Development of Mexico's State of Hidalgo.

CoHemis has also been collaborating with the UPRM's Institute for Regional Studies, Center for Applied Social Studies, Center for the Philosophy and History of Technology, Civil Infrastructure Research Center, Sea Grant, and the MRCE Center for Natural Disaster Mitigation. The CoHemis Center has involved (through voluntary work, proposal-writing, and presentations in its seminars and conferences) approximately forty faculty from all four colleges in UPRM. It has also provided work-study or assistantships to about eight graduate and six undergraduate students.

The Center has also collaborated with non-academic US and Puerto Rican entities. It has helped the National Institute for Standard Technology (NIST) and the PR Department of Consumer Affairs to organize two Caribbean Metrology Workshops. It has collaborated with the PR Department of State in providing materials and data for its Caribbean programs. It is organizing a series of workshops to stimulate export entrepreneurship in renewable energy technologies in Puerto Rico together with the following: Puerto Rico's Planning Board, Department of Natural Resources, and Economic Development Bank, the local office of the US Small Business Administration, and UPADI, the Pan American Union of Engineering Associations.

In the week of April 25-29th, CoHemis organized a series of meetings of executives and researchers from Oak Ridge National Laboratories, headed by Associate Director for Environmental, Life, and Social Sciences, David E. Reichle, with high officials from the Puerto Rican government and the University of Puerto Rico. The meetings arranged included: PR Department of Natural Resources, PR Department of Agriculture, PR Energy Affairs Administration, PR Department of Education, UPR Rio Piedras Campus, UPR Resource Center for Science and Engineering, UPR Medical Sciences Campus, and UPR Mayaguez Campus.

APPENDIX 3: 1992

CoHemis' significant accomplishments of 1992 include: coordinating a collaborative seismic project in Argentina involving the National University of Cordoba, UPRM, and the Sandia and Lawrence Livermore National Laboratories; the initiation of a pilot program of CoHemis research at UPRM; the introduction of the concept of a CoHemis Consortium of US institutions; a productive meeting with its Advisory Committee in Washington, DC; the addition of several renowned individual advisers; the publication of the bilingual conference proceedings; the elaboration and personal presentation of a three-year, \$945,000 proposal to the National Science Foundation.

Research

In May, 1992 the CoHemis Center initiated the **Pilot Program for Joint CoHemis Research**. Its main purpose was to explore the potential of UPRM faculty to generate proposals involving researchers from Latin America and the Caribbean which followed the CoHemis guidelines of short term economic benefits for more than one country. As a result of a request for pre-proposals in the Mayaguez Campus, twelve pre-proposals were received, all focused on applied research and including visiting investigators from Latin America or the Caribbean. The Center examined the twelve pre-proposals submitted concerning CoHemis guidelines, and selected the eight that complied with them for external evaluation on technical merits. These were sent to volunteers in the US and Latin America for evaluations on technical merits. The five finally chosen were submitted to the Puerto Rico Science and Technology Board for possible funding and were preliminarily accepted. At the end of 1992, the projects were in the proposal-development phase with the benefit of the inputs derived from the external evaluations previously carried out by CoHemis. In 1993 one of the projects, "Organic Waste Disposal Using Earthworms", was approved while others are still under revision.

CoHemis also set up a joint team to participate in an international applied research effort which was to have taken place in Argentina in 1993.¹ The National University of Cordoba was collaborating with the government, the electric utility, Japanese builders, and German equipment manufacturers on simulating, measuring and extrapolating the effects of ground movement on a building which was to house a nuclear power reactor. CoHemis facilitated the collaboration of UPRM researchers on vibrating non-structural elements and on geotechnics, and of Sandia and Lawrence Livermore scientists and engineers on underground explosions and ground-movement measurements.

Three-year Proposal

A proposal for three years and \$946,565 that would establish CoHemis as an operating and successful hemispheric research center was submitted to National Science Foundation for cross-program funding. The funding requested would have supported:

- * Creating a CoHemis Consortium of US universities, laboratories and research centers to provide additional opportunities for investigators and students from the hemisphere;

- * Organizing thematic conferences on different high-priority topics to take place in Mayaguez to propitiate the creation of multinational teams of investigators;

- * Organizing workshops for following-up the conference topics and enhancing the capacity and competitiveness of the region's investigators. These would be held in Mayaguez and in different countries of Latin America and the Caribbean. Various countries offered to collaborate in organizing workshops.

¹ This project was cancelled by the Argentinian government before it actually began.

* Facilitating the production of joint proposals following CoHemis guidelines for competitive funding by the teams created at the conferences and the joint research projects which eventually get funded.

* This proposal was to have been funded by contributions from about ten different NSF Science and Engineering Programs. However, this mechanism proved to be unworkable, and CoHemis was asked to submit separate proposals for each program. This has been done successfully.

Advisory Committee Meeting and Presentation

The Advisory Committee created by the 1991 conference, consisting of the delegates of Canada, Mexico, Trinidad and Tobago, Venezuela and Argentina, met at the Puerto Rico Federal Affairs Office in Washington, DC, in April, 1992. It revised in detail the concept of the center and its projected by-laws. Together with the Chancellor of the Mayaguez Campus, the committee made a presentation to delegates of hemispheric and OAS embassies, as well as to several US agencies and the State Department.

Outreach and Dissemination

With travel support from the President of the University and the Chancellor of the Mayaguez Campus, the Center's unique concept was presented in relevant circles in Washington, DC and New York City, including: private foundations; Hon. Rick Boucher, President of the Subcommittee for Science and Technology of the House of Representatives; staff from other Congressional committees dealing with science and technology and appropriations; Dr. Allan Bromley, President Bush's Adviser for Science and Technology; officials of the Inter American Development Bank; Dr. Dunja Pastizzi-Ferencic, Director of the Department of Social and Economical Development of the UN, and Adolfo Korn, from of its Division of Science and Technology, Energy, Environmental and Natural Resources; and national officials from several American professional and scientific associations related to science and technology.

Hemispherical and Institutional Relations

Venezuela and Guatemala were visited to learn their views on hemispheric cooperation in science and technology and their particular situations. These two countries are near opposite ends of the economic development scale in Latin America. Communication was established in those countries with various institutions that are related to the mission of CoHemis. In addition to the respective national organizations for science and technology, these institutions include the National University of San Carlos and Segeplan in Guatemala, and the Engineering Research Foundation, IVIC, INZIT-CICASI, COLCYT-SELA and Bolivar Program in Venezuela. The Venezuelan CONICIT paid all local expenses for this trip.

During 1992, CoHemis received the official endorsements of the national organizations for science and technology of various Latin American countries, including Argentina, Colombia, Costa Rica, Cuba and Brazil. Various Latin American universities and other institutions established direct relationships and exchanges of publications with the Center.

Different US institutions interested in hemispheric collaboration were visited to discuss possible mechanisms and areas for collaboration in preparation for the creation of the CoHemis Consortium: the universities of Colorado State and New Mexico, and the Sandia and Los Alamos National Laboratories. CoHemis also kept in contact with Virginia Polytechnic and Georgia Tech through the CoHemis advisers belonging to those universities.

CoHemis and Georgia Tech co-sponsored in Mayaguez the First PRELECT Conference (Preeminent Engineering Lectures and Conference in High Technology). It was organized

by Dr. Walter Rodriguez, CoHemis Adviser and a Professor at Georgia Tech. As a result, a PRELECT network (later renamed AHEAD) was created to increase the participation of Hispanics in Science and Engineering in the US.

Organization and Infrastructure

Early in 1992, UPRM provided CoHemis with a fully-equipped office at the R&D Center's main building and increased its level of support. The CoHemis staff consisted of a coordinator, a secretary and a part-time graduate student, in addition to its two Co-directors. NSF funding continued during the year.

In May, Dr. Jorge I. Velez-Arocho, former UPRM Dean of Business Administration, substituted Dr. Carlos I. Pesquera as Co-director of CoHemis. Dr. Pesquera had become Director of the Civil Engineering Department's Infrastructure Research Center, and at the end of the year was named Puerto Rico Secretary of Public Works. Dr. Velez-Arocho is an experienced international consultant on organization, Strategic Planning and Total Quality Management.

At the end of the year, CoHemis Director Dr. Luis Pumarada resigned as Chairperson of the General Engineering Department to dedicate more time to the Center.

APPENDIX 4: 1993 AND EARLY 1994

Outreach and Dissemination

In the US

In the early part of 1993 a trip was made to Washington DC and Chicago to present the CoHemis Center to key institutions, agencies and Congressmen as part of a long range strategy to obtain substantial Federal funds for the Center. Hon. Governor Pedro Roselló endorsed these visits in letters addressed to the persons with whom the meetings were planned. These meetings were held at: NASA; National Institute for Standards and Technology (NIST); AID, Department of Energy (DOE); Puerto Rico Federal Affairs Office; and the White House, for a meeting with Atty. Lilliam Fernández. There were personal meetings held with Hon. George Brown, President of the House Committee on Science, Technology and Space Affairs, and with Congressmen Luis Gutiérrez, Carlos Romero-Barceló and Nydia Velázquez. In addition, there were meetings with the chief legislative advisers of the Hons. José Serrano, Xavier Becerra and Bill Richardson, all of them members of the Hispanic Caucus, and of the Hon. Rick Boucher, President of the House Subcommittee on Science and Technology.

In Chicago, CoHemis made presentations to Dr. Angel Taboas, Director of the DOE Field Office at Argonne National Laboratories, as well as to several program directors. Argonne is the US' largest civilian national laboratory. There were also meetings at the McCarthur Foundation and at the Roberto Clemente Community Academy.

In a short visit to Washington, DC in November, 1993 Drs. Luis Pumarada and Jorge I. Vélez presented and discussed CoHemis' proposals and preproposals, its new UNITEC division for technology assessment, and the CoHemis Consortium. The trip included visits to the DOE, where a new UPRM-Turabo proposal on Solar Detoxification was discussed; to CoHemis adviser Gary Williams at Argonne's Washington Office to arrange a future workshop for UPRM faculty who will be participating in UNITEC projects; to Congress' Office of Technology Assessment for future interactions with UNITEC; and to NASA for generating support for a UPRM preproposal for a "Gulf/Caribbean Workshop on Remote Sensing for Land:Sea Interface Studies".

A meeting with the Federal Highway Administration's Associate Administrator for Research and Development, Dr. John A. Clements, was held as suggested by PR-DTPW Secretary Dr. Carlos Pesquera, a CoHemis adviser. While discussing a possible UNITEC project on IVHS (Intelligent Vehicle and Highway Systems) for PR and Latin America, the agency's great interest in Latin America and the great potential which CoHemis holds for contributing to its implementation became very clear to all the participants. At NSF, local matching funds and conditions pertaining a future proposal were discussed, and two CoHemis proposals already submitted to other programs were followed-up. At NIST, a meeting was held with Ms. Gale Morse, manager of the State Technology Extension Program (STEP) on UPRM's future proposal. Ms. Morse encouraged a UPRM proposal and explained how a winning proposal should be put together.

In Puerto Rico and Latin America

In Puerto Rico, CoHemis made presentations to the Planning Board, the PR Industrial Development Company, and the Economic Development Administration. A meeting was held with personnel from the Governor's Office for Federal Affairs. Upon their recommendation, a successful visit was made to Mr. Juan Woodroffe, President of the PR Industrial Development Co. (PRIDCO) to obtain \$100,000 in matching funds for the STEP planning grant proposal and

\$20,000 for the "CoHemis-NSF Workshop on Geoenvironmental Issues Facing the Americas". A meeting was also held in the Capitol with Atty. Luis Berríos, Legislative Adviser to Hon. Zaida Hernandez, President of the House of Representatives. He suggested ways to arrange Puerto Rican legislative support for CoHemis.

Cycle of CoHemis Conferences on Technology Assessment and Exporting Technical Services

April 27, 1993: "Technology Assessment" A conference with the participation of CoHemis, the UPRM Department of Economics, and the UPR School of Planning. Aimed at getting UPRM faculty and students interested in Technology Assessment (TA).

May 5, 1993: "Exporting Technical Services to Latin America" A conference with the participation of Edibaldo Silva (*Clapp & Mayne*), Juan Castañer (*GB International*), José Custodio (*CSA Architect and Engineering*), and Jorge Ramírez (*Colorado State University*). Aimed at getting UPRM faculty interested in international consulting and other services.

January 21, 1994: "Methodologies and Experiences in Technology Assessment" Dr. Anthony Dvorak, Director of Argonne National Laboratory's Environmental Impact Division, offered this four-hour seminar for the group of UPRM professors involved in CoHemis TA projects. The workshop emphasized project organization, ethics, and credibility. UNITEC's directors later had the opportunity to discuss crucial issues face-to-face with the person who heads one of the largest TA operations in the US.

February 10, 1994: "Global Industrial Trends and the Need for Interdisciplinary Education" (Collaboration with the UPRM Global Awareness Program) Dr. Vladimir Yackovlev, who spent eight years as Director of the Science and Technology Division of the Organization of American States before heading the training program for the top executives of *Petróleos de Venezuela*, that country's largest multinational corporation, addressed engineering and science faculty and students.

"UN Expert Group Meeting on Technology Assessment, Monitoring and Forecasting"

CoHemis participated in this meeting, held at the UNESCO headquarters in Paris between January 25 and 28, 1993, through an invitation made by Dr. Carlos Nones-Sucre, CoHemis individual adviser and Chief of the Science and Technology Branch of the UN's Science, Technology, Energy, Environment, and Natural Resources Division. CoHemis presented a paper on its possible role in the assessment and forecasting of technology and its impacts in the Western Hemisphere (see portfolio).

The participants included 27 experts plus representatives from 11 UN divisions and 18 other organizations. They came from Germany, Argentina, Brazil, China, Spain, US, Philippines, France, Ghana, Netherlands, Hungary, India, Israel, Japan, Kenya, Korea, Mali, Nigeria, Norway, Poland, Puerto Rico, Russian Federation, Switzerland, Togo, Sri Lanka and Venezuela. Among the UN agencies were: UNDP, UNEP, UNU/INTECH, ECA, ESCAP, WHO, ILO, FAO, UNESCO and UNIDO.

IATAFI

As part of the above meeting, CoHemis participated in the creation of a committee for organizing the International Association of Technology Assessment and Forecasting Institutions (IATAFI). After having cooperated with this committee by coordinating the flow of information from Central America, Mexico and the Caribbean basin, CoHemis was named to the Executive Committee of IATAFI.

Regional Meeting of Engineering Centers for Graduate Studies and Research and Development

CoHemis participated in the above meeting in Caracas, Venezuela on December 13 and 14. It was organized by Venezuela's CONICIT and its COPLAC program and by UNESCO's ORCYT (Regional Office for Science and Technology, located at Montevideo, Uruguay). CONICIT invited CoHemis and paid all local expenses. CoHemis presented a paper on the possible contribution of CoHemis and UPRM to the establishment of a network for the enhancement of engineering in Latin America and the Caribbean (see portfolio).

Foundation of REPADI

As a result of this meeting, which brought together participants from Chile, Cuba, Mexico and Uruguay, as well as Venezuela, REPADI, the Network of Programs for the Enhancement of Engineering in Latin America and the Caribbean, was created. Initially, this network will consist of four programs, including one on continued education, to be managed by CoHemis and its Consortium. The other programs are: exchange of graduate students, faculty, and researchers; inter-university relationships and industry-university relationships.

Joint Activities with the National Laboratories:**Support for UPRM research**

Thanks to CoHemis adviser Dr. Nestor Ortiz, the Center coordinated a visit to UPRM by Sandia's Vice-President, Dr. Dan Harley and Michael Lee (NASA-University of Nuevo Mexico). They discussed future NASA-Sandia collaborations with Campus officials. As a direct result of their meetings, an agreement was signed by which Sandia promotes UPRM research and equipment proposals and became a member of the CoHemis Consortium.

"Conference on Energy and Environmental Issues Facing the Americas"

CoHemis organized the conference "Environmental and Energy Issues Facing the Americas" in Mayaguez in September 28-29, 1993. It was co-sponsored by Georgia Tech, Sandia, and INDUNIV. The center invited three participants from Latin America (Mexico, Chile and Colombia) with funds provided by USAID and OAS. The College of Engineering contributed by inviting the NSF's Program Director who deals with geoenvironmental issues, Dr. Mehmet Tumay. Sandia sent five speakers, and the Denver Renewable Energy National Laboratory sent one. Georgia Tech sent one participant on behalf of its Center for Sustainable Technologies. Other participants included UPRM faculty, University of Turabo, and the PR Electric Power Authority.

As a result, Sandia, UNITEC and the PR Electric Power Authority agreed to collaborate in a joint project to install a pilot wind turbine project. In addition, two joint proposals on solar detoxification of liquid waste have been submitted by UPRM and Turabo and another is being prepared by Mexico and UPRM for an integrated hog/algae/fish farm. An idea to make CoHemis the Latin America and Caribbean node of Sandia's proposed ENVIROtrade network data bank on environmental mitigation technologies was amply supported.

"Seminar on Technical Assistance for Environmentally Conscious Manufacturing"

CoHemis, together with Sandia's Dr. Nestor Ortiz, organized this event primarily directed at Puerto Rico's industry on March 17-18, 1994. Co-sponsored by the PR Economic Development Administration, it lined up Consortium researchers and engineers from the Sandia and Los Alamos National Laboratories, NIST, and the National Autonomous University of Mexico, as well as private sector experts from Baxter Healthcare Corporation, Benchmark Environmental Corp., Beta Corporation International, Isaksen Group, and Costco.

The presentations demonstrated that modifications in manufacturing processes which reduce waste and the need to mitigate or treat polluting effluents can lead to higher profits. They covered, among others, the following topics: Low-residue Soldering, Waste Assessment of Manufacturing Processes, Manufacturing Process Optimization, Agile Manufacturing, and Decision Analysis for Process Safety.

A research engineer from the National Autonomous University of Mexico (UNAM), presented an anaerobic waste-water treatment technology developed at their Engineering Institute. The Institute has patented three developments associated to this European-led technology and transfers it to the private sector by means of license agreements with consultants. The industry-university partnerships now have about ten plants in operation.

Collaborations with the Government of Puerto Rico:

At the request of the PR Department of State, CoHemis put together information on all UPR program offerings pertaining to environmental studies. This department has been receiving increasing numbers of requests for information on such programs in Puerto Rico from Latin America and the Caribbean and from USAID contractors. CoHemis has also been working together with the PR Planning Board on the organization of a hemispheric conference on renewable energy technologies. It is on call by the Economic Development Bank of Puerto Rico for providing information through UPRM faculty on new technologies which may come up for investment. The PR Economic Development Administration and the PR Industrial Development Company have co-sponsored CoHemis activities.

Research

One of the five proposals produced for the CoHemis Pilot Program for Joint Research and which were submitted in 1992 to the PR Science and Technology Board was approved to receive \$75,000 per year for three years. Except for a proposal originated by UPRM's Dr. Sergio González, which he retired upon being named Executive Director of the PR Highway Authority, the rest are still under consideration by that body upon being revised by their authors.

The project funded to date deals with the biological processing of chicken wastes by earthworms and its eventual conversion into fertilizer and/or chicken feed. It was produced by UPRM's Drs. José Latorre and Sonia Borges and will involve a Colombian researcher. CoHemis has identified a researcher at the Consortium's University of Florida who is willing to collaborate with the part on protein conversion. In order to afford this, CoHemis is looking for funds from the PR chicken industry.

"Panel on Science and Technology Policies for Economic Development"

On March 3rd, 1994 CoHemis presented, with the co-sponsorship of the Resource Center for Science and Engineering and the UPRM Global Awareness Program, the panel "Science and Technology Policies for Economic Development". It featured: Dr. Richard P. Barke, Acting Director of Georgia Tech's School of Public Policy and Consultant to the Carnegie Commission on Science and Technology; Dr. Manuel Gomez, Director of the UPR's EPSCoR program; Mr. Juan Woodroffe, President of the PR Industrial Development Company; Ms.

Norma E. Burgos, President of the Puerto Rico Planning Board, who delivered a special message from Governor Rossello; and Eng. Raul Placencia, General Coordinator of Educational Programs of the Ministry of Social Development of the State of Hidalgo, Mexico.

The panelists dealt with legislation and decision-making in Science and Technology Policy, enhancement of human resources for science and technology and the role of the UPR, Puerto Rico's new economic model and the role it assigns to Science and Technology, and the aggressive science and technology enhancement policies which Mexico has been implementing for the last six years.

Collaboration with US Institutions

Program with the Representative Districts of Congressmen Velázquez, Serrano and Gutiérrez:

After having visited the Roberto Clemente Community Academy, located in the Chicago district represented by Hon. Luis Gutiérrez to discuss a future "Program for Hispanic Students with Special Talent in Science and Mathematics", and having received at UPRM a visit by a group of students from that school as part of an educational trip to Puerto Rico, CoHemis secured a commitment by the tutorial programs at UPRM to support potential students with Spanish language limitations which may be admitted into UPRM coming from that school. On the other hand, Argonne NL has agreed to invite talented students and science and math teachers from Clemente HS to visit and train at their facilities. CoHemis also located Hispanics who work in science and engineering in Argonne and who are willing to lecture at Roberto Clemente HS and become potential role models for the Puerto Rican and other Latin students at the troubled inner city school. Once this initiative proves successful, similar programs may be launched with similar schools in other districts with a high percentage of Puerto Ricans.

National Institute for Standards and Technology

CoHemis collaborated with Puerto Rico's Consumer Affairs Department (DACO) in organizing an activity for NIST. The "Third Caribbean Workshop on Metrology" was held at UPRM on February 7-10, 1994; it was open to UPRM students, faculty and laboratory technicians. It was followed on February 11th by a regional meeting of the National Conference of Standards Laboratories. Industry laboratories and quality control departments, as well as personnel from government regulatory agencies, participated in these events. Attendees came from several Caribbean islands, including Puerto Rico, Central America, and Ecuador.

Los Alamos National Laboratories

CoHemis codirector, Dr. Jorge Vélez-Arocho, was named to the Editorial Board of the *International Journal of Environmentally Conscious Manufacturing* by its Director, Dr. Jeff Weinrach, from Los Alamos National Laboratory. Dr. Weinrach was one of the speakers featured in CoHemis' Seminar on Technical Assistance for Environmentally Conscious Manufacturing held at UPRM.

Hemispherical and Institutional Relations

Kingston-Ocho Rios, Jamaica

Dr. Leandro Colón, a professor at the UPRM Economics Department and member of UNITEC, presented at one of the panels of the "18th Annual Conference of the Association for Caribbean

Studies" the paper "Technology Assessment". It was written by Dr. Luis F. Pumarada-O'Neill and Dr. Jorge I. Vélez-Arocho, co-directors of CoHemis.

Visit to Mexico

CoHemis' co-directors met with officials from Mexico's National Council for Science and Technology (CONACYT) and the Universidad Nacional Autónoma de México (UNAM) in Mexico City on January 24-27, 1994. The CONACYT official who is handling US-Canada-Mexico science and technology cooperation discussed Mexican participation in future CoHemis events and coordinated meetings for CoHemis with several key researchers and officials from UNAM. This mammoth institution of 270,000 students, 28,000 professors, and 1000 researchers is the oldest university in the Americas. It has dozens of research centers, many of which are excellent. CoHemis made valuable contacts at the Geography, Ecology, and Engineering research institutes for future UNAM participation in joint research and conferences. As a result of this visit, UNAM is about to formalize a broad bi-lateral agreement with UPRM which can facilitate the CoHemis Consortium as well as other cooperation and exchange initiatives. It has already sent a researcher to a CoHemis Consortium activity at Mayaguez.

Publications

The publication of CoHemis' bilingual quarterly newsletter, *CoHemis...update*, has continued and its hemispheric circulation expanded. A special issue emphasized technology assessment and sustainable agriculture.

Dr. Adolfo Korn, *Institutional Arrangements for the Establishment and Support of Technology Assessment Capacity - the African Context*, a reprint of a paper commissioned by the UN for a 1993 Seminar on Technology Assessment at Kampala, Uganda, May 1994.

APPENDIX 5: FUTURE ACTIVITIES

In addition to the planned future activities mentioned above, the following are contemplated:

- **Writing proposals:** Hemispheric Conference on Technology Assessment, Monitoring, and Forecasting (to be sent to the NSF's Science, Technology, and Society Division); Infrastructure and Institutionalization of UNITEC, CoHemis' Division for Technology Assessment (for the University of Puerto Rico); The Ecuador Shrimp Crisis--using cultured shrimp as indicators of environmental degradation (with Oak Ridge National Laboratories, for the US DOE); Common problems and solutions in urban rail transportation in the Americas.
- **CoHemis Consortium:** Coordinate proposals on behalf of the Consortium to the Interamerican Development Bank for UNITEC Technology Assessment and other applied projects, and to USAID and international agencies for short courses and educational programs. Coordinate activities and identify other possible joint proposals. Participate on behalf of the Consortium in proposals presented by REPADI (Network for Enhancing Engineering in Latin America and the Caribbean) to international agencies and set up short courses, faculty and student exchanges, etc. with Consortium Institutions, North and South. Get Oak Ridge NL and Argonne NL to formalize their membership. Establish a Consortium Directory to coordinate activities and identify possible joint proposals.
- **Funding:** Secure funds to: support conferences, workshops and panels on timely subjects related to CoHemis' objectives addressed to UPRM faculty and students using local and Consortium resources; provide for the local expenses of resources, Consortium or otherwise, who pay for their own transportation; cover travel expenses of CoHemis officials to participate in meetings, coordinate Consortium activities and joint proposals, and make presentations to research and funding agencies; pay the salaries, materials, and maintenance of the basic equipment and staff of CoHemis/UNITEC .
- Extend the range of UNITEC's assessment activities to Latin America and the Caribbean, and promote the export of services
- Work with Venezuela on joint proposals on Coastal Management focused on tourism, recreational, and industrial uses.
- Participate in proposals presented by REPADI (Network for Enhancing Engineering in Latin America and the Caribbean) to international agencies.
- Work towards a \$100,000 per year line-item Federal budget appropriation for expanding and improving the center's basic activities.

APPENDIX 6: VITAS

LUIS PUMARADA-O'NEILL, Director of CoHemis

Academic:

Ph. D. in Urban Systems and Policy Planning from Northwestern University, Evanston, Illinois (1986). Dissertation: "Decision Support for Problems with Alternatives which Affect Downstream Decisions, with an Energy Application"

Graduate Laboratory Participantship, Oak Ridge Associated Universities, US Department of Energy (1981-82); dissertation support at the Puerto Rico Center for Energy and Environment Research, Mayagüez.

Master of Science in Architectural Technology from Columbia University, New York (1969). Kinney Traveling Fellowship.

Bachelor of Science in Civil Engineering. University of Puerto Rico, Mayagüez Campus (1966). High Honors.

Experience:

Director, Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis), University of Puerto Rico at Mayagüez (1991-).

Acting Director and co-founder, UNITEC: CoHemis Division for Technology Assessment, Forecasting and Monitoring, University of Puerto Rico at Mayagüez (1993-)

Professor, University of Puerto Rico, Faculty of Engineering; 1991- , Associate Professor, 1986-91, Assistant Professor, 1978 to 86 ; School of Architecture; Assistant Professor, 1977-78 Instructor: 1969-1977.

REPADI (Network of Programs Supporting the Development of Engineering in Latin America and the Caribbean): Co-founder, Member of the Executive Committee, and Director of its educational outreach program. (1993-)

Member, Advisory Committee of the "Cross-disciplinary Program for Engineering and Science Students on Global Awareness", University of Puerto Rico Mayaguez Campus, (1993-)

Member, Executive Committee of the International Association of Technology Assessment and Forecasting Institutions, Bergen, Norway (1993-)

Member, Advisory Committee of the Latin American Center for Science and Technology Cooperation of Colorado State University (1993-)

Member, Steering Committee of the Mexican Institute for Sustainable Energy, Xalapa, Mexico (1993-)

Consultant in Industrial Archeology and History of Engineering to private firms and government agencies (1977-).

Chairman, Department of General Engineering, University of Puerto Rico at Mayagüez (1989-92).

Created the course on Theory and Administration of Systems at the UPR School of Engineering (1987).

As part-time visiting professor, taught a graduate course on Business Strategy at the School of Business Administration of Interamerican University, San German Campus (1986).

Professional trips to:

- Mexico, 1994. Presentations to the National Science and Technology Council (CONACYT) and university research centers.
- Atlanta, Gainesville FL, Washington, 1993. Meetings and CoHemis & UNITEC presentations to research-sponsoring agencies and university officials.
- Washington DC, New York, Colorado, New Mexico; 1992, 1993. Meetings and CoHemis presentations to research-sponsoring agencies and foundations, congressional and executive branch offices, UN division offices, embassy staff, Interamerican Development Bank, national laboratory officials, etc.
- Venezuela and Guatemala, 1992. Visits and presentations to universities, research centers and industrial parks.

Related Publications:

Editor: *CoHemis... update*: quarterly newsletter of the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (1991-).

*Produced (and contributed two sections for) the bilingual proceedings of the *Hemispherical Conference on Technological Cooperation: a Preliminary Activity for the Establishment of a Hemispherical Center in Puerto Rico, 1992*.

"A Systems Approach Decision-making Scheme for the PR. Sugar Industry", presented at the Annual Meeting of the Puerto Rico Section of the American Society of Agricultural Engineers, Mayagüez, PR, Nov. 17, 1989.

Other Recent Publications:

Los puentes históricos de Puerto Rico ("Puerto Rico's Historic Bridges"), Mayaguez Campus Research and Development Center, Mayaguez, 1991. 168 pages, illus.

La Industria Cafetalera de Puerto Rico, 1736-1969 ("The Puerto Rican Coffee Industry, 1736-1969"), Mayaguez Campus Research and Development Center, Mayaguez, 1990. 204 pages, illus.

"Study and Recommendations on the San Germán Vaulted Brick Tunnel Storm Sewer System", Final Technical Report to the US Dept. of the Interior, Project No. 5, Grant agreement No. 14-08-0001-G-1249, July 1988.

JORGE IVAN VELEZ-AROCHO, Codirector of CoHemis

Education:

Ph.D., University of Florida, Gainesville, Florida, Management Science, 1978.

M.B.A., University of Puerto Rico, Rio Piedras, PR, Quantitative Methods, 1973.

B.B.A., University of Puerto Rico, Rio Piedras, PR, Statistics. 1970.

Experience:

Professor, School of Business Administration, University of Puerto Rico at Mayaguez, August 1986 to present. Teaches courses in Statistics, Decision Analysis, Strategic Management, Quantitative Methods and Production Planning and Control.

Coordinator: Center for International Perspectives, School of Business Administration, University of Puerto Rico at Mayaguez, August 1990-Present.

Dean, School of Business Administration, University of Puerto Rico at Mayaguez, August 1986 to August 1990.

Associate Professor, School of Business Administration, University of Puerto Rico at Mayaguez, 1981 to 1986.

Assistant Professor, School of Business Administration, University of Puerto Rico at Mayaguez, 1978 to 1981.

Consultant in Puerto Rico and Central America in areas related to management of operations in private and public organizations, 1978 to present.

Honors:

Cum Laude, BBA, 1970; Alpha Iota Delta Honor Society, 1976; Phi Kappa Phi Honor Society, 1980; Puerto Rico Telephone Company, 1982; American Production and Inventory Control Society, Professional Chapter, 1987; Catholic Educator of the Year, National Catholic Association of Commercial Education, 1988; American Production and Inventory Control Society, Student Chapter, 1988; American Marketing Association, Student Chapter, 1988; International Association of Students Economics and Commercial Sciences, 1989; Board of Trustees of Hospital La Concepción, 1989; Distinguished Citizen in Education, Jaycees, 1990.

Seminars:

Several seminars in industry in areas such as: Quality Control, Sampling Methods, Zero Base Budgeting, Materials Requirement Planning, Quality Circles, Maintenance Management, and Supervision.

Papers and Publications:

"Perceptions of the Residents of Cataño Pueblo, Sabana, Amelia of the Townships of Cataño and Guaynabo of their Pollution Problems" Masters Thesis. April 1973.

"Effects of Uncertain and Nonstationarity Parameters Upon Capital Market Equilibrium Conditions: An Adendum". Co-authored and presented to the South Western Financial Association Meeting in Dallas, Texas. November 1977.

"Bayesian Modeling of Nonstationarity in Normal and Lognormal Processes with Applications in CVP Analysis and Life Testing Models". Doctoral Dissertation. May 1978.

- "Retail Food Price Differentials and Supermarket Cost/Price Margins: A Comparison Between Puerto Rico and the United States". Co-author. July 1979.
- "Hispanic Participation at High Managerial Positions of USA and other Multinational subsidiaries in Puerto Rico". Co-authored with Marta Calas and presented to the second National Symposium on Hispanic Business and Economy in the US Miami, Florida, 1979.
- "Retail Food Price Differentials: A Comparison Between 1979 and 1980 in Puerto Rico". Presented to the third National Symposium on Hispanic Business and Economy in the US, Chicago, Illinois 1981.
- "A Bayesian Predictive Approach to CVP Analysis Under Parameter Uncertainty". Co-authored with Christopher B. Barry and Paul Welch. *Quarterly Review of Economics and Business*, Vol. 24, Number 2. Summer 1984.
- "Cambios en la Educación en Contabilidad: más integración, más educación y más especialización". Co-authored and presented to the Interamerican Conference of Accounting. Asunción, Paraguay. September 1989.
- "Development of a Student Exchange Program: Finding a Partner". Co-authored and presented to the 7th Annual Conference of Academic Chairpersons: Developing Faculty, Students and Programs. Orlando, Florida 1990.

Professional Societies:

Institute of Industrial Engineering

Institute for Decision Sciences

American Production and Inventory Control Society

APPENDIX 7

- Letters of endorsement and international requests for information
- Bilateral agreements
- Brochures used for CoHemis seminars, conferences and symposia
- Newsletters
- Papers presented at international meetings
- Samples of press reports on the Center

**Letters of endorsement and
international requests for
information**



La Fortaleza

27 de julio de 1993

Dr. Luis F. Pumarada O'Neill
Director
Centro Hemisférico de Cooperación en Investigación
y Educación en Ingeniería y Ciencia Aplicada
Universidad de Puerto Rico
Mayaguez, Puerto Rico 00681-5000

Estimado doctor Pumarada O'Neill:

Le agradezco su carta de fecha reciente en donde me informa sobre el éxito de sus gestiones en la Capital Federal.

Me complace saber que nuestra aportación haya sido de utilidad. Si existiera alguna otra iniciativa con la que podamos colaborar para el desarrollo de sus propuestas y con el establecimiento de la Unidad de Evaluación del impacto de la tecnología, me reitero a sus ordenes.

Reciba la expresión de mi mayor consideración.

Cordialmente,

PEDRO ROSSELLO
Governador



The Governor of Puerto Rico

April 13, 1993

The Honorable John H. Gibbons
Assistant to the President
Science and Technology
White House
Old Executive Office Building
Room 423
Washington, DC 20506

Dear Mr. Gibbons:

Luis Pumarada O'Neill and José Vélez Arocho, PhD's are co-directors of the Hemispheric Cooperation Centers for Engineering and Applied Science Research and Education. They will be visiting Washington, D.C., on April 19th. thru the 21st and I will appreciate you meeting with them.

This initiative started in 1991 at a Hemispherical Conference on Science and Technology including 12 Latin American and Caribbean countries with the participation of the United States of America and Canada. The Center aims to become a source of scientific and technological research that will benefit all countries involved in the project. It will also provide scholarships to 200 graduate students, either at the University of Puerto Rico-Mayagüez (UPRM) or US Continental Institutions. The UPRM is a state educational institution with land, sea and space awards status. The university grants PhD's in Marine Science and has started an engineering doctoral program as well.

The Center is expected to contribute to hemispheric integration, economic development and global competitiveness. It will increase Puerto Rico's technological capacity to lend support to a variety of industries and export service throughout the American continents.

I support this initiative and hope that after meeting with Mr. Pumarada O'Neill and Mr. Vélez Arocho, PhD's you will consider its merits, and support it as well.

Cordially,

Raúl Arocho

Raúl Arocho

COMMONWEALTH OF PUERTO RICO

OFFICE OF THE GOVERNOR
SAN JUAN, PUERTO RICO 00901



April 7, 1992

Hon. D. Allan Bromley
Assistant to the President for Science
and Technology
Old Executive Office Building
Room 358
Washington, D.C. 20506

Dear Mr. Bromley:

The Mayaguez Campus of the University of Puerto Rico is launching a hemispherical cooperation center for engineering and applied science. Drs. Luis Pumarada and Carlos I. Pesquera, its organizers, will be visiting Washington, D.C., during the week of April 6th and will try to arrange a meeting with you.

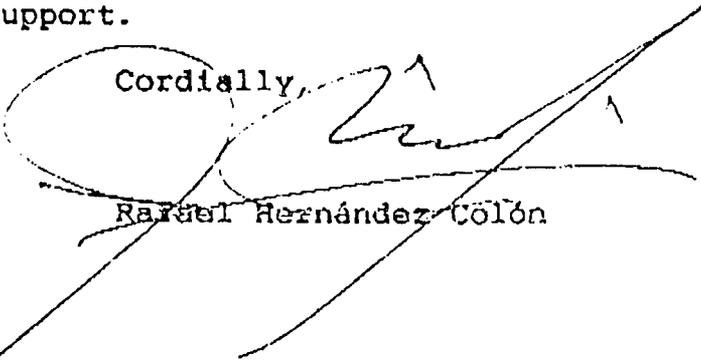
This center of 100 researchers from different countries working on common problems is conceived as an international organization, proportionately supported by member nations. It will be established at Mayaguez and focus on quick-return projects with educational and service components. Assistance will be granted to over 100 graduate students from the Americas who would be enrolled at the Mayaguez Campus, a fully U.S.-accredited school of engineering ranked 12th in the United States in number of engineering undergraduates and producing 20% of all Hispanic engineers in the nation.

This effort already has the support of many countries in our hemisphere willing to contribute to its operation. It will cater to private industry, national research agencies and government needs. Also, it will contribute to hemispheric economic development and to a stronger hemispherical market and industry. Researchers will be exposed to new problems and solutions and it will push scientific technology and education across the ideal bridge that Puerto Rico stands for.

Hon. D. Allan Bromley
April 7, 1992
Page 2

We endorse this project very strongly and suggest that you meet the organizers to consider its merits for any possible Congressional support.

Cordially,


Rafael Hernández Colón

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230



March 25, 1994

OFFICE OF THE
DIRECTOR

Dr. Luis F. Pumarada-O'Neill
Centro Hemisferico de Cooperacion
en Investigacion y Ciencia Aplicada (CoHemis)
Universidad de Puerto Rico
Mayaguez, PR 00681-5000

Dear Dr. Pumarada:

Thank you for your letter of February 18, providing information on the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) prior to my trip to Mexico. I appreciate your thoughtfulness and wish you success in extending your efforts to include Latin American and Canadian institutions.

Sincerely,

A handwritten signature in cursive script that reads 'Neal Lane'.

Neal Lane
Director

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

September 25, 1991

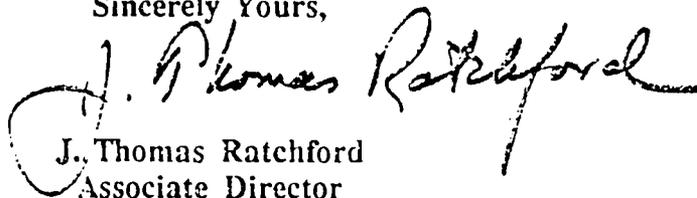
Dear Dr. Pumarada-O'Neill:

Thank you for your letter of August 19, and invitation to participate in the Hemispherical Cooperation Conference on Engineering and Applied Science Research from November 13 - 15, 1991. I am impressed with the scope and depth of this conference on such an interesting and timely subject; and I am honored to be included.

Unfortunately, I regret that, because of schedule conflicts, I must decline the invitation.

Best wishes in your ambitious endeavor. I would welcome an opportunity to review a record of the proceedings, should one be produced after the meeting.

Sincerely Yours,



J. Thomas Ratchford
Associate Director

Dr. Luis Pumarada-O'Neill
Centro de Investigación y Desarrollo
Universidad de Puerto Rico
Recinto de Mayagüez, PR 00709-5000

JOSE E. SERRANO
EIGHTEENTH DISTRICT NEW YORK

COMMITTEE
EDUCATION AND LABOR

SMALL BUSINESS

MEMBER, CONGRESSIONAL
HISPANIC CAUCUS

ASSOCIATE MEMBER, CONGRESSIONAL
BLACK CAUCUS

WASHINGTON OFFICE
7 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-3218
(202) 225-4361

Congress of the United States
House of Representatives
Washington, DC 20515-3218

DISTRICT OFFICE
390 GRAND CONCOURSE
BRONX, NY 10451-2828
(212) 538-5400

September 12, 1991

Dr. Luis Pumarada
Conference Director
COHEMIS
Centro de Investigacion y Desarrollo
Universidad de Puerto Rico, Recinto de Mayaguez
Mayaguez, Puerto Rico 00709-5000

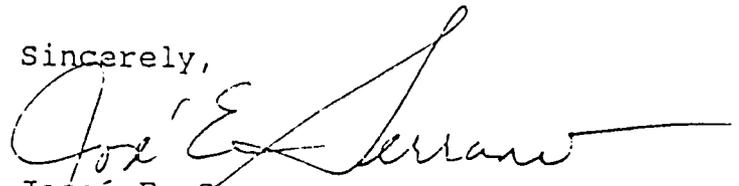
Dear Dr. Pumarada:

Thank you for your very kind invitation to attend the opening of the Hemispherical Cooperation Conference on Engineering and Applied Science Research, which will take place on November 13 in the Mayaguez campus of the University of Puerto Rico. Regrettably, I will be unable to attend due to scheduled events in Washington.

I would, however, like to take this opportunity to commend your committee on organizing such a relevant and pertinent conference. As we move into the future, this exchange of ideas will help build a network that will strengthen all of the communities involved. I am confident that this event will be successful and beneficial for the participants.

Once again, thank you for your generous invitation. With this letter, please receive my warmest personal regards.

Sincerely,


Jose E. Serrano
Member of Congress

JES:cmf

25 de mayo de 1992
0492-DM.MICIT-92

Dr. Luis Pumarada
Research and Development
UNIVERSITY OF PUERTO RICO
Mayaguez Campus
Mayaguez, Puerto Rico 00709-500

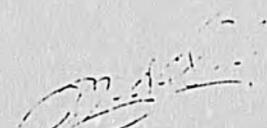
Dr. John D. Scalas
Program Director
Structures and Building Systems
National Sciences Foundation
1800 G. Street, N.W.
Washington, D.C. 20550

Estimados señores:

He recibido informacion del Director del Instituto de Investigaciones en Ingenieria, Ing. Ismael Mazón, referente a las ventajas que tendria el Centro Hemisférico de Cooperacion en Investigacion y Educacion en Ingenieria y Ciencia Aplicada.

Ya que este Centro permitira el intercambio de experiencias tecnologicas, la participacion de grupos multidisciplinarios en la ejecucion de proyectos nacionales o regionales el apoyo y proyectos y programas de transferencia tecnologica, mi criterio calurosamente apoya las gestiones para la constitucion de dicho Centro Tecnologico.

Con toda consideracion,


Dr. Orlando M. Morales
Ministro



al

415

Ministerio de Estado
Presidencia del Consejo
Nacional de Investigaciones Científicas
y Tecnológicas, CONICIT

Cartagena,

03 ABR. 1992

Ciudadano
Dr. Luis Pumaraca O'Neill
Centro de Cooperación Hemisférica
CO-HEMIS
Universidad de Puerto Rico
Recinto de Mayaguez
San Juan de Puerto Rico

Tengo el agrado de dirigirme a usted, en la oportunidad de manifestarle nuestra complacencia por la iniciativa de la Universidad de Puerto Rico para promover la creación de un Centro Hemisférico para la Cooperación en Enseñanza e Investigación en Desarrollo en Ingeniería y Ciencias Aplicadas.

Nuestro interés en propiciar el desarrollo de las capacidades productivas de América Latina y el Caribe, se ha expresado en muy diversas ocasiones, una de ellas es la reciente puesta en marcha del Programa Bolívar para la Integración Tecnológica Regional, la Innovación y la Competitividad Industrial, una iniciativa latinoamericana que propicia la cooperación entre empresas, centros de investigación y organismos públicos y privados para generar un nuevo sistema de relaciones entre los sectores científicos, técnicos e industriales.

Estamos convencidos de que aunando esfuerzos por la vía de la cooperación entre actores de varios países, fortaleceremos nuestras capacidades endógenas, así como la incorporación efectiva de la variable científico-tecnológica al proceso productivo; por tanto, vemos con sumo interés las posibilidades de establecer vínculos de cooperación entre el Programa Bolívar y el Centro de Cooperación Hemisférica (CO-HEMIS).

Augurándole el mayor éxito en las actividades que iniciaran en breve y expresándole mis sentimientos de consideración y estima.

Dulce Arnaz de Uzcátegui
Ministra de Estado
Presidenta del CONICIT

Presidencia de la Nación
Secretaría de Ciencia y Tecnología

FAX N° 809-265-3826

BUENOS AIRES, 13 ENO 1992

Doctor Luis F. PUMARADA O'NEILL
Oficina Formativa del CO-HEMIS
S. / D.

Tengo el agrado de dirigirme a Ud. para poner en su conocimiento el interés de este Organismo en el desarrollo de las actividades tendientes a la constitución del Centro de Cooperación Hemisférica para Educación e Investigaciones en Ingeniería y Ciencia Aplicada.

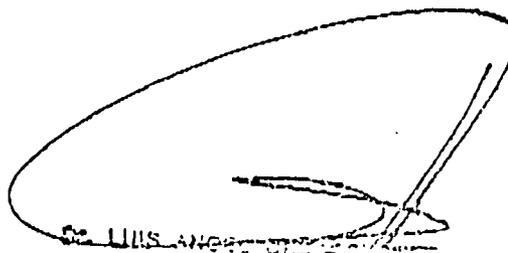
El informe presentado por nuestro enviado, Ing. Numa CAPIATI, nos ha permitido apreciar las ventajas y posibilidades que implican la organización del Centro, para la República Argentina y para toda la Región. Al mismo tiempo cabe destacar las favorables perspectivas que se abren para una iniciativa como la presente, dada la relevancia de las instituciones involucradas en su constitución.

Es nuestro deseo colaborar con las diversas actividades que se realicen con el objeto de elaborar un proyecto de Centro apto para organizar la cooperación hemisférica en materia de investigación científica y de formación de recursos humanos en el área de la Ingeniería y Ciencia Aplicada, como paso previo a evaluar la conveniencia y factibilidad de solicitar su incorporación como miembro del mismo.

En tal sentido, apreciamos que nuestro país haya sido designado miembro del Comité Asesor y respaldamos la presencia en el mismo del Ing. Numa CAPIATI, quien reúne las condiciones y capacidades inherentes a las actividades a desarrollar.

Saludo a Ud. con mi consideración más distinguida.

M.C.



LUIS PUMARADA O'NEILL
Subsecretario Técnico
y de Asuntos Internacionales

ESTADO LIBRE ASOCIADO DE PUERTO RICO
COMPAÑIA DE FOMENTO INDUSTRIAL DE PUERTO RICO

29 de diciembre de 1993

DR. LUIS F. PUMARADA O'NEILL
CENTRO HEMISFERICO DE COOPERACION EN
INVESTIGACION Y EDUCACION EN INGENIERIA
Y CIENCIAS APLICADAS
UNIVERSIDAD DE PUERTO RICO
MAYAGUEZ, PR 00681-5000

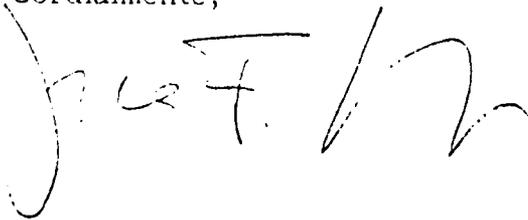
Estimado doctor Pumarada O'Neill:

Por este medio quiero felicitarle por los esfuerzos de su organización en la preparación y organización del Taller "**Geo-Environmental Issues Facing The Americas**" así como los proyectos de investigación relacionados.

Me es sumamente grato informarle que a petición nuestra, el Comité de Inversiones Industriales de la Compañía de Fomento Industrial de Puerto Rico, autorizó la asignación de \$20,000.00 para la celebración del Taller, el cual atraerá a Puerto Rico una serie de investigadores en el campo del Geo-Ambiente, lo cual fomentará la investigación en Puerto Rico en esa área.

Entendemos que esta asignación se justifica, ya que tanto el Taller como los proyectos de investigación a realizarse ayudarán tanto al gobierno como a la industria a manejar los críticos problemas de infraestructura de Puerto Rico.

Cordialmente,



Head Office

20 VICTORIA AVENUE
PORT OF SPAIN TRINIDAD, W. I.
TEL 825-2110 825-4145 FAX 825-4161



NIHERST

NATIONAL INSTITUTE
OF HIGHER EDUCATION
RESEARCH SCIENCE AND TECHNOLOGY

INCORPORATED BY ACT OF PARLIAMENT ACT NO. 20 OF 1994

OUR REF
YOUR REF

To : Dra. Luz Leyda Vega, Coordinator, COHEMIS
c/o University of Puerto Rico

From : Mrs M. Manchouck, Ag. President

Fax : 1-809-265-6340

Date : April 18, 1994

The December 1993 issue of COHEMIS Update highlights a number of new and exciting initiatives which have been launched by COHEMIS and for which we must congratulate you and your team at the UPRM. These initiatives include, inter alia, the establishment of the COHEMIS Consortium, responsibility for the REPADI Outreach Program, the creation of UNITEC etc.

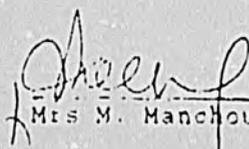
We are hoping that through your support and cooperation small island states such as ours will be allowed to actively participate in and benefit from the various initiatives undertaken by COHEMIS. We should like you to know that Trinidad and Tobago would wish to:

- be part of the new network for enhancing graduate level engineering education.
- pursue membership of the St Augustine Campus of the University of the West Indies in the COHEMIS Consortium of universities and research laboratories at an appropriate date in the future.
- participate in the various research projects of the Centre. Our research interests include, inter alia, the Environment, Energy, Biotechnology and Microelectronics.

We wish, as a result, to be kept informed of developments on the hosting of the First World Congress on Intelligent Manufacturing Processes and Systems and the Gulf/Caribbean Workshop on Remote Sensing for Land/Sea Interface Studies. NIHERST would be happy to promote in Trinidad and Tobago the new B.Sc. in Industrial Biotechnology at the UPRM if you send us the relevant information.

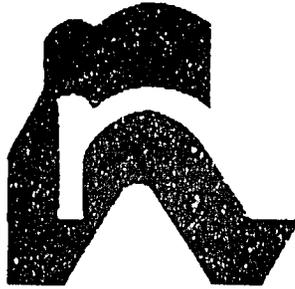
We would also be pleased to disseminate copies of the proceedings of the conference entitled Environmental and Energy Issues Facing the Americas (September 28-29, 1993) and the Regional Meeting of Research and Development Centers and Graduate Study Institutions in Engineering (December 13-14, 1993, Caracas) when these become available.

We once again congratulate the staff of the Centre for the splendid job which they have been doing.


Mrs M. Manchouck

Head Office

20 VICTORIA AVENUE, PORT-OF-SPAIN,
TRINIDAD AND TOBAGO.
TEL 625-8108/2110/4145



NIHERST

NATIONAL INSTITUTE
OF HIGHER EDUCATION
RESEARCH SCIENCE AND TECHNOLOGY

INCORPORATED BY ACT OF PARLIAMENT ACT NO 20 OF 1994

April 05, 1994

Mrs Luz Leyda Vega
Coordinator
COHEMIS
c/o University of Puerto Rico
Mayaguez
PUERTO RICO 00681-5000

Fax: 1-809-265-6340

Dear Mrs Vega:

We are pleased to announce that the Government of Trinidad and Tobago has given its approval for Trinidad and Tobago to pursue membership in COHEMIS. NIHERST has been designated the national focal point for the Centre and its President is the designated national representative.

We should be grateful if you could convey the above developments to the appropriate officials of COHEMIS.

Yours sincerely

/s/ Ag. President

JLY/Ej

Subj: INFORMACION SOBRE COHEMIS

Date: Fri, 25 Mar 1994 15:00:17 -0400 (GMT-0400)

From: Gustavo Munevar <gmunevar@colciencias.colciencias.gov.co>

Subject: INFORMACION SOBRE COHEMIS

To: COHEMIS_RUM@RUMAC.UPR.CLU.EDU

Message-Id: <Pine.3.87.9403251517.A13116-0100000@colciencias>

Mime-Version: 1.0

Content-Type: TEXT/PLAIN; charset=US-ASCII

Recientemente hemos recibido un ejemplar de su Boletín Cohemis ... al día publicado el 30 DIC 1993. En él he encontrado tópicos de mucho interés para las actividades que desarrollamos en el Programa Nacional de Desarrollo Tecnológico Industrial y Calidad de COLCIENCIAS que es el Instituto Colombiano para el fomento de la Ciencia y la Tecnología, por esta razón me gustaría recibir de ustedes información de las actividades

Press RETURN for more...

MAIL>

#1 25-MAR-1994 16:33:55.76

NEWMAIL

y emprendimientos que actualmente realizan, y así mismo solicitar la inclusión de mi nombre en la lista del correo electrónico.

En las páginas 2 y 5 del mismo boletín se menciona la realización de un taller sobre "Metodologías y Experiencias en la Evaluación del Impacto de la Tecnología" dirigido por el Dr. Anthony Dvorak. Es posible obtener copia de los documentos o memorias de este taller?

Nuestra actividad en el programa se centra en la génesis y posterior financiamiento de proyectos de investigación científica y desarrollo tecnológico, proyectos conjuntos universidad-industria, proyectos cooperativos interempresas y en general emprendimientos de carácter cooperativo. De manera similar trabajamos el desarrollo de redes temáticas. En este último aspecto hemos iniciado contactos para constituir una red en el tema de evaluación de tecnología.

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#16 18-FEB-1994 20:13:07.29

MAIL

From: SMTP%"egutierr@dino.conicid.ve"
To: L_PUMARADA
CC:
Subj: solicitud

From: egutierr@conicid.ve (Edixon Gutierrez (LUG))

Message-Id: <9402190004.AA00724@dino.conicid.ve>

Subject: solicitud

To: l_pumarada@rumac.upr.clu.edu

Date: Fri, 18 Feb 1994 20:04:04 -0400 (AST)

Cc: egutierr

X-Mailer: ELM [version 2.4 PL21]

Mime-Version: 1.0

Content-Type: text/plain; charset=US-ASCII

Content-Transfer-Encoding: 8bit

Content-Length: 1394

Dr. Luis Pumarada O'Neill

Press RETURN for more...

MAIL>

Esc-ctrl: ^] help: ^]? port: TES parity:none echo:rem VT300

#16 18-FEB-1994 20:13:07.29

MAIL

Presidente de COHEMIS

Estimado Dr. Pumarada

Sirva la presente en primer lugar para presentarle mis saludos. En la pasada II Reunion de Centros de Investigacion y Desarrollo y Estudios de Posgrado en Ingenieria, en Caracas Venezuela, planteo la posibilidad de asistencia a los cursos programados por COHEMIS para 1994, asi como de cierto apoyo para ello. En principio tengo interes por asistir a uno de

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December 28, 1993

CoHemis
University of Puerto Rico
Mayagüez, PR 00681-5000

Dear Madam/Sir:

I recently learned of the existence of CoHemis from a friend at the U.S. Federal Highway Administration in Washington and was impressed by the nature and scope of your program. I was also taken by the similarity between your objectives and those of a program with which I am associated.

The American Consulting Engineers Council (ACEC), a professional association of some 5,000 firms, maintains an active international program through its International Engineering Committee (IEC). About two years ago, it was decided that ACEC would start a program of contacts and cooperation with our counterparts throughout the Western Hemisphere. Currently, our activities in this regard are being carried out by a subcommittee of IEC called the Hemispheric Cooperation Committee and I am its Chairman.

We have established an understanding and special agreement with the Mexican Camara Nacional de Empresas de Cosultoria (CNEC), have been working with the Latin American Federation of Consultants (FELAC), and are in the process of contacting each of the national associations of either consulting engineering or simply consulting in general. Our objectives are to promote a better understanding of the common interests and concerns and to work together toward improvements of our mutual and respective positions. We also want to know each other better and to overcome prejudices based on a lack of interaction.

We and the other national groups in the hemisphere hope to help each other in the transfer of technology and in strengthening our respective associations. The possibility of a hemispheric federation is just now beginning to be explored.

It would be of great interest to us to hear about the work of CoHemis in greater detail and to examine with you the ways in which our programs may support and complement each other. Please let me know if anyone from CoHemis plans to be in this area; it would be a pleasure to receive them and to introduce them to the ACEC, IEC and HCC key personnel.

Sincerely,

David Jaffe

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UNIVERSIDAD NACIONAL DE COLOMBIA
FACULTAD DE INGENIERIA - SANTAFE DE BOGOTA, D. C.

DECANATO

Al contestar
cítese este número

Santafe de Bogotá, Octubre 6 de 1993

D-0384-93

Doctor
LUIS PUMARADA O'NEILL, Ph.D.
Director
Centro Hemisférico de Cooperación, COHEMIS
Universidad de Puerto Rico
Mayaguez, PR 00681-5000

Apreciado doctor Pumarada:

En mi reciente visita a Georgia Tech , tuve oportunidad de conocer al doctor Emir Jose Macari, quien me informó sobre la existencia del Centro Hemisférico de Cooperación, COHEMIS, de la Universidad de Puerto Rico.

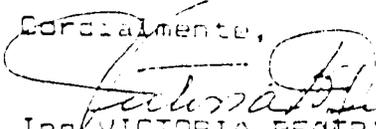
Es de gran interés para la Facultad de Ingeniería, vincularse a este Centro no solo para acceder al apoyo de las actividades docentes e investigativas , sino para promover sus trabajos de investigación y educación continuada en el campo de la Ingeniería y de las ciencias aplicadas.

La Facultad de Ingeniería de la Universidad Nacional de Colombia es la mas grande del país; cuenta con 6.000 alumnos y ofrece a nivel de programas de pregrado seis (6) carreras de Ingeniería Agrícola, Civil, Electrica, Mecánica, Química y de Sistemas, a nivel de postgrado tenemos 11 programas de Especialización y Maestría en diferentes campos de la Ingeniería.

Le agradecería suministrarme información sobre el procedimiento y requisitos para hacer parte del Centro, pues como le manifiesto, y como le informe al doctor Macari, nos interesa establecer relaciones con otras Universidades e Institutos que realicen investigación en Ingeniería, a través del centro, y cooperar con ellos en actividades de mutuo interés.

En espera de su respuesta, suscribo

Cordialmente,


Ing. VICTORIA BEATRIZ DURÁN
Decana



Betty B.
COHEMIS

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CoHemis Consortium

Consortium for Hemispheric Cooperation
in Research and Education
in Engineering and Applied Science

Full members:

Colorado State University
Los Alamos National Laboratories
Sandia National Laboratories
University of Florida
Georgia Institute of Technology
Universidad Simon Bolivar (Venezuela)

Joining members:

Universidad Nacional Autonoma de Mexico
Oak Ridge National Laboratories
Universidad de Chile

Host member:

CoHemis Center
University of Puerto Rico, Mayaguez Campus
Mayaguez, PR 00681-5000
COHEMIS_RUM@RUMAC.UPR.CLU.EDU.
Tel: (809) 265-6380; Fax: (809) 265-6340

MEMORANDUM OF UNDERSTANDING FOR CoHEMIS CONSORTIUM

The Mayagüez Campus of the University of Puerto Rico, herein represented by its Chancellor, Dr. Alejandro Ruiz-Acevedo, and the Colorado State University, herein represented by its President, Dr. Albert Yates, are interested in a hemispheric science and technology enhancement initiative for the purpose of and in accordance with the following understandings:

1. The initiative, identified as "CoHemis Consortium", will receive the active cooperation of the University of Puerto Rico's Mayagüez Campus and of Colorado State University, referred to hereon as "consortium university", as well as other institutions as may be necessary to successfully implement the program objectives defined in the following section.
2. The major objectives of this program are:
 - 2.1 Increase the global competitiveness of Western Hemisphere industry.
 - 2.2 Increase the number and quality of Hispanic-American Engineering and Applied Science Ph.D.'s
 - 2.3 Enhance the technological capabilities of Latin America and the Caribbean and hence their social, economic and commercial development.
 - 2.4 Foster the protection of the hemisphere's environment and resources.
 - 2.5 Increase the awareness of high priority regional problems among researchers.
 - 2.6 Support the Mayagüez Campus' Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) in its mission of providing funds and facilities and conducting joint applied research, technology assessment, and human resources development programs to serve the needs of the Americas with the participation of engineering and science researchers and graduate students from the different countries of the hemisphere.
 - 2.7 Identify areas in science and technology in which the faculty and facilities of the two institutions complement each other to make it feasible to conduct joint research and technology assessment projects which are expected to produce results with potential benefits for more than one country in the Western Hemisphere in a relatively short term with the participation of CoHemis visiting researchers and students.
 - 2.8 Seek financial support for such projects from diverse national and international sources.
 - 2.9 Develop programs for faculty, graduate student and information exchanges and for training and research to support the type of project defined in section 2.6 above.
3. The University of Puerto Rico's Mayagüez Campus, through its Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science, will support the Consortium in the following ways:
 - 3.1 Facilitate visiting professorships and sabbaticals by consortium university faculty in Latin American and Caribbean institutions and industry.

Off. [Signature]

- 3.2 Provide CoHemis assistantships from external research funds to consortium university's graduate students doing dissertation work in applied research of hemispherical interest either at CoHemis or at the consortium university.
 - 3.3 Facilitate institutional and professional relations and exchanges of faculty and students between the consortium university and universities and research centers in Latin America and the Caribbean.
 - 3.4 Enable the consortium university's faculty to conduct joint research of hemispherical interest at the Mayagüez Campus through CoHemis researchers and graduate students by means of short periodic visits.
 - 3.5 Provide facilities, communications, infrastructure and support for CoHemis.
4. The consortium university will support the Consortium in the following ways:
 - 4.1 Grant assistantships to CoHemis students qualifying for admission to their institutions after completion of their M.S. degrees at the Mayagüez Campus.
 - 4.2 Grant fellowships to minority Mayagüez Campus junior faculty qualifying for admission to their institutions as graduate students.
 - 4.3 Co-sponsor conferences or other activities, either at CoHemis, the consortium university's premises, or in Latin America and the Caribbean, through CoHemis' hemispheric network of collaborators.
 - 4.4 Provide access to research facilities to CoHemis researchers and graduate students.
 - 4.5 Collaborate with CoHemis in reviewing technical information from Latin American and Caribbean countries and in evaluating research proposals.
 5. The Mayagüez Campus and the consortium university will sustain a continuous exchange of information on relevant projects and results.
 6. General Dispositions:
 - 6.1 The present memorandum of understanding will not be interpreted as creating legal or financial relationships between the parties. This memorandum of understanding constitutes a declaration of intentions aiming to promote interactions in matters of collaborative research and graduate education expected to increase the well-being of the countries of the Americas. Nothing agreed upon in here will affect the rights of both parties to enter in similar agreements with other institutions.
 - 6.2 The agreement may be amended at any time after the written consent of both parties.
 - 6.3 This constitutes the entire understanding between the Mayagüez Campus and the consortium university as sponsors of the CoHemis Consortium. The understanding may be amended or terminated by mutual agreement of the sponsors.

Yell
Yell

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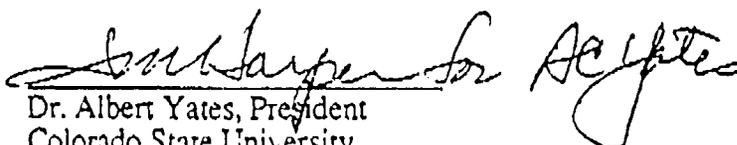
In testimony of which the authorized representatives of the University of Puerto Rico, Mayagüez Campus and the consortium university sign the memorandum of understanding accepting all of its elements.



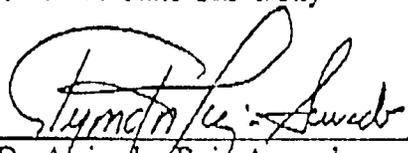
Dr. A.A. Dyer, Dean
College of Natural Resources
Colorado State University

~~

Dr. Francis Kulaeki, Dean
College of Engineering
Colorado State University~~ (no longer at CSU)



Dr. Albert Yates, President
Colorado State University



Dr. Alejandro Ruiz-Acevedo
Chancellor
University of Puerto Rico
Mayagüez Campus

MEMORANDUM OF UNDERSTANDING FOR CoHEMIS CONSORTIUM

The **Mayagüez Campus of the University of Puerto Rico**, herein represented by its Acting Chancellor, Prof. Pablo Rodríguez, and **Los Alamos National Laboratory**, herein represented by Dr. Michael G. Stevenson, Associate Director of Energy and Environment, are interested in a hemispheric science and technology enhancement initiative for the purpose of and in accordance with the following understandings:

1. The initiative, identified as "CoHemis Consortium", will receive the active cooperation of the University of Puerto Rico's Mayagüez Campus and of Los Alamos National Laboratory, hereon referred to as "the laboratory", as well as other institutions as may be necessary to successfully implement the program objectives defined in the following section.
2. The major objectives of this program are:
 - 2.1 Increase the global competitiveness of Western Hemisphere industry.
 - 2.2 Enhance the technological capabilities of Latin America and the Caribbean and hence their social, economic and commercial development.
 - 2.3 Foster the protection of the hemisphere's environment and resources.
 - 2.4 Increase the awareness of high priority regional problems among researchers.
 - 2.5 Increase the number and quality of Hispanic-American Engineering and Applied Science Ph.D.'s
 - 2.6 Support the Mayagüez Campus' Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) in its mission of conducting joint applied research, technology assessment, and human resources development programs to serve the needs of the Americas with the participation of engineering and science researchers and graduate students from the different countries of the hemisphere.
 - 2.7 Identify areas in science and technology in which the researchers and facilities of the two institutions complement each other to make it feasible to conduct joint research and technology assessment projects, with expected potential benefits for more than one country in the Western Hemisphere in a relatively short term.

- 2.8 Seek financial support for such projects from diverse national and international sources.
- 2.9 Develop faculty, graduate student and information exchange programs for training and research in support of the type of project defined in section 2.6.
3. The University of Puerto Rico's Mayagüez Campus will support the Consortium in the following ways:
 - 3.1 Promote the participation of the laboratory and its scientists in suitable projects of Hemispheric interest in Latin American and Caribbean countries.
 - 3.2 Enable the laboratory to have joint research of hemispherical interest to be conducted at the Mayagüez Campus by CoHemis researchers and graduate students, supervised by means of short periodic visits.
 - 3.3 Facilitate the participation of Mayagüez Campus faculty and students in laboratory research.
 - 3.4 Promote the participation Mayagüez Campus Hispanic-American and Latin American researchers and students in suitable laboratory projects of Hemispheric interest carried on at the laboratory or in Latin American and Caribbean countries under its scientists.
 - 3.5 Provide facilities, communications, infrastructure and support for CoHemis.
4. The laboratory will support the Consortium in the following ways:
 - 4.1 Promote the participation of Mayagüez Campus and CoHemis researchers and students in laboratory projects.
 - 4.2 Co-sponsor or contribute to conferences or other activities through CoHemis' hemispheric network of collaborators.
 - 4.3 Provide CoHemis' researchers and graduate students involved in specific projects of mutual interest access to research facilities.
 - 4.4 Collaborate with CoHemis in reviewing technical information from Latin American and Caribbean countries and in evaluating research proposals.
5. The Mayagüez Campus and the laboratory will sustain a continuous exchange of information on relevant projects and results.
6. General Dispositions:

- 6.1 Access to the laboratory and participation in its projects will be subject to security measures and nationality restrictions determined by the laboratory.
- 6.2 The present memorandum of understanding will not be interpreted as creating legal or financial relationships between the parties. This memorandum of understanding constitutes a declaration of intentions aiming to promote interactions in matters of collaborative research and graduate education expected to increase the well-being of the countries of the Americas. Nothing agreed upon in here will affect the rights of both parties to enter in similar agreements with other institutions.
- 6.3 The agreement may be amended at any time after the written consent of both parties.
- 6.4 This constitutes the entire understanding between the Mayagüez Campus and the laboratory. The understanding may be amended by mutual agreement of the parties. In addition, the understanding may be terminated thirty (30) days after receipt of notice of one party to the other party.
- 6.5 After CoHemis becomes an semi-autonomous institution, no longer fully a part of University of Puerto Rico's Mayagüez Campus, the Center's administration will continue with the sections of this memorandum of understanding which pertain to the Mayagüez Campus until they are amended or terminated as established in the preceding section. Both the semi-autonomous CoHemis and the laboratory will try to permit any ongoing consortium initiatives to continue until their conclusion.

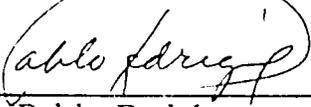
In testimony of which the authorized representatives of the University of Puerto Rico, Mayagüez Campus and the laboratory sign the memorandum of understanding accepting all of its elements.



 Dr. Michael G. Stevenson
 Associate Director of
 Energy and Environment
 Los Alamos National Laboratory

Oct 5, 1993

Date



 Prof. Pablo Rodríguez
 Acting Chancellor
 University of Puerto Rico,
 Mayagüez Campus

Sept. 10, 1993

Date

INTER-INSTITUTIONAL AGREEMENT

BETWEEN

COHEMIS

(CENTER FOR HEMISPHERICAL COOPERATION IN RESEARCH AND EDUCATION
IN ENGINEERING AND APPLIED SCIENCE)

CONSORTIUM

AND

THE UNIVERSITY OF FLORIDA

1994



INTER-INSTITUTIONAL AGREEMENT

FOR

CoHEMIS (Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science) CONSORTIUM

The Mayaguez Campus of the University of Puerto Rico, herein represented by its Chancellor, and the University of Florida, herein represented by its President are interested in a hemispheric science and technology enhancement initiative for the purpose of and in accordance with the following:

1. The initiative, identified as "CoHemis Consortium", will receive the active cooperation of the University of Puerto Rico's Mayaguez Campus and the University of Florida, referred to hereon as "consortium university", as well as other institutions as may be necessary to successfully implement the program objectives defined in the following section.
2. The major objectives of this program are:
 - 2.1 Increase the global competitiveness of Western Hemisphere industries;
 - 2.2 Increase the number and quality of Hispanic-American Engineering and Applied Science Ph.D.'s;
 - 2.3 Enhance the technological capabilities of Latin America and the Caribbean, and hence their social, economic and commercial development;
 - 2.4 Foster the protection of the hemisphere's environment and resources;
 - 2.5 Increase the awareness of high priority regional problems among researchers;

- 2.6 Support to the extent possible the Mayaguez Campus' Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) in its mission of providing funds and facilities and conducting joint applied research, technology assessment, and human resources development programs to serve the needs of the Americas with the participation of engineering and science researchers and graduate students from the different countries of the hemisphere;
 - 2.7 Identify areas in science and technology in which the faculty and facilities of the two institutions complement each other to make it feasible to conduct joint research and technology assessment projects which are expected to produce results with potential benefits for more than one country in the Western Hemisphere in a relatively short term with the participation of CoHemis visiting researchers and students;
 - 2.8 Seek financial support for such projects from diverse national and international sources; and
 - 2.9 Develop programs for faculty and graduate student information exchange, and for training and research to support the type of projects defined in section 2.6 above.
3. The University of Puerto Rico's Mayaguez Campus, through CoHemis, will support the Consortium in the following ways:
 - 3.1 Facilitate visiting professorships and sabbaticals by consortium university faculty in Latin American and Caribbean institutions and industry;

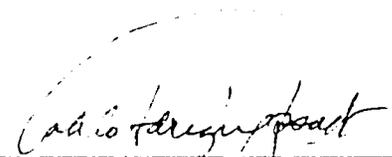
- 3.2 Seek to provide CoHemis assistantships to the consortium university's graduate students doing dissertation work in applied research of hemispherical interest either at CoHemis or at the consortium university;
 - 3.3 Facilitate institutional and professional relations and exchange of faculty and students between the consortium university and universities and research centers in Latin America and the Caribbean;
 - 3.4 Enable the consortium university's faculty to conduct joint research of hemispherical interest at the Mayaguez Campus through CoHemis researchers and graduate students by means of short periodic visits; and
 - 3.5 Provide facilities, communications, infrastructure and support for CoHemis.
4. The consortium university will support the Consortium in the following ways:
- 4.1 Attempt to locate or grant assistantships for CoHemis students qualifying for admission to the University of Florida after completion of their M.S. degree at the Mayaguez Campus;
 - 4.2 Attempt to locate or grant fellowships for minority Mayaguez Campus faculty qualifying for admission to the University of Florida as graduate students;

- 4.3 Co-sponsor conferences or other activities as appropriate, either at CoHemis, the consortium university's premises or in Latin American and the Caribbean, through CoHemis' hemispheric network of collaborators;
 - 4.4 When possible, provide access to research facilities to CoHemis researchers and graduate students; and
 - 4.5 Collaborate with CoHemis in reviewing technical information from Latin American and Caribbean countries and in evaluating research proposals.
5. The Mayaguez Campus and the consortium university will sustain a continuous exchange of information on relevant projects and results.
 6. General Dispositions:
 - 6.1 The present agreement will not be interpreted as creating legal or financial obligations between the parties. This agreement constitutes a declaration of intent to promote interactions in matters of collaborative research and graduate education expected to increase the well-being of the countries of the Americas. Nothing agreed upon in here will affect the rights of both parties to enter in similar agreements with other institutions;
 - 6.2 The agreement may be amended at any time after the written consent of both parties; and
 - 6.3 This constitutes the entire agreement between the Mayaguez Campus and the consortium university as sponsors of the CoHemis Consortium. This agreement may be amended or terminated by mutual agreement of the sponsors.

In testimony of which the authorized representatives of the University of Puerto Rico, Mayaguez Campus and the consortium university sign this Inter-Institutional Agreement accepting all of its elements.



John V. Lombardi
President
University of Florida
Gainesville, Florida
Date: 2/7/94

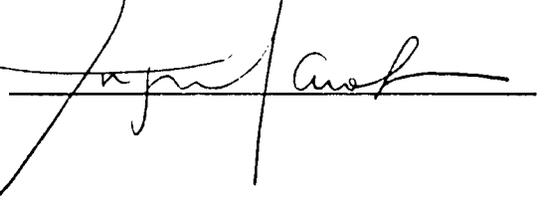


Pablo Rodriguez Rosado
Chancellor
University of Puerto Rico
Mayaguez Campus
Date: 3/1/94

WITNESS:




WITNESS:

MEMORANDUM OF UNDERSTANDING THE COHEMIS CONSORTIUM

THE GEORGIA INSTITUTE OF TECHNOLOGY AND THE UNIVERSITY OF PUERTO RICO AT MAYAGÜEZ

The Mayaguez Campus of the University of Puerto Rico, herein represented by its Interim Chancellor, Prof. Pablo Rodriguez, and the Georgia Institute of Technology, herein represented by its President, Dr. John P. Crecine, are interested in promoting a hemispheric science and technology enhancement initiative for the purpose of and in accordance with the following understandings:

1. The initiative, identified as "CoHemis Consortium", will receive the active cooperation of the University of Puerto Rico's Mayaguez Campus and of the Georgia Institute of Technology, referred to hereon as "consortium university", as well as other consortium institutions as may be necessary to successfully implement the program objectives defined in the following section.
2. The major objectives of this program are:
 - 2.1 Increase the global competitiveness of Western Hemisphere industry.
 - 2.2 Increase number and quality of Hispanic-American Engineering & Applied Science PhDs
 - 2.3 Enhance the technological capabilities of Latin America and the Caribbean and hence their social, economic, and commercial development.
 - 2.4 Foster the protection of the hemisphere's environment and natural resources.
 - 2.5 Increase the awareness of high priority regional problems among researchers.
 - 2.6 Support the Mayaguez Campus' Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) in its mission of providing funds and facilities and conducting joint applied research, technology assessment, and human resources development programs to serve the needs of the Americas with the participation of engineering and science researchers and graduate students from the different countries of the hemisphere.
 - 2.7 Identify areas in science and technology in which the faculty and facilities of the two institutions complement each other to make it feasible to conduct joint research and technology assessment projects which are expected to produce results with potential benefits for more than one country in the Western Hemisphere in a relatively short term with the participation of CoHemis visiting researchers and students.

2.8 Seek financial support for such projects from diverse national and international sources.

2.9 Develop programs for faculty, graduate student and information exchanges and for training as well as research to support the type of project defined in section 2.6 above.

3. The University of Puerto Rico's Mayaguez Campus, through its Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science, will support the Consortium in the following ways:

3.1 Facilitate visiting professorships and sabbaticals by the consortium university faculty in Latin American and Caribbean institutions and industry.

3.2 Facilitate mechanisms for providing graduate assistantships to the consortium university's graduate students doing dissertation work in applied research of hemispherical interest either at CoHemis or at the consortium university or both.

3.3 Facilitate institutional and professional relations and exchanges of faculty and students between the consortium university and universities and research centers in Latin America and the Caribbean.

3.4 Enable the consortium university's faculty to conduct joint research of hemispherical interest at the Mayaguez Campus through CoHemis researchers and graduate students by means of short periodic visits.

3.5 Provide facilities, communications, infrastructure, and support for CoHemis.

4. The consortium university will support the Consortium in the following ways:

4.1 Target qualified CoHemis Ph.D. students after completion of their M.S. degrees at the Mayaguez Campus.

4.2 Co-sponsor conferences or other activities, either at CoHemis, the consortium university's premises or in Latin American and the Caribbean, through CoHemis' hemispheric network of collaborators.

4.3 Provide access to research facilities to CoHemis researchers and graduate students.

4.4 Collaborate with CoHemis in reviewing technical information from Latin American and Caribbean countries and in evaluating research proposals.

5. The Mayaguez Campus and the consortium university will sustain a continuous exchange of information on relevant projects and results.

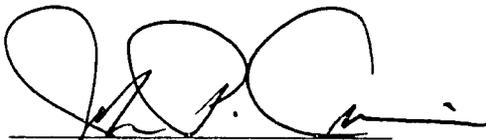
6. General Dispositions:

6.1 The present memorandum of understanding will not be interpreted as creating legal or financial relationships between the parties. This memorandum of understanding constitutes a declaration of intentions aiming to promote interactions in matters of collaborative research and graduate education expected to increase the well-being of the countries of the Americas. Nothing agreed upon in here will affect the rights of the parties involved to enter in similar agreements with other institutions.

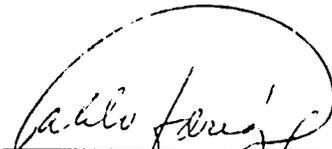
6.2 The agreement may be amended at any time after the written consent of both parties.

6.3 This constitutes the entire understanding between the Mayaguez Campus and the consortium university as sponsors of the CoFlemis Consortium. This understanding may be terminated by either of the sponsors after consultation with the other party.

In testimony of which the authorized representatives of the University of Puerto Rico, Mayaguez Campus and the Georgia Institute of Technology sign the memorandum of understanding accepting all of its elements.



Dr. John P. Crecine
President
Georgia Institute of Technology



Prof. Pablo Rodriguez
Interim Chancellor
University of Puerto Rico
Mayaguez Campus

CONVENIO DE COOPERACION GENERAL ENTRE

LA UNIVERSIDAD SIMON BOLIVAR
(Caracas, Venezuela)

LA UNIVERSIDAD DE PUERTO RICO
(Mayagüez, Puerto Rico)

DE UNA PARTE: La UNIVERSIDAD SIMON BOLIVAR, Instituto de Educación Superior creado por Decreto de la Presidencia de la República No. 878 de fecha 18 de julio de 1967 modificado por Decreto No. 94 de fecha 9 de julio de 1969, con sede en Sartenejas, Municipio Autónomo Baruta del Estado Miranda, Venezuela, quien en adelante se denominará "USB", representada por su Rector, Prof. FREDDY MALPICA PEREZ, venezolano, mayor de edad, titular de la Cédula de Identidad Número 3.226.163, del mismo domicilio, suficientemente autorizado para este acto por el Consejo Directivo en sesión de fecha.

DE OTRA PARTE: EL RECINTO UNIVERSITARIO DE MAYAGUEZ DE LA UNIVERSIDAD DE PUERTO RICO, quien en adelante se denominará "RUM", representado en este acto por su Rector Interino, PROF. PABLO RODRIGUEZ ROSADO, mayor de edad, con domicilio en Mayagüez, Puerto Rico, se ha acordado celebrar un Convenio General que se regirá por las cláusulas contenidas en este documento:

PRIMERA: La "USB" y el "RUM" convienen en suscribir el presente Convenio General para promover actividades de colaboración; así mismo convienen en la suscripción de Convenios Específicos para la ejecución de actividades y programas concretos si la naturaleza de éstos así lo requieren.

SEGUNDA: El presente Convenio General tendrá como principales objetivos:

- a. Fortalecer la capacidad tecnológica de Puerto Rico y Venezuela, consecuentemente el desarrollo social, educativo, científico, económico y comercial.
- b. Resguardar los recursos y el medio ambiente del hemisferio.
- c. Concientizar a nuestros investigadores sobre la necesidad de atender problemas regionales de interés mutuo.
- d. Identificar áreas en ciencias y tecnología en las cuales el respectivo personal e instalaciones puedan complementarse para así emprender una acción conjunta a través de proyectos de investigación y desarrollo que conlleven a la producción de resultados que beneficien a corto plazo a las dos instituciones y en consecuencia a los dos países.
- e. Lograr apoyo financiero para dichos proyectos, tanto a nivel nacional como internacional.

TERCERA: Para el logro de tales objetivos, ambas instituciones se comprometen a través de Convenios Específicos a:

- a. Facilitar el intercambio de profesores e investigadores a través de las figuras de años sabáticos y profesores visitantes.

- b. Promover el intercambio de estudiantes de postgrado, a fin de que éstos participen en los programas de cuarto y quinto nivel (maestría y doctorado) que ofrecen las dos instituciones.
- c. Facilitar el intercambio de estudiantes de pregrado entre ambas Instituciones, con el debido reconocimiento de crédito.
- d. Fortalecer los programas de Educación Continua ofrecidos por las dos Universidades, a través de un sistema de cooperación mutua.
- e. Establecer un intercambio de experiencias para la adecuación de la transferencia de tecnología entre ambos países.

CUARTA: Los Convenios Específicos que a tal efecto se suscriban deberán contener en forma precisa los alcances y los recursos humanos y financieros requeridos para su realización, pudiendo establecer cada institución por separado, convenios similares con otras universidades.

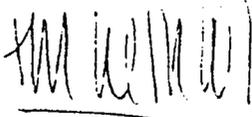
QUINTA: Con el objeto de coordinar e impulsar las actividades de cooperación, asesoramiento e intercambio de que trata este Convenio General y para lograr la celebración de los convenios particulares referidos, a través de los cuales se logrará el fin convenido, las Universidades designan como representantes al Vice Rector Administrativo, Profesor Juan León Livinalli, por parte de la "USB" y al Dr. Luis F. Pumarada O'Neill, Director del Centro Hemisférico de Cooperación en Investigación y Educación en Ingeniería y Ciencia Aplicada (CoHemis), por parte del "RUM", quienes dirigirán, coordinarán y supervisarán el cumplimiento de los mismos, pudiendo a su vez delegar en cada Convenio Específico las representaciones necesarias, debiendo éstos últimos presentarles periódicamente un informe evaluativo del trabajo realizado.

SEXTA: La vigencia del presente convenio será de dos (2) años contados a partir de la firma del mismo, pudiendo prorrogarse previo acuerdo de las partes. Sin embargo, las partes podrán resolverlo, ya sea de mutuo acuerdo o unilateralmente por medio de una comunicación dirigida a la otra parte, con treinta (30) días de anticipación a la fecha de la terminación.

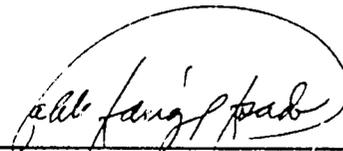
SEPTIMA: Los programas, cursos y otras actividades que se hubiesen iniciado al amparo del presente convenio y que no hubiesen concluido a su vencimiento, prórroga o resolución no se verán afectados y, en tal sentido, proseguirán hasta su culminación.

OCTAVA: Las dudas y controversias que pudieran presentarse en la interpretación y ejecución del presente convenio, serán resueltas de mutuo acuerdo entre las partes.

En Mayagüez, Puerto Rico el lunes, 13 de junio de 1994.



 PROF. FREDDY MALPICA PEREZ
 RECTOR
 UNIVERSIDAD SIMON BOLIVAR



 PROF. PABLO RODRIGUEZ ROSADO
 RECTOR INTERINO
 RECINTO UNIVERSITARIO DE MAYAGUEZ

**Brochures used for CoHemis
seminars, conferences
and symposia**

PRECONFERENCE

*RENEWABLE ENERGY FOR LATIN
AMERICA AND THE CARIBBEAN:*

*OPPORTUNITIES AND
EMPOWERMENT FOR EXPERTS
AND CONSULTANTS*

June 17, 1994
8:00 AM - 5:00 PM
Caribe Hilton Hotel
San Juan, PR

*The Center for Hemispherical Cooperation in
Research and Education in Engineering
and Applied Science (CoHemis),*

with the co-sponsorship of

U.S. Economic Development Administration

P.R. Energy Affairs Administration

Economic Development Bank for Puerto Rico

Puerto Rico Planning Board

Panamerican Union of Engineering Associations (UPADI)

Small Business Administration

P.R. Small Business Development Center

invites you to participate in the preconference:

***RENEWABLE ENERGY FOR LATIN AMERICA AND THE
CARIBBEAN: OPPORTUNITIES AND EMPOWERMENT
FOR EXPERTS AND CONSULTANTS***

Objective:

Stimulate and prepare Puerto Rican entrepreneurs, consultants, scientists, engineers, researchers, and technology centers to get full advantage of the opportunity to be provided by the *Renewable Energy in the Americas Conference and Exhibition*. This Conference will be held at Hyatt Regency Cerromar Hotel in Puerto Rico from June 26th to July 1st. The preconference that will be held at the Caribe Hilton Hotel on June 17th will create capability for exporting technical services to transfer and support renewable energy technologies to Latin America and the Caribbean.

Speakers:

Internationally renowned experts from Sandia National Laboratories, University of Florida, Georgia Tech, Colorado State University, National University of Mexico.

Firms from Puerto Rico with experience in international consulting.

Among the topics to be covered are:

- Issues, Problems and Experiences in the Export of Technical Services
- The Management of the Process of Exporting Technical Services, Practical Experiences
- Technologies for Renewable Energy and the Nature of the Technical Services that they Require
- Needs for Renewable Energy and Related Technical Assistance in Latin America and the Caribbean
- Nature and Importance of Renewable Energy for Sustainable Development

Reservation Form

Send to: Center for Hemispherical Cooperation (CoHemis)
University of Puerto Rico at Mayagüez
PO Box 5000
Mayagüez, PR 00681-5000

Please, confirm your participation in this important preconference, by calling CoHemis at (809) 265-6380 or by fax (809) 265-6340 before June 14, 1994.

Name _____
Title _____
Company _____
Address _____
City _____ Zip Code _____
Co. Phone _____ Res. Phone _____
Fee: (Includes coffee breaks, lunch, cocktail, and materials)
\$55 per person
Payment included: _____ Please, bill me: _____
(Please make check to: University of Puerto Rico at Mayagüez)
Fax: (809) 265-6340 Tels: (809) 265-6380 • 832-4040 X-3755

We will provide simultaneous translation!

SEMINAR ON TECHNICAL ASSISTANCE FOR ENVIRONMENTALLY CONSCIOUS MANUFACTURING

March 17-18, 1994 • Mayagüez Campus

AGENDA: PARTICIPANTS

MARCH 17

THEMES

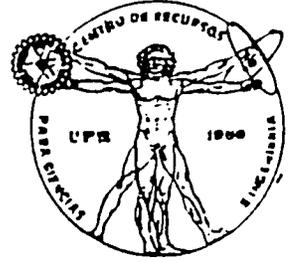
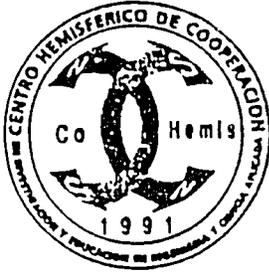
PRESENTERS

8:15 am	Registration	
8:30 am	Introduction	
8:45 am	Environmentally Conscious Soldering at Sandia National Labs.	Nestor R. Ortiz, Sandia National Laboratories
9:30 am	ECM Technologies at Los Alamos National Laboratory	Ronald L. Iman, Sandia National Laboratories
10:15 am	Break	Jeffrey Weinrach, Los Alamos National Laboratory
10:30 am	Waste Assessment of Manufacturing Processes	
11:15 am	Manufacturing Process Optimization	Steven Sielfert, Benchmark Environmental Corporation
12:00 pm	Lunch (Cafeteria Annex)	James E. Campbell, Sandia National Laboratories
1:15 pm	Efficient Waste-Water Treatment	
2:00 pm	Environmental Needs of the Manufacturing Industry in Puerto Rico	Juan M. Morgan, National University of Mexico
2:45 pm	Break	Elaine Rivera, Baxter Healthcare Corp.
3:00 pm	Environmental of the Government of Puerto Rico	
3:45 pm	Industry, Government, and University Working Together in Manufacturing Issues	Government representative
4:00 pm	Adjourn	Panel Discussion

MARCH 18

8:30 am	Introduction	Nestor R. Ortiz, Sandia National Laboratories
8:45 am	Agile Manufacturing	Heinz W. Schmitt, Sandia National Laboratories
9:30 am	Manufacturing Extension Partnerships	James Thurston, NIST
10:15 am	Break	
10:30 am	Decision Analysis for Process Safety	Evaristo J. Bonano, Beta Corporation International
11:15 am	Food Processing (ECM)	Amy E. Isaksen, Isaksen Group
12:00 pm	Lunch (Cafeteria Annex)	
1:15 pm	Food Processing (Customer/Supplier Relationship)	Christine Summers, Costco
2:00 pm	Break	
2:15 pm	Project identification workshops	Discussion in small groups
3:15 pm	Summary / Conclusions	Group discussion
3:30 pm	Adjourn	

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Global Awareness Program

PANEL SOBRE POLÍTICAS DE CIENCIA Y TECNOLOGÍA PARA EL DESARROLLO ECONÓMICO

CoHemis, el Global Awareness Program y el Centro de Recursos para Ciencias e Ingeniería de Puerto Rico, conscientes de la importancia de la ciencia y la tecnología para el desarrollo económico de países y regiones, le invitan a este interesante panel. Importantes personalidades discutirán la política pública de Puerto Rico, Estados Unidos y México en las áreas científicas y tecnológicas para fomentar el desarrollo, incluyendo el rol de la universidad en sus vertientes de educación, investigación y servicio.

PANELISTAS INVITADOS

SR. JUAN WOODROFFE, Presidente
Compañía de Fomento Industrial de Puerto Rico

DR. MANUEL GÓMEZ, Director
Centro de Recursos para Ciencias e Ingeniería, UPR

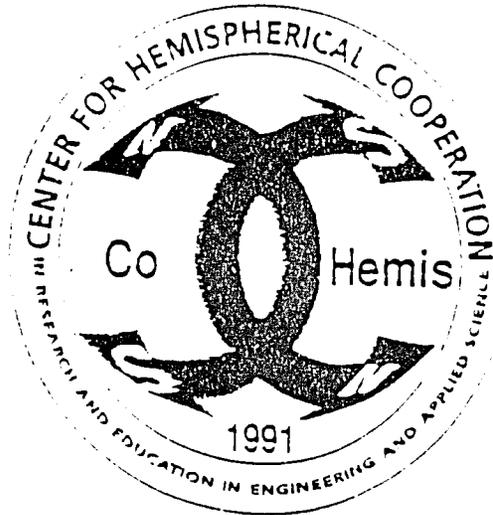
ING. RAÚL PLACENCIA, Coordinador General Académico
de la Secretaría de Desarrollo Social
Gobierno del Estado de Hidalgo, México

DR. RICHARD P. BARKE, Director Interino
Escuela de Política Pública de Georgia Tech
Consultor de Ciencia y Tecnología de la Comisión Carnegie

3 DE MARZO DE 1994
9:00 AM - 12:00 M / 1:30 PM - 3:30 PM
Anfiteatro de Enfermería
Recinto de Mayagüez

Para más información llame a CoHemis al teléfono 265-6380 ó a la extensión 3755.

COHEMIS' WORKSHOP



METHODOLOGIES AND EXPERIENCES IN TECHNOLOGY ASSESSMENT

Speaker

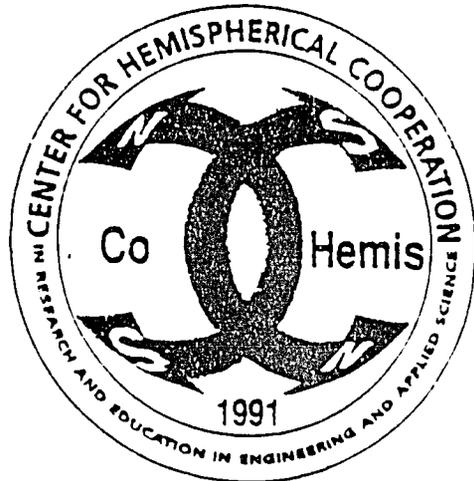
DR. ANTHONY J. DVORAK

DEPUTY DIVISION DIRECTOR
ENVIRONMENTAL ASSESSMENT AND INFORMATION SCIENCES
ARGONNE NATIONAL LABORATORY

January 21, 1994
1:00 - 4:30 pm
Eugene Francis Room
(Physics Bldg.)
Mayagüez Campus

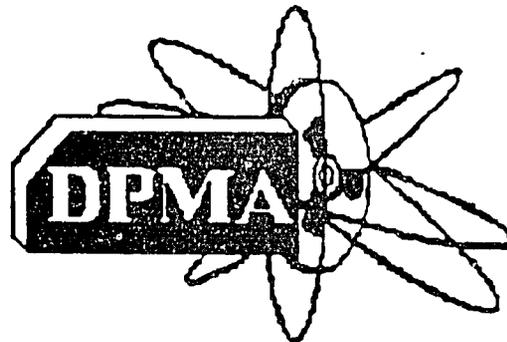
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CoHEMIS CONFERENCE



INFORMATION MANAGEMENT TODAY AND TOMORROW

"How business and office systems are coming together"

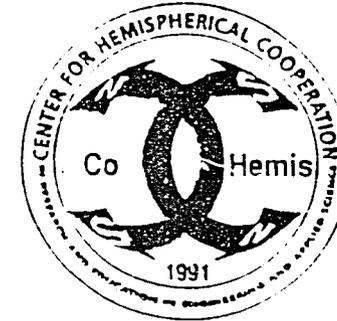


Speaker

SUSAN BLOMENBERG
Technical Specialist
XEROX CORPORATION

OCTOBER 26, 1993
MAYAGÜEZ CAMPUS
STEFANI BUILDING (ENGINEERING)
ROOM 113 - 10:30 AM

CoHEMIS' CONFERENCE



University of Puerto Rico at Mayagüez
National Science Foundation

*ENVIRONMENTAL AND ENERGY
ISSUES FACING THE AMERICAS*

September 28-29, 1993
Eugene Francis Room (Physics Building)
University of Puerto at Mayagüez

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AGENDA

"ENVIRONMENTAL AND ENERGY ISSUES FACING THE AMERICAS"

SEPTEMBER 28

In the morning

- 8:30 - 8:45 AM Welcome and introductions
- 8:45 - 9:15 AM Overview of Sandia National Laboratories' Energy and Environment Sector
Dr. Néstor Ortiz, SNL
- 9:15 - 9:45 AM NSF Research Priorities in Geotechnical-
Geoenvironmental Engineering
Dr. Mehmet Tumay, NSF
- 9:45 - 10:15 AM The Center for Sustainable Technologies-
Addressing Hemispheric Environmental
Problems
Emir Macari, Georgia Tech
- 10:15 - 10:30 AM Break
- 10:30 - 11:00 AM Sharing the Environmental Challenge in
the Americas-Issues, Technologies, and
Opportunities for Collaboration
Dr. Ken Pergeron, SNL

11:00 - 11:30 AM The EnviroTRADE Information System-
Demonstration of Software
Dr. Charlene P. Harlan, SNL

11:30 - 12:00 MD Discussion

12:00 - 1:30 PM Lunch

In the afternoon

1:30 - 3:00 PM Forum Discussion: Environmental
Issues Facing the Americas Today and
Tomorrow

Moderator:

Dr. Jaime Benitez, RUM

Presenters:

Dr. Hugo Sandoval, Chile

Dr. Michel Hermelín, Colombia

Dr. Eugenia Olguín, México

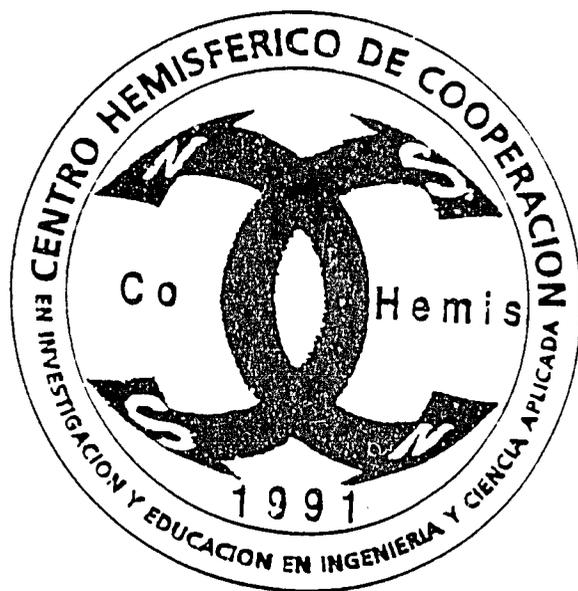
3:00 - 3:15 PM Break

3:15 - 4:30 PM Continue forum discussion

4:30 - 5:00 PM Closing comments
Dr. Néstor Ortiz, SNL
Dr. Luis F. Pumarada, CoHemis

5:00 PM Adjourn

CENTRO HEMISFERICO DE COOPERACION EN INVESTIGACION Y
EDUCACION EN INGENIERIA Y CIENCIA APLICADA (CoHEMIS)



INVITA A LOS

ESTUDIANTES GRADUADOS

DE INGENIERIA, GEOLOGIA Y CIENCIAS AGRICOLAS

A UNA CHARLA SOBRE:

OPORTUNIDADES DE ESTUDIOS DOCTORALES EN COLORADO STATE UNIVERSITY

POR:

DR. JORGE A. RAMIREZ

Co-Director del Centro Latinoamericano para
Cooperación en Ciencia y Tecnología de C.S.U.

Miércoles, 12 de mayo de 1993

Edificio de Ingeniería Civil

Salón 112

4:00 pm

**Habrá refrigerios*

RUM



Auspician:

Centro Hemisférico de Cooperación en
Investigación y Educación en Ingeniería y
Ciencia Aplicada (CoHemis)

Colegio de Ingeniería

Facultad de Artes y Ciencias

Departamento de Economía

Centro para la Perspectiva Internacional

FOMEXPORT

CONFERENCIA CoHEMIS



RUM - NSF

*EXPORTACION DE
SERVICIOS TECNICOS
A LATINOAMERICA*

11 de mayo de 1993

Recinto Universitario de Mayagüez

EXPORTACION DE SERVICIOS TECNICOS A LATINOAMERICA

La exportación de servicios nunca ha sido más oportuna como medio para expandir clientela y ganancias como lo es hoy. El mercado mundial, en particular el de Latinoamérica, representa una gran oportunidad para que los puertorriqueños proveedores de servicios puedan multiplicar su mercado doméstico.

En muchos países, exportar es simplemente una forma básica de alcanzar la clientela necesaria para tener una operación exitosa y para tomar ventaja de oportunidades que se dan en países cercanos. Para los proveedores de servicios de Puerto Rico, la exportación podría significar una mayor clientela, la oportunidad de entrar en actividades o localidades nuevas y de aprovechar mejor unas experiencias y conocimientos adquiridos. Podría ser una forma de compensar por la pérdida de clientes en nuestro mercado. En algunos casos podría comenzar a base de brindar servicio a otras operaciones de los mismos clientes que ya se tienen en Puerto Rico.

El éxito en el mercado doméstico de servicios requiere que haya una demanda por el servicio, que se reconozca la capacidad del proveedor y que su trabajo sea de excelencia. El éxito en la exportación de servicios requiere esos mismos elementos. Sin embargo, las diferencias en costumbres, clima, ingresos, transportación y educación hacen que las mismas estrategias no puedan aplicarse en otros países aunque éstos tengan elementos comunes con Puerto Rico.

Esta conferencia examinará el proceso de exportar servicios, sus implicaciones para la economía de Puerto Rico, y las oportunidades existentes en Latinoamérica.

PROGRAMA

8:00 AM	Registro
8:30 AM	<i>Puerto Rico como suplidor de Servicios Técnicos a Latinoamérica</i> Sr. Héctor Ledesma, Ex-presidente del Banco Popular
9:30 AM	<i>La Exportación de Servicios Técnicos como Actividad Económica</i> Dra. Loida Rivera, Directora Asociada del Depto. de Economía
10:30 AM	Receso
11:00 AM	<i>Oportunidades para la Exportación de Servicios Técnicos a Latinoamérica</i> Sr. Edibaldo Silva, Presidente de Clapp & Mayne, Inc.
12:00 MD	Libre para almorzar
1:00 PM	<i>Experiencia de la Universidad de Colorado en la Exportación Internacional de Servicios Técnicos</i> Dr. Jorge Ramírez, "Latin American Center for Science and Technology Cooperation", CSU
2:30 PM	Conclusiones y Despedida

LA CONFERENCIA SE CELEBRARA EN:

Sala Eugene Francis
Edificio de Física
Recinto Universitario de Mayagüez
11 de mayo de 1993
8:00 AM - 3:30 PM

QUIENES DEBEN ASISTIR:

Esta conferencia será de particular interés para aquellos que desarrollan actividades técnicas que tienen demanda en Latinoamérica.

Especialmente será de interés para ingenieros, contadores, científicos, economistas, planificadores, especialistas en finanzas, gerencia, mercadeo, manufactura, mercadeo y computadoras; así como para profesores y estudiantes avanzados de esas disciplinas y profesiones.

Por favor, confirme su asistencia llamando al teléfono 265-6380 o al 832-4040, extensión 3755.

COHEMIS

El Recinto de Mayagüez de la Universidad de Puerto Rico está auspiciando el Centro Hemisférico de Cooperación en Investigación y Educación en Ingeniería y Ciencia Aplicada (CoHemis). Este Centro es el resultado de una conferencia planificadora celebrada en noviembre de 1991, coauspiciada por la Fundación Nacional de Ciencias de los Estados Unidos y la Universidad de Puerto Rico. A esa conferencia asistieron delegados de las organizaciones nacionales de ciencia y tecnología de Estados Unidos, Canadá y doce países de Latinoamérica y el Caribe. La asamblea produjo una declaración unánime creando el Centro CoHemis, nombrando cinco delegados que forman un Comité Asesor para colaborar en la organización del mismo, y endosando al RUM como su sede.

El Centro CoHemis es una forma efectiva y flexible de reducir la brecha económica y técnica que existe entre norte y sur en las Américas y así aminorar sus efectos nocivos. El Centro proveerá fondos y facilitará la investigación aplicada y el desarrollo de programas para el mejoramiento de recursos humanos para servir a las necesidades del hemisferio con la participación de ingenieros, científicos y estudiantes graduados de los diferentes países del hemisferio.

Al presente, CoHemis opera en el RUM con fondos de la UPR y de la Fundación Nacional de Ciencias para:

- realizar proyectos y programas que demuestren la factibilidad y ventaja de su concepto único y,
- alcanzar una escala en la cual se pueda transformar en un Centro multinacional, costado por sus miembros, según planificado en la conferencia del 1991.

CONCEPTO UNICO

El Centro CoHemis en su etapa multinacional ha sido de finido como un centro de clase mundial para la investigación aplicada en el cual puedan participar aproximadamente 100 investigadores y 200 estudiantes graduados. Un Consorcio CoHemis de instituciones de E.U. aumentará los ofrecimientos disponibles. Se realizarán proyectos de interés hemisférico principalmente por investigadores visitantes que regresarán a sus países una vez completados. Los investigadores del RUM proveerán continuidad a los esfuerzos de investigación y serán responsables del progreso académico e investigativo de los estudiantes graduados con becas CoHemis.

El Centro estará abierto a todos los países de las Américas y servirá a las naciones miembros y a la industria regional, así como a las agencias de investigación. El Centro complementará sus actividades de investigación y educación graduada, facilitando investigación conjunta e intercambios y organizando talleres temáticos.

OBJETIVOS:

- conducir y fomentar investigación conjunta cuyos resultados puedan tener un amplio y rápido impacto regional.
- mejorar la capacidad tecnológica interna de los países en desarrollo del Hemisferio Occidental y transferir tecnología mediante el regreso de investigadores y egresados.
- promover la participación de investigadores y estudiantes graduados de todos los países miembros.
- proveer ayudas para estudiantes graduados de Latinoamérica y el Caribe.

TÓPICOS PRIORITARIOS:

- energía
- ambiente
- infraestructura
- recursos naturales
- tecnologías de procesos y manufactura

CONFERENCIA COHEMIS



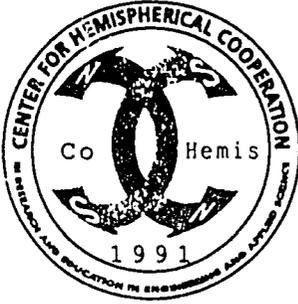
EVALUACION DEL IMPACTO DE LA TECNOLOGIA

27 de abril de 1993
Recinto Universitario de Mayagüez

Auspician

Centro Hemisférico de Cooperación en
Investigación y Educación en Ingeniería
y Ciencia Aplicada (CoHemis)
y
Departamento de Economía

Newsletters



CoHemis... update

Overcoming through cooperation

December 30, 1993
Vol. 3, Nos. 3 & 4

University of Puerto Rico at Mayagüez -- National Science Foundation

Colorado St. Univ., Sandia and Los Alamos join UPRM

THE CoHEMIS CONSORTIUM BECOMES A WORKING REALITY

The CoHemis Consortium has become reality through agreements signed by UPRM with three renowned American institutions of excellence that are committed to support hemispheric cooperation in science and technology. Colorado State University and the Sandia and Los Alamos National Laboratories have joined the Consortium, while the University of Florida (Gainesville), Georgia Tech, Argonne National Laboratory, and Simon Bolivar University (Venezuela) are expected to become members shortly. Contacts have been also initiated with the National University of Chile (Santiago), National University of Colombia (Bogota), National Universities of Rio Cuarto and Cordoba (Argentina) and the University of the Republic of Uruguay (Montevideo).

The objectives of the CoHemis Consortium are: to improve the global competitiveness of Western Hemisphere industry; to increase the number and quality of Hispanic-American, Latin American and Caribbean Engineering and Applied Science Ph.D.'s; to develop awareness of high priority regional problems among researchers; to enhance the technological capabilities of Latin American and Caribbean countries and hence their social, economic and commercial development; and to foster the protection of the hemisphere's environment and resources. This network of

institutions of excellence can have an enormous impact on the enhancement of science and technology (S&T) in the hemisphere. There are more Ph.D.'s in S&T in a large National Laboratory than in most Latin American and Caribbean countries.

In order to achieve these objectives, the consortium institutions will stimulate and facilitate exchanges of researchers, professors and students, as well as foster joint research and technology assessment projects expected to produce results with potential short term benefits for more than one country in the hemisphere. They will share information, exchange publications, evaluate pre-proposals, identify areas in (Continues on page 3.)

CoHemis Entrusted with REPADI Outreach Program

NEW NETWORK WILL ENHANCE ENGINEERING IN LATIN AMERICA

With the objective of enhancing graduate-level engineering education for Latin America and the Caribbean by means of international cooperation, several institutions attending a meeting sponsored in Venezuela by UNESCO created REPADI (Spanish acronym for "Network of Programs Supporting the Development of Engineering"). CoHemis' director Luis Pumarada-O'Neill belongs to its Executive Committee, and CoHemis has been put in charge of its educational outreach program.

CoHemis' co-directors, Dr. Jorge I. (Continues on page 5.)

"UNITEC" Will Do Technology Assessment

CoHemis Creates a Division for TA Projects

CoHemis' effort to provide Puerto Rico and UPRM with a unit for conducting Technology Assessment, Monitoring and Forecasting (TA) projects have culminated in the creation of UNITEC. It is presently a division of the CoHemis Center.

UNITEC is about to begin TA projects in Puerto Rico with the collaboration of the island's government. Its plans are to eventually serve Latin America and Caribbean. Four multidisciplinary teams of UPRM researchers have been formed. These teams will conduct the first TA projects for Puerto Rican public corporations and possibly a Federal agency.

TA information will allow decision-makers to achieve more effective technology transfers and eliminate the possibility of making blunders. This will benefit both the exporting and the host countries. The technology which is best suited for the context, resources, and objectives of the importing country will most likely be the one selected as a result of a multidisciplinary evaluation process which will include not only a cost/benefit analysis but also environmental and social impacts, technical feasibility, infrastructure needs, etc.

UPRM has the credibility and most of the multidisciplinary expertise needed for TA studies in Puerto Rico and abroad. CoHemis will complement this with Consortium specialists when needed and recruit experts from the host countries to participate in the assessment process. This will enhance the endogenous TA capabilities of Latin American and Caribbean countries by means of experiential learning and at the same (Continues on page 4.)

More Inside:

CoHemis Pilot Program Success
Activities Scheduled for 1994
Congress on Intelligent Manufacturing
IATAFI News
Joint Conference with Sandia NL
Industrial Bio-technology at UPRM

Activities Scheduled for 1994

For more information on any of the following please contact CoHemis.

"Workshop on Methodologies and Experiences in Technology Assessment", by Dr. Anthony Dvorak, Argonne National Laboratory. **January 21**, 1:00 - 4:30 PM.

"Panel on Science and Technology Policy for Economic Development". **February 8**, 9:00 AM to 4:00 PM.

"Conference on Technical Assistance for Environmentally Conscious Manufacturing", with speakers from Sandia and Los Alamos NL. **March 7 and 8**. Will demonstrate the benefits of using processes that do not produce waste or contaminants instead of managing the waste or removing pollutants from plant effluents. Will provide information on process alternatives and development opportunities for large and small firms. Expected co-sponsorship by the PR Economic Development Administration (PRIDCO).

Participation in NIST Conference at Tennessee, for enhancing the capabilities of Southeastern states to get NIST funding. **March**.

Case Study Workshop of a Shrimp Industry Crisis as an Indicator of Global Environmental Degradation. **June**. (Pending a grant from NASA, NOAA, or NSF. See page 6.)

Participation in IATAFI Founding General Assembly and First Conference. Bergen, Norway. **May 2-6**. (See page 4.)

"Conference-Workshop on the Repair and Rehabilitation of the Civil Infrastructure of the Americas". **July**. Will invite top experts from industry and academia in the US, Puerto Rico, Latin America, and the Caribbean to discuss problems and alternatives related to deteriorating buildings, highways, water supply, sewer services, etc. Will feature materials, but will not exclude other aspects. (Pending a grant from NSF.)

"Workshop on Geo-environmental Issues Facing the Americas". **September**. Will invite top experts from industry and academia in the US, Puerto Rico, Latin America, and the Caribbean to discuss problems and alternatives related to clean-up and prevention of pollution in soil and subsurface water. A final session will identify Puerto Rico's top research priorities in these fields and foster joint research proposals for solving them. To be funded by: NSF, PRIDCO, Georgia Tech, and UPRM. CSU will co-sponsor.

"Gulf/Caribbean Natural Disaster Assessment and Mitigation Conference and Workshop". **November**. Will invite top researchers and hazard managers from the region to discuss priorities and collaborations. Will lay a basis for developing regional hazard mitigation programs for hurricanes, earthquakes, volcanoes and resulting disasters, such as floods, landslides, and wind damage. (Pending grants from NSF, USGS, FEMA, and other organizations.)

First Success of the CoHemis Pilot Program

Funds Granted to CoHemis Project

One of the five CoHemis Pilot Program Proposals submitted to the Puerto Rico Science & Technology Board has been granted funds. The project will focus on avoiding ground and water pollution produced by waste from the large-scale production of chicken in a tropical environment.

The proposal is called: "Organic Waste Disposal Using Earthworms". This three-year biotechnology project was submitted by Drs. Sonia Borges and José Latorre, from the UPRM Biology and Animal Science Departments respectively. It will also involve a Colombian researcher. CoHemis is searching for additional funds from industry to expand its scope, since a Consortium researcher from the University of Florida may be able to contribute to a downstream phase: converting the worms into ingredients for animal feed. The worms will transform this waste, common in most countries in the hemisphere, into non-polluting, valuable organic fertilizer.

(Continues on page 4.)

CoHemis... update is the newsletter of the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis), sponsored by the University of Puerto Rico, Mayagüez Campus and the National Science Foundation of the United States.

CoHemis... update is published in English and Spanish and distributed free of charge to entities and individuals contributing to technology cooperation, education, or research in the Americas.

Editor: Luis F. Pumarada

Center Co-directors: Luis F. Pumarada and Jorge Ivan Velez-Arocho.

Coordinator: Luz Leyda Vega

Mailing address: CoHEMIS,

University of Puerto Rico,
Mayagüez, PUERTORICO 00681-5000.

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CoHemis-Sandia NL Conference:**"Environmental and Energy Issues Facing the Americas"**

The conference "Environmental and Energy Issues Facing the Americas" was held on September 28-29, 1993, at the Mayaguez Campus. It was organized by CoHemis and Sandia National Laboratories, a member of the CoHemis Consortium. The Renewable Energy National Laboratory and Puerto Rico's Electric Power Authority (PREPA) collaborated with speakers. As a result of this event, which had some hemispheric participation, several significant action items were identified for eventual implementation.

The activity was an initiative of Dr. Nestor Ortiz, an executive of Sandia NL and a UPRM-alumnus. The visiting speakers included biologist Eugenia Olguin, environmentalist Hugo Sandoval, and geologist Michel Hermelin, from Mexico, Chile and Colombia respectively; Drs. Jim Pacheco, Ken Bergeron, and Chris Cameron, all from Sandia; Dr. Mark Mehos, from Denver's Renewable Energy National Laboratory; Dr. Mehmet Tumay, Director of the NSF Geotechnical, Geomechanics and Geo-environmental Program; Dr. Emir Macari, from Georgia Tech's Center for Sustainable Technologies; and Dr. Eileen Chant, from the University of Turabo's emerging School of Engineering. The UPRM School of Engineering, Georgia Tech, USAID, the Organization of American States, Sandia, and INDUNIV (an industry-university research foundation operated by group of pharmaceutical companies operating in Puerto Rico) contributed with funds and/or travel costs.

The conference began with a welcome message from the Vice-president of the Puerto Rico Planning Board on behalf of the Governor. The first session focused on the EnviroTRADE software project for creating an international network of waste management information. The second session was devoted to solar detoxification technology for waste fluids. The participants discussed the laboratory donated by Sandia to Turabo University and the pilot plant proposal developed at UPRM by Drs. Cardona, Colucci and Reyes from the Chemical Engineer-

ing Department. The third session, which treated renewable energy technologies, featured an interesting presentation on demand trends and renewable energy alternatives for Puerto Rico by Eng. Luis Cruz, Director of the PREPA Planning Office.

Dr. Dallas Alston, from the UPRM Marine Sciences Department, presented an initiative for creating an emergency task force of experts to discuss the shrimp culture crisis at Ecuador's Guayas Bay. Other participants included Dr. Benjamin Perez de Gracia, Executive Director of INDUNIV, CoHemis' co-directors Drs. Pumarada and Velez-Arocho, and Dr. David Serrano, Associate Dean of Engineering for Research.

Several possible collaborations were identified as a result of this event and will be followed-up for eventual implementation. Among others: the possible service of CoHemis as a node for EnviroTRADE information exchange with Latin America and the Caribbean; a UPRM-Sandia-PREPA collaboration in an upcoming wind energy demonstration project; a joint PR-Mexico research proposal on integrated hog/algae/fish production;

CoHemis' participation in the Mexican Institute for Sustainable Energy; UPRM-Turabo-Sandia collaborations in solar detoxification technologies; a possible workshop in solar detoxification technology for Latin American participants; Latin American participation in CoHemis' 1994 activities; and possible participants in a shrimp crisis task force. The speakers and observers, which included faculty and graduate students, expressed great satisfaction with the conference discussions and results.

The participants were enthused about the potential of the EnviroTRADE concept, which provides, very handily, the most relevant state-of-practice information needed for very specific problems of pollution mitigation and clean-up. The NSF geo-environmental section has also been working in a similar program. An EnviroTRADE network would offer the American environmental technology most suitable for the problem at hand to governments and firms in Latin America and the Caribbean. This information will work to the advantage of all sides in terms of a healthy hemispheric and global environment, efficient match-up of problems and solutions, and advancement of a mutually beneficial economic bloc outlook.

CoHemis Consortium...

which the faculty and facilities of the institutions complement each other, seek financial support for joint projects and exchanges, and collaborate with the CoHemis Center's projects and activities. The Center does not plan to actively pursue further Consortium growth in the US. Elsewhere it plans to eventually include the best national universities in Latin America and the Caribbean as well as at least one Canadian institution.

In its agreement, Colorado State University intends to grant Ph.D. assistantships to CoHemis MS graduates. CSU also intends to grant doctoral fellowships to qualified UPRM faculty candidates who are American citizens. CoHemis, on the other hand, will facilitate visiting professorships, short courses, and sabbaticals by CSU faculty in Latin America and Caribbean institutions and industry,

and enable its researchers to conduct joint research at UPRM through CoHemis researchers and graduate students by means of short periodic visits. UPRM will continue to provide the facilities, infrastructure and communication support needed by the CoHemis Center.

Consortium Expansion: USA

The CoHemis Center and its Consortium were presented at Georgia Tech and the University of Florida in the second week of November. CoHemis' co-directors, Luis Pumarada and Jorge I. Velez-Arocho, met enthusiastic responses from administrators at both institutions, while their faculty expressed interest in participating in joint proposals and ongoing CoHemis projects.

In Gainesville they met first with Dr. Paul Yates Thompson, Director of the
(Continues on page 5.)

IATAFI CONFERENCE AND FIRST GENERAL ASSEMBLY

The International Association for Technology Assessment and Forecasting Institutions (IATAFI) will hold its first Conference and General Assembly between the 2nd and 6th of May, 1994 in Bergen, Norway. Organizations which conduct or sponsor Technology Assessment are invited to attend this important meeting and join the Association. This conference will focus primarily on technologies developed in the former Soviet Union and Central Europe, whose dissemination and development was hampered by the recent political and economic crises. It will also discuss technology transfer and technology assessment in the context of developing countries. Moreover, it will include workshops on TA methodology.

Technology Assessment information, as a basis for the most effective technology choice, is a critical tool for a country seeking to achieve sustainable development. It allows developing countries to make informed decisions between developing or importing technology, to transfer a technology which will achieve its objectives in the context of the particular country, to enhance impacts on development and mitigate any adverse social and environmental effects.

The goal of IATAFI is to advance international cooperation among institutions evaluating and/or forecasting the impact of technology innovation. This will allow decisions better able to promote continued, sustainable development throughout the world in response to global change. The umbrella association aims: to link the countries which lack TA with countries which have those capabilities; to promote the use and consideration of TA in the decision-making process; to establish communication links and create collaboration opportunities among members, exchange personnel for training to strengthen or build skills and expertise; to coordinate activities, procedures, and methodologies; and to cooperate with international activities being car-

ried out under the global change agenda.

IATAFI's short range plans include a bi-monthly newsletter, the organization of scientific conferences and workshops, the establishment of regional centers in cooperation with member institutions, and the development of its own data base and of communication capabilities to access key databases worldwide.

There is a sliding membership fee. For organizations based in OECD (Organization for Economic Cooperation and Development) countries with fewer than 20 persons working in TA, the fee is US\$1000. For similar organizations in non-OECD countries, it is US\$500.

Its president is Dr. Jan A. Andersen, representing the Bergen High-Technology Centre; its Executive Secretary is Dr. Gary Williams, from Argonne National Laboratory and a CoHemis adviser. For membership or conference information:

IATAFI Secretariat
HIB Information Networking Centre
PO Box 4463, 5028 Bergen, Norway
Tel: +47 55 54 37 80
Fax: +47 55 96 21 75
E-mail: IATAFI@BBB.NO

UNITEC...

time produce evaluations which respond well to the host country's particular circumstances. On the other hand, the competitiveness of US technology exports will be enhanced by comprehensive TA studies recommending how to increase the benefits of the technology and how to mitigate or reduce undesirable impacts.

UNITEC has been placed under a board that includes: Dr. Luis Pumarada-O'Neill, its Acting Director, who holds a Ph.D. in the field of Urban Systems and Policy Planning; Dr. Jorge I. Velez-Arocho, a specialist in Statistics, TQM, and Strategic Planning; Dr. Leandro Colon, Chairperson of the UPRM Department of Economics; and Dr. Eduardo Kicinski, Director of its Institute for Regional Studies.

CoHEMIS IN THE IATAFI EXECUTIVE COMMITTEE

CoHemis' director, Dr. Luis Pumarada-O'Neill, has been included in the Executive Committee of IATAFI, the International Association of Technology Assessment and Forecasting Institutions. This association, of which CoHemis is a founding member, is initially being sponsored by the UN, Argonne National Laboratory, and the city of Bergen.

First Success...

The CoHemis Pilot Program began in May, 1992 with a Request for Preproposals sent to UPRM faculty seeking for projects promising short-term economic benefits for more than one country and involving at least one researcher from Latin America or the Caribbean. The twelve acceptable pre-proposals received were sent to voluntary evaluators in collaborating institutions in the US and Latin America. Five were selected, enhanced following the suggestions of the evaluators and sent to compete for funds to the PR Science and Technology Board, an organization which sponsors applied research which may benefit Puerto Rico. Three other pilot program proposals are pending. A fifth one had been withdrawn by its principal investigator when he became Executive Director of the Puerto Rico Highway Authority.

A new Call for Preproposals will be announced in February. Consortium researchers will be invited to produce or suggest joint North-South proposals.

CoHemis Consortium...

Department of Civil Engineering. After a fruitful exchange of ideas, they joined faculty and high-ranking officials from different divisions of the university for a presentation and discussions. Dr. Thompson is presently working on a draft agreement which would be signed by officials from both Universities early in 1994.

In Atlanta, Velez-Arocho and Pumarada participated in several productive meetings. These were set-up by Dr. Emir Macari, Associate Professor of Civil Engineering at Georgia Tech and a CoHemis adviser. Dr. John A. White, Dean of Engineering, showed a strong interest in the possibility of joining the Consortium; he saw CoHemis as a natural partner for Georgia Tech's newly created Center for Sustainable Technologies. Dr. Allan Porter, Director of the Technology Policy and Assessment Center, collaborated with CoHemis' UNITEC division for technology assessment (TA) by explaining how his own TA center works. Dr. David Frost, an expert in geo-environmental problems, accepted to collaborate with Dr. Macari in organizing a CoHemis-NSF geo-environmental workshop set for 1994. Dr. Jean-Lou Chamcau, Director of the Department of Civil Engineering and of the Center for Sustainable Technologies, agreed to follow-up on Georgia Tech's joining the Consortium as a milestone in a future official relationship between the Center for Sustainable Technologies and CoHemis.

Faculty and officials in both institutions welcomed the concept, mentioning that it was generally easier to get funding through a consortium than individually. They saw the CoHemis Consortium as a means to participate in exchange, joint research and short course programs with institutions in Latin America and the Caribbean, as well as a way to get more competitive minority doctoral students from UPRM.

The Consortium extends South

On December 15th, CoHemis' co-directors visited the beautiful campus of Venezuela's prestigious Simon Bolivar University, located on the cool, comfortable outskirts of Caracas. Similar in size,

state-support, stability and culture of excellence, SBU is Venezuela's UPRM: the goal of Venezuela's best science and mathematics-oriented high-school graduates. Twenty-one year old SBU, however, has a higher proportion of graduate students and of European-educated faculty than UPRM. Following-up on a previous meeting held in Mayaguez, Drs. Pumarada and Velez-Arocho met with the Vice-chancellor, Dr. Jaime Leon, and the Dean of Graduate Studies, Dr. Carlos Perez. They exchanged drafts of possible bilateral agreements between SBU and UPRM which include the CoHemis Consortium. Possible faculty and student exchanges, short courses, sabbatical leave destinations, and joint research projects are some of the possible outcomes of a promising future relationship between the two institutions.

The Consortium in Action

The "Activities Scheduled for 1994" (page 2) includes brief descriptions of two Consortium collaborations: a workshop on environmentally conscious manufacturing and a geo-environmental hemispheric workshop. In addition:

Dr. Sherry Oaks, from Colorado State University and a CoHemis adviser, will be visiting Mexico with Drs. Pumarada and Velez-Arocho in late January. They will meet with officials from CONACYT, universities, and research institutions. One of the goals of this visit is to invite Mexico's National Autonomous University to join the Consortium.

On January 21st, Dr. Anthony Dvorak, Director of Argonne National Laboratory's Environmental Impact Division, will visit UPRM to conduct a workshop on Technology Assessment, Monitoring and Forecasting. Argonne and CoHemis/UPRM plan to collaborate in a program to enhance student interest and achievement in science and mathematics in a mostly Hispanic Chicago high school: Roberto Clemente Comm. Acad.

REPADI Network...

Velez-Arocho and Dr. Pumarada-O'Neill, accepted invitations to participate in the "Regional Meeting of Research and Development Centers and Graduate Study Institutions in Engineering", held at Caracas on December 13-14, 1993. This meeting was sponsored by the UNESCO Regional Office for Science and Technology (ORCYT), based at Montevideo, Uruguay, and co-sponsored by Venezuela's CONICIT (National Council for Research in Science and Technology) and its COPLAC program for promoting and funding student and faculty exchanges. The meeting featured representatives of institutions from Chile, Cuba, Mexico, Puerto Rico, Uruguay, and Venezuela. The industrial sector was represented by PDVSA, Venezuela's oil and gas conglomerate.

CoHemis was put in charge of the network's educational outreach program, whose objective will be to develop human resources in post-baccalaureate engineering for Latin America and the Caribbean mainly by means of short courses. The other initial network programs will be: Enhancement of Graduate Studies, which will initially focus on exchanges of faculty and graduate students; Inter-University Relations; and University-Industry Relations.

The network coordination was entrusted to Dr. Claudio Bifano, from Venezuela's Engineering Research Foundation and the CONICIT's consultant for the COPLAC program. He will lead the production of funding proposals to industry and international organizations. The COPLAC Program facilitates faculty and graduate student exchanges with travel funds, stipends, and information. Although originally intended to serve Latin America and the Caribbean, COPLAC is presently limited to exchanges which involve Venezuelans because no other country has been providing funds up to this moment.

Counting on the assistance of the CoHemis Consortium institutions, the CoHemis Center will do its best to allow its 1994 activities to serve the purposes of the educational outreach program until REPADI funding materializes. These activities appear in page 2.

CoHemis searches for funding**Proposal to Study Ecuadorian Shrimp Crisis**

"Case Study of a Shrimp Industry Crisis as an Indicator of Global Environmental Degradation" is the title of a CoHemis pre-proposal by Drs. Dallas E. Alston (UPRM-CoHemis) and Philip Buike (Ecuador). The Ecuadorian shrimp culture industry is undergoing a crisis of large proportions. Profitability and investments have waned considerably, and production has declined markedly. Shrimp farming represents the third most important industry in Ecuador, generating over US\$400 million annually. Ecuador, the most important shrimp-producing nation in the Americas, occupied the first place in world shrimp production in 1983 with 35,600 mt. Now it is fourth, following China, Thailand, and India.

Almost twenty percent of the shrimp consumed in the US comes from Ecuador, mainly from the Guayas Bay estuary. A crash of the Ecuadorian industry would certainly affect American commercial and consumer interests. Many US investors are involved in shrimp culture in the region and significant quantities of American materials and equipment are bought by this industry.

Marine shrimp farms are only practical in coastal waters, often threatened by urban, industrial and agricultural pollution. As early as 1986, Guayas' production of wild postlarval shrimp seed for the farm ponds was decreasing. This decline in natural productivity, which has been countered by cultivated larvae, may be due to one or more of the following factors:

- Rapid destruction of mangrove swamps.
- The El Niño phenomenon, with its climatic changes and ocean current reversals.
- Urban pollution of the Guayas estuary resulting from the rapid growth of the city of Guayaquil.

In addition, problems may have become exacerbated due to diseases in hatcheries and ponds and harmful chemicals from industrial wastes and agricultural

applications.

Virtually all Guayas producers have been reporting low shrimp survivals. Survival has recently averaged 15 to 20%, down from 55 to 60%. Some individual producers have reported losses reaching 90% of stocked larvae. Feed conversion ratios have made the industry no longer profitable for many producers. Major mortalities are apparently occurring within the first forty days of stocking.

Preliminary studies have characterized the problem in terms of possible disease pathology, but the etiology remains unknown. It is now conjectured that water and soil quality may be a major factor. Dr. Claude Boyd and Dr. Donald Lightner, water quality and disease specialists, respectively, are currently trying to determine the cause of the problems for the producers.

Given the serious nature of the problem and the fact that environmental factors are suspected, there should be an international collaborative effort to determine the nature and extent of this problem. To this effect, an important meeting is being proposed in Puerto Rico through CoHemis by CENAIM (Ecuador's National Aquaculture and Research Center) and the UPRM Department of Marine Sciences. It would bring together international experts in ecology, water quality, and shrimp pathology and experts from Taiwan and Thailand, who have had similar shrimp industry crises, to discuss this situation in Ecuador. The meeting will also discuss how this situation relates to general global environmental degradation. The industry failures in Thailand and Taiwan were documented largely with anecdotal information and without elucidating key environmental issues from a global perspective.

Arising from the results of the study eventually set up in the meeting, a predictive model will be developed to allow a contingency plan for the management of global aquatic resources relevant to the contemporary world-wide situation together with the application of remote sensing technology for anticipating and/or monitoring such situations.

On 1995: CoHemis will collaborate

World Congress on Intelligent Manufacturing

Dr. Vladimir R. Milacic, visiting professor at UPRM and a renowned expert on hi-tech manufacturing technology, is organizing the "First World Congress on Intelligent Manufacturing Processes & Systems". It will be held at Mayaguez, February 13-17, 1995. The potential contributors include NASA and NSF.

The main objective of this congress is to provide a world forum for the exchange of knowledge, experience, and information regarding various aspects of the intelligent factory of the future. Its "first announcement and call for papers, panels and workshops" is just beginning to circulate.

This event will provide the opportunity to put together interdisciplinary and multidisciplinary approaches to create a new generation factory environment. It will pave the way to educate "renaissance scientists and engineers" for the factories of the future. It will feature a two-day Conference on Intelligent Manufacturing in a Space Environment, and eventually may also include Intelligent Manufacturing under the Sea.

The First World Congress on Intelligent Manufacturing Processes & Systems aims: to discuss all aspects of manufacturing intelligence at the decision, control and perception levels for the design, planning, and production tasks in a modern IMP&S environment; to introduce the basic techniques, examine the current state-of-practice, predict future trends, and define a research agenda for the IMP&S environment; and to establish bridges between manufacturing engineering and other related disciplines, such as artificial intelligence, cognition, computer vision, intelligent control, electronics, etc.

For more information, please contact CoHemis or Dr. Vladimir Milacic, Mechanical Engineering Department, University of Puerto Rico, Mayaguez, PR 00681-5000. Tel: (809) 832-4040, ext. 2575 or 2560; Fax: (809) 265-3817.

New UPRM Program**B.S. in Industrial Bio-technology**

The Mayaguez Campus of the University of Puerto Rico will be initiating an undergraduate program in industrial biotechnology in January 1994. It will be the first such program in Puerto Rico and one of the few existing in the United States. Its is expected to contribute to the economic development of Puerto Rico by producing capable human resources for this key, expanding field.

This program is focused on satisfying present and future needs of industry in Puerto Rico, particularly the pharmaceuticals. It will provide this sector with the industrial bio-technologists and scientists required for the development of new and better operational processes. In turn, this capability will encourage existing firms to expand their operations and should attract new ones.

The Industrial Bio-technology program will have an interdisciplinary nature, including aspects of industrial microbiology, genetics, biochemistry, chemical engineering processes, environmental sciences and engineering, agriculture, plus food sciences and technology.

UN Expert collaborates with UNITEC and UPRM

Dr. Adolfo Korn, recently retired from the Science and Technology Division of the United Nation's Department of Economic Development, was invited to UPRM by its Global Awareness Program with the collaboration of CoHemis. On December 7, he discussed with UPRM faculty and students the UN's mission, organization and activities, as well as the value of an international perspective related to the education and practice of science, engineering, and business. The next day he met with the directors of CoHemis' UNITEC.

Dr. Korn, a mining engineer with international experience in technology assessment, shared his experiences and valuable advice on TA initiatives with the Unit for Technology Assessment,

UPRM International Shorts

Dr. Eduardo Schroder, a distinguished researcher and professor from the Faculty of Agricultural Sciences, taught the course "Biotechnology of the Biological Fixation of Nitrogen" as a visiting professor in the Faculty of Natural, Physicochemical and Exact Sciences of the National University of Rio Cuarto in Argentina. The course took place between November 22 and December 4, 1993.

Dr. L. Antonlo Estevez, Associate Director of the Department of Chemical Engineering, has been named to the Editorial Board of Chile's newly created journal *Investigación Tecnológica*. This journal is expected to have a wide reach within the Latin American scientific community. Dr. Estevez has also been appointed to the Technical Committee of the Second Conference on Computer Applications to Process Engineering, to be held in Santiago, Chile, from November 7 to 10, 1994.

Dr. Vladimir Milacic, visiting professor at the Department of Mechanical Engineering, will be chairing a session on Expert Systems and Manufacturing Applications at the Second World Congress on Expert Systems to be held in Lisbon during January 10-14, 1994. Dr. Milacic will present two papers: "Expert Systems for Tooling Selection in Manufacturing and Process Planning Based on Automation Theory" and "Concepts of FMS Machine Design".

Monitoring and Forecasting. They discussed two proposals currently being developed by UNITEC.

The Global Awareness Program promotes providing UPRM science, engineering, and business students with a broad, international view on cultural diversity, regulations, communications, international organizations, competition, and other aspects. Operating from within the campus' Center for International Perspectives, it is directed by Dr. Ramachandra Asundi and co-directed by CoHemis' Dr. Jorge Velez-Arocho, with the participation of faculty from the three fields involved.

In Washington, DC**CoHEMIS PROJECTS PRESENTED**

CoHemis' co-directors made a short trip to Washington DC on November 9 and 10. Drs. Luis Pumarada and Jorge L. Velez-Arocho presented CoHemis' proposals and preproposals, its new UNITEC division for technology assessment, and the CoHemis Consortium.

In a meeting held at the DOE a new proposal on Solar Detoxification technology produced by UPRM Chemical Engineering and Chemistry professors was discussed, as well as the action items which came up in the September conference "Energy and Environmental Issues Facing the Americas" (described in page 3), which had been co-sponsored by the DOE's Sandia NL, a member of the CoHemis Consortium. In Argonne National Laboratory's Washington Office they met with CoHemis' adviser Gary Williams to arrange a future workshop for UPRM faculty interested in participating in technology assessment projects. In a meeting held at the Congressional Office of Technology Assessment for learning about their methodologies and policies, its Associate Director, Dr. Peter Blair, accepted to become part of an advisory body to help CoHemis' UNITEC. In a meeting at NASA, its University Programs Division offered to seek support of other Administration divisions for a UPRM preproposal for a "Gulf/Caribbean Workshop on Remote Sensing for Land/Sea Interface Studies" and for an emergency task force meeting to consider the Ecuador shrimp crisis, described in page 6.

The trip's highlight was a meeting with the Federal Highway Administration's Associate Administrator for Research and Development, Dr. John A. Clements. This meeting had been suggested by Dr. Carlos Pesquera, Puerto Rico's Secretary of Public Works and a CoHemis adviser. While discussing a possible UNITEC technology assessment project on Intelligent Vehicle and Highway Systems (IVHS) for PR and Latin America, the agency's great interest in Latin America and the great potential which CoHemis holds for contributing to its implementation became very clear to all the participants. A very interesting potential technology assessment project was mentioned: the Darien Crossing of the Pan American Highway.

Collaboration Possibilities for Improving Graduate Engineering Education in Latin America and the Caribbean

by: Luis Pumarada-O'Neill and Luz L. Vega,
CoHemis, University of Puerto Rico at Mayaguez

Summary of CoHemis' paper for the "Regional Meeting of Research and Development Centers and Graduate Engineering Study Institutions in Latin America and the Caribbean", held in Caracas, Venezuela on December 14-16, 1993, sponsored by UNESCO and CONICIT-Venezuela.

In developing countries, the human resources needed for solving a country's most important economic and health problems are scarce in quantity and diversity. As in other fields, it is advantageous to form alliances that combine the resources of the collaborating nations in order to make these resources available to other nations at the most effective moments in ways that benefit all members.

The CoHemis Center and the CoHemis Consortium

CoHemis, the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Sciences, was founded in Mayagüez in 1991, as a result of a conference sponsored by the National Science Foundation and the University of Puerto Rico's Mayagüez Campus (UPRM). The national science and technology organizations of thirteen countries of the Americas were represented in this conference. The activities of the CoHemis Center focus primarily on serving the needs of the Americas with the participation of engineers, scientists and students from different countries, and emphasizing the projects whose results may bring short-term benefits for more than one country of our Western Hemisphere.

UPRM delegates to CoHemis the initiation and implementation of activities for hemispherical cooperation. CoHemis has been developing a support network, the CoHemis Consortium, based on a series of bilateral agreements between the Campus and other universities and laboratories throughout this hemisphere. At present, the CoHemis Center is the focus of agreements with Colorado State University and the Sandia and Los Alamos National Laboratories.

The purposes of CoHemis' participation in this Regional Meeting are: to expand the CoHemis Consortium to Latin American and Caribbean universities of excellence; and to contribute towards the creation of a Latin American and Caribbean network of research and development centers and institutions for graduate Engineering studies.

Graduate Engineering Study at UPRM

The College of Engineering of the University of Puerto Rico is part of its Mayagüez Campus. It offers the degrees of Master of Science and Master of Engineering in the following branches of engineering: chemical, manufacturing, civil, electrical, and mechanical. There is also a graduate program in Managerial Systems Engineering, offered by the Industrial Engineering Department. A doctoral program in Civil Engineering was started one year ago.

The College of Engineering has approximately 4000 students. 573 were identified as graduate students in the 1992-93 academic year; 36% of these are women, and more than 40% come from Latin America and the Caribbean. About 83% of all UPRM Engineering graduate students receive some type of financial aid.

Graduate students from UPRM who qualify and wish to obtain research and educational experience outside the Campus or to continue doctoral studies in prestigious American universities may use the opportunities provided by the CoHemis Consortium institutions. They can also work in projects with researchers from Consortium institutions either in Puerto Rico or at the institutions themselves.

The cost of graduate study at UPRM for a foreign student is approximately \$1500 per semester.

(Continues on the next page.)

Summary of paper...

Normally, it takes a student 2 years to complete a master's degree. Housing and normal, everyday costs for an unmarried student in Mayaguez add up to some \$5000 annually. There are research and teaching assistantships available for full-time graduate students who qualify; priority is given to those pursuing the Masters of Science degrees. Financial aid packages go from a minimum of \$5000 plus tuition for a period of ten months, to a maximum of \$9600 plus tuition for students who are working in projects financed with external funds, including full-time research work between semesters (June and July).

Most courses offered are taught in Spanish, and the rest in English. Textbooks are the same ones used in other universities in the US system. Many Puerto Ricans and Latin Americans interested in pursuing doctorate degrees in famous American universities take advantage of the opportunity offered by the graduate studies at UPRM to improve their English and familiarize themselves with the US educational system. At the same time they can approve graduate courses in Spanish that will be totally accepted in the university where they will pursue their doctorates. All of this with the benefits of a relatively low cost and a Latin American environment. Some students have taken only two years to complete doctorates in prestigious universities such as Purdue and VPI (Virginia Polytechnic) after having completed their MS degrees at UPRM.

Ideas on a Network of R&D Centers and Institutions for Graduate Engineering Studies

A network for supporting graduate education and research must serve and interact with the industries of the different countries and become part of government-academy-industry joint initiatives if it is to have an impact on regional and national economic development.

The network should include, among others, the following mechanisms:

- **Electronic mail** with a "bulletin board" type of service to serve the different fields and sub-fields of Engineering with messages such as:
 - requests for professors for short courses or workshops which complement curriculums, enhance the capability of researchers, or address the immediate needs of industry
 - announcements about professors interested in spending sabbatical leaves abroad
 - announcements about assistantships available for graduate students who are willing to work in specific research projects
 - requests for specialized equipment or personnel for completing teams for joint research
- **Telecommunications network** to transfer knowledge effectively and efficiently through interactive remote courses.
- **Hemispheric or Latin American Conferences on Education, Curriculum, and Other Relevant Topics:**

These conferences allow the education of engineers to respond to today's dynamic technological, environmental, social, and ethical trends. They can help standardize some professional and educational aspects, as well as to encourage multilateral agreements that facilitate exchanges of students and professors.
- **Hemispheric or Latin American Thematic Expert Conferences:**

These conferences promote the formation of multinational research teams and the inter-institutional relations that result in exchanges of students and professors. They facilitate joint research on common or regional problems; direct research towards top priority problems; increase the efficiency of the utilization of scarce resources by preventing duplication of efforts; promote new ideas through the exchange of information, hypotheses and results; and create awareness within investigators from different countries of the problems and needs of other countries, so they may realize the applicability of present and future ideas to these problems.



CoHemis... al día

Hacia la superación mediante la cooperación

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Acuerdos del RUM con la Universidad Estatal de Colorado y los Laboratorios Nacionales Sandía y Los Alamos

CONSORCIO CoHEMIS CONVERTIDO EN REALIDAD

El Consorcio CoHemis se ha convertido en una realidad mediante acuerdos firmados entre el RUM y tres renombradas instituciones de Estados Unidos comprometidas a respaldar la cooperación hemisférica en ciencia y tecnología. Son ya miembros del consorcio Colorado State University y los laboratorios nacionales Los Alamos y Sandía. Se están concertando acuerdos también con Georgia Tech y la Universidad de Florida (Gainesville), la Universidad Simón Bolívar (Venezuela), y el Laboratorio Nacional Argonne. En Latinoamérica ha habido contacto preliminar con las Universidades Nacionales de Córdoba y Río Cuarto, ambas en Argentina, la Facultad de Ingeniería de la Universidad Nacional de Colombia en Bogotá, la Universidad Nacional de Chile de Santiago y la Universidad de la República de Uruguay en Montevideo.

Los objetivos del Consorcio CoHemis son: fomentar la competitividad de la industria del hemisferio occidental a nivel mundial; aumentar la calidad y el número de grados doctorales en Ingeniería y Ciencias Aplicadas contenidos a hispanoamericanos en Estados Unidos, Latinoamérica y el Caribe; desarrollar una mayor conciencia entre los investigadores sobre los problemas de alta prioridad en la región; mejorar la capacidad tecnológica de los países latinoamericanos y del Caribe y de esa manera contribuir a su desarrollo social, económico y comercial; y promover la protección de los recursos naturales del

hemisferio. Esta red de instituciones de excelencia puede ser de gran impacto para el mejoramiento de la ciencia y la tecnología del hemisferio. Como muestra del impacto que puede tener, existen más investigadores con doctorados en Ciencia y Tecnología en un laboratorio nacional que en la mayoría de países latinoamericanos y del Caribe.

Con el propósito de lograr sus objetivos, el consorcio estimulará y facilitará intercambios entre investigadores, profesores y estudiantes; también desarrollará la investigación conjunta, enfatizando aquellos proyectos cuyos resultados pue-

(Continúa en la página 3)

CoHemis se une al programa REPADI RED MEJORARIA LA INGENIERIA EN LATINOAMERICA

Con el objetivo de mejorar la educación en ingeniería a nivel graduado en Latinoamérica y el Caribe por medio de la cooperación internacional, varias instituciones asistieron a una reunión auspiciada en Venezuela por la UNESCO. En esta actividad se organizó REPADI (Red de Programas para el Desarrollo de la Ingeniería). El director de CoHemis, Dr. Luis F. Pumarada O'Neill, pertenece al comité ejecutivo de esta red. CoHemis está a cargo de su programa educacional.

Los directores de CoHemis, Dres. Jorge I. Vélez Arocho y Luis F. Pumarada O'Neill aceptaron la invitación a partici-

(Continúa en la página 5)

"UNITEC"

División de Evaluación de Tecnología en CoHemis

El esfuerzo de CoHemis en proveerle a Puerto Rico y al RUM una unidad para llevar a cabo proyectos de Evaluación, Supervisión y Pronóstico del Impacto de la Tecnología (ET) han culminado en la creación de UNITEC. Actualmente UNITEC es una división de CoHemis.

UNITEC está por iniciar varios proyectos de ET en Puerto Rico con la colaboración del Gobierno de la isla y como consecuencia de esto ya se han formado cuatro equipos multidisciplinarios de investigadores del RUM. Se planea que eventualmente UNITEC sirva a Latinoamérica y el Caribe. Los equipos realizarán proyectos de ET para las corporaciones públicas puertorriqueñas y posiblemente para una agencia federal de EE.UU..

La información generada por la ET permitirá que las personas encargadas de la toma de decisiones realicen una transferencia de tecnología más efectiva, eliminando la posibilidad de equivocaciones. Esto beneficiará tanto a los países exportadores de tecnología como a los importadores. La tecnología que mejor se ajusta al contexto, recursos y objetivos del país importador será la seleccionada como resultado del proceso de evaluación multidisciplinaria, el cual incluye no sólo el análisis de costos y beneficios, sino también los impactos sociales y ambientales, posibilidades técnicas, necesidades de infraestructura, etc.

El Recinto de Mayagüez tiene la credibilidad y mucha de la experiencia multidisciplinaria necesaria para realizar estudios de ET en Puerto Rico y en el extranjero. CoHemis complementará los recursos del RUM con especialistas del Consorcio cuando se necesiten, y reclutará expertos de los países anfitriones para que participen en el proceso de evaluación. Esto realzará las capacidades de ET de Latinoamérica y el Caribe por medio del aprendizaje por experiencia y al mismo tiempo producirá evaluaciones que respondan mejor a las circunstancias particulares del país anfitrión. Por otra parte, la competitividad de las exportaciones tecnológicas

(Continúa en la página 4)

Además:

Éxito del Programa Piloto CoHemis
Actividades Programadas para 1994
Congreso de Manufactura Inteligente
Noticias de IATAFI
Conferencia Energía y Ambiente
Biotecnología Industrial en el RUM

Actividades programadas para 1994

Para más información sobre estas actividades, por favor, comuníquese con CoHemis

Taller sobre Metodología y Experiencia en la Evaluación del Impacto de la Tecnología; por el Dr. Anthony J. Dvorak, Laboratorio Nacional Argonne. 21/ENERO

Panel sobre modelos nacionales y regionales de políticas sobre ciencia y tecnología para el desarrollo socioeconómico. Manuel Gómez, Juan Woodroffe, México, Agencia de Desarrollo Económico de Georgia. 3/MARZO

Seminario sobre ayuda técnica para las Industrias manufactureras sobre procesos que emitan menos o ninguna contaminación o desechos. Laboratorios Nacionales Sandía y Los Alamos. Recinto de Mayagüez. Auspiciado por La administración de Fomento Económico de Puerto Rico. 17-18/MARZO

Participación en la primera asamblea y conferencia de IATAFI. Bergen, Noruega. (Ver página 4.) 2-6/Mayo

Estudio sobre la Crisis de la Industria del Camarón del Ecuador como Indicador de la Degradación Ambiental Global. (En espera de fondos de NASA, NOAA o NSF. Ver página 6.)

"Conference-Workshop on the Repair and Rehabilitation of the Infrastructure of the Americas". Presentará aspectos tales como materiales y otros. Se solicitan fondos a NSF y al Centro de Investigación para Infraestructura del Departamento de Ingeniería Civil del RUM. JULIO

"Workshop on Geo-environmental Issues Facing the Americas". Este taller atraerá expertos de la industria y académicos de Estados Unidos, Puerto Rico, América Latina y el Caribe. Se discutirán problemas y alternativas relacionadas a la limpieza y prevención de contaminación del suelo y el agua subterránea. Identificará las prioridades investigativas de Puerto Rico en estas áreas con el fin de preparar propuestas en conjunto que aporten a la solución de dichos problemas. Colaborará Colorado State University. Aportarán para ésta NSF, Fomento Industrial de Puerto Rico, Georgia Tech y el RUM. SEPTIEMBRE

"Gulf/Caribbean Natural Disaster Assessment and Mitigation Conference and Workshop". Reunirá a investigadores de la región con administradores de riesgos para discutir prioridades y colaboraciones, y a su vez crear equipos de trabajo para desarrollar programas regionales de mitigación de riesgos relacionados a huracanes, terremotos, volcanes y los desastres asociados a estos, tales como inundaciones, desprendimientos, temblores y daños por el viento. Los fondos se están solicitando a NSF, USGS, FEMA y otras organizaciones. NOVIEMBRE

Primer Exito del Programa Piloto

Fondos para Proyecto CoHemis

Una de las cinco propuestas del Programa Piloto CoHemis sometida a la Junta de Ciencias y Tecnología de Puerto Rico ha sido seleccionada para recibir fondos. El proyecto buscará evitar la contaminación del agua y del suelo producida por los desperdicios de la producción a gran escala de pollos en un ambiente tropical.

El título de la propuesta es "Manejo de desperdicios orgánicos usando lombrices de tierra". Este proyecto de biotecnología, que tiene una duración de tres años, fue sometido por los doctores Sonia Borges y José Latorre, de los Departamentos de Biología y Ciencias Animales del RUM respectivamente. Este proyecto también incluye una investigadora de Colombia. CoHemis está gestionando fondos adicionales de la industria para expandir su alcance. Un investigador del Consorcio de la Universidad de Florida podría contribuir con una fase posterior: convertir las lombrices en ingrediente para alimento de animales.

Las lombrices transformarán este tipo
(Continúa en la página 4)

CoHemis... al día es el boletín informativo del Centro Hemisférico para Cooperación en Educación e Investigación en Ingeniería y Ciencia Aplicada (Co-Hemis), auspiciado por el Recinto de Mayagüez de la Universidad de Puerto Rico y la National Science Foundation de Estados Unidos.

CoHemis... al día se publica en inglés y español y se distribuye libre de cargos a entidades e individuos que contribuyen a la cooperación, educación o investigación en las Américas.

Director del boletín: Luis F. Pumarada
Co-dirección de CoHemis:

Luis F. Pumarada y
Jorge I. Vélez Arocho

Coordinadora: Luz Leyda Vega

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Conferencia CoHemis-Laboratorio Nacional Sandía**"Problemas Ambientales y Energéticos que Impactan a las Américas"**

Los días 28 y 29 de septiembre de 1993 CoHemis sirvió de anfitrión a la conferencia "Problemas ambientales y energéticos que impactan a las Américas". Esta actividad fue patrocinada y organizada por el Laboratorio Nacional Sandía, miembro del Consorcio CoHemis. El Laboratorio Nacional de Energía Renovable y la Autoridad de Energía Eléctrica de PR contribuyeron con ponencias. Como resultado de este evento, en el cual participaron importantes investigadores del hemisferio, se identificaron varios puntos que han de ser implementados eventualmente.

Esta actividad se llevó a cabo por iniciativa del Dr. Néstor Ortiz, ejecutivo de Sandía y ex-alumno del RUM. Los conferenciantes visitantes incluyeron a cuatro investigadores de Sandía, los Dres. Jim Pacheco, Ken Bergeron, Chris Cameron y Charlene Harlan; el Dr. Mark Mehos del Laboratorio Nacional de Energía Renovable de Denver; el Dr. Mehmet Tumay, director del Programa de Asuntos Geoambientales y Geotécnicos de la Fundación Nacional de Ciencias de EE.UU. (NSF); el Dr. Emir Macari del Centro para Tecnologías Sostenibles de Georgia Tech, la Dra. Eileen Chant de la Escuela de Ingeniería de la Universidad del Turabo, y los doctores Eugenia Olguín (bióloga), Hugo Sandoval (ambientalista) y Michel Hermelín (geólogo) de México, Chile y Colombia respectivamente. Contribuyeron fondos el Colegio de Ingeniería del RUM, Georgia Tech, USAID, la Organización de Estados Americanos y la entidad "Industry University Research Center" (INDUNIV), que agrupa a varias empresas farmacéuticas que operan en Puerto Rico.

El mensaje de bienvenida estuvo a cargo del Vicepresidente de la Junta de Planificación de Puerto Rico en nombre del Gobernador. La primera sesión fue sobre EnviroTRADE, un proyecto que desarrolla Sandía para crear una red internacional para difundir información sobre el manejo de desperdicios. En la segunda sesión, sobre tecnología para la desintoxicación solar de líquidos, se discutieron el proyecto que Sandía auspicia en el Turabo y la propuesta del RUM preparada por los doctores Cardona, Colucci y Reyes del Departamento de Ingeniería Química. En la tercera sesión, sobre tecnología para energía renovable, el ingeniero Luis Cruz, Director de la Oficina de Planificación de la Autoridad

de Energía Eléctrica de PR (AEEPR) y graduado del RUM, hizo una presentación sobre los aspectos de la tecnología y la demanda de energía eléctrica en Puerto Rico.

Otros miembros de la facultad del RUM que participaron, además de los ya mencionados y los co-directores de CoHemis, doctores Pumarada y Vélez Arocho, incluyen al Dr. Benjamín Pérez de Gracia, Director Ejecutivo de INDUNIV y al Dr. David Serrano, Decano Asociado de Ingeniería para Investigaciones; también el Dr. Dallas Alston del Departamento de Ciencias Marinas, Jay Banerjee del Departamento de Ingeniería Mecánica y Jorge González, estudiante doctoral de Ingeniería Mecánica en Georgia Tech.

Como resultado, se identificaron posibles colaboraciones con las que se está trabajando para lograr su implementación. Entre otras: posible uso de CoHemis como núcleo para el intercambio de información de EnviroTRADE con Latinoamérica y el Caribe; colaboración del RUM-Sandía-AEEPR en investigación y desarrollo e instrumentación de alternativas para energías, propuesta conjunta entre Puerto Rico y México para desarrollar una producción integrada de cerdos/algas/

peces; colaboración de RUM-Turabo-Sandía en tecnologías de desintoxicación solar; colaboraciones mutuas entre CoHemis y el Centro de Tecnologías Sostenibles; taller en tecnología de desintoxicación solar con participantes de LAC; participación de CoHemis-LAC en actividades de 1994; y posibilidades de participación en la reunión para tratar la crisis del camarón ecuatoriano. Los conferenciantes, la facultad y estudiantes graduados del RUM manifestaron su satisfacción con los resultados de la conferencia.

Generó gran entusiasmo el concepto EnviroTRADE, el cual provee información actualizada y accesible para problemas específicos de la mitigación de contaminación y limpieza. La sección geoambiental de NSF está laborando en un programa similar. La red EnviroTRADE le ofrecerá a los gobiernos y empresas de América Latina y el Caribe la tecnología ambiental más conveniente para la solución de sus problemas. Esta información será ventajosa para todas las partes en términos de la salud y el ambiente hemisférico, la solución eficaz de problemas y al impulsar un enfoque de bloque económico para beneficio mutuo.

Consorcio CoHemis...

dan traer beneficios para más de un país del hemisferio a corto plazo. Se comparará información; se intercambiarán publicaciones; se evaluarán prepropuestas; se identificarán las áreas en que las facultades se puedan complementar mutuamente; se buscará ayuda económica para proyectos conjuntos e intercambios, y se colaborará con los proyectos y actividades del Centro. El Centro actualmente no planea continuar realizando gestiones de crecimiento en Estados Unidos, aunque pretende, eventualmente, incluir las mejores universidades nacionales de América Latina y al menos una institución canadiense.

En su acuerdo, la Universidad Estatal de Colorado (CSU) manifiesta la intención de conceder asistencia económica a los graduados de Maestría de CoHemis. CSU también ofrecerá becas doctorales a candidatos a entrar a la facultad del RUM que sean ciudadanos americanos. CoHemis, por otro lado, facilitará las visitas de profesores, los ofrecimientos

de cursos cortos y sabáticas por parte de profesores de CSU a la industria e instituciones de Latinoamérica y el Caribe. Además, le permitirá a sus investigadores conducir investigaciones conjuntas en el RUM mediante estudiantes graduados e investigadores de CoHemis utilizando como medio visitas periódicas cortas. El RUM continuará suministrando las facilidades de infraestructura y comunicación necesarias para el Centro.

Gestiones en Estados Unidos

Se hicieron presentaciones sobre CoHemis y el Consorcio en las Universidades de Georgia Tech y Florida durante la segunda semana de noviembre. Los co-directores de CoHemis, Dr. Luis F. Pumarada O'Neill y Dr. Jorge I. Vélez Arocho recibieron respuestas muy entusiastas de parte de los administradores de ambas instituciones, mientras que los profesores presentes expresaron su interés en participar en proyectos y propuestas de CoHemis.

En Gainesville se entrevistaron con
(Continúa en la página 5)

Conferencia y Primera Asamblea General de IATAFI

La Asociación Internacional para la Evaluación y Pronóstico del Impacto de la Tecnología (IATAFI, por sus siglas en inglés) llevará a cabo su primera Conferencia y Primera Asamblea General del 2 al 6 de mayo de 1994 en Bergen, Noruega. Las organizaciones que realizan o auspician evaluación de tecnología se han invitado a asistir a esta reunión tan importante y a pertenecer a la Asociación. Esta conferencia enfocará primordialmente las tecnologías desarrolladas en la antigua Unión Soviética y Europa Central, cuya divulgación y desarrollo se ha detenido a raíz de la reciente crisis política y económica. También se discutirá la transferencia y evaluación de la tecnología en el contexto de los países en desarrollo. Además, incluirá talleres sobre metodología de ET.

La información generada por la evaluación del impacto de la tecnología como base para la decisión tecnológica más eficaz es una herramienta crucial para un país en busca de desarrollo sostenible. Esto le permite a países en desarrollo tomar decisiones informadas entre desarrollar o importar tecnología, transferir una tecnología que logrará sus objetivos en el contexto de ese país en particular, mejorar impactos positivos y mitigar cualesquiera efectos sociales y ambientales adversos.

La meta de IATAFI es adelantar la cooperación internacional entre instituciones que evalúan y/o pronostican el impacto de la innovación tecnológica. Esto permitirá decisiones más capaces de promover desarrollo sostenible continuo en el mundo en respuesta a los cambios globales. Esta "asociación sombrilla" aspira a: enlazar los países que carecen de ET con aquellos que poseen esas capacidades; promover el uso y la consideración de ET en el proceso de toma de decisiones; establecer vínculos de comunicación y crear oportunidades de colaboración entre los miembros, intercambio de personal para entrenamiento o para fortalecer o desarrollar destrezas; coordinar actividades, procedimientos y

metodologías; y coordinar actividades internacionales que se realicen bajo la agenda de cambio global.

En los planes de IATAFI a corto plazo están un boletín bi-mensual, la organización de conferencias y talleres, el establecimiento de centros regionales con la cooperación de miembros de la institución, y el desarrollo de una base de datos con capacidad para alcanzar información en clave alrededor del mundo.

Existe una cuota flexible para convertirse en miembro. Si el país está considerado como organización para el desarrollo y la cooperación económica (OECD, por sus siglas en inglés) y hay un mínimo de 20 personas trabajando en ET, la cuota es de US\$1,000. Para organizaciones similares en países que no son OECD, la cuota es de US\$500.

Su presidente es el Dr. Jan A. Anderson, representante del Centro de Alta Tecnología en Bergen, Noruega; el secretario ejecutivo es el Dr. Gary Williams, del Laboratorio Nacional Argonne y asesor individual de CoHemis. Para solicitar membresía o información, refiérase a esta dirección:

IATAFI Secretariat
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PO Box 4463, 5028 Bergen, Norway
Tel.: +47 55 54 37 80
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E-mail: IATAFI@BBB.NO

UNITEC...

de Estados Unidos podrían ser realizadas por estudios comprensivos de evaluación de la tecnología que recomienden cómo aumentar los beneficios socioeconómicos de la tecnología y cómo mitigar o reducir los impactos no deseados.

La Junta de Directores de UNITEC está compuesta por: el Dr. Luis F. Pumarada O'Neill, director interino, quien posee un doctorado en Sistemas Urbanos y Política de Planificación; Dr. Jorge I. Vélez Arocho, especialista en estadísticas, "TQM" y Planificación Estratégica; el Dr. Leandro Colón, Director del Departamento de Economía, y el Dr. Eduardo Kicinski, Director del Instituto y Estudios Regionales del RUM.

COHEMIS EN EL COMITÉ EJECUTIVO DE IATAFI

El Dr. Luis Pumarada, director de CoHemis, ha sido incluido en el Comité Ejecutivo de IATAFI. Esta entidad está localizada en Bergen, Noruega, y fue patrocinada inicialmente por la ONU, el Laboratorio Nacional Argonne de EE.UU., la oficina congressional de EE.UU. para la Evaluación de la Tecnología (OTA), la ciudad de Bergen y la Compañía Petrolera STATOIL de Noruega. La misma celebrará su primer congreso general y de fundación en Mayo del 1994. Las discusiones se centrarán en el tema de la tecnología desarrollada en la antigua Unión Soviética, la cual en gran medida se ha detenido por la crisis política y económica actual.

Primer Exito...

de desperdicio, común en muchos países del hemisferio, en un fertilizante orgánico no contaminante.

El Programa Piloto CoHemis comenzó en mayo de 1992 con una solicitud para prepropuestas enviada a la facultad del RUM solicitando proyectos con posibles beneficios económicos a corto plazo para más de un país y que envuelvan por lo menos a un investigador de Latinoamérica y del Caribe. Las doce prepropuestas recibidas fueron enviadas a evaluadores voluntarios en instituciones de Estados Unidos y Latinoamérica. Fueron seleccionadas cinco de ellas; se siguieron las sugerencias de los evaluadores y se enviaron para competir por los fondos de la Junta de Ciencia y Tecnología de Puerto Rico. Esta es una organización que patrocina la investigación aplicada que pueda beneficiar a Puerto Rico. Están pendientes otras tres propuestas del programa piloto. La quinta propuesta fue retirada por su investigador principal cuando éste se convirtió en el Director Ejecutivo de la Autoridad de Carreteras de Puerto Rico.

En febrero se anunciará cuándo se podrán someter nuevamente otras prepropuestas. Los investigadores del Consorcio serán invitados a producir o sugerir propuestas en conjunto con elementos norte-sur.

Consorcio CoHemis...

el Dr. Paul Yates Thompson, Director del Departamento de Ingeniería Civil. Luego de un fructífero intercambio de ideas, se unieron a varios miembros de la facultad y administradores de alto rango de varias divisiones de la Universidad para presentar el concepto de CoHemis y discutir posibles colaboraciones. El Dr. Thompson está actualmente desarrollando un acuerdo preliminar, el cual sería firmado por ambas universidades a principios del 1994.

En Atlanta, Vélez Arocho y Pumarada participaron en varias reuniones muy productivas. El Dr. Emir Macari, profesor del Departamento de Ingeniería Civil de Georgia Tech y asesor de CoHemis, organizó todas las reuniones. El Dr. John A. White, Decano de Ingeniería, demostró gran interés ante la posibilidad de integrarse al consorcio; él vió a CoHemis como un socio natural para el recién creado Centro de Tecnología Sostenible de Georgia Tech. El Dr. Allan Porter, director del Centro para la Política y Evaluación Tecnológica, colaboró con UNITEC, la división de evaluación del impacto de la tecnología, al explicar cómo trabaja su propio centro de evaluación. El Dr. David Frost, experto en problemas geo-ambientales, aceptó colaborar con el Dr. Macari en la organización del taller geo-ambiental a ser presentado por CoHemis en 1994. El Dr. Jean-Lou Chameau, Director del Departamento de Ingeniería Civil y del Centro de Tecnología Sostenible, acordó darle seguimiento al ingreso de Georgia Tech al Consorcio. Este sería el comienzo de la futura relación entre ambos centros.

El profesorado y la administración de ambas instituciones le dieron la bienvenida al Consorcio mencionando que es más fácil obtener fondos para un consorcio que para instituciones individuales. Ellos vieron en CoHemis un medio efectivo para participar en intercambios, investigaciones conjuntas, programas de cursos cortos con instituciones de América Latina y el Caribe, así como como una forma de conseguir más estudiantes doctorales competitivos del RUM.

El Consorcio se extiende hacia el Sur

El 15 de diciembre los directores de CoHemis visitaron el hermoso campus de la prestigiosa Universidad Simón Bolívar de Venezuela, localizada en las afueras de Caracas. De tamaño similar

al RUM, apoyada por el gobierno y de excelente estabilidad, la Universidad Simón Bolívar es el RUM venezolano: la meta de los estudiantes más sobresalientes en matemáticas y ciencias del país. La Universidad Simón Bolívar, con sólo 21 años de fundada, tiene una proporción mayor de estudiantes graduados y una facultad más europea en comparación con la del RUM. En una discusión previa, realizada en el RUM, los doctores Pumarada y Vélez se reunieron con el Dr. Jaime León, Vicerrector, y con el Dr. Carlos Pérez, Decano de Estudios Graduados. Inter-cambiaron ideas sobre posibles acuerdos bilaterales entre la universidad Simón Bolívar y el RUM que incluye el Consorcio CoHemis. Posibles intercambios de estudiantes y profesores, cursos cortos, sabáticas y proyectos de investigación conjunta serían los posibles resultados de una prometedora relación entre ambas universidades.

EL CONSORCIO EN ACCION

Las "Actividades en Agenda para 1994" (página 2) incluyen descripciones breves de dos colaboraciones del consorcio CoHemis: un seminario sobre "Procesos de manufactura benignos con el medioambiente" y un "Taller Hemisférico Geo-ambiental". En adición: la Dra. Sherry Oaks de la Universidad Estatal de Colorado y miembro del Consejo Asesor de CoHemis estará visitando México con los doctores Pumarada y Vélez Arocho a fines de enero. Ellos se reunirán con oficiales del CONACYT, universidades e instituciones de investigación. Una de las metas de esta visita es invitar a la Universidad Autónoma de México a unirse al Consorcio.

El Dr. Anthony Dvorak, Director de la División de Impacto Ambiental del Laboratorio Nacional Argonne, visitará el Recinto de Mayagüez de la Universidad de Puerto Rico el 21 de enero de 1994 para ofrecer un taller sobre "Metodologías y Experiencias en la Evaluación del Impacto de la Tecnología". Argonne y CoHemis planifican colaborar en un programa para aumentar el interés y la preparación de los estudiantes de la escuela superior hispana de Chicago, Roberto Clemente Community Academy, en las áreas de ciencia y matemáticas.

REPADI...

par en la "Reunión Regional de Centros de Investigación y Desarrollo y Estudios de Postgrado en Ingeniería" celebrada en Caracas el 13 y 14 de diciembre de 1993. Esta reunión fue auspiciada por la Oficina Regional de la UNESCO para Ciencia y Tecnología (ORCYT), localizada en Montevideo, Uruguay, y coauspiciada por el Consejo Nacional de Ciencia y Tecnología de Venezuela (CONICIT) y su programa COPLAC, que promueve y auspicia intercambios de estudiantes y profesores. Participaron representantes de instituciones de Chile, Cuba, México, Puerto Rico, Uruguay y Venezuela. El sector industrial estuvo representado por Petróleos de Venezuela (PDVSA).

CoHemis fue puesto a cargo del Programa Educativo de la red para Latinoamérica y el Caribe. Su objetivo es: mejorar la capacidad de profesores y practicantes de ingeniería por medio de cursos cortos. Los otros programas de la red serían: Mejoramiento del Postgrado, lo cual inicialmente se centraría en intercambios de profesores y estudiantes; Relaciones Inter-universitarias; y Relaciones Universidad-Industria.

La coordinación de la red fue delegada al Dr. Claudio Bifano, de la Fundación Instituto de Ingeniería de Venezuela y consultor del CONICIT para el programa COPLAC. El dirigirá la preparación de propuestas solicitando fondos a la industria y organizaciones internacionales. El programa COPLAC facilita intercambios de profesores y estudiantes de postgrado proveyéndoles fondos para viajes, viáticos e información. Aunque originalmente COPLAC debió servir a Latinoamérica y el Caribe, está actualmente limitado a los intercambios de Venezuela porque ningún otro país ha provisto fondos hasta el momento.

CoHemis, contando con las instituciones de su consorcio, hará el mayor esfuerzo para que sus actividades de 1994 sirvan a los propósitos del programa educativo mientras los fondos para REPADI se materializan. Las actividades de CoHemis aparecen en la página 2.

CoHemis en busca de fondos**PROPUESTA PARA EL ESTUDIO DE LA CRISIS DEL CAMARON EN ECUADOR**

"El estudio de la crisis de la industria ecuatoriana del camarón como indicador de la degradación ambiental global" es el título de la prepropuesta de CoHemis hecha por los doctores Dallas E. Alston (RUM-CoHemis) y Philip Buike (Ecuador). La industria ecuatoriana del camarón está confrontando una crisis de grandes proporciones. Las ganancias e inversiones han disminuido considerablemente, y la producción ha bajado de forma marcada. El cultivo de camarones representa la tercera industria de mayor importancia en Ecuador, generando sobre \$400 millones anualmente. Ecuador, la nación más importante en la producción de camarones en las Américas, ocupaba el primer lugar a nivel mundial en el año 1983 con 35,600 tm. Actualmente Ecuador está en la cuarta posición, detrás de China, Tailandia e India, que ocupan las primeras tres posiciones.

Casi el 20% de los camarones consumidos en Estados Unidos vienen de Ecuador, mayormente del estuario Bahía de Guaya. Un colapso total de la industria ecuatoriana, ciertamente afectaría el comercio de EE.UU. y los intereses de los consumidores. Muchos inversionistas estadounidenses están envueltos en el cultivo de camarones en la región, industria que consume cantidades significativas de materiales y equipos estadounidenses.

Los cultivos del camarón marino son prácticos solamente en aguas costeras, pero a menudo éstos son amenazados por la contaminación urbana, industrial y de la agricultura. A principios de 1986 estaba disminuyendo la producción de semilla de camarón postlarval silvestre para las charcas y los criaderos en Guayas. Esta disminución en productividad natural la cual ha sido demostrada por la larva cultivada, puede deberse a uno o más de los siguientes factores:

- Destrucción de manglares
- El fenómeno El Niño, con sus cambios climáticos y reversión de corrientes marinas
- La contaminación urbana del estuario de Guayas como consecuencia del rápido crecimiento de la ciudad de Guayaquil.

Por otro lado, los problemas pueden haber comenzado debido a enfermedades en criaderos y charcas, por químicos tóxicos de los desechos industriales y

por aplicaciones agrícolas.

Virtualmente todos los productores de Guayas han estado informando escasez de camarones sobrevivientes. La supervivencia reciente arroja un promedio de 15 a 20 % donde antes fluctuaba entre un 55 y un 60%. Algunos productores han informado pérdidas alcanzando el 90% de las larvas introducidas. Las razones de conversión de alimentación han hecho que la industria no produzca ganancias para algunos productores. Las mortalidades mayores aparentemente ocurren dentro de los primeros 40 días de cultivo.

Estudios preliminares han caracterizado el problema en términos de una posible enfermedad patológica, pero la causa de la enfermedad sigue siendo desconocida. Se presume que la calidad del agua y del terreno pueden ser el factor principal o determinante. Los doctores Claude Eoyd y Donal Lightner, especialistas en calidad del agua y enfermedades respectivamente, están actualmente tratando de determinar las causas de los problemas que enfrentan los productores.

Debido a la seriedad del problema y al hecho de que se sospecha de los factores ambientales, debería darse un esfuerzo de colaboración internacional para determinar la naturaleza y la extensión de este problema. Es por esto que una reunión de suma importancia ha sido propuesta en Puerto Rico a través de CoHemis por CENAIM y el Departamento de Ciencias Marinas del RUM. Se traerían expertos en ecología, calidad de agua y patología de camarones, así como expertos de Taiwan y Tailandia, quienes han enfrentado crisis similares en la industria del camarón, para que éstos discutan entre sí la situación existente en Ecuador. En esta reunión también se discutirá cómo esta situación se relaciona con la degradación del ambiente global. Los fracasos de la industria en Taiwan y Tailandia no estuvieron bien documentados en causas y términos de la perspectiva global. Tomando los resultados del estudio que eventualmente se expondrán en la reunión, se desarrollará un modelo predictivo para permitir un plan de contingencia para la gerencia de los recursos acuáticos globales que sea relevante a la situación mundial contemporánea en conjunto con la aplicación de percepción remota para anticipar tales situaciones.

En 1995 CoHemis colaborará

Congreso Mundial sobre Manufactura Inteligente

El Dr. Vladimir R. Milacic, profesor visitante del RUM y un renombrado experto en manufactura de alta tecnología, está organizando el "Primer Congreso Mundial en Procesos y Sistemas Inteligentes de Manufactura". El mismo se llevará a cabo en Mayagüez del 13 al 17 de febrero de 1995. Los posibles auspiciadores son NASA y NSF.

El objetivo principal de este congreso es proveer un foro mundial para el intercambio de conocimiento, experiencia e información relacionados a varios aspectos de la "fábrica inteligente" del futuro. El primer anuncio y petición de presentaciones, paneles y talleres está comenzando a circular.

Este evento brindará la oportunidad de comparar puntos de vista interdisciplinarios para crear el ambiente de las fábricas de la nueva generación. El mismo preparará el camino para educar a "ingenieros y científicos renacentistas" para las fábricas del futuro. El Congreso constará de dos días, en los que se llevará a cabo una Conferencia de Manufactura Inteligente en el Ambiente Espacial y eventualmente podría incluir Manufactura Inteligente bajo el océano.

El "Primer Congreso sobre Procesos y Sistemas Inteligentes de Manufactura" está dirigido a discutir los aspectos de la manufactura inteligente en los niveles de toma de decisiones, control y percepción para el diseño, planificación y tareas de producción en ambientes modernos IMP&S. Además, en el Congreso se introducirán las técnicas básicas para el ambiente IMP&S y se examinará cómo se practica al presente, se predecirá la agenda futura y se establecerán "puentes" entre la ingeniería de manufactura y otras disciplinas relacionadas, tales como la inteligencia artificial, visión de computadoras, control inteligente, electrónica, estructura de la cognición, etc.

Para más información, comuníquese con la Oficina de CoHemis o con el Dr. Vladimir Milacic, Departamento de Ingeniería Mecánica, Recinto Universitario de Mayagüez, PR 00681; teléfono (809) 832-4040 X-2575, 2560; fax (809) 265-3817.

Programa en el RUM**Nuevo Grado en Biotecnología Industrial**

El Recinto Universitario de Mayagüez de la Universidad de Puerto Rico iniciará en enero de 1994 un programa de grado en Biotecnología Industrial. Este es el primer programa de Puerto Rico en esta área y uno de los pocos que habrá en Estados Unidos. Se espera que este programa contribuya al desarrollo económico de Puerto Rico preparando recursos humanos para esta área tan importante y en franco desarrollo.

Este programa está dirigido a satisfacer las necesidades presentes y futuras de la industria en Puerto Rico, particularmente las farmacéuticas. Le proveerá a este sector los científicos y biotecnólogos requeridos para el desarrollo de nuevos y mejores procesos operacionales. Por otro lado, esta capacidad motivará a las compañías existentes a expandir sus operaciones y atraerá otras firmas a la isla.

El programa de Biotecnología Industrial tendrá una naturaleza interdisciplinaria, incluyendo aspectos de microbiología industrial, genética, bioquímica, procesos de ingeniería química y ambiental, así como ciencias ambientales, agricultura y ciencias y tecnología de alimentos.

EXPERTO ONU COLABORA CON UNITEC Y RUM

El Dr. Adolfo Korn, recientemente retirado de la División de Ciencia y Tecnología del Departamento de Desarrollo Económico de las Naciones Unidas (ONU), fue invitado al RUM por el Programa de Perspectiva Global con la colaboración de CoHemis. El 7 de diciembre de 1993, el Dr. Korn discutió con los estudiantes y la facultad del RUM la misión, organización y actividades de la ONU, así como el valor de la perspectiva internacional con relación a la educación y la práctica de la ciencia, la ingeniería y los negocios. Al día siguiente se reunió con los directores de UNITEC.

El Dr. Korn, un ingeniero en minería con experiencia internacional en la evaluación de la tecnología, compartió sus experiencias y valiosos consejos sobre iniciativas en la evaluación tecnológica

Cortos Internacionales Recinto de Mayagüez

El Dr. Eduardo Schroder, distinguido profesor e investigador de la Facultad de Ciencias Agrícolas, enseñó el curso "Biotecnología de la Fijación Biológica del Nitrógeno" como profesor visitante en la Facultad de Ciencias Exactas, Naturales y Psicoquímicas de la Universidad Nacional de Río Cuarto en Argentina. El curso se llevó a cabo entre el 22 de noviembre y el 4 de diciembre de 1993.

El Dr. L. Antonio Estévez, Director Asociado del Departamento de Ingeniería Química, ha sido nombrado miembro de la Junta Editora del recién creado boletín chileno "Investigación Tecnológica". Se espera que este boletín se difunda a gran parte de la comunidad científica latinoamericana. El doctor Estévez también ha sido invitado a pertenecer al comité técnico de la Segunda Conferencia de Aplicaciones de Computadoras a Procesos de Ingeniería. La misma se celebrará en Santiago de Chile del 7 al 10 de noviembre de 1994.

El Dr. Vladimir Milacic, profesor visitante en el Departamento de Ingeniería Mecánica del Recinto Universitario de Mayagüez, estará moderando una sesión sobre "Sistemas Expertos" que se celebrará en Lisboa del 10 al 14 de enero de 1994. El doctor Milacic hará dos presentaciones: "Sistemas expertos para seleccionar herramientas en los procesos de planificación y manufactura basados en la teoría de automatización" y "Conceptos de FMS para el diseño de máquinas".

con UNITEC, la Unidad de Evaluación, Monitoreo y Pronóstico Tecnológico. Se discutieron dos propuestas que están siendo desarrolladas por UNITEC, una división de CoHemis.

El Programa de Perspectiva Global pretende proveerle a los estudiantes de ciencia, ingeniería y empresas del RUM un amplio y diverso marco conceptual que incluya: cultura, reglamentos, comunicaciones, organización internacional, competencia y otros aspectos. Este programa opera en el Recinto a través del Centro de la Perspectiva Internacional, dirigido por el Dr. Ramachandra Asundi y co-dirigido por el Dr. Jorge I. Vélez Arocho, con la participación de las facultades de los tres campos envueltos (ciencia, ingeniería y empresas).

En Washington, DC**SE PRESENTAN PROYECTOS DE CoHEMIS**

Los directores de CoHemis hicieron un corto viaje a Washington, DC del 9 al 10 de noviembre. Los doctores Luis F. Pumarda O'Neill y Jorge I. Vélez Arocho presentaron propuestas y prepropuestas de CoHemis y su nueva división para evaluación de la tecnología, UNITEC. Además, presentaron el Consorcio CoHemis.

En una reunión celebrada en el Departamento de Energía se discutió una nueva propuesta sobre tecnología para Desintoxicación Solar producida por profesores de Química e Ingeniería Química. También se discutieron los puntos de acción que resultaron de la conferencia de septiembre "Problemas ambientales y energéticas que impactan a las Américas" (descritos en la página 3), que fue co-auspicada por el Laboratorio Nacional Sandía, miembro del Consorcio CoHemis. En la oficina de Washington del Laboratorio Nacional Argonne los directores del Centro se reunieron con el Dr. Gary Williams, asesor de CoHemis, para discutir la posibilidad de que en el futuro se ofrezca un taller a la facultad del RUM interesada en participar en proyectos de evaluación de tecnología. En una reunión celebrada en la Oficina de Evaluación de Tecnología del Congreso (OTA) para aprender sobre sus metodologías y políticas, su director asociado, el Dr. Peter Blair, aceptó ser parte de un consejo asesor de UNITEC. La división de programas universitarios de la NASA ofreció buscar apoyo de otras divisiones de esa administración para una prepropuesta del RUM titulada: "Gulf/Caribbean Work-shop on Remote Sensing for Land/Sea Interface Studies" y para una reunión de emergencia de un grupo de trabajo para considerar la crisis de los camarones en el Ecuador, según se describe en la página 6.

Uno de los puntos más importantes del viaje fue una reunión con el Administrador Asociado de la Autoridad Federal de Carreteras para Investigación y Desarrollo, el Dr. John A. Clements. Esta reunión fue sugerida por el Dr. Carlos Pesquera, Secretario de Transportación y Obras Públicas de Puerto Rico y asesor de CoHemis. Mientras se discutía un posible proyecto de UNITEC, sobre la Evaluación de un sistema de Vehículos y Carreteras Inteligentes para Puerto Rico y Latinoamérica, se evidenció el interés de la agencia en Latinoamérica y el gran potencial con el cual CoHemis cuenta para contribuir a su instrumentación. Se mencionó un posible gran proyecto para evaluación de tecnología: el tramo del Darién de la Carretera Panamericana.

Posibilidades de Colaboración de Parte del Recinto Universitario de Mayagüez y CoHemis para Mejorar la Educación de Postgrado en Ingeniería en Latinoamérica y el Caribe

por: Luis F. Pumarada O'Neill y Luz Leyda Vega
CoHemis, Universidad de Puerto Rico, Mayagüez

Resumen de la Ponencia presentada en la "Reunión Regional de Centros de Investigación y Desarrollo y de Estudios de Postgrado en Ingeniería" celebrada en Caracas, Venezuela, 14-16 de diciembre de 1993, coauspiciada por la UNESCO y el CONICIT de Venezuela.

Dado que los recursos humanos y físicos con que cuentan nuestros países para solucionar sus problemas más apremiantes son insuficientes en cantidad y en diversidad, se hace necesario utilizar estos recursos escasos con un mínimo de inversión en el momento más efectivo. Como en otros campos, es ventajoso formar alianzas que combinen recursos de varios países para lograr situaciones en las que todos los participantes salgan ganando.

CoHemis y el Consorcio CoHemis

CoHemis, el Centro Hemisférico de Cooperación en Investigación y Educación en Ingeniería y Ciencia Aplicada, con sede en Mayagüez, se creó en 1991, como resultado de una conferencia auspiciada por la National Science Foundation de EE. UU. y el Recinto de Mayagüez de la Universidad de Puerto Rico (RUM) en la cual estuvieron representadas las organizaciones nacionales de ciencia y tecnología de trece países de las Américas. Las actividades de este Centro Hemisférico se encaminan primordialmente a servir a las necesidades de las Américas con la participación de ingenieros, científicos y estudiantes de sus diferentes países y enfatizando aquellos proyectos cuyos resultados puedan traer beneficios para más de un país del hemisferio occidental en un corto plazo.

El Recinto Universitario de Mayagüez delega en CoHemis la realización de iniciativas de cooperación hemisférica. CoHemis ha venido desarrollando una red de apoyo, el Consorcio CoHemis, basada en una serie de acuerdos bilaterales entre el Recinto y otras universidades y laboratorios del hemisferio. Actualmente, CoHemis tiene acuerdos con la Universidad Estatal de Colorado y los Laboratorios Nacionales Sandía y Los Alamos.

Nuestros propósitos al concurrir a esta actividad son adelantar la estructuración de acuerdos bilaterales para ampliar el Consorcio a entidades latinoamericanas y caribeñas y contribuir a la creación de una red latinoamericana y caribeña de centros de investigación y desarrollo y de instituciones de estudios de postgrado en ingeniería.

El Programa Graduado de Ingeniería en el RUM

El Colegio de Ingeniería de la Universidad de Puerto Rico pertenece al Recinto Universitario de Mayagüez (RUM). Ofrece programas de postgrado dirigidos a conferir los títulos de Maestro ("Magister") en Ciencias y Maestro en Ingeniería en las siguientes ramas de la ingeniería: química, manufactura, civil, eléctrica, y mecánica. También existen estudios de postgrado en ingeniería de sistemas gerenciales, ofrecidos por el Departamento de Ingeniería Industrial. Los estudiantes de postgrado en ingeniería civil pueden especializarse en estructuras, recursos de agua y ambiente, geotecnia o transportación. Los estudiantes de postgrado en ingeniería eléctrica pueden seleccionar opciones en generación y distribución, electrónica, controles o comunicaciones. El programa de ingeniería mecánica permite concentraciones en diseño mecánico, ciencias térmicas e ingeniería de manufactura. Hace un año se inició el programa de Doctor en Ingeniería Civil.

El Colegio de Ingeniería cuenta con un total aproximado de 4,000 estudiantes. Unos 573 estaban identificados como estudiantes de postgrado en el año académico 1992-93. De éstos, el 36% son mujeres y más del 40% provienen de Latinoamérica y el Caribe. El 83% de los estudiantes de postgrado en ingeniería tienen algún tipo de beca.

Aquellos estudiantes de postgrado del RUM que cualifican y desean obtener experiencias en investigación y académicas fuera del campus o continuar estudios doctorales en universidades estadounidenses de renombre pueden utilizar las oportunidades provistas por las instituciones del Consorcio CoHemis. Pueden trabajar en proyectos con investigadores del Consorcio tanto en PR o en estas instituciones.

Los costos de estudiar postgrado en el RUM para un estudiante extranjero sin beca son de \$1,500 por semestre. Los estudiantes becados están exentos de pagar la matrícula, pero sí tienen que pagar algunas cuotas especiales. Normalmente la maestría toma entre 1.5 y dos años para completarse. Los costos de vivienda y demás gastos ordinarios de un estudiante soltero en Mayagüez se estiman en \$5,000 anuales. Existen becas de investigación y enseñanza disponibles para estudiantes de postgrado cualificados que estén estudiando a tiempo completo. Se les da prioridad a los que están haciendo la Maestría en Ciencias de Ingeniería. Las becas van desde un mínimo de \$5,000 más el pago de matrícula por un período de diez meses, hasta un máximo de \$9,600 más el pago de matrícula para estudiantes que estén trabajando en proyectos de investigación financiados con fondos externos al Recinto, e

(Continúa en la página 9)

Resumen Ponencia...

incluyendo trabajo de investigación a tiempo completo durante los dos meses entre semestres.

El programa de postgrado le da la oportunidad a los que poseen un bachillerato en Ingeniería de recibir entrenamiento a un nivel avanzado, desarrollar experiencia de investigación y prepararse para entrar a las industrias de alta tecnología. Los cursos son ofrecidos principalmente en español, aunque algunos se dictan en inglés. Los libros de texto son los mismos que se usan en otras universidades del sistema de Estados Unidos. Muchos puertorriqueños y latinoamericanos interesados en alcanzar grados doctorales de universidades famosas estadounidenses aprovechan la oportunidad que les brindan los estudios de postgrado del Recinto para ir mejorando su inglés y familiarizándose con el sistema educativo estadounidense a la vez que aprueban cursos de posgrado en español que les serán convalidados totalmente en la universidad donde tomarían su doctorado. Todo esto a un costo relativamente bajo y dentro de un ambiente latino. Se han dado casos de personas a las que sólo les ha tomado unos dos años terminar doctorados en lugares de tal prestigio como Purdue y VPI (Virginia Polytechnic Institute) tras haber terminado su *magister* en el Recinto.

Ideas para una Red de Centros de Investigación y Desarrollo y de Instituciones de Estudios de Postgrado

Una red para apoyar la educación de postgrado y la investigación debe servir e interactuar con las industrias de los diferentes países y formar parte de iniciativas conjuntas gobierno-academia-industria si se desea tener un impacto en el desarrollo económico de la región o nación.

La red debe incluir, entre otros, mecanismos dirigidos a facilitar lo siguiente:

- **Correo electrónico:** Es de primera importancia tener una red electrónica de comunicación tipo "bulletin board" para enviar mensajes comunes a todos sus suscritores. Los anuncios electrónicos a continuación utilizarían estos "bulletin boards".

Anuncios electrónicos:

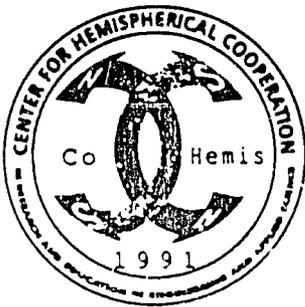
- pidiendo profesores para presentar cursos cortos o talleres que complementen currículos. capaciten a investigadores o se dirijan a necesidades temporales de la industria
- notificando sobre profesores disponibles para trasladarse en su año de sabática
- notificando la disponibilidad de becas para estudiantes de postgrado que estén dispuestos a realizar trabajos de investigación específicos para sus tesis
- pidiendo personal o equipo especializado para completar equipos para investigación conjunta
- **Red de telecomunicación:** La mejor forma en términos de efectividad vs. costo para transferir conocimiento sería mediante cursos remotos interactivos mediante satélite.
- **Conferencias hemisféricas o latinoamericanas sobre educación, currículos y temas de actualidad:**

Estas conferencias permiten que la educación de los Ingenieros responda a las tendencias tecnológicas, ambientales, económicas, sociales y éticas cuya dinámica es cada vez más controversial y cambiante. Pueden ayudar igualmente a la estandarización de aspectos educativos y profesionales, así como a lograr acuerdos multilaterales que faciliten los intercambios de estudiantes y profesores.

- **Conferencias temáticas hemisféricas o latinoamericanas de Investigadores:**

Las conferencias temáticas de Investigadores son de gran utilidad:

- promueven la formación de equipos multinacionales de investigadores y las relaciones interinstitucionales que redundan en intercambios de profesores y estudiantes
- facilitan la investigación conjunta de problemas comunes y regionales
- enfocan la investigación hacia los problemas de mayor prioridad
- aumentan la eficiencia de la utilización de recursos escasos al evitar la duplicidad de esfuerzos
- crean conciencia en los investigadores de los diversos países respecto a los problemas y necesidades de los otros países de manera que vean la aplicabilidad a éstos de sus ideas
- promueven nuevas ideas mediante intercambios de información, hipótesis y resultados.



CoHemis... update

Overcoming through cooperation

June 30, 1993
Vol. 3, No. 2

University of Puerto Rico at Mayaguez -- National Science Foundation

CoHemis included in IATAFI Organizing Committee

CoHemis was invited last April 2nd to join the Organizing Committee for the International Association of Technology Assessment and Forecasting Institutions (IATAFI). A small organizing committee had been created at the Expert Conference on Technology Assessment, Monitoring and Forecasting, held in Paris on January 25-29 with the participation of CoHemis. At a preliminary meeting held in March by this committee several other institutions, including CoHemis, were invited to join. The Paris meeting and the creation of this network respond to the United Nation's Science and Technology Branch, directed by Carlos Nones-Sucre, Ph.D.

The University of Puerto Rico at Mayaguez, well aware of the tremendous importance of technology assessment and forecasting in the context of developing countries, accepted the invitation. Immediately, CoHemis began to do its assigned share by getting information on TA institutions in the region which includes Mexico, Central America, and the Caribbean Basin, and forwarding it to the IATAFI Secretariat. The University of Sao Paulo's Institute for Advanced Studies, which was represented in Paris by Jacques Marcovitch and Bruce Johnson, is doing the same for the southern part of the Hemisphere. Argonne National Laboratory and the Congressional Office of Technology Assessment are identifying TA institutions in northern North America.

IATAFI's Chairman is Jan A. Andersen, from the Bergen, Norway, High Technology Center. This institution will host a meeting of the organizing committee programmed for July 8-9. The foundation/general assembly meeting is tentatively scheduled for October. The Secretariat is held by Dr. Gary Williams, from Argonne's Washington Office.

The other institutions which constitute the IATAFI organizing committee are: Analytical Centre of the Russian Academy of Sciences, Centre de Prospective et Evaluation (France), Fraunhofer Institute for Systems and Innovation Research (Continues on page 2)

Conference-Workshop Program under Revision

The conferences on Geoenvironmental Engineering, Remote Sensing, and Coastal Management and Development, which had been tentatively scheduled for September 1993 pending National Science Foundation funding, have been postponed. NSF programs are unable to support follow-up activities such as those included for enhancing the joint research preproposals resulting from the conference-workshops. These activities were a significant part of the 3-year, \$946,545 CoHemis proposal for 1993-95. NSF officials, also affected by budget cuts in FY 93, suggested that the conferences and workshops on different research fields, the most important (Continues on page 2)

Washington trip opens new alternatives

Between April 14 to 21, CoHemis Co-directors, Luis Pumarada-O'Neill and Jorge Velez-Arocho, traveled to Chicago and Washington for several important meetings. A letter of introduction provided by Puerto Rico's governor, Hon. Pedro Rossello, contributed to the receptiveness and the hierarchy of the officials present. In Washington, CoHemis visited NASA, AID, DOE, NIST, the White House, Capitol Hill and the Puerto Rico Federal Affairs Office; in Chicago, the McCarthur Foundation, Argonne National Laboratory, and the Roberto Clemente Community Academy. These meetings have definitely strengthened CoHemis and its Consortium and opened new possibilities for future activities and funding.

The continuity of our work, the regularity and relevance of our newsletter, the impressive record of the UPR Mayaguez Campus, and the support which hemispheric cooperation evokes have created a positive image for CoHemis. On Capitol Hill, CoHemis' co-directors were granted a meeting by Hon. George Brown, President of the House Committee on Science, Technology and Space Affairs. After listening to a short presentation, Hon. Brown enthusiastically endorsed CoHemis' concept and agenda and entrusted his Legislative Director, Dr. Bob Palmer, to follow-up on the Center's activities and to be alert for ways of helping CoHemis. The meetings with Puerto Rican Congressmen Hon. Luis Gutierrez and Hon. Nydia Velazquez followed similar patterns. (Continues on page 3)

New S & T Organization in Honduras

As part of the process of modernization of the country's institutions, Honduras created last January the *Consejo Hondureño de Ciencia y Tecnología* (COHCIT). A Presidential Office, its mission is to advise, coordinate, formulate and promote programs and actions which execute policies that stimulate the nation's scientific and technological development. It is headed by Dr. Humberto Cosenza J., National Commissioner on Science and Technology.

Doctor Cosenza notified CoHemis about the creation of this body, and kindly offered to coordinate future collaborations between Honduras and CoHemis and its Consortium. He explained that affairs related to the environment should be addressed to Dr. Carlos Medina, National Commissioner on the Environment.

CoHemis welcomes this new national organization for science and technology and the joint efforts which it will permit.

CoHemis Conferences postponed...

component of the proposal, be resubmitted as individual proposals addressed to specific corresponding NSF programs.

Dr. Emir Macari, Presidential Faculty Fellow in the UPRM Department of Civil Engineering, is working with CoHemis on a proposal for a conference on Geoenvironmental Engineering. Six prominent researchers from Latin America and the Caribbean will be invited to present papers. The thrust areas would be: design issues, such as sanitary landfills and geoenvironmental fabrics for containment; commercial waste / soil interactions, including analysis and clean-up; numerical methods for modelling waste transport, and other simulations in Geoenvironmental Engineering; and sustainable clean-up technologies for geoenvironmental problems related to pharmaceutical plants.

Dr. Mario Ierkic, a researcher from the UPRM Department of Electrical and Computer Engineering who has done work at the Cornell-NSF Arecibo Observatory, as well as in Peru, Germany and Japan, will be working with CoHemis on a proposal for a conference on Remote Sensing for Environmental Uses. NASA has already shown interest and should be able to send some of

its experts to participate. Previous CoHemis contacts with Los Alamos, Sandia and Argonne National Laboratories point at similar possibilities for collaboration.

Dr. Perez Nieto, from Venezuela and president of IOCARIBE, is interested in hosting a workshop on Coastal Management and Development in Venezuela to be co-sponsored by CoHemis. An important participant in the UN Conference on Environment and Development held last year in Rio de Janeiro, Dr. Perez Nieto sees this workshop as a regional follow-up to UNCED, and a pursuit of the global goal of sustainable development.

CoHemis in IATAFI...

(Germany), National Research Center for Science and Technology for Development (China), Office of Technology Assessment of the German Parliament, Pan African Union for Science and Technology, State Committee for Scientific Research (Poland), Technological Innovation Research Center of Budapest (Hungary), Interdisciplinary Center for Technology Analysis and Forecasting, Israel, and the Center for Technology Strategy (United Kingdom)

UPRM Sea Grant project will benefit the Lesser Antilles

The UPRM Sea Grant Program is being awarded a contract by UNESCO to continue UNESCO/COMAR's COSALCI pilot project on coastal and beach stability in the Lesser Antilles. Some of the elements of the project are: setting up a new monitoring program to measure coastal erosion/accretion and evaluating the existing programs; designing and setting up a computer data bank containing the data collected; and assisting in the management and coordination of the existing COSALCI program and in planning its future development.

In order to provide the necessary continuity, Dr. Manuel Hernandez-Avila, Director of Puerto Rico's Sea Grant Program and individual adviser to CoHemis, is bringing to UPRM as a visiting researcher to collaborate in the project Dr. Gilliam Cambers, who was in charge of its previous phase.

CoHemis... update is the newsletter of the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis), sponsored by the University of Puerto Rico, Mayagüez Campus and the National Science Foundation of the United States. *CoHemis... update* is published in English and Spanish and distributed free of charge to entities and individuals contributing to technology cooperation, education, or research in the Americas.

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Trip opens new...

The staff of Puerto Rico's Resident Commissioner, Hon. Carlos Romero-Barcelo, is studying alternatives for short term funding which he may push in Congress. Drs. Pumarada and Velez also met with staffers from Congressmen Bill Richardson, Jose Serrano, and Xavier Becerra. These important members of the Hispanic Caucus are being kept abreast of new developments on CoHemis. A visit was also made to the Hon. Rick Boucher's office to keep his staff up to date.

In the East Wing of the White House, Ms. Lillian Fernandez, a Puerto Rican lawyer and Legislative Assistant to President Clinton, welcomed CoHemis and provided valuable advice based on her legislative and industrial experience. She stated that CoHemis and UPRM had more than enough merits to fully deserve a line item in the budget authorizations of one or more Federal departments or agencies for furthering the goals of hemispheric cooperation and the enhancement of graduate minority education. Although she recommended that such funding should be a short term goal, the amounts which could be expected were limited due to budget restrictions. Ms. Fernandez suggested private foundations as a complement or alternative, with industry partnerships and self-sufficiency as long term goals. She alerted CoHemis on a potential problem of patents and intellectual property rights: "several countries which may be involved have a record of not respecting the applicable international regulations."

At the S & T agencies

In NASA, they met with Dr. Frank Owens, who heads its Office of Education, Dr. Julius Dasch, Director of the Space Grant Program, and Dr. Sherry McGee, from the Educational Programs Division. Dr. Owens mentioned NASA's interest in remote sensing and its possible

collaboration for any workshop or conference organized by CoHemis. Other NASA programs could also do likewise. Dr. Ralph Schmuckler, Executive Director of AID's University Center, had an emergency meeting and was represented by Dr. Lark Carter, Specialist in the Center for University Cooperation in Development, and Dr. Twig Johnson, Director of the Office of Environment and Natural Resources. They listened to a presentation on CoHemis and reacted with suggestions on possible collaborations. The ideal economic, language, and cultural situation of the fully accredited and excellent Mayaguez Campus for AID-sponsored training and education of Latin Americans became obvious to these officials.

Dr. Richard Stevens, Director of the Department of Energy's Office of University and Science Education Programs, mentioned that his department's main thrust was in energy and environment projects. He suggested several ways in which the DOE could collaborate with the Center. He offered to coordinate a presentation to DOE program directors on possible mutual collaborations near October. Drs. Pumarada and Velez also met with Dr. Stephen Carpenter, NIST Director for International Relations, an old friend of CoHemis who participated in the November 1991 conference which launched the center. NIST, which is under the Department of Commerce, is a key actor in the new administration's bid for technology innovation and indus-

trial competitiveness.

At the Puerto Rico Federal Affairs Office, CoHemis had a very promising meeting with Wanda Rubianes, Esq., Director, and her staff. They agreed to study funding alternatives within their reach in coordination with the Resident Commissioner.

Meetings in Chicago

In Chicago, Pumarada and Velez visited the McArthur Foundation. This Foundation's World Environment Program is focused on conserving biodiversity, and it is funding programs which contribute to this objective in specific parts of the globe, including some regions of Latin America.

Argonne National Laboratory, located in suburban Chicago, is operated by the University of Chicago for the US Department of Energy. The person in charge of the DOE Field Office at Argonne is Dr. Angel Taboas, a dynamic science manager born in Puerto Rico and an active patron of minority participation. CoHemis officials spent a whole day with Argonne executives and visited some of the Lab's excellent facilities, including the multi-million dollar *7.1 GeV Advanced Photon Source*. Argonne and DOE officials, including Dr. Taboas, were very interested in collaborating with hemispheric research through CoHemis and its Consortium. They are presently analyzing a draft memorandum of understanding for joining the Consortium.

Reinforcing the CoHemis Consortium

Dr. Sherry Oaks, Assistant Professor at Colorado State University and former Congressional Fellow of the American Association for the Advancement of Science, joined Drs. Velez and Pumarada in their visit to Hon. George Brown. This visit was the first joint CoHemis-CSU activity, an exercise of goodwill preceding the framework of the CoHemis Consortium, whose memorandum of understanding, already signed by Mayaguez Campus Chancellor, Dr. Alejandro Ruiz-Acevedo, is at the moment being signed by CSU officials.

A month later, CSU's Dr. Jorge Ramirez came to UPRM to participate in a conference and meet UPRM graduate students.

On-going projects

At the moment, CoHemis, with the collaboration of many UPRM researchers interested in hemispheric cooperation, is working on or developing several proposals. These efforts include:

Writing the proposal "A Regional Conference on Earthquake, Hurricane and Volcano Hazard Assessment and Mitigation" as a follow-up on the UN's World Conference on Hazard Mitigation to be held in Yokohama in May of 1994 as a primary activity of the International Decade for Natural Disaster Reduction. This will be a joint activity with UPRM-NSF's MRCE-Natural Hazard Mitigation Center.

Developing a proposal for launching a technology assessment unit within CoHemis to promote and support UPRM assessments for Puerto Rico and for Latin America and the Caribbean. The unit would begin with a scanning program, three local TA projects, and a data bank established with the data gathered for the projects.

Writing the proposal "A Comprehensive and Interdisciplinary Research and Training Program in Applied Ethics for the Science, Engineering and Business Administration Faculties of UPRM". This addresses the questions raised at the "Conference on Engineering Ethics in Engineering Education", funded through a grant from NSF.

Writing a proposal on the social and economic consequences of environmental policies.

Developing an environmental/biodiversity proposal for the McCarthur Foundation and jointly for AID's University Linkages Program, involving a Latin American university and UPRM.

Writing a proposal for holding a workshop in Mayaguez on current issues in Geoenvironmental Engineering for NSF.

Developing a proposal for conducting in Venezuela a Caribbean Basin conference on coastal management and development to be sponsored jointly by IOCARIBE, Puerto Rico Sea Grant and other regional and UN organizations and US agencies.

Strategy for a CoHemis TA Unit

As part of an overall strategy to bring together UPRM's many experienced and disperse resources into a Technology Assessment Unit to serve Puerto Rico and other parts of our hemisphere, CoHemis has undertaken several activities. The most important have been two conferences at Mayaguez aimed at promoting interest in Technology Assessment among UPRM faculty, and a presentation to an agency of the government of Puerto Rico.

The first conference, *Evaluating the Impacts of Technology*, was mostly concerned with defining Technology Assessment and its issues. It took place in April 27, 1993, co-sponsored by the UPRM Department of Economics. The individual presentations were:

"Evaluating the Impacts of Technology", Drs. Luis Pumarada and Jorge Velez Arocho, Co-directors of CoHemis

"The Social, Cultural and Ethical Variables Present in Technology Assessment", Dr. Gerardo Navas, UPR School of Planning, Rio Piedras Campus.

"Technology Assessment and Economic Development", Dr. Leandro Colon, UPRM Department of Economics.

The second conference, held on May 11, 1993, *Export of Technical Services to Latin America*, viewed TA as an opportunity for qualified professionals to collaborate with Latin America. It was co-sponsored by: FOMEXPORT, a PR government agency which promotes exports, and UPRM's School of Engineering, Faculty of Arts and Sciences, Department of Economics, and Center for International Perspective. The speakers were all from outside UPRM, and their presentations were:

"Puerto Rico as a Supplier of Technical Services to Latin America", Eng. Jose Custodio, *Architecture and Engineering, Inc.*

"The Experience of Colorado State University in the International Exportation of Technical Services", Dr. Jorge A. Ramirez, Co-director of CSU's Latin American Center for Science and Technology Cooperation (LACSTC) and Assistant Professor of Civil Engineering.

"Opportunities in the Exportation of Technical Services to Latin America", Mr. Edibaldo Silva, *Clapp & Mayne, Inc.*

"The Export of Technical Services as an Economic Activity", Mr. Juan Castañer, General Manager, *GB International.*

Late in May, CoHemis made a presentation in a meeting with the Puerto Rico Planning Board's executive staff and consultants, many of whom belong to task forces dealing with policy issues in Puerto Rico's new administration. In this meeting it became clear that there are several areas in which collaboration between CoHemis and the Planning Board and other agencies involved in defining policy alternatives would be mutually beneficial. Most of these areas can fit under the umbrella of Technology Assessment.

Participation of graduate students and some senior personnel from Latin America and the Caribbean in these projects will serve CoHemis' hemispheric mission while the experience gained by the TA Unit will build-up a record which will enable it to get TA projects in LAC. These will, in turn, involve greater numbers of LAC personnel.

UPRM students come out on top

The excellent quality of UPRM students and education has been again attested. Their achievements in three national competitions, especially the first place attained by a team of three Mechanical Engineering students, have been celebrated by everyone on campus.

Several different firms and professional trade associations sponsor competitions among US universities. The one held by the Disney Imagineering Corp., the firm which designs the Disney thematic amusement parks, was won by a team of UPRM students. They designed a theme park concept based on the mysteries of the Bermuda triangle, devising an excellent poster and video presentation. The students won a cash prize and a one-semester job at the company headquarters. CoHemis' Director, Dr. Luis Pumarada-O'Neill, was one of the judges in the local competition held to select Puerto Rico's three entries for the national contest among the 14 projects submitted.

Meanwhile, a solar-powered car totally designed and built by students according to competition guidelines qualified within the final ten among more than 70 cars in the Sunrayce '93 event at the Indianapolis Speedway. Another automobile, this time a *Formula SAE* car, is also a finalist in the Society of Automotive Engineers (SAE) contest. Last year's competition saw UPRM's first-time entry placing 26th out of 77 cars.

ENVIRONMENTAL PROGRAMS AT THE UNIVERSITY OF PUERTO RICO

There are two ABET-accredited programs which prepare Mayaguez Campus graduates to work as Environmental Engineers. However, there is no B.S. degree with the name Environmental Engineering at the University of Puerto Rico.

Environmental Engineering is one of the fields on which today's applicants from Latin America and the Caribbean show most interest. This has been especially true after the 1992 UN Conference on Environment and Development.

The solid record of US legislation, technology, and education in environmental matters attracts many young people from Latin America, where laws are only beginning to reflect the growing world concern with the global environment. Where but in the University of Puerto Rico can these students find an excellent US university, with varied expertise and solid research records in this field, inserted within a Latin culture and with no need for intensive language training?

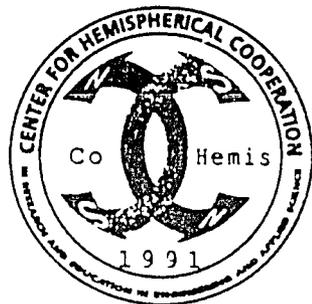
The Civil Engineering program includes three courses in environmental matters which are required of all their graduates: Introduction to Environmental Engineering, Water Resources Engineering, and Design of Water Supply and Sewer Systems. Those interested in Environmental Engineering as a career take the following electives: Applied Chemistry in Sanitary Engineering, Management of Solid Waste, Introduction to Hydrology, Applied Hydraulics, Water Treatment and

Pollution Control, Chemistry for Environmental Engineers, and Fundamentals of Air Pollution.

Chemical Engineering students at UPRM can option in Environmental Engineering by taking: Fundamentals of Air Pollution, Control of Air Pollution, Control of Industrial Waste, and Micro climate and the Dispersion of Pollutants in Air. Individual study courses such as Special Problems and Undergraduate Research provide the students an opportunity to explore specific interests under the guidance of expert faculty.

At the graduate level, the Civil Engineering Department has MS and Ph.D. programs in Environmental and Water Resources Engineering. The courses include: Biological Waste Water Treatment, Ground Water Hydrology, Water Resources Systems, Sanitary Engineering Microbiology, Stochastic Hydrology, Urban Drainage Modeling, Water Quality Modeling, Sediment Transport and Control. Courses open in the Marine Sciences Department include: Chemical Oceanography, Physical Oceanography, and Aquatic Pollution Biology.

At the UPRM School of Arts and Sciences, the Department of Chemistry offers a program option in Environmental chemistry. The UPR-Rio Piedras Campus, located in San Juan, offers an degree in Environmental Sciences. The UPR Medical Sciences Campus' School of Public Health offers a MS degree in Environmental Health.



CoHemis... update

Overcoming through cooperation

March 15, 1993

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University of Puerto Rico at Mayagüez -- National Science Foundation

CoHEMIS PARTICIPATES IN ITS CREATION:

A WORLDWIDE TECHNOLOGY ASSESSMENT ORGANIZATION IS BORN

The UN's Science and Technology Branch, headed by Dr. Carlos Nones-Sucre, laid the groundwork for the creation of an *International Association of Technology Assessment Institutions* in a meeting held on January 29, 1993. The "Special Session on Technology Assessment Network Building" of the "Expert Group Meeting on Technology Assessment, Monitoring and Forecasting", which took place at the UNESCO headquarters in Paris, France with the participation of CoHemis, discussed a draft constitution for this association and designated an organizing committee with the mission of holding its first assembly this Summer in Norway.

TA for Development was defined as the aggregation of the functions and analytical processes, planning and management which may be necessary for establishing technology policy and for the identification and evaluation of technology alternatives capable of contributing to national and international development. It includes search, monitoring and forecasts related to technology, in addition to the evaluation of its economic, social, cultural, environmental, and ethical impacts. The expert group meeting set the stage for the network-building effort by demonstrating the importance of the subject. In the words of Dr. Nones-Sucre: "The capabilities to monitor, foresee and assess technological developments and their consequences are a crucial element of the scientific and technological base of a society".

The congressional Office of Technology Assessment (OTA) and Argonne National Laboratory represent the US in the organizing committee. CoHemis offered to collaborate with its Latin American member, Jacques Markovitch (University of Sao Paulo), in contacting enti-

ties in Mexico and the Caribbean Basin.

CoHemis was invited to participate in the Expert Group Meeting by Dr. Nones-Sucre, who is a member of its advisory committee. The S&T Branch has been entrusted to become a focal point for Technology Assessment for Development by the UN General Assembly. It organized this activity jointly with UNESCO and UNIDO, the UN's organization for industry. (Continues on page 3)

TA Activities at UPRM

In order to get UPRM's faculty more involved in TA and to demonstrate both the importance of TA and Puerto Rico's comparative advantage in this field, CoHemis is working on the following activities:

CoHemis and the UPRM Department of Economics have organized a one-day conference on TA to be held on April 27 at Mayagüez. It will emphasize: the concept of TA; the relationship between technology, TA, and economic development; and the importance of the social, ethnic and cultural variables in the TA process. Together with the UPRM Center for International Perspective, CoHemis will sponsor a one-day conference on the Export of Technical Services on May 5th. This second conference will focus on markets, niches, regulations, technology transfer and assessments, and strategies for exporting services. The conferences aim to foster the creation of a UPRM network of experienced and potential practitioners willing to undertake TA in P.R. and elsewhere.

CoHemis and FormExport, the branch of the government of PR in charge of promoting exports, are designing a similar activity to be held in San Juan this Summer to address the professional sector and the technology community beyond UPRM. Special emphasis will be placed on joint venture projects in the international arena.

Appointments from Bolivia, Brazil and Colombia for CoHemis

Brazil and Colombia, which had not been present at the Hemispherical Cooperation Conference which founded CoHemis in Mayagüez in 1991, have named their respective delegates to the center. On the other hand, Bolivia's Science and Technology Adviser to the Vice President complimented CoHemis for its publication of the Conference Proceedings and designated the President of the Bolivian Academy of Sciences as the country's liaison with CoHemis.

Brazil's CNPq named Dr. Ivan Rocha, while Colombia's Colciencias designated Dr. Jaime Tabares-Mesa. We are grateful for the confidence on our center which is implied in these appointments, and congratulate them for upholding the idea of international cooperation for the benefit of all the countries of the Americas.

CoHemis Projects for 1993

At present, CoHemis is working on the planning or implementation of the following projects:

Promoting joint research: As reported in *Update 2.5*, CoHemis submitted a three-year proposal to NSF for conducting three two-day technical conferences with complementary workshops on the third day. These would take place in 1993, 1994, and 1995 at Mayagüez, Puerto Rico. They shall provide a forum for potential joint research collaborators to meet and exchange ideas on possible projects and supply them with information on how the Center and its consortium of US institutions may cooperate. The main objective is to propitiate the formation of multinational joint research teams to conduct research under the CoHemis umbrella. The conference will provide time and facilities to propitiate the formation of multinational teams of researchers. The teams formed will be asked to submit proposals at the end of the (Continues on page 2)

CoHemis 1993 projects...

conference.

Researchers from LAC and Canada who are interested in participating in joint projects of regional interest at UPRM or CoHemis Consortium institutions will be asked to submit work statements to their national S&T organizations. The work statements will outline one or two possible projects and shall include letters of intent declaring the researcher's desire and availability to relocate to continental US or PR with a temporary visa during the research period and return to his/her country upon its termination. This letter must be endorsed by the person's university or institution. US and Canadian industry with Latin American operations and the Programa Bolivar of joint industry research in LAC will be invited to participate. The UN, UNESCO, OAS and BID will be invited, as well as the University of Miami's North-South Center, UNM's ISTEAC, COLCYT-SELA, and other hemispheric initiatives.

Collaboration with Argentina: As reported in the previous *Update*, the Center is coordinating the participation of Sandia and Lawrence Livermore National Laboratories, and three researchers and graduate students from the Mayagüez Campus, in an international joint project of the University of Cordoba, Argentina. Its purpose is to determine the seismodynamics of two nuclear power plants.

CoHemis Consortium: CoHemis is working to complete the creation of the CoHemis Consortium. The National Laboratories of Sandia and Los Alamos, plus Colorado State and Virginia Tech Universities, have responded favorably and are considering or waiting for drafts of a possible agreement with UPRM concerning CoHemis. Argonne National Laboratory and the Universities of New Mexico and Georgia Tech are being contacted, as will be done several NSF Engineering Research Centers.

Joint Research Pilot Program: The consideration of the proposals submitted to the Puerto Rico Science and Technology Board, including four CoHemis proposals, has been delayed because of recent changes in membership. The center continues to follow up on them.

Diversification of Funding Sources: The Center has submitted a proposal to the Tinker Foundation as an initial step in the implementation of a complementary

funding plan based on proposals to foundations and other sources.

Hemispheric Conference on TA: The proposal to the Tinker Foundation mentioned above seeks to host a Hemispheric Conference on Technology Assessment. This would help the U.N. initiative for creating a world network for TA and provide an opportunity for UPRM and Consortium specialists to serve the region.

Strategic Plan for Caribbean Aquaculture: Professors from UPRM and the University of Rhode Island are developing a proposal to coordinate a strategic plan to enhance aquaculture in the Caribbean. This initiative will receive support from CoHemis in the collection of information on aquaculture plans in other countries of the region and in the coordination of regional research in mariculture.

Possible UPRM agreement with Sandia and NASA

As a result of contacts made by CoHemis and members of the PRELECT network, an important meeting was held at UPRM on March 4, 1993 with visitors from Sandia National Laboratories and the National Aeronautics and Space Administration (NASA). Sandia's Vice President for Energy and Environment, Dr. Dan L. Harley, and Dr. Nestor Ortiz, SNL's Director of Energy and Environment, came to UPRM with Dr. Michael Lee, from NASA and the University of New Mexico (UNM).

The distinguished visitors discussed possible future collaborations with Drs. Alejandro Ruiz Acevedo, Chancellor of the Mayagüez Campus, José F. Lluch, Dean of Engineering, and his associate deans, David Serrano and Jorge Ortiz-Alvarez, Dr. José R. López, Acting Director of the R&D Center, CoHemis Co-director Jorge I. Vélez-Arocho, and Leandro Rodríguez, Professor of Civil Engineering and former dean. They also visited some Department of Electrical and Computer Engineering research laboratories and spoke with graduate students.

Dr. Harley spoke of a possible memorandum of understanding for supporting collaboration between DOE, UPRM, and other minority institutions. It may include bringing researchers from the National Laboratories to the UPRM graduate school as visiting professors, research opportunities for UPRM professors and graduate students in Laboratory projects, and increasing the number of Hispanic minority graduate students at UPRM. Dr. Lee emphasized the mutual benefits of UNM joining UPRM in the CoHemis Consortium and spoke of NASA's commitment to enhancing graduate education for minorities. All parties came out very satisfied with the meeting and agreed on meeting again soon with a specific agenda.

**INTERACTION BETWEEN
CoHEMIS AND OTHER
U.P.R. PROGRAMS**

As part of an effort to increase collaborations with other programs of the University of Puerto Rico which seek to improve research and graduate education, CoHemis made a presentation in the joint annual conference of the NSF-PR Experimental Program to Stimulate Competitive Research (EPSCoR) and the PR Chapter of the American Association for the Advancement of Science.

The conference was held in the UPR's Mayagüez Campus on February 6, 1993 with the attendance of more than 100 scientists, mathematicians and engineers. Closer contacts will stimulate EPSCoR researchers to use the CoHemis' network to submit proposals jointly with researchers from Latin America and the Caribbean on projects (*Continues on page 6*)

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Worldwide TA Association...

trial development.

Twenty seven experts from Argentina, Brazil, China, Spain, United States, Philippines, France, Germany, Ghana, Netherlands, Hungary, India, Israel, Japan, Kenya, Korea, Mali, Nigeria, Norway, Poland, Russia, Switzerland, Togo, Sri Lanka and Venezuela presented papers. Eleven representatives from UN organizations and 18 delegates from other institutions participated in the discussion. The UN agencies present were: UNDP, UNEP, UNU/INTECH, ECA, ESCAP, WHO, ILO, FAO, UNESCO and UNIDO. CoHemis submitted a paper (summarized

below) which outlines the possible role of the center pertaining TA in the Americas.

Adnan Badran, UNESCO's General Assistant Director for Science, formally opened the activity. Dr. Nones-Sucre narrated the events which led up to the meeting. He emphasized that its main purpose was to enhance the endogenous science and technology capabilities of developing and transition countries, and stated three objectives: develop a deeper understanding of the processes of TA and management of technological change, revising existing methodologies, and considering alternatives and recommending priorities for future international coopera-

tion.

The meeting's final recommendations included, among others, the following:

- Develop an inventory of existing technologies relevant to developing countries.
- Institutionalize TA processes in developing countries and promote endogenous TA expertise.
- Make known the great need for TA among those who make policy decisions pertaining technology.
- Provide education on TA processes and techniques in the principal educational institutions of developing countries and experiential learning through participation in projects at more developed countries.

In Puerto Rico, TA is not as yet institutionalized within any branch of government. UPRM's R&D Center, with its history of TA studies and EISs, should become PR's main TA tool for both the public and private sectors. Latin American and Caribbean countries may stand to gain from this through CoHemis actions for promoting the participation of their graduate students and experts in these TA projects. Training and education programs on TA established at UPRM may be enhanced by US agencies such as EPA and AID to serve hemispheric needs.

Summary of the CoHemis Presentation:**TECHNOLOGY ASSESSMENT ISSUES AND A ROLE FOR COHEMIS**

CoHemis acknowledges that in the context of developing countries technology assessment (TA) is at least as important as R&D and probably more cost-effective. Many developing countries are not exploiting existing technologies which may be important for their development, while too often wrong choices are made in the type of technology to transfer to a country or in the way in which it is implemented. Our center can foster TA in Latin America and the Caribbean (LAC), lower the cost of TA in the region, enhance its effectiveness and responsiveness, and help to link the region to a proposed world TA network.

Puerto Rico's technology community, specially UPRM's faculty, has experience and expertise in US-type environmental impact studies, pollution control, and technology assessments. Moreover, PR shares many social, economic, and climatological characteristics with the countries of LAC, and identifies itself with their problems.

UPRM has accredited programs in the main fields of technology, in those disciplines which support it and evaluate its impacts, and in those which apply it to economic growth: engineering, agricultural sciences, natural sciences, marine sciences, social sciences, economics, and business administration. For two decades, the UPRM-DOE Center for Energy and Environment Research did technical, economic, planning and environmental impact studies on energy technologies such as: solar ponds, ocean thermogradient energy conversion (OTEC), solar cooling, biomass-energy cane, and wind turbines.

CoHemis can use its comparative advantage in the Western Hemisphere to: promote the perception that TA pays off; encourage the inclusion of TA in LAC university curricula; facilitate the participation of LAC scientists and engineers in joint projects for experiential learning, and foster the creation of competitive multinational TA teams, helping them to secure projects and financial resources. The center would like to foster the creation of a Caribbean Technology Assessment which could: put the expertise of US Hispanics and Puerto Ricans at the service of LAC and provide infrastructure support (e.g.: measurements, data analysis and interpretation) to LAC assessors; maintain a data bank on LAC assessors, reports and other pertinent TA information on call for policy makers need information or a particular expertise; and develop models for cooperative technology monitoring, forecasting, and assessment processes involving the public and private sectors, parallel to the British Center for the Exploitation of Science and Technology.

As suggestions to the UN Science and Technology Branch on its role in fostering worldwide TA for Development, CoHemis recommended that the S&T Branch become a clearinghouse for exchanging information, reports and results worldwide, disseminate models for market mechanisms providing reward structures which strengthen sustainable systems, and promote the concept that the earth is but a single system, environmentally as well as economically and in terms of its finite resources. The S&T Branch, which had specifically asked for such suggestions, could also conduct or sponsor global-level T.A. and systems studies for technologies with potential global impacts.

NEW COORDINATOR IN COHEMIS

Ms. Luz Leyda Vega became CoHemis' new coordinator, replacing Eng. Gisela Gonzalez. Gisela had to move into the Center for Infrastructure Research upon the resignation of its Director, Dr. Carlos I. Pesquera to head Puerto Rico's Department of Transportation and Public Works.

Luz has been working at CoHemis since 1991, when she was a honor-roll Senior at UPRM's School of Business Administration. A bright, enthusiastic, hard worker who shares our goal of overcoming underdevelopment and global competition through hemispheric cooperation, she heads an excellent support staff made up by Ms. Ana Alvarez, secretary, and UPRM students Glorymar Peña, Carlos Poventud and Omar Laboy.

CoHemis has just acquired a Macintosh Centris 650 computer with the necessary peripherals to enhance its desktop publishing capabilities. We now have three desktop and one laptop computer, a fax and a photocopy machine in our office at the UPRM R&D Center. We are installing a line to the Campus' VAX computer to access the Internet and Bitnet networks.

THE LAND GRANT MODEL: TECHNOLOGY TRANSFER FOR THE AMERICAS

The application of the *land grant* model and its extension service to high technology and manufacturing appears to be one of the most favored alternatives for improving the competitiveness of the United States in the post-cold war era. In developing nations, this model could be made more effective by encompassing technology assessment in addition to the transfer to local agriculture and industry of both imported technology and innovations developed within the country. The Mayaguez Campus, the land grant, sea grant and space grant branch of the University of Puerto Rico, is in a very good position to implement this extended model in Puerto Rico and to collaborate, through CoHemis, toward its application in other countries of our hemisphere for the benefit of all.

Manufacturing extension is based on the notion that government should do more to speed the flow of technology to manufacturers. Its advocates in the US say that government should set up networks of local centers, modeled on state agriculture extension services, to provide information about advanced technologies and business practices to the small- and medium-sized firms.

The National Competitiveness Act of 1993, introduced in both branches of Congress, would authorize \$150 million in FY 1994 and \$280 million in FY 1995 for a new "National Manufacturing Outreach Program" housed in the National Institute for Standard Technology (NIST). The Manufacturing Outreach Program would link state manufacturing extension centers and NIST's Manufacturing Technology Centers with new efforts by NIST to help states set up manufacturing extension centers. President Clinton has expressed his support for manufacturing extension and has proposed creating 170 Manufacturing Extension Centers, at a cost of \$510 million per year by 1996. Extension service, applied to agriculture, is a feature of the land grant university.

The land grant institutions in US territory were created and shaped by laws enacted between 1887 and 1914 with regard to agriculture and partly extended to engineering. The world leadership still enjoyed by US agriculture is in good part a result of the ability of the land grant model to develop, teach, and transfer agricultural technology from the university to the end-user. This national, federally-supported

program is flexible enough to respond to the needs of small- and mid-sized operations and sensitive to regional differences. Its experimental stations and extension service pulls the researchers out of the ivory towers and puts them in contact with the end-users and their real problems. The agricultural experimental stations are university facilities for research, development and demonstration of new technology. The extension service is an outreach program which provides services and on-site practical training in new technology directly to producers and their workers.

In the case of engineering, the land grant laws only support teaching and did not create experimental stations and extension services. The comparatively poor record of the United States in putting new technology into competitive products may be amended by extending the full model into engineering, high technology and manufacturing. Inspired by the success of technology transfer programs enacted at the state level, such as industrial extension services and research/technology parks, several US congressmen have introduced bills with this purpose since 1992. The main thrusts of the national efforts would be to improve the practical education of engineering students and a more prompt and effective transfer of university-created technology into production, especially for small- to medium-sized industries.

In less developed countries, the impact of a similar program should be much bigger and decisive. The land grant model can be applied not only to new technology created by the universities for the country's needs but also to technology already developed in more developed countries which may be useful but has not been yet successfully adopted locally. The grantee institutions can do the technology assessment studies, contribute to the technology management decisions, and help producers and workers to implement the technology.

The Mayaguez Campus has been applying the land grant model for eight decades in its School of Agricultural Sciences, and has similar programs in marine sciences and small business development. It is looking into extending the model to other technologies in Puerto Rico. The Campus may collaborate with other countries in the Americas in developing similar programs in their agricultural and industrial sectors.

SUSTAINABLE AGRICULTURE

In most countries, increases in food production must come from raising output per unit area, since most agricultural land is already being exploited and significant portions of it is being lost to urban development, transportation and other uses. The situation is made worse by the fact that yields are declining together with the increased application of fertilizer. Currently, developing countries are struggling just to maintain their actual agricultural research capacity, which is being asked not only to produce innovations to expand production but also to halt the decline of agricultural productivity.

Meanwhile, Rio's UN Conference on Environment and Development has raised world concern on the environmental impacts of many growth alternatives in agricultural production. Intensified agriculture may bring about loss of soil due to erosion, water-logging and salinization, surface and ground water contamination from plant nutrients and pesticides, resistance of insects, weeds and pathogens to present methods of control, and the loss of natural habitats. Expansion of agriculture into forests and fragile lands contributes to desertification, soil erosion, species loss, degradation of water quality, and climate changes.

According to Vernon W. Ruttan in his recent article in the Interamerican Development Bank's newsletter, the basis for the information included here, the real challenge is to develop a basic research agenda that will produce the technical and institutional knowledge that society needs in order to develop a sustainable agriculture. This author claims the main issue to be the conflict of present versus future generations, since the increasing the use of non-reproducible resources above present levels invites a future catastrophe. They argue that in order to have the present generation pay the real cost of using the world's finite resources, the conventional methods used in assessments for discounting the future, which encourage the rapid depletion of resources, must change in order to make the users internalize the costs of actions.

(Continues on page 6)

WORLD OFFICE OF YOUNG SCIENTISTS IN PUERTO RICO

The FISS World Office of Young Scientists, created by the successful First World Congress of Young Scientists, has become a reality. This office will help to develop leadership in young scientists so that they can bring their minds together to enhance the development of our society in an ethical manner. Dr. Jorge A. Velez

FORUM EMPHASIZES TECHNOLOGICAL INNOVATION

The Forum "Science and Technology in Latin America" of the First World Congress of Young Scientists, described above, emphasized the importance of technological development for Latin American countries and the necessity of their incorporation to the productive sector. This forum included the participation of representatives of Costa Rica and Venezuela, with Dr. Jorge Iván Vélez-Arocho, Co-Director of CoHemis, as its moderator.

Atty. Mario Cordero Maduro, from the Ministry of Sciences and Technology of Costa Rica, gave the presentation titled "Central-American Project of Investment in the Technological Development of Productive Sectors". He summarized the change that has occurred in Latin America with respect to putting scientific knowledge to the service of productive sectors to support their competitive ability. The Central-American Project aims to design a scientific-technological basis to sustain the growth of that region by: improving research centers to enhance their service to productive sectors, training people in graduate studies and technical subjects, and improving the institutional frame that enhances regional cooperation in technology.

Dr. Jose Miguel Camino, of the National Council on Science and Technology Research (CONICIT) of Venezuela, presented "The Regional Integration of Science and Technology in Latin America". "No country can insert itself in the global economy if it doesn't improve its scientific-technological capacity", he noted, and added: "Science and technology must be coupled with the productive sectors if we want substantial economic development in our countries."

Arocho represented CoHemis in this Congress, held at the Interamerican University of Puerto Rico in August, 1992.

The FISS World Office for Young Scientists is a program of the FISS Foundation, the International Federation of Scientific Societies, with headquarters in Venezuela. FISS is incorporated in twelve nations from the Americas (Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Salvador, Mexico, Peru, Puerto Rico, United States, and Venezuela) and three European countries (France, Italy, and Spain), and is supported by several other important countries in the five continents. The fundamental purpose of the FISS World Office for Young Scientists, which is supported by Interamerican University, is to initiate a creative dialogue with the following objectives:

Identify, describe or diagnose needs, anxieties, motivations, problems, and hopes of the young scientists of the world.

Help the development of regional or global strategies for the exchange, cooperation, and development of young scientists and their societies, and for the solution of common or inter-related problems.

Propose or explore synthesis methods that facilitate the convergence of different sciences in new disciplines or in particular applications.

Stimulate greater motivation for science and technology research in young scientists, oriented toward the well-being of humanity, peace, and the enhancement of education.

Promote scientific research whose results contribute practical solutions for the problems of humanity.

Stimulate friendship within the international community of scientists.

CoHemis will continue to collaborate wholeheartedly with this and all other hemispheric and global international cooperation initiatives for enhancing the positive applications of science and technology. The FISS World Office of Young Scientists is at:

Interamerican University
P. O. Box 1293
San Juan, P. R., 00913-1293
Fax: (809) 753-0152.

CONFERENCE ON NATURAL RISKS

The Puerto Rico Department of Natural Resources and its Planning Program for the Mitigation of Natural Risks will celebrate its "Conference on Natural Risk 1993" at the Emilio S. Balaval Theater of the Sagrado Corazón University in San Juan on June 2, 1993.

Papers will be accepted concerning: Vulnerability/Risk; Strategies/Projects of Mitigation; Concientization Programs; Improvements to the Building Code, Standards/Practices; Redevelopment Strategies; Communication Systems for Emergencies; Housing Relocation; Shelters; Evacuation Plans; Risk Control Works (for floods, landslides, etc.); Alarm Systems for Flash Floods; Operational Planning for Emergencies; Land Use Planning; Fulfillment of Laws and Regulations; and Mental Health/Epidemiology.

Abstract of papers may be submitted during March, 1993 in an 8.5" x 11" page, double space. Acceptance of papers will be notified on or before April 15, 1993. Please send all communications related with this Conference to:

Ms. Lourdes S. Bernier
Tel. (809) 722-1776
Acting Director, Natural Risks Planning
P. O. Box 5887
San Juan, PR 00906

New Chemistry Building Under Way at UPRM

The Mayagüez Campus took an important step towards maintaining its leadership in scientific education and high technology in Puerto Rico. On December 22, 1992 the contract for the construction of a new Chemistry building was signed for approximately \$20 million. The facilities provided in this building, which will rely on the most modern computerized instrumentation, will be up to the challenge of the XXI Century. Research work will occupy approximately 40% of its capacity, with 36 research laboratories for professors and graduate and under-graduate students. It will be a milestone in the implementation of a future interdisciplinary doctoral program.

THE PROFESSIONAL OF THE NEXT DECADE

The ability to adapt to the changes of a dynamic environment, the appreciation of the individual needs of the employees, and the recognition of the international outlook of organizations will be the most important elements of the professional needed for the next decade, according to Dr. Jorge I. Vélez Arocho in a lecture presented to the National Quality Forum. This forum, held the last October 2, in San Juan, was sponsored by the PR chapter of the American Society for Quality Control (ASQC).

Dr. Vélez, co-director of CoHemis, emphasized the importance of communication between the university, the sectors that employ its graduates, and the professional organizations in the training of the work force to enable the professionals to conquer the challenges of the future.

Sustainable agriculture...

including technical change, which harm the environment.

He calls for striking a common ground between traditional economists and environmentalists and transform the concerns about sustainable agriculture into a research agenda and then into practice. Left alone, this situation can result in widespread hunger, rising food prices, threats to peace, and future environmental disasters. Solving it will require research strategies which pool together resources from many developing countries with common problems into solving regional issues with the participation of concerned developed countries. These strategies can benefit greatly from the coordinating and resource-pooling activities of regional, North-South organizations such as CoHemis.

The same issue of the IDB newsletter lists ten goals which according to bank president Enrique V. Iglesias should underpin the region's economic and social policies for the 1990s. This list includes, among others, to: increase the region's international competitiveness through the incorporation of advanced technology into the productive processes; carry out massive human resource development; intensify regional economic integration to improve international competitiveness, develop new ways for the region to participate in the international market, and ensure that development is environmentally sustainable. All of these goals are consistent with the mission of CoHemis.

Other UPR Programs...

able to produce short term benefits on a regional scale, the type of activity which CoHemis seeks to promote.

The main objective of the NSF's EPSCoR program is to improve the quality and quantity of competitive research in those regions of the United States having a lower level of competitive research funding. It supports the implementation of strategic plans to develop research infrastructure, as well as specific initiatives to strengthen competitive research. EPSCoR-Puerto Rico, headed by Dr. Manuel Gómez, a physicist from the UPR Río Piedras Campus, has been the fastest growing state-level program. The number of Puerto Ricans earning PhDs in science, math and engineering has doubled in the last five years, partly as a result of this program. Dr. Gómez is an individual adviser to CoHemis, and the Resource Center for Science and Engineering, which he also directs, has contributed to some CoHemis activities.

EPSCoR-PR supports, among others, research centers for materials, computational mathematics, metal clusters, terrestrial ecology, tropical marine biotechnology, and engineering infrastructure. The last two, plus a Laser and Spectroscopy Facility, are located at the Mayaguez Campus. These initiatives seek to make use of the inherent advantage of Puerto Rico's geographical and climatological setting and to build on existing strengths of its scientific community.

HEMISPHERIC OUTREACH BY UPRM FACULTY

Dr. Emir Macari visited **Mexico** from October 15 to 26, 1992 to offer several technical presentations related to his **Presidential Faculty Fellow** grant. He was invited by the National Council for Science and Technology (CONACYT).

Dr. Jay Banerjee visited the University of Los Andes at Mérida, **Venezuela** on invitation as a member of the panel to examine work on "The Optimal Design Method for Machine Elements".

Dr. Leandro Rodríguez participated from December 1 to 7, 1992, in the "Latin American Partnership Workshop" held at San Jose, **Costa Rica**. Dr. Rodríguez was invited by the Central United States Earthquake Consortium (CUSEC) to participate as a member of the United States delegation.

Dr. Manuel F. Rodríguez-Perazza has been appointed Vice Chair of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) Student Activities Committee. In this position, he will be responsible for the establishment and achievement of goals and standards for over fifty thousand engineering students in 145 countries throughout the world. He has also been appointed to the student activities task force of the **Transnational Committee of the IEEE**, where he will be interacting with distinguished professional engineers from all over the world.

Dr. H. Mario Ierikic was appointed to the **National Science Foundation** panel which recently reviewed Instrumentation and Laboratory Improvement (ILI) proposals at Washington, D.C. Dr. Ricardo Lopez was involved in a similar activity for the Large Structures and Building Systems Program.

ARECIBO OBSERVATORY RESEARCH PROCEDURES

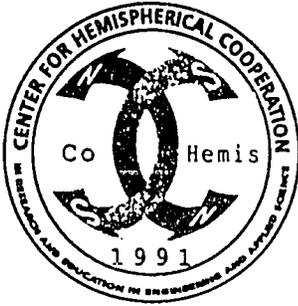
Dr. Mario Ierikic, UPRM Department of Electrical and Computer Engineering

The Arecibo Observatory (AO) is a research facility operated by Cornell University under a cooperative agreement with the National Science Foundation. Its radio-telescope and related facilities are available to all scientists from all over the world for observational research in Atmospheric Science, Radio Astronomy, and Radar Astronomy. Scientists interested in using the Arecibo facility for studies of the lower and upper atmosphere are encouraged to contact the author through CoHemis.

Scientists can use the AO facilities after their research proposals have been reviewed and accepted. Acceptance of proposals rests largely on scientific merits and on equipment availability. The review process takes from one to six months. The AO may provide some support for travel and for publication of results.

Some research programs at the AO are famous worldwide. Important radar and optical projects probe the earth's lower and upper atmosphere. The AO uses a steerable, 1MW peak power 430 MHz radar. This system is routinely used for atmospheric studies starting at tropospheric levels and reaching into the ionosphere.

Active areas of research include Radio Reflectivity Measurements of the Neutral Gas, Climatological Studies of Wind Profiles and Turbulence, and Orographic Effects on the Dynamics of the Atmosphere. Other areas include studies of Ionospheric Structure, Electric Fields, Temperature, and Composition. Artificially excited Non-Linear Plasma Phenomena are studied with the help of a powerful HF facility nearby. Other diagnostic facilities include a S-Band radar, a 46.8 MHz radar, an Ionosonde, and the Optical Laboratory, with a Lidar for middle and lower atmosphere studies.



CoHemis... update

Overcoming through cooperation

December 15, 1992
Vol. 2, No. 5

University of Puerto Rico at Mayagüez -- National Science Foundation

THE FIRST COHEMIS JOINT PROJECT MAY TAKE PLACE IN ARGENTINA

The first joint project promoted by CoHemis between U.S. and Latin American researchers could take place in mid-1993 in Argentina. This event is being made possible by the good relationships which have been established with various institutions, north and south, as well as by the fact that the Center is becoming better known throughout the U.S. and Latin America.

The National University of Cordoba will be conducting tests for seismic simulation for complex structures using vibrators and underground explosions. The Sandia and Lawrence Livermore National Laboratories, with initial coordination by CoHemis, would collaborate in the design of the experiment and in the measurement of the results. Three professors from the Mayaguez Campus would collaborate in the analysis of the data obtained: Dr. Leandro Rodríguez, the structures, Dr. Luis Suárez, born in Argentina, the non-structural elements, and Dr. Emir Macari, born in Mexico, the geotechnics. Japanese and German teams will also participate in this effort. An international conference would be tentatively scheduled one year later to discuss the interpretation of the results. Dr. Nestor Ortiz, from Sandia National Laboratory, is searching for funds from U.S. institutions which may be interested. These funds would cover the collaborations of the Laboratories and the Mayaguez Campus.

The goal of the national delegates who formed CoHemis in 1991 was precisely to create an organism for promoting joint

research projects with the participation of different countries of the hemisphere for the benefit of all. This project will definitely be a good example.

U.P.R. MAYAGUEZ INITIATES ITS FIRST Ph.D. PROGRAM IN ENGINEERING

After several years of preparation, the Mayaguez Campus will initiate in January 1993 a Doctoral Degree Program in Civil Engineering in the field of Structures. The disciplines of Geotechnics, Water Resources, Transportation, Construction Management, and Environmental Management will follow in the succeeding semesters. Three students, all Latin Americans, have been admitted up to now into the first Engineering Ph.D. program in Puerto Rico.

This program will improve the quality and quantity of research in this important field. It will also increase the number of courses available to the 60 students currently enrolled in the Master Degree Program, and will improve the services and research conducted by the department's EPSCoR Center for Infrastructure Research. It is expected that a Ph.D. Program in Chemical Engineering will follow.

ATTAINMENTS OF 1992

CoHemis achieved important milestones in 1992. In addition to the seismic project in Argentina reported in this page, other significant accomplishments were: the initiation of a pilot program of joint research at UPRM, the introduction of the concept of a CoHemis Consortium of U.S. institutions, a productive meeting with the advisory committee in Washington, DC, the addition of several distin-

(Continues in page 3)

CoHEMIS FOUNDER AND ADVISER TO KEY POSITION

Dr. Carlos I. Pesquera, Co-director of CoHemis at the time it was founded by the Hemispherical Cooperation Conference in November 1991 and presently an individual adviser, was named Puerto Rico's Secretary of Transportation and Public Works. Dr. Pesquera, a Professor of the Civil Engineering Department of the Mayaguez Campus who specializes in Structures and a Cornell University alumnus, was the Director of the Campus' Center for Infrastructure Research at the time of his designation by Dr. Pedro Rosello, who had been elected Governor on November 3rd.

Carlos, we congratulate you on behalf of the personnel, directors, delegates, friends and collaborators of the Center which you helped to create. With your intelligence, dedication and desire in everything which you set out to do, we know you will do a superb job!

Venezuela's Delegate and Adviser Visits CoHemis

Dr. Graciela Sosa, Venezuela official delegate to CoHemis and member of the Center's Advisory Committee, visited the offices of the Center from the 23rd to the 25th of November. Her very welcome visit allowed Dr. Sosa to study in depth the proposal submitted by the Center to the National Science Foundation and to discuss the possibility of Venezuela hosting a follow-up workshop on one of the conference topics (see "Attainments of 1992").

The possibility of organizing a workshop on Coastal Management and Development in Venezuela was discussed in a meeting with Dr. Manuel Hernandez-Avila, CoHemis Adviser and Director of Puerto Rico's Sea Grant Program, who is slated to be the coordinator for that conference topic. Another possible project discussed was in the environmental field with the participation of the University of Puerto Rico's Mayaguez Campus, private industries, Venezuela CONICIT, and U.S. institutions belonging to the CoHemis Consortium. Through Dr. Sosa, CoHemis learned more about the efforts that Venezuela and other Latin American countries are doing to integrate the productive sectors with research programs in the academic and government sectors. This integration is a concern for most organizations promoting research oriented to



Standing: Dr. Antonio Gonzalez, CoHemis collaborator, Dr. Jose R. Lopez, Interim Director of the R&D Center, Dr. Jorge I. Velez-Arocho, CoHemis' Co-director, and Dr. Carlos I. Pesquera, CoHemis adviser Puerto Rico's Secretary of Public Works. Sitting: Dr. Luis Pumarada-O'Neill, CoHemis Director, Dra. Graciela Sosa, Policy and Planning Director of Venezuela's CONICIT, and Dr. Leandro Rodriguez, CoHemis founder-collaborator.

economic development. Dr. Sosa mentioned the Programa Bolivar, the Technology-based Industry Program and the Parques Tecnológicos (Research Parks) as initiatives in this direction.

DESERVED RECOGNITION FOR DR. LEANDRO RODRIGUEZ

The *Proceedings of the Hemispherical Cooperation Conference in Engineering and Applied Science* which is being mailed to delegates, participants and hemispheric national science and technology organizations which are members of CoHemis has been dedicated to Dr. Leandro Rodriguez, Professor of the Mayaguez Campus' Civil Engineering Department.

The Dedication reads partially as follows: "Dr. Rodriguez is endowed with exceptional capacity and dynamism while always remaining

natural and sincere. He is the person who has done the most to promote research in our School of Engineering, contributing significantly to the transformation which the campus experiences today. Together with Dr. Rafael Muñoz-Candelario, presently Professor Emeritus of Engineering, he was the originator of the idea of hosting an NSF-supported conference as the initial step for the creation of a cooperative technology research center dedicated to regional problems".

CoHemis... update is the newsletter of the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis), sponsored by the University of Puerto Rico, Mayaguez Campus and the National Science Foundation of the United States.

CoHemis... update is published in English and Spanish and distributed free of charge to entities and individuals contributing to technology cooperation, education, or research in the Americas.

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Attainments of 1992...

gushed individual advisers, the bilingual publication of the proceedings of the November 1991 conference, the elaboration and personal presentation of a three year proposal to the National Science Foundation, the informative visits to two Latin American countries, and the presentation of the CoHemis concept to U.S. government officials in the executive and legislative branches. Most of these activities have been featured in previous numbers of the *CoHemis...update* newsletter.

Advisory Committee

The five country delegates who constitute the Advisory Committee created by the conference remains active. The committee met in the Office of Puerto Rico in Washington, D.C., in April. It revised in detail the concept of the center and its by-laws. Together with the Chancellor of the Mayaguez Campus, the committee made a presentation to delegates of hemispheric and OAS embassies, as well as to several U.S. agencies and the State Department.

At present, the center's body of advisers includes eleven additional distinguished individuals: Alberto Pignotti of Siderca, Argentina; Rafael Bras of MIT; Wayne Clough of Virginia Tech; Manuel Hernandez-Avila of Sea Grant; Ignacio Rodriguez-Iturbe of Simon Bolivar University, Venezuela; Walter Rodriguez of Georgia Tech; Harvey Bernstein of the Civil Engineering Research Foundation; Carlos Nones-Sucre, Chief of the Science and Technology Branch of the Division of Science, Technology, Energy, Environmental and Natural Resources of the UN; Louis Martin-Vega of Florida Tech; Manuel Gomez of the UPR's Resource Center for Science and Engineering; and Carlos I. Pesquera, Puerto Rico's Secretary of Public Works. These personalities have been collaborating with constructive criticism and suggestions with respect to proposals and drafts, referring proposals for evaluation, searching for funds, and other ways.

Pilot Program

The center is presently involved in a pilot research program to demonstrate the feasibility of the CoHemis concept and to develop its capacity to attract funds. As a result of requesting pre-proposals in the Mayaguez Campus, twelve pre-proposals for applied research with the participation of visiting investigators from Latin America and the Caribbean, were received. Five were chosen for their potential for regional benefits in a short term (refer to page 4). These have been preliminarily accepted by the Board of Science and Technology of Puerto Rico. Presently, the projects are in the proposal-development phase with the benefit of input from external evaluators which CoHemis collected.

National Science Foundation

A proposal for three years and \$946,565 that would leave CoHemis established as an operating and successful hemispheric research center was submitted to NSF. The program submitted consists of:

- * A CoHemis Consortium of U.S. universities, laboratories and research centers to provide additional opportunities to investigators and students from the hemisphere.
- * Conferences for developing multinational teams of investigators and workshops for enhancing the capacity and competitiveness of the investigators. (Three UPRM professors are responsible for the topics which would be treated in September, 1993: Geotechnics, Coastal management and development and Environmental and other applications of radar and remote sensing.)
- * Workshops to follow-up each topic discussed in the conferences will be held in different countries of Latin America and the Caribbean. Various countries have already offered to collaborate.
- * Research Projects following CoHemis guidelines with competitive funds and visiting investigators which arise from the teams created in the conferences and workshops.

Information Efforts

With the full support of the President of the University, the Chancellor and Deans of the Mayaguez Campus, the Center's unique concept has been presented in relevant circles in Washington, D.C. and New York City. Meetings with private foundations have been held, as well as with personnel belonging to congressional committees for science and technology, with the Hon. Rick Boucher, President of the Subcommittee for Science and Technology of the House of Representatives, with Dr. Allan Bromley, the President's Adviser for Science and Technology, officers of the Interamerican Development Bank, with Dr. Dunja Pastizzi-Ferencic, Director of the Department of Social and Economic Development of the UN, and Adolfo Korn, responsible of its Division of Science and Technology, Energy, Environmental and Natural Resources, as well as with officials from several associations related to science and technology.

Newsletter

The *CoHemis...update* newsletter, initiated to support the 1991 conference, has been enhanced to support other activities and disseminate useful information. Its geographical and institutional reach has expanded significantly.

Hemispherical and Institutional Relations

Venezuela and Guatemala were visited to learn their views on hemispheric S&T cooperation and their particular situations. Communication was established with various institutions in those countries which are related to the mission of CoHemis. In addition to the respective national organizations for science and technology, the institutions visited include the National University of San Carlos and *Segeplan* in Guatemala, and the Engineering Foundation, IVIC, INZIT-CICASI, COLCYT-SELA and Bolivar Program in Venezuela.

CoHemis has received the official endorsement of the national
(Continues in page 4)

PILOT PROGRAM UPDATE

The following five proposals were chosen as candidates for the CoHemis pilot program for investigation and sent to the Puerto Rico Board of Science and Technology to compete for funds.

1. Modeling Parking Demand and Level of Service within Urban Transportation Planning Models
2. Strains of Endemic Entomopathogenic Nematodes: Culture, Storage and Rearing Condition Studies
3. Patterns of Inelastic Deformation in the Joints of Reinforced Concrete Frames Subjected to Earthquakes
4. Design, Development and Performance-testing of an Experimental Flash Dryer for Coffee
5. Organic Waste Disposal Using Earthworms

In the previous edition of *CoHemis...Update* it was noted that of the twelve pre-proposals submitted to the Pilot Program by investigators from the Mayaguez Campus, eight were selected in terms of geographic range, magnitude and celerity of their expected benefits. These were sent to experts in the respective fields to be evaluated on technical merits.

All the proposals included investigators from Latin America and the Caribbean. The ones selected mention researchers from

Chile, Jamaica, Dominican Republic, Martinique, and Costa Rica.

Attainments of 1992...

organizations for science and technology of various countries, including Argentina, Costa Rica, Cuba and Brazil. Various Latin American universities and other institutions have established direct relationship and exchange of publications with the Center.

Different U.S. institutions interested in hemispheric collaboration have been visited, discussing possible mechanisms and fields for collaboration in preparation for the creation of the CoHemis Consortium. These institutions are the universities of Colorado State and New Mexico and the Sandia and Los Alamos National Laboratories. CoHemis has also been in contact with Virginia Tech and Georgia Tech through CoHemis advisers who belong to those universities.

CoHemis co-sponsored in Mayaguez the First PRELECT Conference (Preeminent Engineering Lectures and Conference in High Technology). It was organized by Dr. Walter Rodriguez, CoHemis Adviser and a Professor at Georgia Tech. As a result, a *PRELECT network* was created to increase the participation of Hispanics in Science and Engineering in the U.S.

A Call to the World's Scientific Community

Dr. David Ferriz-Olivares, President and founder of the World Center Bureau of the International Federation of Scientific Societies, appealed urgently to the scientific community and governments to re-examine their respective roles in the development of their countries. This call was part of his keynote speech to the First World Congress of Young Scientists, presented at Interamerican University of Puerto Rico in August, 1992.

Dr. Ferriz emphasized: "There is need great for an active, ethical scientific leadership for the benefit of humanity. What is important is men, land, the planet. Mankind can't live only for economics". He mentioned as obstacles for this leadership the facts that development is not planned, but is often the result of individual conquests; the fragmented and specialized character of an investigation oriented to peers; and that scientists do not participate in government because of their different formation and work environment.

Bulletin Board: opportunities

NSF fellowships for US investigators at foreign centers of excellence

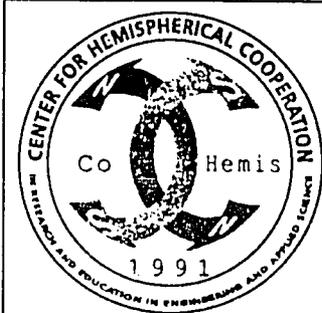
The National Science Foundation is funding research by U.S. investigators in top research centers abroad. This can provide centers in Latin America and the Caribbean with an opportunity to bring in additional human resources to complement their programs. Awards are made for research in any field of science or engineering supported by NSF for visits abroad of between three and twelve months' duration. Appropriate centers include industrial research laboratories, government research laboratories and centers, privately sponsored non-profit institutions, and universities.

CoHemis offers help both, interested, U.S. researchers and top facilities in Latin America and the Caribbean, to pair each other's interests.

The Arecibo, Puerto Rico, Radio Observatory

News services around the world wired on October 6, "Huge antenna in Arecibo will zero in on extraterrestrial communications". Astronomers started, symbolically on October 12, the "first comprehensive, high-technology search for evidence for intelligent life elsewhere in the universe. The first "listening" was done at the world's largest radiotelescope at Arecibo, Puerto Rico, which systematically tuned in on some 800 stars within 100 light-years of Earth which are similar to the sun in both age and size. "Presumably these stars could have planetary systems where life might have evolved". In addition to those in Puerto Rico and California, other telescopes in West Virginia, Australia, Argentina, Russia, and India will join this effort.

Researchers from Latin America and the Caribbean may use the NSF-Cornell University facility for research while they are with CoHemis as visiting investigators at the University of Puerto Rico at Mayaguez.



CoHemis... update

Overcoming through cooperation

July 30, 1992
Vol. 2, No. 4

University of Puerto Rico at Mayagüez -- National Science Foundation

THE PILOT PROGRAM FLIES TO WASHINGTON, D.C.

CoHemis' directors, Luis F. Pumarada-O'Neill and Jorge I. Velez-Arocho, spent most of the week of June 21 to 26 at Washington, DC for discussions with National Science Foundation (NSF) program directors about the pre-proposal requesting additional funds for the Center's incipient pilot program. They used the opportunity afforded by this trip to establish contact with such entities as the Economic Commission for Latin America and the Caribbean (ECLAC), the American Association of Engineering Societies, the Civil Engineering Research Foundation, USAID, and potential funding sources such as the Interamerican Development Bank (IDB). On June 25 they spent the day in New York City to meet with the Tinker Foundation and UN officials.

It may be implied from conversations with persons who deal with international programs and visits to legislative offices that the perception in Washington is that there are many projects for fomenting technological cooperation with Latin America in competition with each other. Dr. Pumarada said to that respect that "CoHemis has many excellent people behind it, as well as countries and institutions from the US and other parts of the hemisphere which understand its singular advantages. Future presentations have to emphasize the uniqueness of our concept, the clear comparative advantage of the UPR Mayagüez Campus as its most natural site, and Consortium CoHemis. We must make clear that

initiatives such as the University of New Mexico's Iberoamerican Science and Technology Consortium (ISTEC), do not duplicate but rather complement our objectives."

At NSF presentations were made of the preproposal for funding the pilot program to doctors John B. Scalzi, Program Director for Structures and Building Systems, William Anderson, Division Director for Earthquakes and Natural Disasters, Harold Stolberg, Program Director for Latin America in the International Programs Division, and Tom Hodgson and Luis Martin-Vega, Program Directors in the Manufacturing Division. The comments received
(Continues on Page 2)

1993's TECHNICAL CONFERENCE AND WORKSHOP

As was mentioned in our previous newsletter, the CoHemis Pilot Program plans to organize every year technical conferences and workshops for hemispheric researchers interested in conducting joint projects on specific fields of hemispherical interest in which UPRM is competitive. Researchers from different countries of the Americas will present their research accomplishments and interests for future collaborative applied research projects and form teams for producing proposals. We expect that many of the multinational teams
(Continues on Page 3)

NEW ADVISERS TO CoHEMIS

The following individuals, all supporters of international cooperation in technology research, have recently become CoHemis advisers. CoHemis gratefully welcomes them and vows to use the opportunity which they bring to become more effective in achieving its goals.

Wayne Clough, Dean of Engineering of Virginia Polytechnic Institute and participant in the November 1991 conference in which our Center was created. He is working closely with CoHemis in the development of a strategy to obtain long term funding for the Center's full programs.

Walter Rodríguez, Professor of Civil Engineering at Georgia Institute of Technology and a UPRM alumnus. Dr. Rodríguez is developing PRELECT, a data base of Hispanic researchers in the U.S., and is advising CoHemis in Consortium issues.

Harvey Bernstein, President of the Civil Engineering Research Foundation. He is committed to improve the introduction of innovations into the world market-place. "It is time to shift the paradigm, time to consider new ideas and methods which differ from the norm and which circumvent barriers to innovation".

Carlos Nones-Sucre, Chief of the Science and Technology Branch of the Science, Technology, Energy, Environment and Natural Resources Division of the Department of Economic and Social Development of the United Nations. The most recent new adviser, he is expected to provide guidance which will permit CoHemis to complement and collaborate with other international efforts.

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Pilot Pogram Flies...

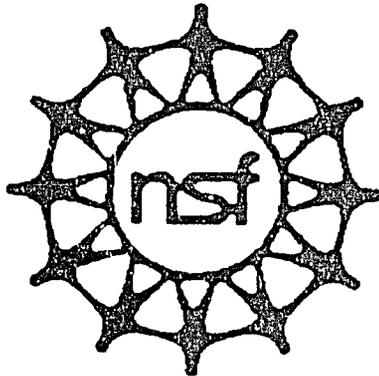
will be useful for developing the full proposal scheduled for presentation in September.

In the ECLAC Washington Office, its Director, Dr. Richard Cohen, met with doctors Pumarada and Velez and with Dr. Leo Soslow, Consultant for Los Alamos National Laboratory. Puerto Rico is an associate member of ECLAC. This UN program is collaborating with Los Alamos, which does research and technology transfer associated to environmental and energy matters. Both entities are interested in arranging technology transfer activities to take place at the Mayagüez Campus. CoHemis can benefit from ECLAC's contacts in Latin America and the Caribbean and is interested in Los Alamos as a potential member of its Consortium.

Four meetings took place in Capitol Hill. The first was with Virginia's Hon. Rick Boucher, Chairman of the House Subcommittee of Science and Technology, his legislative assistant, Brad Penney, and Dr. Wayne Clough, Dean of Engineering of Virginia Polytechnic Institute (VPI) and adviser to CoHemis. Discussion centered on the fruitful collaborations that have taken place between the schools of engineering of VPI and Mayagüez and the significant, hemisphere-wide benefits which the Consortium could bring about. The meetings with Ray Ramirez, legislative assistant for New Mexico's Hon. Jeff Bingaman, Chairman of the Senate Science Subcommittee, and with Stephen Crout, legislative director for New Mexico's Hon. William Richardson, Chairman of the House Committee on Energy and Commerce, also emphasized the Consortium's mutual advantages and highlighted the contributions that cooperative applied research would have on the economies of Latin America and hence on the future of American overseas trade. The incipient collaboration between the Iberoamerican Science and Technology Consortium (ISTEC) and Los Alamos National Laboratory came up in this context. The meeting with Miss Jennice Fuentes, Legislative Director for Hon. Antonio J. Colorado, Puerto Rico's Resident Commissioner in the House, served

for arranging follow-up actions to the other initiatives.

CoHemis was presented to doctors John Wilson and Anthony Tumarello, from the State Department's USAID. Out of this meeting came the possibilities that USAID could provide CoHemis graduate assistantships for students from client countries and that the Mayagüez Campus could operate a USAID International Train-



ing Center (ITC). Dr. Tumarello provided information on the agency's Program in Science and Technology Cooperation (PSTC), for which CoHemis proposals could compete.

The Civil Engineering Research Foundation has as its mission to stimulate research having larger and more immediate effects on industry. After its President, Eng. Harvey Bernstein, understood from the presentation made by Drs. Velez and Pumarada that CoHemis had a very similar research philosophy, he accepted to become an individual adviser to the Center.

At the headquarters of the American Association of Engineering Societies, its International Programs Director, Harry Tollerton, recommended that CoHemis make use of the fact that the Pan American Engineers' Association (UPADI) will soon be moving its head office to Puerto Rico. Gene Rosenberg, who attended the November 1991 CoHemis planning conference and is in charge of Western Hemisphere programs for the American Association for the Advancement of Science (AAAS), also present in this meeting, recommended that CoHemis study the model and experiences of the Center for International Applied Systems Analysis (IASA), located in

Austria, because its organization parallels the CoHemis paradigm.

At the main office of the Inter-American Development Bank, the process for CoHemis acting as a consultant in IDB projects was made clear. Dr. Tomas Facet, IDB's Director of Technical Programming, enthused with the Center, offered to coordinate a CoHemis presentation to relevant Department heads in a future visit.

Ms. Renata Rennie, Executive Director for the New York-based Tinker Foundation, met personally with doctors Pumarada and Velez. This relatively small foundation makes grants in the order of \$50 thousand to \$100 thousand for solving Latin American problems; it is able to fund conferences and planning activities. CoHemis plans to send a proposal for its March 1993 deadline.

Doctors Dunja Pastizzi-Ferencic, Director of the UN's Department of Social and Economic Development, and Adolfo Korn, in charge of its Division of Science and Technology, keenly welcomed the uniqueness of the CoHemis concept and agreed on designating UN experts to participate on future CoHemis seminars. Dr. Pastizzi-Ferencic also offered to find an official in her division who
(Continues in Page 3)

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SUSTAINABLE GROWTH AND APPROPRIATE TECHNOLOGIES

Many discussions of today's economic policy makers are centered around the issue of the level of "sustainable growth" and the technologies which can support it. The term is associated to the type of economic growth which can occur in the planet in harmony with its ecological and climatological systems.

Sustainable growth seems to have both upper and lower limits. The four-car suburban family stereotype, with the non-renewable resources which must be consumed and the level of pollution and solid waste generated in order to support its lifestyle, may be an upper-limit example. The destruction of forests for firewood in less developed countries with no other energy alternatives is an example of the latter.

"Appropriate technology" is the term applied to technologies which minimize pollution and the use of non-renewable resources. It is often used as opposite to high-technology, but it is not. Examples of high-tech appropriate technology are the solar cell and the wind turbine.

It has been proposed that one of the most important tasks of our society is to "insure that the most appropriate knowledge in physical, technological and social sciences is implemented to meet the needs of present generations without foreclosing options to future generations". To *act sustainably*, to pro-

vide a richness of options for present and future generations, requires major changes in the transfer and use of technology. This process requires balancing technological implementation, successful economic performance and sustainability.

A well-managed combination of high technology and "appropriate technologies" will be needed in order to implement sustainable growth. The need to unify the hemisphere around the issues of sustainable growth and appropriate technologies is of paramount importance. CoHemis can contribute positively to the definition of sustainable growth with appropriate technologies.

Pilot Program Flies...

would be willing to serve as an individual adviser. Dr. Carlos Nones-Sucre's appointment resulted from this support.

In addition to their participation in these official activities, Drs. Pumarada and Velez were present at the reception offered to the Presidential Faculty Fellows by the White House Office of Science and Technology Policy upon the invitation of Dr. Emir Macari, Mayagüez Campus PFF in Engineering. There they had the pleasure of meeting Drs. Carlos Castillo-Chavez and José Escobar, PFFs in Mathematics and Latin Americans.

CONGRATULATIONS!

Dr. Rafael L. Bras, an alumnus and former faculty of UPRM and a member of the CoHemis Advisory Committee, has just been appointed Head of the Massachusetts Institute of Technology's Department of Civil Engineering. Dr. Bras is a world-renowned hydrologist in the areas of geomorphology and hydroclimatology, formed under Venezuela's Ignacio Rodríguez-Iturbe.

1993 Summer Conference...

created will include Mayagüez researchers and result in future CoHemis projects.

At present, four topics have been selected for the 1993 Summer Technical Conference and Workshop:

- TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT
- COMPUTER APPLICATIONS IN CIVIL ENGINEERING
- COASTAL MANAGEMENT
- PRACTICAL APPLICATIONS OF RADAR AND RADIO RESEARCH

The workshops will focus on what is being investigated currently in these areas, who is conducting research, and what are the best possibilities for funding, as well as to discuss guidelines for preparing successful proposals to different agencies. Before the year ends CoHemis plans to disseminate more information on this important activity.

CoHEMIS FORUM

Eng. Atilio Nava-Viloria, from FUNDACITE-Zulia, Venezuela, plans to visit the Mayagüez Campus to observe the experience of Puerto Rico in relation to the dissemination of knowledge in agricultural technology. CoHemis was instrumental in linking the interest of Eng. Nava and the resources available at UPRM.

Dr. Jay K. Banerjee, from UPRM's Mechanical Engineering Department, and Drs. **Constantino Bortone** and **Andrés Capacho** from the Universidad Nacional Experimental del Tachira, Venezuela, presented the paper "Metalforming Experiments in an Instructional Laboratory" at the recent meeting of the American Association for Engineering Education. It explains three very instructive laboratory experiments.

Several **Mayagüez Campus** departments are currently using in their research projects the instrumentation provided by the Minority Research Center for Excellence (MRCE) to the Geology Department. The million-dollar grant awarded in 1991 includes the following: Siemens X-Ray Diffraction Apparatus, Carmeca Micro Probe and Siemens X-Ray Fluorescent Spectrometer. It is expected that such use will show a considerable increase as the versatility of this equipment becomes better known on the Campus.

PRELIMINARY SELECTION OF PILOT PROGRAM RESEARCH PREPROPOSALS

The CoHemis pilot program features an effort to demonstrate its capacity to initiate and host collaborative research projects which are able to produce short term benefits for the welfare or economic development of the countries in our hemisphere. Each of the twelve preproposals submitted to this program by UPRM researchers, mentioned in the previous issue of *CoHemis...update*, was evaluated in terms of the geographic range and short time-frame of its expected benefits. As a result, **the following eight were selected for technical evaluation:**

1. Modeling Parking Demand and Level of Service within Urban Transportation Planning Models (Collaboration with Chile)
2. Strains of Endemic Entomopathogenic Nematodes: Culture, Storage and Rearing Condition Studies for Mass Production
3. Plant Growth Promoting Rhizobacteria to Improve Nitrogen Fixation in Pigeonpea (Collaboration with Jamaica)
4. Development of a Unified Methodology for the Analysis and Comparison of Active Solar / Low Grade Thermal Energy Operated Desiccant and Absorption Cooling Systems for Applications in Hot and Humid Regions
5. Patterns of Inelastic Deformation in the Joints of Reinforced Concrete Frames Subjected to Strong Earthquakes
6. Design, Development and Performance-testing of an Experimental Flash Dryer for Coffee
7. Organic Waste Disposal Using Earthworms
8. Pilot Project for the Utilization of Mangroves for Tertiary Treatment of Sewage Effluents

Based on the evaluations under way by friends of hemispherical cooperation based in several major institutions of North America, one preproposal will be selected from each of the the fields of: engineering, science and agriculture. Once the three are developed into full proposals, CoHemis will present them for competitive funding.

Tablón de Edictos

"Tablón de Edictos" (Bulletin Board) is a new section in *CoHemis... Update*. All friends of CoHemis may use it to post announcements which will reach research and educational institutions from Canada to Argentina. Through it we can share projects, ideas, petitions and information of interest. Send your message to CoHemis and it will be included in the next issue of our newsletter.

Opportunity for collaborative research

Dr. L. D. Mitchell, Randolph Professor of Mechanical Engineering at Virginia Polytechnic Institute, has contacted CoHemis to take advantage of its offer of helping to coordinate joint research within the Americas. He is interested in finding collaborators in Puerto Rico and Latin American or Caribbean countries to do cooperative research in the application of laser-based experimental dynamics to the topics of improved analytical methods, non-destructive testing of large and small structures, preventive maintenance, and active noise and vibration control. Currently, most of his research revolves around mechanical engineering applications.

Information

Dialog Information Services has announced the addition of "Info-South: Latin American News" to its Dialog Service. It is a service which delivers on-line abstracts of articles from sources within each Latin American country as well as from over 1,500 international newspapers and journals covering Latin American issues. For any questions about Info-South, contact Dialog Customer Services at 800-334-3564, ext. 2.

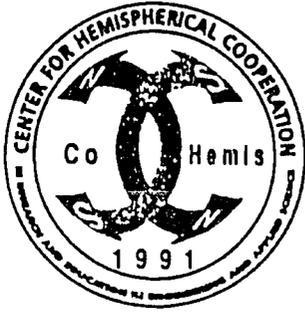
STIS is an electronic dissemination system providing access to NSF publications at no cost, 24 hours a day. It is available through E-mail, Internet file transfer, and on-line Internet. For information you may use fax (202) 357-7663 or use Internet E-mail "stis-request@nsf.gov".

New books

Dr. Jaime Benítez, from the Mayagüez Campus' Department of Chemical Engineering, has authored *Process Engineering and Design for Air Pollution Control*. It will soon be available from Prentice Hall, Englewood Cliffs, NJ.

The Puerto Rico Highway and Transportation Authority is distributing Dr. Luis Pumarada's *Los Puentes Históricos de Puerto Rico*. It includes descriptions and photographs of highway and railroad bridges as well as a short history of land transportation in the island.

Dr. Walter Rodriguez, who heads Georgia Tech's Engineering Graphics program, has recently published *The Modelling of Design Ideas* (McGraw Hill, NY), an introductory text for engineering computer graphics.



CoHemis... update

Overcoming through cooperation

June 30, 1992
Vol. 2, No. 3

University of Puerto Rico at Mayagüez -- National Science Foundation

A NEW STRATEGIC INITIATIVE:

The CoHemis Pilot Program

During the CoHemis presentations held in Washington in April (*CoHemis... update*, 2,2), it became clear that due to the critical situation of the Federal budget and the many collaborative research initiatives being proposed at present for Eastern Europe and the Western Hemisphere it is unlikely that during this session of Congress we achieve our launching fund goal of \$3 million per year for 3 years. As a result, the Center is presently embarked in a demonstration or pilot program which will enhance its presence and outreach in the hemispheric R&D community and evidence the feasibility of the CoHemis concept in order to increase its attractiveness for full-launch funds.

In order to follow the 1991 conference mandate of not diluting our launching efforts, this program, as well as any other new activities, will be initiated and managed by additional personnel. In this case we have added two investigators to the CoHemis staff, Drs. Mario Ierkić and Antonio González-Quevedo. They are in charge of the pilot research component and of developing an \$800K, 3-year proposal to NSF for funding the program and establishing CoHemis as a successful operating research organization.

The program consists of four major elements:

- Research projects, assistantships and visiting professorships which follow CoHemis guidelines.
- A CoHemis consortium of North American universities, laborato-

ries and research centers for providing further opportunities for hemispheric researchers and students. (*Continues on Page 2*)

NEW FACES IN CoHEMIS

Antonio González-Quevedo is a member of the Dept. of Civil Engineering in the field of construction management. Following a BSCE degree from the Mayagüez Campus in 1975, he completed an MS in Structures at MIT in 1977. Dr. González went from MIT into Stone and Webster Engineering Corp. and then to Franklin Research Center. However, his teaching vocation drove him back to academia. He earned his Ph.D. at the University of Purdue in 1991 in computer simulation of construction procedures, and he has co-authored several papers on the subject.

Mario Ierkić belongs to the Department of Electrical and Computer Engineering. He became an Electrical Engineer in 1971 at Lima's Universidad Nacional de Ingeniería. After working for 3 years at the NSF's Jicamarca Radio Observatory in Peru he entered Cornell University and obtained his Ph.D. in 1980. He has hence conducted research at Kyoto's Radio Atmospheric Science Center, the Arecibo Radio Observatory in Puerto Rico (the largest in the world) and the Max-Planck Institut für Aeronomie. He has published many papers on radar, wave and plasma phenomena and related fields.

JORGE VELEZ-AROCHO:

New Co-director in CoHemis

Dr. Jorge Iván Vélez-Arocho has been selected to replace Dr. Carlos I. Pesquera after the latter's resignation for heading the Civil Engineering Center for Infrastructure. CoHemis' new co-director is a Professor of Business Administration specializing in Decision Analysis, Strategic Management and Production Planning and Control. He was Dean of Mayagüez's School of Business Administration between 1986 and 1990. He has worked as a consultant in Puerto Rico and Central America and conducts seminars for industry in such topics as Quality Control, Materials Requirement Planning and Total Quality Management.

Dr. Vélez has a B.B.A. and an M.B.A. from the School of Business Administration of the University of Puerto Rico at Rio Piedras and a Ph.D. in Management Science from the University of Florida at Gainesville. He is a member of the National Steering Committee of the Catholic Church for the Development of Youth Programs and works as a volunteer with US-PR youth exchange programs.

About CoHemis, our new co-director believes that it "could be a cornerstone for strengthening the capacity of the hemisphere to obtain increasingly higher and sustainable levels of wealth". He expects to contribute to the CoHemis team by helping to incorporate managerial and strategic approaches to the Center.

Pilot Program...

- Yearly technical conferences and workshops to enhance the capabilities of hemispheric researchers and develop multinational research teams.
- Direct ties with major technology institutions in Latin American and the Caribbean (L.A.C.)

CoHemis Research

We have already commenced this effort which will demonstrate our capacity to initiate and host collaborative research projects which are able to produce short term benefits for the welfare or economic development of the countries in our hemisphere. By the June 15th deadline we had received twelve joint research pre-proposals from U.P.R.-M. faculty. These pre-proposals involve at least one researcher from L.A.C. and, in many cases, also from the U.S. Those pre-proposals which evidence the wide geographic range and short time-frame of expected benefits requested of all CoHemis projects will be evaluated externally for technical merits. One pre-proposal will be selected from each main field: engineering, science and agriculture. CoHemis will submit three full proposals for competitive funding. The proposals will compete for funds on their own merits and, if successful, will start early in 1993.

Consortium CoHemis

This consortium will be a set of bi-lateral agreements with universities, research centers and other education and research institutions in North America interested in cooperating with research and education in engineering and applied science in the Americas through CoHemis.

Some elements to be agreed on are:

CoHemis will provide assistantships to regular consortium graduate students doing dissertation work in applied research of hemi-

spherical interest either at CoHemis or at their home campuses.

CoHemis will facilitate institutional and professional relations and exchanges of faculty and students for consortium members and their faculty with universities and research centers in Latin America and the Caribbean.

CoHemis will enable consortium faculty to conduct research at CoHemis without relocating to Mayagüez by means of periodic visits.

Consortium institutions will provide access to research facilities which are not available in UPRM to CoHemis researchers and graduate students.

Consortium institutions will grant assistantships to CoHemis students qualifying for admission after completion of their M.S. degrees at UPRM.

Consortium institutions may co-sponsor conferences or other activities, either at CoHemis, their own premises or LAC, through CoHemis' hemispheric network of collaborators.

Conferences and workshops

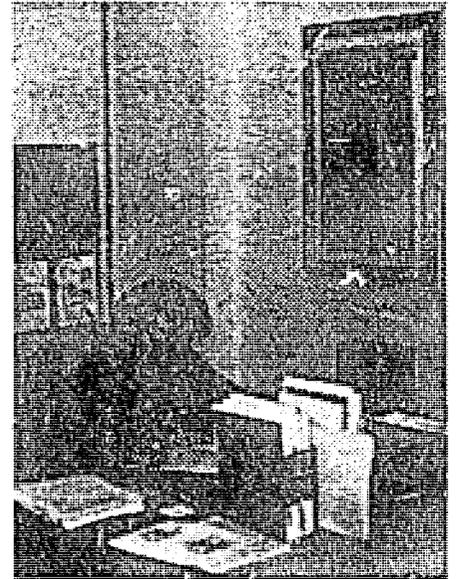
The technical conferences and workshops to be conducted for hemispheric researchers interested in conducting joint projects will concern specific fields of hemispherical interest in which U.P.R.M. is very competitive. This component will result in additional CoHemis research using U.P.R.M. or consortium facilities in those fields.

Hemispherical outreach

An important component of the outreach effort is *CoHemis... update*. We will expand the focus of this newsletter to provide support for the new CoHemis activities. It will carry information on the CoHemis research projects, promote

participation on the conferences and workshops and serve as a vehicle for the Consortium and for collaborative research opportunities and exchanges. We would stay with and try to expand our program of information exchange visits to key and representative countries in the Western Hemisphere, establishing contact with their foremost research and education centers.

(More information in page 4)



Dr. Luis Pumarada is at present fully dedicated to CoHemis from us new facilities.

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A SUMMARY PRESENTATION

The first meeting of the Co-Hemis Hemispheric Advisory Committee in Washington last April reviewed the Center's concept and by-laws. The following summary incorporates the revised concept.

The Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) is an initiative of the University of Puerto Rico at Mayagüez (U.P.R.M.). It was founded in November 1991 at a conference funded by the National Science Foundation and U.P.R.M. with the attendance of delegates from the N.S.F. counterparts from thirteen countries of the Americas. The purpose of this Center is to improve the technological capacity of Latin America and the Caribbean and thus stimulate its social and economic development. This shall enhance the industrial competitive capacity of the Western Hemisphere on a global level.

The planning conference delegates unanimously backed U.P.R.M. as the site for this Center. U.P.R.M. is a fully recognized U.S. Land Grant and Sea Grant university with a rapidly growing technology research component in which about 80% of its classes are conducted in Spanish. Twenty percent of its faculty and fifty percent of its graduate students are from Latin America and the Caribbean. These particular conditions provide a bilingual and bicultural environment which is critical to the success of such an activity.

CoHemis is a unique concept which consists of:

A world class multi-disciplinary research center, governed and partially funded by member countries, conducting projects carried on mainly by visiting researchers and graduate students who return home

upon the completion of their projects or degrees.

Each project shall involve researchers from more than one country, each of which must have different degrees of development.

The center shall focus on projects that will produce results able to generate wealth and well-being in a short term to more than one country.

The fully mature Center shall harbor about 100 researchers, of which 75 will be visiting researchers and 25 will be U.P.R.M. faculty providing continuity and supervising some 200 U.P.R.M. graduate students with CoHemis assistantships.

This Center will become an autonomous institution associated to U.P.R.M., governed and partially funded by member countries. After a 3-year initial period of U.S. funding, member countries will provide support proportional to the benefits which each one is receiving. Two years later, member country support will change to an OAS-type formula.

It shall benefit L.A.C. by means of enhanced human resources in the form of more experienced and better prepared scientists and engineers, which is the most effective

type of *technology transfer*, as well as by the applicability of the research results.

HEMISPHERIC SUPPORT GROWS

The Center recently received with great satisfaction a communiqué from Costa Rica's Minister of Science and Technology, Dr. Orlando Morales, addressed to Dr. Luis Pumarada and to Dr. John B. Scalzi of the National Science Foundation. Dr. Morales writes:

"I have received information from the Director of our Engineering Research Institute, Eng. Ismael Mazón, referring to the advantages which the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science would have.

"Since this Center will permit the exchange of technological experience, the participation of multidisciplinary groups in the execution of national or regional projects and programs of technology transfer, my judgement warmly supports the steps which are underway for its establishment."

Similar letters have now been received from Venezuela, Argentina and Cuba while others are forthcoming.



Dr. Luis Pumarada talks about CoHemis' plans to Eng. Antonio Colorado, Puerto Rico's Resident Commissioner, and Dr. Elenora Sabadell, NSF Program Director, at the Puerto Rico Federal Affairs Office during the Advisory Committee meeting in April.

NSF Conference

CoHemis made a presentation at a National Science Foundation Grantees Conference organized by the Mayagüez Campus and held in San Juan, PR on June 11th. The presentation emphasized the "multiple advantages of creating a CoHemis consortium" and asked for their collaboration to this end.

The conference was sponsored by NSF's Division of Mechanical and Structural Systems. Researchers from the US and PR presented their results, while guest Latin American speakers Carlos Prato, Roberto Azevedo and Miguel Romo informed about related research in their countries.

Several participants welcomed the opportunity provided by CoHemis. NSF Program Directors Mehmet T. Tumay and Ken P. Chong were enthusiastic about the idea, while Dr. John B. Scalzi stimulated the submittal of joint proposals to NSF directly or through CoHemis. The Center is in the process of asking the interested participants for pre-proposals in order

to begin locating research collaborators in Latin America and the Mayagüez Campus. Some of the projects may become part of the CoHemis demonstration program.

Caribbean Basin Conference

CoHemis participated in the 7th Caribbean Basin Business Conference. It was organized by the Puerto Rico Department of State and focused on New Strategies for Global Competitiveness. CoHemis information was distributed to the participants: influential businessmen, officials and industrialists from around the Caribbean basin.

Dr. Jorge I. Vélez-Arocho, co-director of CoHemis, participated in the special session "Two Alternatives for Production and Quality Strategies for Competing in the World Market." A central element in his presentation was the changing of production patterns based upon the deliberate and systematic absorption of new technologies and effective managerial approaches in order to compete in global markets.

Mayaguez Faculty member honored

Dr. Emir Macari, a member of the faculty of the University of Puerto Rico at Mayagüez' Civil Engineering Department, was honored with a Presidential Faculty Fellowship for his contributions to research in Geomechanics. The award was presented on June 22 in a presidential reception at the White House. Mexico-born Emir is a staunch supporter of hemispherical cooperation; he participated in the CoHemis planning conference last November.

A total of fifteen engineers and fifteen scientists and mathematicians were selected among residents and citizens of the United States to receive this very important distinction. PFFs receive \$100,000 per year for five years to support their area of research. The two PFFs in Mathematics were also Latin Americans: Mexico-born Carlos Castillo and Colombian national José Escobar.

CoHemis congratulates them for this great achievement.

PRE-PROPOSALS SUBMITTED FOR THE PILOT PROGRAM

CoHemis received pre-proposals from the following UPRM departments: Engineering—Chemical, Civil, Mechanical, Agricultural and Industrial; Sciences—Chemistry, Marine Science and Biology; Agricultural Sciences—Crop Protection, Animal Industry and Agronomy and Soils. Four pre-proposals have investigators from two different departments.

Most of the pre-proposals do not offer names of LAC researchers. They only specify the task for CoHemis to find the person if the proposal is developed and accepted. The titles are:

1. Catalytic Materials for Energy-related Reactions
2. Modeling Parking Demand and Level of Service within Urban Transportation Planning Models
3. Fate of Polychlorinated Biphenyls (PCBs) in the Tropical Marine Environment
4. Limiting Deformations in Biaxial Stress Systems During Manufacturing
5. Strains of Endemic Entomopathogenic Nematodes: Culture, Storage and Rearing Condition Studies for Mass Production
6. Plant Growth Promoting Rhizobacteria to Improve Nitrogen Fixation in Pigeonpea
7. Development of a Unified Methodology for the Analysis and Comparison of Active Solar / Low Grade Thermal Energy Operated Desiccant and Absorption Cooling Systems for Applications in Hot and Humid Regions
8. Patterns of Inelastic Deformation in the Joints of Reinforced Concrete Frames Subjected to Strong Earthquakes
9. Design, Development and Performance-testing of an Experimental Flash Dryer for Coffee
10. Organic Waste Disposal Using Earthworms
11. Pilot Project for the Utilization of Mangroves for Tertiary Treatment of Sewage Effluents
12. Robust Economical Design of Assembly Lines



Co-Hemis... update

Working Towards a Hemispherical Center for Cooperation in Technology

CoHemis achieves several important goals in Washington, D.C.

According to Dr. D. Allan Bromley, Scientific Advisor to the President and Director of the White House's Office for Science and Technology Policy (OSTP), the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis): "is a great idea that could be in agreement with President Bush's Enterprise for the Americas Initiative". The general tone of welcoming for the CoHemis concept was this enthusiastic in the executive and legislative offices at Washington D.C.

The successful series of activities celebrated in Washington by the Launching Office of Co-Hemis between April 5th and 10th constituted a very significant step for the concretization of the concept, succeeded at creating consciousness of the advantages of the center among the people who will eventually intervene in its approval, and set the foundations and directions for future actions.

These activities included a meeting of the CoHemis Advisory Committee, a presentation of the project to U.S. agencies and ambassadors' representatives, and introductory visits to important federal executive and legislative offices that may become instrumental in the actual execution of the project. This was achieved with the cooperation of the legislative offices of Puerto Rico, the Mayaguez Campus, the President of the University of Puerto Rico and its Resource Center for the

Learning of Science and Engineering.

Other goals that were achieved were: defining a concept that represents the hemispheric point of view; exploring mechanisms for U.S. to contribute the initial costs of establishing the center; and to seek the active support of embassies and *(Continues on page 3)*

Decided Venezuelan support for CoHemis

In a message sent from Caracas, Mrs. Dulce Arnao Uzcátegui, Ph.D., Minister of State and President of the National Council for Science and Technology Research (CONICIT), expressed her complacency towards the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) project and showed interest in creating ties between the center and the recently founded Programa Bolívar. Dr. Paul Esqueda, President of the Institute of Engineering Foundation, called the founding of a center like CoHemis a very important event, and offered the institute's cooperation in orchestrating a development plan. Similar sentiments were expressed by Dr. Rubén Bracho, president of the INZIT- *(Continues on page 2)*

Guatemala: Challenge and Opportunity for CoHemis

Attorney Magaly Morales, Coordinator of the Secretariat of the recently created National Science and Technology Council (CONCYT) of Guatemala, showed a marked interest in CoHemis and its goals, and offered herself to present the concept in the May meeting of the Central American and Panamanian Technology Commission (CETECAP). Her generous offer came up during the visit made to this country by Dr. Luis Pumarada, Director of the Launching Office of the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis).

The purpose of this trip, which took place between March 29 and April 1, was to present to the Guatemalan community of research and development the benefits of CoHemis and receive their suggestions and points of view, become familiar with the situation of research and higher education in technology in a small country of great cultural diversity, and explore the mechanisms by which Guatemala and other countries with scarce economic resources may belong to CoHemis, and search for the active support of the government in its international relations.

The interviews were kindly arranged by Eng. Edgar Bravatti Castro, delegate of Guatemala to CoHemis and Secretary of the *(Continues on page 4)*

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Venezuela...

CICASI of Maracaibo, and Dr. Ignacio Rodríguez Iturbe, who is recognized world-wide as an authority in the field of hydrology.

Their statements came as a result of a series of presentations by Dr. Luis Pumarada, director of the Launching Office of CoHemis, that took place in the homeland of Bolívar between the 23rd and 28th of February. These visits were kindly scheduled by Dr. Graciela Sosa, Venezuelan delegate to CoHemis and Planning Director of CONICIT. This agency and INZIT-CICASI covered the expenses of the stay. The trip's purposes were: to present the advantages of CoHemis to the Venezuelan research and development community and receive their suggestions and point of view; to become familiarized with the situation of research and higher learning in technology in one of the more developed countries of Latin America; to explore the mechanisms through which Venezuela may belong to CoHemis; and to seek the government's active support in its international relations.

Dr. César Martínez, Vice-minister of Science and Technology and Vice-president of CONICIT, gave Dr. Pumarada an official welcome on Monday. Later, an exchange of ideas took place with Dr. Antonio Leone, Executive Secretary of the Latin American Scientific and Technological Commission (COLCYT) of the Latin American Economic System (SELA) and organizer of Programa Bolívar.

At the Institute for Advanced Studies (IDEA), Pumarada presented the CoHemis concept to its Director, Francisco Astudillo, and to Drs. Iaccoca and Quintana from the IberoAmerican Institute for Scientific and Technological Policy. The world-renowned hydrologist Dr. Ignacio Rodríguez Iturbe, professor at the Simón Bolívar University and advisor to the Massachusetts Institute of Technology, joined them

for lunch and set himself at service of CoHemis to the point of accepting the position of independent advisor of its Launching Office.

At the Institute of Engineering Foundation, there was a meeting with its President, Dr. Paúl Esqueda, and with Drs. Rafael Padilla and Claudio Bifano and other officers. At the Venezuelan Institute of Scientific Research (IVIC), Mr. Luis Alvarez, manager of the Technological Center, acted as host and guide. At both institutes the CoHemis concept was presented, their facilities were visited, and the research and services which they render were appreciated.

Fundacite Mérida was visited Thursday, and a meeting held with its executive director, Dr. Osmañ Rosell. At the University of the Andes' Center for Technological Innovation (CITEC-ULA), an industrial incubator that is part of the Technological Parks Program, Dr. Pumarada was able to appreciate the development of an entire high-technology industry which promises to be quite competitive and have the potential to positively affect the population.

On Friday, the Zulian Institute of Technological Research (INZIT) of Maracaibo was visited. Pumarada presented CoHemis to its President, Dr. Rubén Bracho, its department directors, and several guests: Mario Leal, of INDESCA, Arnaldo Bracho, from the Ministry of the Environment and Renewable Natural Resources of Zulia, Alicia Soto de León, from the Institute for the Conservation of Lake Maracaibo, Atilio Nava, of Fundacite Zulia, and Mario Herrera, Mercylino Quinto Leudo, Miguel A. Sánchez, Odalis de Rincón and Carmelo Urdaneta, all from the University of Zulia.

The productive week produced valuable suggestions regarding problems which CoHemis may anticipate, contributions which it can make, and possible means and mechanisms of cooperation. It was

realized that Venezuela, one of the more developed Latin American countries, could contribute to CoHemis in such fields as petroleum chemistry, coal, environmental matters, corrosion and biomedicine. On the other hand, the country may benefit from the center with regards to graduate studies, professional growth of its researchers, the opportunity to use equipment that would not be affordable to have in the country, the chance to involve foreign experts in subjects in the country's interest, the reinforcement of possibilities for other cooperation programs, the applications of electronics and pharmacological processes and others.

Dr. Pesquera: a new pursuit

Since Dr. Carlos I. Pesquera is now implementing the new Center for Infrastructure of the Civil Engineering Department, he will vacate his position as CoHemis co-director in May.

In name of all CoHemis personnel, delegates and counselors: **Thanks Carlos for your contributions, and may you continue to have success!**

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Washington...

hemispheric organizations.

The members of the Advisory Committee that attended were Dr. Graciela Sosa, CONICIT official from Venezuela, Eng. Keith Crichlow, professor at the University of the West Indies and adviser and delegate of NIHERST of Trinidad & Tobago, Eng. Numa Capiati, technical adviser and delegate of the Argentinian CONACT, Dr. Alberto Pignotti, researcher for the Foundation for Technological Development and individual adviser of CoHemis, and with a similar position, Dr. Jorge Vélez Arocho, former Dean of the Faculty of Business Administration of the Mayaguez Campus. Dr. Vélez presided over the Monday and Tuesday work sessions, which were also attended by Drs. Carlos I. Pesquera and Luis Pumarada, co-directors of the Launching Office. Dr. Robert Kavanagh of Canada and Dr. Manuel Martínez of Mexico were excused, as were advisers Dr. Rafael Bras, of the Massachusetts Institute of Technology and Dr. Ignacio Rodríguez Iturbe, from Simón Bolívar University.

On the first day, the CoHemis people were welcomed by Atty. José R. Martínez, Director of the Federal Affairs Office of Puerto Rico, which spent all week serving CoHemis. On Tuesday morning, Eng. Antonio J. Colorado, Resident Commissioner of Puerto Rico to the House of Representatives, called on the group, backed the project and offered his Washington resources for its success. That same morning the committee met with Dr. Elenora Sabadell, Director of the Natural Disasters Programs of the National Science Foundation.

On Wednesday afternoon, the Launching Office co-directors, it's Advisory Committee and Dr. Alejandro Ruiz Acevedo, Chancellor of the Mayaguez Campus, presented the concept of CoHemis to a group of

representatives of U.S. agencies, including N.S.F., N.I.S.T., U.S.G.S., Department of Energy the State Department, the directors of the OAS' Scientific Division, and representatives of the Mexican, Chilean, Argentinian, Paraguayan, Venezuelan and U.S. embassies (before OAS). The Interamerican Development Bank (IDB) was celebrating an important activity in Santo Domingo that week and excused itself via Mr. Romano. After the presentation, there were supportive reactions and suggestions. Some of these were: establishing more direct contacts with existing cooperation efforts; keeping in perspective the great differences in degree of development of the Latin American countries; and using to capacity the major research strengths of the Mayaguez Campus in the developing stage of the center. The Chancellor, inspired by the warm welcome of the concept, promised to try to include a building for CoHemis in the University's building programs.

The co-directors of the office stayed until Friday to visit legislative assistants and committees of the House of Representatives and the Senate, the Chief of the Engineering division of NSF and Dr. D. Allan Bromley, Scientific Adviser to President Bush. Interviews in legislative offices were accomplished despite their having been requested for the last two days of the congressional session, in the middle of voting, committee meetings and with legislators and assistants in election campaigns. Legislative advisers of Puerto Rico, who will follow-up these initial contacts, attended all these meetings.

There is a total consensus in Washington as to the desirability of technological and scientific cooperation with Latin America. In spite of this, funds are limited by the legislation that aims to balance the

U.S. national budget. In this context, programs of foreign aid find much opposition because they reduce the funds for fighting poverty and crime within the United States. CoHemis was introduced to the Americans as an effective way of helping to improve technology and economical development in Latin America which is also feasible in the political and budgetary reality of the United States. In contrast to more traditional forms of technological cooperation, CoHemis would provide a showcase to North-South cooperation, use funds efficiently and find less opposition from taxpayers who increasingly refuse to send money out of the country.

The congressional offices that were visited were those of Hon. José Serrano, Puerto Rican representative of the Bronx, Hon. Robert Torricelli, representative of New Jersey and President of the Subcommittee on Western Hemisphere Affairs, and Hon. Jeff Bingaman, Senator of New Mexico, who belongs to the Senate Committee on Science and Technology. The committee offices visited were those of the Senate Subcommittee on Science, Technology and Space, Senate Committee on Commerce, Science and Transportation, Subcommittee on Veterans Administration, HUD and Independent Agencies of the Senate Appropriations Committee, and the Science, Space and Technology Committee of the House. The welcome given to CoHemis in all these offices was extremely positive.

Dr. Joseph Bordogna, NSF's Associate Director of Engineering, knew well the Campus and its School of Engineering and was very enthusiastic about the CoHemis initiative.

Bordogna as well as his Acting Assistant Director, Dr. William Hakala, and Dr. John B. Scalzi, director of the program which sponsored the November hemispheric conference, warmly embraced

Washington...

the prompt submittal of a preproposal for a more detailed plan for launching CoHemis and for holding a technical conference to delineate areas of possible cooperation. This would permit pushing on preparations for the definite launching of CoHemis.

Guatemala...

Faculty of Engineering of the (University of San Carlos. Eng. Bravatti is campaigning for the office of Dean of Engineering in elections which will take place this June. Attorney Cesar Martinez, Head of the Science and Technology Unit of the General Secretariat of the National Economic Planning Council (Segeplan), the agency that named Eng. Bravatti as Guatemala's delegate to CoHemis, officially welcomed by Dr. Pumarada.

In the University of San Carlos, the two-century old national university, site of most of the research projects conducted in the country, a meeting was held with Dr. Marco Quezada, Secretary of the University Council and the Chancellor, and with Eng. Edgar Franco, General Director of Research. Dr. Pumarada also met with Eng. Jorge Mario Morales González, Dean of the Engineering Faculty, and visited the Engineering Research Center and its dependencies, including the Office of Information and Publications.

The Guatemalan CONCYT was created by law as recently as September 1991, and its Secretariat is still in a developing stage. It's Coordinator, Atty. Magaly Morales, mentioned in her meeting with Dr. Pumarada the possibility that CETECAP represent all its member countries in CoHemis and payed their respective quotas. The other CETECAP countries are Costa Rica, Honduras, Nicaragua, Salvador and Panama. Atty. Morales belongs to the CETECAP board and promised

to present our project to the other delegates this May. The possibility of collaboration between CoHemis and the Central American Institute of Research in Industrial Technology (ICAITI), a CETECAP regional entity located in Guatemala, was also mentioned. In this trip, Dr. Pumarada was unable to visit ICAITI, but this will be done in the future.

In contrast with other more developed and culturally uniform countries, Guatemala presents great challenges to development as a function of technological progress. It has necessities that are basic. Alphabetization, agricultural productivity and manageable rural technologies are top priorities. The country's progressive academic community and a government that is ready to offer support are valuable assets. Its large indigenous population is not integrated to general social production, but at the same time it shows a cultural diversity that combines with the rich Guatemalan natural and archeological resources to generate an enormous potential for tourism. The technological and social development of the country constitutes very complex challenge: how to develop competitive industries that increase wealth while preserving the natural resources threatened by the needs and wastes of a growing population and its urbanization patterns and at the same time implement rural systems and technologies for immediate application to improve the situation of the indigenous population without altering their basic culture and way of life.

CoHemis can collaborate in all of these areas. The Mayagüez Campus has had effective service programs for the rural population which have approximately a century of existence. This experience could serve as framework for the development of socio-technical systems directed at the rural population and

its problems. The wide distribution of this type of situation in the hemisphere creates an enormous potential market for an industry of simple machines and products that can have an impact in its solution. The presence in CoHemis of people of different disciplines and countries would help such products and systems to be more wide-reaching and effective. The positive and negative experiences of tropical Puerto Rico with its intensive tourism and industrial development would be advantageous in the design of systems that creatively attack problems related to similar developments in other tropical regions while at the same time controlling their environmental effects.

CoHemis Helps NIST and Small Caribbean Nations

Gisela González, Coordinator of CoHemis Founding Office, collaborated with a seminar of laboratory metrology sponsored by the US National Institute of Standards and Technology (NIST) and the Department of the Consumer's Affairs of Puerto Rico that took place in Mayagüez Campus between February 10th and 14th. CoHemis also sought financial support for some of the visitors, that came from the Virgin Islands, Mexico, St. Lucia, Jamaica, Barbados, Grenada, and Puerto Rico.

The seminar was given in English and Spanish and included basic concepts and procedures of mass and volume measurements, statistics, and measurement control programs. NIST is planning another seminar for interlaboratory measurements in mass calibration and a future meeting with the purpose of creating a Regional Measurement Program.



Co -Hemis... update

Working Towards a Hemispherical Center for Cooperation in Technology

THE CO-HEMIS CONFERENCE A DEFINITE SUCCESS

The Hemispherical Cooperation Conference on Engineering and Applied Science Research, held at the University of Puerto Rico, Mayagüez Campus on November 13-15, 1991, culminated with the creation of the **Center for Cooperation in Education and Research in Engineering and Applied Science (Co-Hemis)**. This step of potential transcendence was taken in the final session of the event which gathered representatives from the respective national agencies in charge of technological research in Argentina, Canada, Costa Rica, Cuba, Chile, Guatemala, Mexico, Peru, Dominican Republic, Trinidad-Tobago, Uruguay, and Venezuela, besides the United States and Puerto Rico. Brazil, which had confirmed its participation but because of last-minute problems could not attend, send its contribution in writing.

The projections are that this Center will eventually attain an annual budget of approximately \$15 million to conduct programs of transfer of information and technology and to assemble, in its own facilities and those of the Mayaguez Campus, a battery of visiting researchers from different countries of America. Research topics will be technological problems of interest to several countries in the region. At present, the Center enjoys a subsidy provided by the National Science Foundation of the U.S. (NSF) and the Mayagüez Campus until December 1992, to help in raising the necessary funds to start its programs.

The purpose of the important

international conference sponsored by the University of Puerto Rico and NSF was, precisely, to plan a Center as a means to improve the technological capacity and public health situation of the countries of the American hemisphere and thus stimulate its social and economic development and its industrial competitive capacity on the global level. In addition to the representatives mentioned, U.S. and Canadian agencies which sponsor or facilitate international research programs, the U.S. State Department, and the Scientific Division of the Organization of American States (OAS) also participated.

A unanimous declaration of the delegates pointed out that Puerto Rico and the Mayaguez Campus are in an advantageous position to be the seat of a hemispheric center of technology because of geographic, political, and cultural circumstances, as well as their human capacity and infrastructure. The delegates committed themselves to promote and generate support to Co-Hemis within their respective governments and institutions.

The conference was endorsed by the technological divisions of UNESCO and United Nations, several U.S. Congressmen, and personnel from the Office of Strategic and Technological Policy (OSTP) of the White House in Washington. During the opening of the important event, the Governor of Puerto Rico, Hon. Rafael Hernández Colón, addressed the participants in a message which pledged support to our initiative.

The Co-chairmen of the Confer-

ence, and now of the Center, Dr. Luis F. Pumarada and Dr. Carlos I. Pesquera, both from the School of Engineering of the Mayagüez Campus, will be advised by a Committee composed of five of the delegates to the Conference, the representatives of Argentina, Canada, México, Trinidad-Tobago, and Venezuela, plus Chile and Guatemala as alternates. The delegates of these countries share the responsibility of organizing the next phase of Co-Hemis, which will be supported partially through proportional contributions of the countries constituting its Board of Directors.

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THANK YOU!

Many thanks to our sponsors, the National Science Foundation of the United States and the University of Puerto Rico, Mayagüez Campus, for their moral and financial support, as well as to John B. Scalzi, Leandro Rodríguez, and Rafael Muñoz-Candelario, for having entrusted us with the conversion of their idea into reality.

The success of the November Conference was principally a consequence of the good will and interest of the agencies and persons participating in it, to all of which we are very grateful. Another key factor was the dedicated work of many of our professors and students, committed to the ideal of hemispheric cooperation, perfectly coordinated by Eng. Gisela González and her fine team.

The relations established in the hospitality room of the College Hotel and the reception at the Chancellor's house, as well as the vibrant display of Puerto Rico tradition in the show given by Don Joaquín Mouliert and young Luis Daniel Colón, were other ingredients which added up to an atmosphere in which all our visitors could feel comfortable. It is therefore not surprising that the final plenary session produced a declaration, beyond the expectations of the organizers, proclaiming the existence of the first phase of the Center and the offer from the delegates to help us with the details of organization of the second phase.

It now remains for us, our institution, and our government, with the advice and cooperation of the Advising Committee, to convert this hemispheric support into concrete commitments and operational funds. That will be our next step!

Conference Participants:

Eng. Numa Capiati, Argentina
 Dr. Alberto Pignotti (invited speaker)
 Eng. Alberto Arcodaci, Argentina
 Dr. David W. Bacon, Canada
 Dr. Robert J. Kavanagh, Canada
 Dr. Mauricio Sarrazin, Chile
 Eng. Ismael Mazon, Costa Rica
 Dr. Félix D. Piedra, Cuba
 Eng. Edgar Bravatti, Guatemala
 Dr. Manuel Martínez, Mexico
 Dr. Mario Rojas Delgado, Peru
 Lic. Franklin Martínez, Dominican Republic
 Dr. Keith Crichlow, Trinidad-Tobago
 Eng. Eduardo Muguerza, Uruguay
 Dr. Graciela Sosa, Venezuela
 Eng. Oscar Rodríguez, Venezuela
 Dr. Wayne Clough, VPI-USA
 Dr. Rafael L. Brás, MIT-USA
 Dr. John B. Scalzi, NSF-USA
 Dr. Jonathan Margolis, US State Dept.
 Dr. Gene Rosenberg, AAAS
 Dr. James L. Noland, Atkinson-Noland Assoc. (USA)
 Dr. Stephen Carpenter, NIST (USA)
 Dr. Saul Hahn, OAS
 Lic. Sylvia I. Correa, EPA (USA)
 Dr. James O'Shaughnessy, WPU-USA
 Mr. Miguel Deynes, Puerto Rico Development Bank
 Dr. Rafael Muñoz-Candelario, RUM-PR
 Dr. Carlos I. Pesquera, RUM-PR
 Dr. Luis F. Pumarada O'Neill, RUM-PR

PLANNED ACTIVITIES

December: Set up a schedule of development stages and budget needs. Establish preliminary contacts with entities which can provide funds or with persons who can move them to do so.

January: Consult with the Advising Committee and the established contacts, internally, about the preliminary scheme.

February: Develop the preliminary scheme in consultation with the Advising Committee. To agree upon March and April meetings.

March: To present a concrete preliminary proposal to governmental entities. To hold meetings with persons in the highest levels of the governments of Puerto Rico, the United States, México, Guatemala, and Venezuela.

April: To hold a meeting of the Advisory Committee in Washington with persons of high level and to reach agreements.

May: To submit concrete proposals to possible sources of funds.

Text of the Statement:

GATHERED ON THE 15TH DAY OF NOVEMBER, 1991, AND SERVING AS DELEGATES OF OUR RESPECTIVE NATIONS OF THE AMERICAS AT THE ACADEMIC SENATE ROOM OF THE MAYAGÜEZ CAMPUS OF THE UNIVERSITY OF PUERTO RICO AS A RESULT OF AN INITIATIVE AND INVITATION OF THE UNIVERSITY SPONSORED BY THE NATIONAL SCIENCE FOUNDATION OF THE UNITED STATES OF AMERICA,

WE HAVE APPROVED UNANIMOUSLY THE IMMEDIATE CREATION OF A HEMISPHERICAL CENTER ON COOPERATION ON ENGINEERING AND APPLIED SCIENCE EDUCATION AND RESEARCH (CO-HEMIS), THE FIRST PHASE OF WHICH WILL BE THE CONFERENCE'S ORGANIZING OFFICE, SUPPORTED BY THE MAYAGÜEZ CAMPUS AND THE NATIONAL SCIENCE FOUNDATION. THIS PHASE WILL BE ACTIVE BETWEEN THIS DAY AND DECEMBER 31, 1992. ITS MISSION WILL BE TO ESTABLISH THE ORGANIZATION AND PRODUCE THE FUNDING FOR A NEXT PHASE WHICH WILL ENJOY THE PARTICIPATION OF THE DIFFERENT COUNTRIES OF OUR HEMISPHERE AND CARRY OUT RESEARCH AND EDUCATIONAL PROGRAMS WHICH ARE OF COMMON INTEREST. A COUNCIL COMPOSED OF FIVE CONFERENCE DELEGATES HAS BEEN CREATED TO ADVISE THE ORGANIZERS IN THIS TASK.

WE SUBSCRIBE, ALSO UNANIMOUSLY, THE STATEMENT WHICH FOLLOWS.

WHEREAS:

The world is moving toward higher levels of social and economic integration.

The advances in communications and transportation have brought countries nearer to each other reduced the size of our world.

Economic development depends largely on technology, education, and research.

Many countries have an urgent need for applied research with the potential of short term benefits.

There are many problems of common interest whose solutions depend to a large degree on the development of technologies, which would be facilitated by the united efforts of the nations of America.

Problems such as pollution and the degradation of resources that extend beyond national

boundaries require regional cooperation for their solution.

Delegates of most of the nations of the Americas are meeting here to discuss hemispheric cooperation, in support of the initiative undertaken by the University of Puerto Rico, under the sponsorship of the National Science Foundation of the United States of America, to consider the creation of a Center to achieve such cooperation.

We understand that Puerto Rico and its Mayagüez' University Campus are in a very advantageous position to become the site of a hemispheric technology Center, by reason of geographical, political, and cultural circumstances, and of their capacity to establish a hemispheric Center of the type we urgently need.

THEREFORE:

We recommend the creation of the referred hemispheric Center for technological cooperation at Mayagüez, Puerto Rico.

The delegates present here resolve to promote and seek support for the Center within our respective governments and organizations, and to promote their membership once it is adequately organized.

We declare that the delegates present in this conference have constituted ourselves into the Provisional Assembly of the Center being developed.

We hereby delegate on the Advisory Committee which has been created the function of collaborating with the office of the Center in the task of defining its organization and of obtaining the funds required for the development of the Hemispheric Center.

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CO-HEMIS MOVES

During January 1992 Co-Hemis will occupy its own offices in the campus' Research and Development Center. These facilities will give the Co-directors ample room to work there, since the development of Co-Hemis will become their principal task for the rest of the academic year. Our new address, fax, and telephone numbers will be notified in the next *Update*. Until then we have (809) 265-3816.

The new office space as well as the time allotted to the codirection of the Center are evidence of the commitment of the Mayagüez Campus to the success of our efforts.

TAKEN FROM THE MESSAGE OF THE GOVERNOR OF PUERTO RICO

..."The goal of hemispheric success within the global market would not be attained without every country having in its hands the tools and knowledge necessary to develop its own resources in a democratic environment. This achievement and overcoming of obstacles we can reach through technological cooperation, which the organizers of this activity very suitably expressed in their slogan, "Overcoming through cooperation".

..."Puerto Rico, as a Latin American and Caribbean country, fully identifies itself with the other Latin American and Caribbean countries. We share the cultural heritage, to a fair extent the climate and geography, and some of the economic problems. On the other hand, the integration of Puerto Rico

to the United States in the economic, professional, and academic aspects helps us to function perfectly within the scientific, research, and educational organization of English-speaking North America"...

..."The level reached by our scientific, educational and industrial activity, although still leaving much room for improvement, enables us to take advantage of our geographic position and historical circumstances to facilitate this cooperation. Understanding both worlds, with bonds to both as no other country has, and as a full participant of the scientific and technological community of the hemisphere, Puerto Rico can help to attain a better communication among the scientists, educators, and agencies of all countries of the Americas and the Caribbean"...

..."It is necessary to share development because you can't sell to people who do not have the capacity to buy; because the more each country develops its own resources, we shall all improve as producers and as consumers, thereby enhancing the interchange. This has been the great lesson of the European Common Market. We, Puerto Ricans believe in shared development. Not only do we believe in it, but we have shared development through the so-called Twin-Plant Program which functions on the Caribbean level"...

..."We hope that the Center may agglutinate here a Center for services and a world-level scientific community in constant renovation in service to the hemisphere, and that it contributes to establishing in this city the first University Industrial Park of Puerto Rico, from which through the Center, all the hemisphere may benefit"...

..."Many conferences and high-level meetings have been held on our island through the years. But, the one that starts here today may perhaps become the most important of all if it succeeds in laying

the foundation of a cooperation that deserves the support of all our countries and thus can provide all with the technological tools that are indispensable to reach that improvement which may bring greater prosperity and a better quality of life to our countries".

FROM THE CHANCELLOR'S MESSAGE

..."It is symbolic that this Conference and the Center of Hemispheric Cooperation to be planned in it, is taking place in Mayagüez, birthplace of Don Eugenio María de Hostos, known as the Educator of America. Exiled by Spain in the nineteenth century due to his political views, Hostos traversed Latin America and sowed seeds which still produce benefits for some of our countries. He founded universities and educational systems in Chile and the Dominican Republic, and favored the ideal of uniting the Greater Antilles into an Antillean Confederacy"...

**Papers presented at
international meetings**

POSIBILIDADES DE COLABORACION DE PARTE
DEL RECINTO UNIVERSITARIO DE MAYAGUEZ
Y *CoHEMIS* PARA MEJORAR LA EDUCACION
DE POSTGRADO EN INGENIERIA EN
LATINOAMERICA Y EL CARIBE

Dr. Luis F. Pumarada O'Neill, Director
Srta. Luz Leyda Vega, Coordinadora

CoHemis
*(Centro Hemisférico de Cooperación en Investigación y Educación
en Ingeniería y Ciencia Aplicada)*

*Ponencia de CoHemis a la Reunión Regional de Centros de Investigación y Desarrollo y de
Estudios de Postgrado en Ingeniería en América Latina y el Caribe*

Caracas, Venezuela
14-16 de diciembre de 1993
UNESCO / CONICIT Venezuela

Resumen

Dado que los recursos humanos y físicos de los países para solucionar sus problemas más apremiantes son insuficientes en cantidad y en diversidad, se hace necesario utilizar los recursos escasos con un mínimo de inversión en el momento más efectivo. Como en otros campos, es ventajoso formar alianzas que combinen recursos de varios países para lograr situaciones en las que los participantes salgan ganando.

En 1991, como resultado de una conferencia auspiciada por la National Science Foundation de EE. UU. y el Recinto de Mayagüez de la Universidad de Puerto Rico, en la cual estuvieron representadas las organizaciones nacionales de ciencia y tecnología de trece países de las Américas, se creó CoHemis, el Centro Hemisférico de Cooperación en Investigación y Educación en Ingeniería y Ciencia Aplicada, con sede en Mayagüez. La misión de CoHemis incluye el conseguir fondos, promover y conducir investigación aplicada conjunta, fomentar y realizar evaluaciones de tecnología, fomentar y conducir cursos y programas para potenciar la capacitación de recursos humanos, y organizar conferencias y talleres para facilitar las metas anteriores. Las actividades de este Centro Hemisférico se encaminan primordialmente a servir a las necesidades de las Américas con la participación de ingenieros, científicos y estudiantes de sus diferentes países y enfatizando aquellos proyectos cuyos resultados puedan traer beneficios para más de un país del hemisferio occidental en un corto plazo.

CoHemis ha venido desarrollando una red de apoyo, el Consorcio CoHemis, basada en una serie de acuerdos bilaterales entre el Recinto y otras universidades y laboratorios del hemisferio. Nuestros propósitos al concurrir a esta actividad son adelantar la estructuración de acuerdos bilaterales para ampliar el Consorcio a entidades latinoamericanas y caribeñas, y contribuir a la creación de una red latinoamericana y caribeña de centros de investigación y desarrollo y de instituciones de estudios de postgrado en ingeniería.

Nuestra recomendación al efecto es que esa red debe incluir, entre otros:

Correo electrónico primordialmente para facilitar el pedir profesores para cursos cortos o talleres, notificar sobre profesores disponibles para trasladarse en su año de sabática y notificar la disponibilidad de becas para estudiantes dispuestos a realizar trabajo de investigación

Red de telecomunicación para cursos remotos interactivos mediante satélite.

Conferencias sobre educación, currículos y temas de actualidad, estandarización de aspectos educativos y profesionales, y acuerdos multilaterales que faciliten los intercambios.

Conferencias de investigadores para facilitar la investigación conjunta de problemas comunes y regionales, enfocar la investigación hacia los problemas de mayor prioridad, y mejorar la eficiencia de la utilización de recursos escasos al evitar la duplicidad de esfuerzos.

A. Introducción

Los problemas que afectan a nuestro hemisferio nos preocupan a todos. Se reconoce que los ingenieros tienen un rol muy importante en la búsqueda de soluciones para estos problemas. Según el mensaje ofrecido en el año 1990 a la XXI Convención de la Unión Panamericana de Asociaciones de Ingeniería (UPADI) por el Director de la Fundación Nacional de Ciencias (NSF) de Estados Unidos, Dr. Erich Bloch: "la habilidad de una nación para innovar depende de la habilidad de su gente para descubrir, generar nuevos conocimientos y resolver problemas técnicos. Los países latinoamericanos necesitan invertir en métodos de enseñanza y currículos más modernos".¹ Por eso la calidad de la educación a nivel de postgrado es tan importante tanto en la ingeniería como en las demás ramas de la ciencia y la tecnología. En palabras de Baena Suárez ante el mismo foro: "Los ingenieros de las Américas, al igual que los profesionales de otras disciplinas, tienen un papel importante en el logro del proceso colectivo".²

Dado que los recursos de los países para solucionar sus problemas más apremiantes son insuficientes en cantidad y en diversidad, se hace necesario buscar alternativas para utilizar los recursos necesarios en el momento más efectivo. En otros campos, como la defensa nacional y regional y el comercio, hemos visto alianzas que buscan combinar los recursos o capacidades de varios países para lograr unos propósitos comunes o situaciones en la cuales todos los participantes salgan ganando algo. Esa misma dinámica también aplica a la utilización de la ciencia y la tecnología para el desarrollo económico.

Reconociendo la necesidad de cooperación internacional para poder solucionar los problemas y mejorar la capacitación de los recursos humanos de nuestros países para lograr resolverlos, surge la iniciativa del crear el Centro Hemisférico de Cooperación en Investigación y Educación en Ingeniería y Ciencia Aplicada (CoHemis). Su creación en año 1991 fue el resultado de una conferencia que tuvo lugar en el Recinto de Mayagüez de la Universidad de Puerto Rico en la que estuvieron representadas las organizaciones nacionales de ciencia y tecnología de trece países de las Américas. El Recinto de Mayagüez (RUM), que auspició la conferencia conjuntamente con la

¹ Bloch, Erich, "Engineering and International Cooperation" Pan American Engineers - Partners for Progress, UPADI XXI Convention. New York; 1991. Página 18.

² Baena Soares, Joao Clemente, Ambassador. Pan American engineers - partners for progress, UPADI XXI Convention. New York; 1991. Página 21.

National Science Foundation de EE. UU., tiene un historial de actividades de colaboración hemisférica en ingeniería como en ciencias marinas, agrícolas y naturales. Los delegados presentes crearon unánimemente este centro con sede en Mayagüez como un medio para trabajar en la solución de problemas sociales, ambientales y económicos de nuestro hemisferio a base de mejorar la tecnología.

CoHemis es un medio para reducir la brecha económica y técnica entre los países de las Américas. Mediante esa reducción se podrá aumentar el intercambio comercial para mutuo beneficio entre Estados Unidos, América Latina y el Caribe, mejorar las condiciones del medio ambiente, proteger mejor los recursos naturales, y reducir el narcotráfico y la emigración de cuadros de la clase trabajadora y la fuga de cerebros.

B . Cooperación Hemisférica en Ciencia y Tecnología

El Recinto Universitario de Mayagüez delega en CoHemis la realización de iniciativas de cooperación hemisférica. La misión de CoHemis incluye el conseguir fondos, promover y conducir investigación aplicada conjunta, fomentar y realizar evaluaciones de tecnología, fomentar y conducir cursos y programas para potenciar la capacitación de recursos humanos, y organizar conferencias y talleres para facilitar las metas anteriores. Las actividades de ese Centro Hemisférico se dirigen primordialmente a servir a las necesidades de las Américas con la participación de ingenieros, científicos y estudiantes de sus diferentes países y enfatizando aquellos proyectos cuyos resultados puedan traer beneficios para más de un país del hemisferio occidental en un corto plazo.

Para ejecutar mejor su misión, CoHemis ha venido desarrollando una red de apoyo, el Consorcio CoHemis, basado en acuerdos bilaterales entre el RUM y otras universidades y laboratorios del hemisferio. En estos momentos CoHemis tiene acuerdos de colaboración con Colorado State University y su Centro Latinoamericano para Cooperación en Ciencia y Tecnología, y con los Laboratorios Nacionales Los Alamos y Sandía. Se están concertando acuerdos también con Georgia Tech y la Universidad de Florida. Los estudiantes latinoamericanos que hagan maestrías en el RUM que lo deseen y cualifiquen podrían obtener experiencia investigativa y educativa fuera del Recinto, y/o continuar estudios doctorales en las universidades estadounidenses del Consorcio. También podrían trabajar en proyectos con investigadores de esas instituciones en sus sedes o en Puerto Rico. CoHemis también forma parte de una organización, *AHEAD*, compuesta por investigadores y profesores hispanos que trabajan en universidades y centros de investigación de

Estados Unidos que están interesados en proveer cursos cortos en Puerto Rico y en otros países latinos. En las universidades del consorcio también hay profesores interesados en ofrecer cursos similares. En esas mismas instituciones hay interés en intercambios de estudiantes y profesores.

En Latinoamérica ha habido contacto con las Universidades Nacionales de Córdoba y Río Cuarto, ambas en Argentina, la Universidad Experimental Simón Bolívar de Caracas y la Facultad de Ingeniería de la Universidad Nacional de Colombia en Bogotá. Aún no se han considerado bases para posibles acuerdos, pero ese es el propósito nuestro al concurrir a esta actividad, además de contribuir a la creación de una red latinoamericana y caribeña de centros de investigación y desarrollo y de instituciones de postgrado. Para iniciar estas gestiones, el apéndice de este trabajo incluye como documento de trabajo un memorando de entendimiento sobre el cual estructurar acuerdos bilaterales para ampliar el Consorcio a entidades latinoamericanas. Apreciaremos el que los presentes lo estudien y discutan en sus respectivas instituciones la posibilidad de formar parte de este conglomerado de universidades y centros de investigación interesados en la colaboración internacional. También deseamos aprovechar esta oportunidad para establecer los lazos personales que luego faciliten las actividades que se puedan pautar entre nuestras respectivas instituciones y para discutir aspectos relacionados al memorando de entendimiento propuesto.

C. Los estudios de Ingeniería en el Recinto de Mayagüez

La ingeniería juega un papel muy importante para CoHemis, estando los ingenieros entre los profesionales que más pueden contribuir a sus metas. La aportación de estos, sin embargo, será en la medida en que la enseñanza práctica y teórica que reciban sea altamente capacitada y atemperada a las necesidades de nuestros tiempos y nuestros países y las oportunidades que se les brinde para mejorarse y para contribuir.

El Colegio de Ingeniería de la Universidad de Puerto Rico pertenece al Recinto Universitario de Mayagüez (RUM). Ofrece programas de postgrado dirigidos a conferir los títulos de Maestro ("Magister") en Ciencias y Maestro en Ingeniería en las siguientes ramas de la ingeniería: química, manufactura, civil, eléctrica, y mecánica. También existen estudios de postgrado en ingeniería de sistemas gerenciales, ofrecidos por el Departamento de Ingeniería Industrial. Los estudiantes de postgrado en ingeniería civil pueden especializarse en estructuras, recursos de agua y ambiente, geotecnia o transportación. Los estudiantes de postgrado en ingeniería eléctrica pueden seleccionar opciones en generación y distribución, electrónica, controles o comunicaciones. El programa de ingeniería mecánica permite concentraciones en diseño mecánico, ciencias térmicas e ingeniería de manufactura. Hace un año se inició el programa de Doctor en Ingeniería Civil.

El RUM cuenta con excelentes facilidades de laboratorio tanto académicos como para investigación, distribuidas en 73,000 pies cuadrados de espacio entre los cinco edificios que forman el Colegio de Ingeniería. Hay un Laboratorio de Instrumentación y otro de LASERs que le dan apoyo a actividades de investigación de todas las facultades del Recinto. El Centro de Investigación y Desarrollo apoya la investigación en áreas de interés para el profesorado y para la industria, el gobierno y las agencias que auspician investigación. El Centro de Cómputos del Recinto opera tres sistemas VAX. El Colegio de Ingeniería tiene su propio centro de computadoras basado en una red de 76 estaciones de trabajo con capacidad gráfica. Además, cada departamento de ingeniería tiene sus propias facilidades, las cuales están generalmente disponibles para el uso de la facultad y de los estudiantes. La colección técnica de la biblioteca del RUM es la mejor y más completa en Puerto Rico y una de las mejores en toda Latinoamérica. La biblioteca opera un sistema computadorizado de información con acceso directo a bancos de datos de Estados Unidos. La mayoría de las computadoras de los profesores de ciencias e ingeniería del Recinto están conectados a Internet a través de las VAX.

La mayor parte del profesorado de Ingeniería y Ciencias es de dedicación completa, ostenta el grado doctoral y realiza labores de investigación o servicio. Un 20% de los profesores provienen de países que no son latinos y dictan sus cursos en inglés, otro 20% son latinoamericanos no puertorriqueños y los demás son boricuas.

Se requiere un mínimo de 30 horas-crédito para una maestría, incluyendo 6 créditos correspondientes a la tesis de la Maestría en Ciencias o tres créditos para el proyecto de la Maestría en Ingeniería. Ese total también incluye seis créditos en cursos que estén fuera del área inmediata de concentración. Los estudiantes deben hacer una presentación en la cual defienden su tesis o proyecto y pasar un examen oral.

Los costos de estudiar postgrado en el RUM para un estudiante extranjero sin beca son de \$1,500 por semestre. Los estudiantes becados están exentos de pagar la matrícula, pero sí tienen que pagar algunas cuotas especiales. Normalmente la maestría toma entre 1.5 y dos años para completarse. Los costos de vivienda y demás gastos ordinarios de un estudiante soltero en Mayagüez se estiman en \$5,000 anuales. Existen becas de investigación y enseñanza disponibles para estudiantes de postgrado cualificados que estén estudiando a tiempo completo. Se les da prioridad a los que están haciendo la Maestría en Ciencias de Ingeniería. Las becas van desde un mínimo de \$5,000 más el pago de matrícula por un período de diez meses, hasta un máximo de \$9,600 más el pago de matrícula para estudiantes que estén trabajando en proyectos de

investigación financiados con fondos externos al Recinto, e incluyendo trabajo de investigación a tiempo completo durante los dos meses entre semestres.

El programa de postgrado le da la oportunidad a los que poseen un bachillerato en ingeniería de recibir entrenamiento a un nivel avanzado, desarrollar experiencia de investigación y prepararse para entrar a las industrias de alta tecnología. Los cursos son ofrecidos principalmente en español, aunque algunos se dictan en inglés. Los libros de texto son los mismos que se usan en otras universidades del sistema de Estados Unidos. Muchos puertorriqueños y latinoamericanos interesados en alcanzar grados doctorales de universidades famosas estadounidenses aprovechan la oportunidad que les brindan los estudios de postgrado en el Recinto para ir mejorando su inglés y familiarizándose con el sistema educativo estadounidense a la vez que aprueban cursos de posgrado en español que les serán convalidados totalmente en la universidad donde tomarían su doctorado. Todo esto a un costo relativamente bajo y dentro de un ambiente latino. Se han dado casos de personas a las que sólo les ha tomado unos dos años terminar doctorados en lugares de tal prestigio como Purdue y VPI (Virginia Polytechnic) tras haber terminado su *magister* en el Recinto.

El Colegio de Ingeniería cuenta con un total aproximado de 4,000 estudiantes. Unos 573 estaban identificados como estudiantes de postgrado en el año académico 1992-93. De éstos, el 36% son mujeres y más del 40% provenían de Latinoamérica y el Caribe. El 83% de los estudiantes de postgrado en ingeniería tienen algún tipo de beca.

D. Financiamiento para intercambio de profesores y estudiantes

Hay algunos mecanismos que podrían usarse para financiar el intercambio de profesores y estudiantes de postgrado. Mediante acuerdos bilaterales podría lograrse que estudiantes de una institución realicen trabajo de investigación relacionados a sus tesis bajo la dirección de un profesor de otra universidad. También podrían moverse estudiantes a tomar uno o varios cursos específicos en otra universidad.

El mecanismo principal que plantea CoHemis para financiar intercambios y pasantías es el proveer becas a estudiantes de postgrado de América Latina y el Caribe a base de su participación en proyectos de investigación. Los proyectos los generarían los equipos multinacionales de investigadores que se forman en conferencias y talleres organizados por CoHemis. Sin embargo, ese mecanismo no necesariamente implica que los estudiantes vayan a estar fuera de la universidad a la cual pertenecen, aunque en el caso del RUM provengan de otros países latinos. Por otro lado,

de esos mismos proyectos saldrían los fondos para las pasantías de los investigadores que se trasladen. Otro mecanismo para los profesores sería el empleo de sabáticas para realizar trabajo docente o de investigación en otras universidades. El ofrecimiento de cursos cortos con participación y contribución monetaria de la industria sería otra manera de mover a profesores e investigadores. También puede gestionarse el establecimiento de pasantías postdoctorales para docencia e investigación en el Recinto.

El Consorcio CoHemis pide que se facilite el intercambio de estudiantes graduados e investigadores entre el RUM y la otra institución, siendo CoHemis el nexo de comunicación y coordinación del intercambio. Algunas instituciones del Consorcio en Estados Unidos pagarían los gastos de viaje de sus profesores o investigadores que asistan a foros, conferencias o en Puerto Rico si se les provee los gastos locales. En algunos casos también podrían hacerlo para viajes a Latinoamérica.

Dentro del Colegio de Ingeniería del RUM existen centros de investigación que proveen becas a estudiantes y contratan profesores e investigadores para ofrecer conferencias. Los principales son el Instituto de Mitigación de Desastres Naturales y el Centro de Investigaciones de Infraestructura Civil. El RUM ocasionalmente contrata profesores para llevar a cabo cursos cortos y seminarios.

F. Experiencias en relación a los posibles mecanismos de colaboración

Al Recinto han venido profesores a hacer pasantías en las cuales han tomado cursos y/o colaborado en trabajos de investigación. Se han hecho propuestas y trabajos de investigación que han incluido investigadores del RUM en conjunto con personas de otras universidades e instituciones. Se han tenido estudiantes de postgrado trabajando en tesis bajo profesores del Recinto que han recibido nombramientos temporeros *ad honorem* en las universidades a que pertenecen los estudiantes. Aunque esto ha sido generalmente con universidades de Estados Unidos, podrían hacerse acuerdos para permitirlo con universidades latinoamericanas.

El Recinto pertenece a un programa estadounidense de intercambio de estudiantes de grado, en el cual el estudiante paga los derechos de matrícula de su universidad por un año pero va a otra. Hay otros programas de intercambio similares de naturaleza bilateral. En todos hay que pre-acordar los cursos que se va a tomar para que sean similares a los de la universidad propia del estudiante. En algunas materias y acuerdos se retiene la nota del lugar del curso, en otros sólo se anota que se cumplió el requisito, pero sin incluir la nota.

G. Ideas sobre la estructuración de una red de Centros de Investigación y Desarrollo y de Estudios de Postgrado

Para ser más efectiva en canalizar la educación y la investigación hacia el desarrollo económico, la red debe atender a y vincularse con las industrias de los diversos países y con iniciativas conjuntas gobierno-academia-industria al estilo del Programa Bolívar. Una industria bien servida estaría dispuesta a auspiciar la red y algunos de sus programas.

Una red de Centro de Investigación y Desarrollo y de Instituciones de Estudios de Postgrado debe incluir, entre otros, mecanismos dirigidos a facilitar lo siguiente:

* Correo electrónico:

Es de primera importancia tener una red electrónica de comunicación que pueda usar Internet y provea un servicio tipo "bulletin board" para enviar mensajes comunes a todos sus suscriptores. Habría tantos "bulletin boards" como campos y subcampos de ingeniería interesados en colaborar. Los anuncios electrónicos a continuación utilizarían estos "bulletin boards".

* Anuncios electrónicos:

- pidiendo profesores para presentar cursos cortos o talleres que complementen currículos, capaciten a investigadores o se dirijan a necesidades temporales de la industria
- notificando sobre profesores disponibles para trasladarse en su año de sabática
- notificando la disponibilidad de becas para estudiantes de postgrado que estén dispuestos a realizar trabajos de investigación específicos para sus tesis
- pidiendo personal o equipo especializado para completar equipos para investigación conjunta

* Red de telecomunicación:

La mejor forma en términos de efectividad vs. costo para transferir conocimiento sería mediante cursos remotos interactivos mediante satélite. Debe ser una meta de la red el desarrollar esa capacidad comenzando con nodos *downlink* que vayan proliferando jerárquicamente a escala nacional y regional y siguiendo con *uplinks* también siguiendo una jerarquía similar.

* Conferencias hemisféricas o latinoamericanas sobre educación, currículos y temas de actualidad:

Estas conferencias permiten que la educación de los ingenieros responda a las tendencias tecnológicas, ambientales, económicas, sociales y éticas cuya dinámica es cada vez más controversial y cambiante. Pueden ayudar igualmente a la estandarización de aspectos educativos y profesionales, así como a lograr acuerdos multilaterales que faciliten los intercambios de estudiantes y profesores.

* Conferencias hemisféricas o latinoamericanas de investigadores:

Las conferencias temáticas de investigadores son de gran utilidad:

- promueven la formación de equipos multinacionales de investigadores y las relaciones interinstitucionales que redundan en intercambios de profesores y estudiantes
- facilitan la investigación conjunta de problemas comunes y regionales
- enfocan la investigación hacia los problemas de mayor prioridad
- aumentan la eficiencia de la utilización de recursos escasos al evitar la duplicidad de esfuerzos
- crean conciencia en los investigadores de los diversos países al tanto de los problemas y necesidades de los otros países de manera que vean la aplicabilidad a estos de sus ideas
- promueven nuevas ideas mediante intercambios de información, hipótesis y resultados.

APENDICE 1: Información a ser incluida en un banco de datos

A continuación la lista de nombres de personas contacto en departamentos académicos y centros de investigación de Ingeniería que pueden ser incluidos en un banco de datos:

Dr. José F. Lluch, Decano
Colegio de Ingeniería
Tel. (809) 265-3822

Dr. Felipe Luyanda, Director
Departamento de Ingeniería Civil
Tel. (809) 265-3815

Dr. Samuel Irizarry, Director
Departamento de Ingeniería Eléctrica
Tel. (809) 833-3821 E-mail: sirizarry@mece19.upr.clu.edu

Dr. Noel Artiles, Director Interino
Departamento de Ingeniería Industrial
Tel (809) 265-3819

Dr. Fernando Plá, Director
Departamento de Ingeniería Mecánica
Tel. (809) 832-4040 Ext. 2496

Dr. Félix Santiago, Director
Departamento de Ingeniería Química
Tel. (809) 265-3818

Dr. Anand Sharma, Director
Departamento de Ingeniería General
Tel. (809) 265-3816

Dr. Antonio González, Director Interino
Departamento de Investigaciones de Infraestructura Civil
Tel. (809) 265-3892 E-mail: ant_gonzalez@upr1.upr.clu.edu

Dr. Ricardo López, Director
Instituto de Mitigación de Desastres Naturales
Tel. (809) 832-4040 Ext. 3401 E-mail: rrl@rmce01.upr.clu.edu

Para enviar correspondencia se debe usar la siguiente dirección en cada uno de los casos:

Recinto Universitario de Mayagüez
Apartado 5000 Estación Colegial
Mayagüez, Puerto Rico 00681-5000

CoHemis puede facilitar la comunicación con estas personas y con otros funcionarios y profesores del Recinto. Nuestra dirección en Internet: es: COHEMIS_RUM@RUMAC.UPR.CLU.EDU

TECHNOLOGY ASSESSMENT ISSUES AND THE POSSIBLE ROLE OF CoHEMIS ¹

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Dr. Jorge I. Vélez-Arocho ³

Director and Co-director,
**Center for Hemispherical Cooperation in Research and
Education in Engineering and Applied Science (CoHemis)**
-- University of Puerto Rico & U.S. National Science Foundation

INTRODUCTION

THE COHEMIS CENTER

The Hemispherical Center for Cooperation in Research and Education in Engineering and Applied Science (CoHemis) is the outcome of a planning conference held on November 1991, sponsored by the U.S. National Science Foundation and the University of Puerto Rico. Attended by delegates from the national organizations for science and technology of the US, Canada, Argentina, Cuba, Uruguay, Dominican Republic, Costa Rica, Chile, Peru, Guatemala, Trinidad-Tobago and Venezuela (and later endorsed by Colombia, Paraguay and Brazil), the assembly produced a unanimous declaration creating the CoHemis Center and endorsing the Mayaguez Campus of the University of Puerto Rico as its site.

At present, CoHemis operates from within the Campus with UPR and NSF funds as it seeks to:

- implement projects and programs which demonstrate the feasibility and advantages of its unique concept, and
- reach a scale at which it can be transformed into the unique, multi-national, member-supported center which was planned at the 1991 Conference.

¹ Contributed to the UN Expert Group Meeting on Technology Assessment, Monitoring and Forecasting, Paris, 25-28 January 1993.

² Professor of Engineering Science, Management of Engineering Systems and History of Technology, College of Engineering, University of Puerto Rico's Mayaguez Campus

³ Professor of Statistics and Management Science, College of Business Administration, University of Puerto Rico's Mayaguez Campus

The full-size, multinational center defined at the planning conference has will be a world-class center for applied research of about 100 investigators and 200 graduate students supported by a consortium of United States institutions and involved in projects of hemispheric interest carried on mainly by visiting researchers who will return home upon the completion of their projects. Resident investigators belonging to the Mayaguez Campus will provide continuity to the research efforts and be responsible for the students' academic and research progress. CoHemis is to be open to all countries of the Americas and will serve member nations and regional industry and research organizations. It will complement research activity by funding graduate students, facilitating joint research and exchanges, and organizing thematic workshops.

Objectives:

- conduct and foster joint research whose results may be expected to have a regional, rapid economic impact.
- enhance the indigenous technological capabilities of the developing countries of the Western Hemisphere and transfer technology and expertise through the returning researchers and graduates.
- promote the participation of researchers and graduate students from all member countries in the hemisphere.
- provide assistantships for graduate students from Latin America and the Caribbean (LAC).

TECHNOLOGY ASSESSMENT IN THE UNIVERSITY OF PUERTO RICO

Puerto Rico is a U.S. Caribbean territory which shares the Spanish language and a common heritage with Latin America. The Puerto Rican technology community has experience and expertise in US-type environmental impact studies, pollution control, and technology assessments. At the same time, Puerto Rico shares many social, economic, and climatological characteristics with the countries of Latin America and the Caribbean, and identifies itself with the problems of the region.

The Mayaguez Campus of the University of Puerto Rico is a fully accredited U.S. Land Grant and Sea Grant university. It has graduate and undergraduate programs in the main fields of technology, in those disciplines which support it and evaluate its impacts, and in those which apply it to economic growth: engineering, agricultural sciences, natural sciences, marine sciences, social sciences, economics, and business administration.

The University of Puerto Rico, especially its Mayaguez Campus, has a history of involvement in technology assessment. For two decades its UPR-USDOE Center for Energy and Environment Research did technical, economic, planning and environmental impact studies on energy technologies

such as: solar ponds, ocean thermogradient energy conversion (OTEC), solar cooling, biomass-energy cane, and wind turbines.

After having studied the "Basic Discussion Paper" for the UN Expert Group Meeting on Technology Assessment, Monitoring and Forecasting and the report "Technology Assessment for Development" [Report of the UN Seminar on Technology Assessment for Development at Bangalore, India. United Nations, New York, 1979], we are confident in asserting that CoHemis can contribute significantly to foster TA in Latin America and the Caribbean, enhance the capacity of the nations in the region to conduct TA, lower the cost of TA work in the region and enhance its effectiveness and responsiveness. We can also collaborate in a global scale by linking the region to a broader network and through recommendations on leadership roles which the UN Science and Technology Branch can take in this important field.

RECOMMENDATIONS TO THE U.N. SCIENCE AND TECHNOLOGY BRANCH PERTAINING TO A.

INFORMATION CLEARINGHOUSE

Become a clearinghouse for exchanging information, reports and results worldwide.

Foster and disseminate models for market mechanisms which provide reward structures which strengthen sustainable systems.

PRODUCING, EXCHANGING AND PROVIDING INFORMATION WITH AND TO COUNTRIES AND PRACTITIONERS WORLDWIDE

Create consciousness in world leaders, academia and the population on international, global-level problems and issues such as environmental aggression and resource depletion.

Promote global thinking: disseminate the concept that all nations must take into account that they are part of the earth, which is one system not only environmentally but also economically and in terms of its finite resources.

Define sustainability globally; derive and disseminate a framework of goals and value alternatives and limits which individual countries and TA practitioners should take into account for assuring global sustainability.

CONDUCT OR SPONSOR GLOBAL-LEVEL T.A. AND SYSTEMS STUDIES

for technologies with potential global impact, and

for social systems with global impacts, such as:

the publicity and communication system and its effect on consumerism, resource depletion, sustainability and social values;

drug production, financing consumption and delivery systems.

Identify priority areas in which to conduct the above studies.

CONDUCT A CONTINUOUS GLOBAL T.A. PROCESS ON WHICH FUTURE U.N. SECURITY COUNCIL RESOLUTIONS CAN BE BASED

The depletion of resources is a form of aggression to present and future generations;

environmental aggression will eventually be recognized by the UN Security Council to be as genocidal as armed aggression;

hence, the Science and Technology Branch may be called upon to provide solid information on which to base council resolutions which may condemn or sanction a country for this type of aggressions. (Witness the information provided the US Surgeon General, based on which limiting regulations have been imposed on the tobacco industry).

POSSIBLE T.A. CONTRIBUTIONS BY CoHEMIS

CoHEMIS CAN USE ITS COMPARATIVE ADVANTAGE IN THE WESTERN HEMISPHERE TO:

Foster TA in Latin America and the Caribbean (LAC)

Find, use and promote ways to convince the countries and their industrial sectors that TA pays off.

Encourage the inclusion of TA processes and related disciplines in LAC university curricula. (UPADI)

Foster the creation of a Caribbean Technology Assessment unit and participate in its activities.

Provide a forum to discuss the issues and the problems of TA in LAC, including the issue of externalities vs. development.

Enhance the capacity of LAC to do TA

Put the TA and environmental issue expertise and experience of US Hispanics and Puerto Ricans at the service of Latin America.

Help LAC to develop institutionalized TA capabilities in government, academic, and research units, as well as in the private sector by conducting workshops for relevant officials.

Help to develop "indigenous capability for wise technology choice" in LAC through participation of LAC scientists and engineers in joint projects and through experiential learning acquired by exchanges which permit participation in other nation's TA projects.

Promote and facilitate the creation of multinational TA teams and help them secure projects and financial resources.

Provide infrastructure support (e.g.: measurement expertise, data analysis and interpretation) to LAC assessors.

CoHemis' Contribution to the UN Expert Group Meeting on Technology Assessment

Foster TA networking of professionals from industrialized-countries with professionals from developing countries.

Facilitate and promote the participation of scientists and engineers from Latin America and the Caribbean (LAC) in TA and EIA projects in Puerto Rico and the US.

Lower the cost and enhance the effectiveness of TA in LAC and of hemispheric scale assessments

Promote a pilot project which can become a model for cooperative technology monitoring, forecasting, and assessment processes involving both public and private sectors of different countries of the Americas.

Participate in adapting the US' TA approach to the context of LAC.

Maintain a data bank on LAC assessors, reports and pertinent TA information on call to respond quickly when policy makers need information or a particular expertise.

Create a hemispheric network for sharing and disseminating assessment data and recommendations and monitored results, plus "new information, new dimensions to consider, and new possibilities for acceptable compromise on an issue", for countries and practitioners. (UPADI)

Facilitate coupling specific TA activities and units in Canada or the US with counterparts in a specific LAC country.

Enhance the effectiveness and responsiveness of TA in LAC

Promote or conduct activities aiming to widen "the spectrum of value choices available to the diverse cultures and interests" which co-exist in Latin America.

Promote or conduct activities aiming to create models of private/public collaboration in technology development suitable for LAC, parallel to the British Center for the Exploitation of Science and Technology.

Play the role of a neutral agent which can lend credibility and reduce suspicion about the coverage and possible bias of regional or national TA projects.

POSSIBLE EXTRA-HEMISPHERIC CONTRIBUTIONS

CoHemis can use its particular nature to:

Act as a clearinghouse for exchanging Western Hemisphere and world data.

CoHemis' multidisciplinary nature would provide a framework to create effectively functioning interdisciplinary study teams and an environment where differences among practitioners from different disciplines could be reconciled in relation to what the different

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professionals consider to be acceptable bases of knowledge, their differing data expectations, etc. and to help assessors shorten the interdisciplinary learning curve.

CoHemis' multidisciplinary, multicultural and multinational nature would provide an ideal framework to discuss and create models for developing multi-value TA procedures.

CoHemis can provide global forums for:

Discussions between planners and private industry on "a centrally planned nation's use of technology assessment" and on how "to plan and to implement technology plans and industrial policy".

Discussions on TA process models in which "stakeholders participate effectively in the assessment process".

**Samples of press reports
on the Center**

Ahora la Reforma Universitaria durante colación de grados

Es necesario reexaminar nuestros programas académicos y ponerlos a tono con el nuevo perfil de nuestro estudiantado, de nuestro claustro, manifiesto el rector Brian González Tejera durante la Octogésima Novena Colación de Grados del Recinto de Río Piedras. Tenemos que diagnosticar nuestros males con sinceridad y valentía y encontrar nuestros meritos. Ligo renunciando a la urgencia de una reforma en ese centro universitario.

Por su parte, el doctor Norman Maldonado, quien se dio como presidente de la Universidad de Puerto Rico durante los actos de graduación, participo al grupo de doctores, estudiantes y profesores presentes en el Teatro de la Universidad, que la reforma universitaria figurara entre los principales componentes de su agenda de trabajo.

En este proceso, que sera de vital importancia para el futuro de nuestra institución, todos tenemos la obligación de participar y aportar. Dijo Maldonado. El presidente invitó tanto a estudiantes y profesores, así como a administradores y a la comunidad en general a introducir efectivamente sus inquietudes y preocupaciones para con la Universidad, de suerte que el producto final de la reforma sea el resultado de una real y efectiva participación.

El nuevo Presidente se comprometió por su parte a constituir el dialogo y la comunicación como la principal alternativa de interacción entre todos los componentes de la comunidad universitaria y los cuadros directivos de la institución. Asimismo, expreso su deseo de ayudar a la Universidad a recobrar el grado de convivencia, solidaridad e imagen positiva que la institución tuvo en el pasado. Maldonado manifiesto que espera que esta constituya una de sus mayores aportaciones durante su cesion en la presidencia de la UPR.

Unos 1,800 estudiantes obtuvieron su diploma durante los actos de graduación. La enorme cantidad de graduandos para la primera sesion de graduación de este año (la segunda se celebra en el verano) obligó a la administración a celebrar por primera vez dos sesiones de graduación en febrero.

En la sesion matutina, 114 estudiantes recibieron sus grados en las areas de Administración de Empresas, Bibliotecología, Manufactura, Comunicación Pública, Derecho y Educación. Mientras, en la sesion de la tarde, 697 jóvenes obtuvieron sus diplomas de las Facultades de Ciencias Naturales, Estudios Generales, Humanidades, Ciencias Sociales y de la Escuela de Arquitectura.

Durante la ultima sesion, fueron galardonados con la distinción de "Profesor Emérito", los doctores: Luis Manuel Díaz, promotor del primer proyecto para la creación del Programa Graduado en Historia del recinto; y Jaime Rosado Albino, reconocido internacionalmente por sus investigaciones en el area de la biología. (por Odalys Rivera)

Celebran panel sobre política tecnológica en el RUM

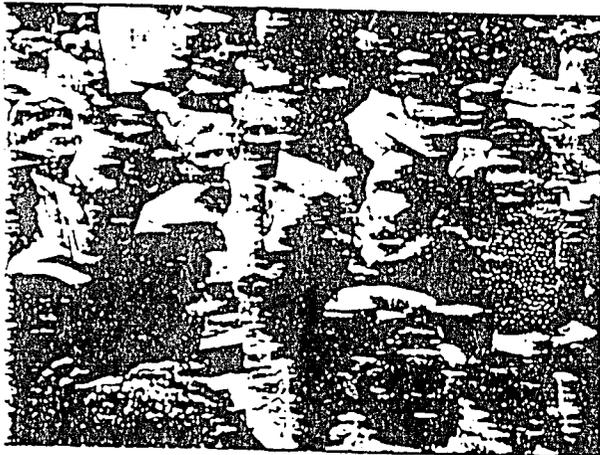
En un momento en que, tanto en Puerto Rico como en los Estados Unidos, se establecen nuevas políticas sobre ciencia y tecnología dentro del contexto de libre comercio con México y la globalización de los mercados, el Centro de Investigación y Educación en Ingeniería y Ciencia Aplicada (CAEIMS) del Recinto Universitario de Mayaguez celebro el pasado 1 de marzo un importante seminario sobre estos temas.

En el mismo se discutió la importancia de estas dos ramas -ciencia y tecnología- en el desarrollo económico de los países. Se cuestionó, en particular, si el desarrollo económico a través de la ciencia y la tecnología justifica su costo social y económico, así como si el agotamiento de los recursos no renovables disponibles a las futuras generaciones. Se plantearon, además, la desconfianza y necesidad de que la universidad se involucra en las decisiones fundamentales de política nacional y regional, y participe en la solución de los problemas de la sociedad.

El panel, dirigido por representantes de Puerto Rico, México y los Estados Unidos, contó con la participación del doctor Richard P. Burke, decano interino de la Escuela de Política Pública del Instituto Tecnológico de Georgia y asesor de la Comisión Carter-Vesco; el doctor Manuel Gómez, director del Centro de Pensamiento para Ciencias e Ingeniería de la UPR; Juan Woodruffe, presidente de la Compañía de Fomento Industrial de Puerto Rico; el ingeniero Paul Placencia, coordinador educativo del Ministerio de Desarrollo Social del Estado de Hidalgo en México; y la planificadora Norma Burgos, presidenta de la Junta de Planificación, quien también estuvo en representación del gobernador del Estado Libre Asociado, Pedro Rossello.



Estudiante Rodrigo, en el centro, se convirtió en la primera estudiante sordomuda en obtener un grado de maestría en la isla.



No hay nada mejor que un beso después de una larga ceremonia. (fotos por Ricardo Alcántara)

Entre las lecciones desarrolladas, el doctor Burke enfatizó en los posibles impactos de las diversas alternativas en el desarrollo económico. En este sentido, senalo que Estados Unidos gasta todos los años \$74,000 millones de dólares en investigación de desarrollo, cuyo porcentaje más grande está dirigido a la investigación relacionada con armamento.

Por otro lado, el doctor Gómez puntualizó en la interacción que debe existir entre el gobierno, la industria y la universidad para promover el desarrollo económico a través de la ciencia y la tecnología; mientras Juan Woodruffe hablo sobre el nuevo modelo económico de Puerto Rico y el rol que este le asigna la tecnología. Rescalto además que el personal del futuro debe conocer varios idiomas y poderse adaptar a un ambiente de continuo cambio.

Sobre el modelo económico de Puerto Rico, Burgos explico que el mismo está basado en aumentos de productividad y en una política que integra lo económico con lo social, y que reconoce el rol de la ciencia y la tecnología como motores de desarrollo. Señalo que habia algunos sectores dentro de la agricultura que eran competitivos a los cuales el gobierno pensaba apoyar.

Por último, Placencia suyo y vio que el proceso de desarrollo y crecimiento es uno gradual y requiere un cambio cultural. Rescalto como el proteccionismo, cada vez más en el pasado, resulta en pérdidas en productividad en la industria y no beneficia a la población al conseguir que los productos sean de menor calidad y tengan mayor precio que lo que tenían en un país libre de comercio.

Según Placencia, una política de ciencia y tecnología debe ser acorde a la política de desarrollo nacional, tomando como punto de referencia elevar la calidad de vida de los ciudadanos de esa nación. En los últimos tres años México ha reclutado a más de 200 científicos e ingenieros de Europa Central y Oriental en calidad de profesores visitantes e investigadores.

CAEIMS va dirigido a mejorar la capacidad tecnológica de nuestra estructura y condiciones sanitarias en Llanos de Arroyo y el Cauce. Según el doctor Luis Zamaraño O'Neil, director del Centro, el concepto promueve la cooperación entre los países de América para estimular su desarrollo económico y social mediante la transferencia de tecnología, de información y de recursos humanos de los países participantes. (por Marganita Santoni)

Profesora de COPU recibe galardón del Freedom Forum

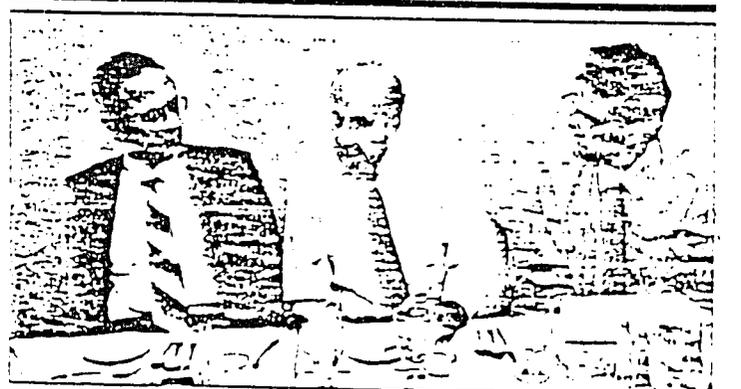
La profesora Norma Vaile, de la Escuela de Comunicación Pública de la Universidad de Puerto Rico recibió una beca profesional del Freedom Forum para periodistas quienes trabajan en educación superior.

El proyecto que le valió la distinción a la profesora Vaile conlleva una serie de entrevistas estructuradas para prensa escrita y radial, acerca de la emigración reciente de profesionales puertorriqueños a Estados Unidos.

Norma Vaile, periodista y feminista, autora de la biografía de Luisa Capetillo, entre otras obras, se desempeña como profesora de periodismo en la Escuela de Comunicación Pública y como asesora del programa de noticias de WRTU-FM, Radio Universidad. Ella fue una de doce miembros de la prensa de Estados Unidos y Puerto Rico quienes fueron premiados por el Freedom Forum. Proximamente los galardonados viajarán al Centro del Pacífico del Freedom Forum en Oakland, California, para un reconocimiento público de sus logros periodísticos y profesionales.



Norma Vaile



Continúa su marcha ascendente Periódicos

Don German Camero, embajador de la UNESCO para México y el Caribe, estuvo de visita en Puerto Rico en días recientes. Camero es además el director del proyecto Periódicos, que se propone ampliar su vigencia por espacio de tres años más e incluir nuevos países en el área. El funcionamiento internacional mínimo que al menos un autor y un editor que continúen sean reconocidos para la nueva serie de Periódicos. El director de Diálogo, el periodista Luis Ferrnando Giss, dijo el pasado 1 de marzo que la Unión de Escritores y Artistas de Puerto Rico para la reunión anual de los miembros de periódicos asociados al trascendental proyecto iterario. El embajador Camero invitó a la UPR y a la UPR por su participación, la excelente y vital importancia de Puerto Rico en la red caribeña que va distribuyendo cerca de cinco millones de ejemplares mensualmente. El doctor Luis Giss Mendez, decano de Ciencias Sociales, agradeció a Giss y Camero por estar.

BUSINESS

P.R. in global markets subject of seminars

By DOREEN NIEMLOCK

Of the STAR Staff

As Puerto Rico looks to expand its international ties, the island conference circuit is going global.

Within the next month, at least three major seminars are slated looking at business with Mexico and Venezuela, economic changes in Cuba, plus scientific research and development policy as a tool for global competitiveness.

On Feb. 18, a day-long seminar at the Ramada Hotel in the Condado will look at opportunities for exports to Mexico and Venezuela — two countries that are lowering their tariffs and opening to imports.

The event is organized by the business administration faculty at the University of Puerto Rico at Rfo Piedras and is co-sponsored by the Manufacturers Association and other business groups.

Talks are targeted for university professors and business executives. They will look at the general economy and overall imports in both countries, as well as laws, documentation and other details for exporting there.

Scheduled to participate from Venezuela are Carlos Romero, a economist from the Central University of Venezuela; Oscar Hernández, director of international negotiations from Venezuela's Foreign Trade Institute; and Edgar Fiol Sotillo, a consultant to the Caracas Chamber of Commerce.

Slated to speak on Mexico are Manuel Gollás and José Romero, economists at Mexico College, and Roberto Rodríguez, Mexico's commercial attaché in San Juan, said professor Paul Latortue, a conference organizer.

For further information, call Eva Burgos at the business administration faculty at 764 0000, ext. 3293 or fax 763 6911.

Also on Feb. 18, Guaynabo based consultants and events organizer Enlace International will sponsor a luncheon at the Condado Plaza Hotel on "Cuba and the New Caribbean Economic Order."

Speaking will be Ernest Preeg, a former U.S. ambassador to Haiti and now the William M. Scholl chair in International Business at the Washington based Center for Strategic and International Studies.

Preeg and research analyst Johnathan Levine last year published a study on Cuba and the Caribbean, which concluded that a radical market oriented restructuring of the Cuban economy could bring rapid economic growth

there.

Preeg's luncheon address will include a look on the implications of Cuba's tourism growth on Puerto Rico, said Enlace Internacional executive Angel Reyes, a Puerto Rico State Dept. official under the Hernández Colón administration.

For more information, contact 721-3444, ext. 5100.

On March 3, the University of Puerto Rico at Mayaguez will host a day-long panel on science and technology policy for economic development.

It is sponsored by its Center for Hemispheric Cooperation in Research and Education in Engineering and Applied Science, known as ColHemis.

Slated to attend from Mexico is Raúl Placencia, academic coordinator at the social development secretariat of Mexico's Hidalgo state government.

From Puerto Rico, speakers will include Juan Woodroffe, president of the Puerto Rico Industrial Development Company and Manuel Gómez, director of UPR's Resource Center for Science and Engineering, organizers said.

For more information, contact ColHemis at 265 6380 or at 832 4040, ext. 3755.

The business administration faculty from UPR at Rfo Piedras also is preparing a seminar on the economies of Cuba and Trinidad later next month, said Latortue.

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Activities of IATAFI Members

By Gary Williams and Jan Andersen

During September 1993, the IATAFI president, Jan Andersen, met Olav Honneyer and Reinhard Coenen in Karlsruhe, Germany to plan a European sponsorship drive. He then travelled to the U.S.A. where he was joined by Jan Jonannessen, Director of HIB. Meetings were held with Anthony Dvorak and Gary Williams of Argonne National Laboratory, Peter Blair and Roger Herdman of the U.S. Office of Technology Assessment to strategically plan for the IATAFI future. Andersen and Jonannessen also travelled to New York and met with Carlos Nones Sucre and Dieter Koenig of the United Nations to discuss the UN - IATAFI link as well as UN consultative status for the IATAFI.

Jan A. Andersen was invited to participate in the UNCTAD Conference on Environmentally Sound Technology in Oslo during October, 1993, by the Norwegian government and UNCTAD. The IATAFI initiative was presented and working contacts were established between the UNCTAD, UNDP and UNEP.

Dr. Luis Pumarada-O'Neil and Jorge Ivan Velez-Arocho of the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemus) and one of the founding members of the IATAFI visited Washington D.C. and met with representatives of two other founding the IATAFI institutions, the

U.S. Office of Technology Assessment (Roger Herdman, Peter Blair, Mary Coates) and Argonne National Laboratory (Gary Williams). Plans for a CoHemus sponsored conference on technology assessment were discussed (to be held in Puerto Rico) as was the exchange of experts. Tony Dvorak, Director of the Environmental Assessment Division at Argonne National Laboratory (and executive member of the IATAFI) will be visiting CoHemus to meet with the CoHemus staff and make a presentation on how to organize multi-disciplinary research for complex problems.

Jan Andersen and David Durnam from HIB/ IATAFI secretariat in Bergen, Norway, met with Baruch Raz, Olav Honneyer, Reinhard Coenen and Bill Martin (Norsk Hydro) in Brussels, Belgium during December 1993. Preliminary decisions regarding the conference to be held in Bergen May 2-6, 1994 were discussed. Progress was made on the conference arrangements and a second call for papers was finalized. Minutes of the meeting are available electronically over Internet and in hard copy upon request.

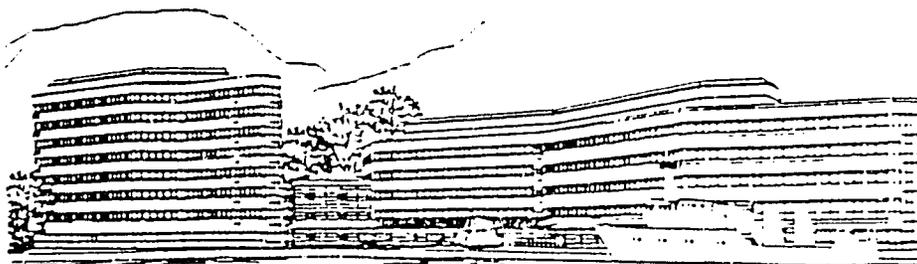
Executive committee member Baruch Raz has been appointed as Scientific Attache for the Israeli Embassy in Paris. David Wield of the Centre for Technology Strategy, UK, has returned from a sabbatical in the U.S. A. and resumes his position as an executive committee member (which Joanna Chatway has held in his absence).



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Location of the IATAFI Secretariat



HIB-INFONET provides professional secretariat services for the IATAFI secretariat from the Bergen High-Technology Centre pictured above.

¿QUÉ PASA EN EL CAMPUS?

CoHemis: unidos en la investigación

Nuestro Recinto es la sede del Centro Hemisférico de Cooperación en Investigación y Educación en Ingeniería y Ciencia Aplicada (CoHemis), un concepto único en educación e investigación que promueve la cooperación entre los países de América para estimular su desarrollo económico y social.

El propósito del Centro es mejorar la capacidad tecnológica, de infraestructura y de condiciones sanitarias de los países de Latinoamérica y el Caribe, esto mediante la transferencia de tecnología, información y recursos humanos. Los países participantes son Estados Unidos, Canadá, México, Cuba, Brasil, Argentina, Chile, Uruguay, Venezuela, Colombia, Perú, República Dominicana, Trinidad, Guatemala, Costa Rica y Puerto Rico.

CoHemis surgió en 1991 a iniciativa del RUM y el auspicio de la Fundación Nacional de las Ciencias (NSF, por sus siglas en inglés). La idea es lograr una mejor calidad de vida en todos estos países mediante el trabajo en conjunto, estableciendo lazos directos con las principales instituciones tecnológicas latinoamericanas y del Caribe con las que se intercambian publicaciones e información.

Recientemente se celebró en nuestro Recinto la conferencia titulada "Problemas Ambientales y Energéticos que Impactan a las Américas", auspiciada por CoHemis y el laboratorio



nacional Sandía en la cual participaron expertos conocedores de distintos países.

El Dr. Luis Pumarada O'Neill, director de CoHemis en el RUM, explica que actualmente el Centro trabaja en la creación de un consorcio de universidades, laboratorios y centros de investigación estadounidenses para proveer mayores oportunidades a los investigadores y a los estudiantes del hemisferio.

En respuesta a la preocupación por la preservación del medio ambiente CoHemis trabaja al presente en propuestas para organizar talleres y conferencias relacionadas con este tema. Entre ellas sobre el uso de sensores remotos para zonas costeras, mitigación de daños debido a desastres naturales y problemas geoambientales.

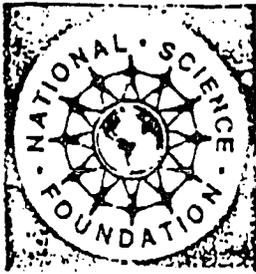
Organizador de la Asociación Internacional de Instituciones de Pronóstico y Evaluación Tecnológica (IATAFI, por sus siglas en inglés) CoHemis está creando una unidad de Impacto de la Tecnología que servirá a Latinoamérica, Estados Unidos y Puerto Rico. En este sentido CoHemis reconoce que en el contexto de las naciones en desarrollo, la evaluación tecnológica es tan importante como la investigación y probablemente más efectiva en términos de beneficios y costos.

"Muchas naciones en desarrollo no están explotando tecnologías potencialmente importantes para su desarrollo, mientras que demasiadas veces se toman decisiones incorrectas respecto al tipo de tecnología que se va a transferir o a la manera que ésta sería implementada", lee un artículo que aparece en el boletín informativo "CoHemis... al día" publicado por el Centro cuatro veces al año. En el mismo se dan a conocer proyectos, actividades e interesante información relacionada con la investigación.

CoHemis proyecta convertirse en un centro multi-disciplinario de investigación de clase mundial, gobernado y parcialmente financiado por los países miembros. Además, en plena madurez, el Centro tendría 100 investigadores, de los cuales 75 serían visitantes y 25 de la facultad del RUM.

Como miembro del Comité

...



Information on STIS

NSF Participates in New Defense Conversion Initiative

The Technology Reinvestment Project (TRP) is being established to help implement the defense conversion strategy outlined by the Clinton administration. The project will be managed by the newly formed Defense Technology Conversion Council (DTCC). A total of \$471.6 million will be available to TRP in fiscal year 1993.

Chaired by the Defense Department's renamed Advanced Research Projects Agency, DTCC includes the Energy Department's Defense programs, the Commerce Department's National Institute of Standards and Technology, the National Aeronautics and Space Administration, and the National Science Foundation. Linked by a Memorandum of Understanding, DTCC members will act in concert to solicit, evaluate, and select proposals. The eight programs covered by TRP are—

- Defense Dual-Use Critical Technology Partnerships (\$81.9 million)—to support the research and development of critical technologies that both meet defense needs and have commercial potential
- Commercial-Military Integration Partnerships (\$42.1 million)—to develop and mature dual-use technologies with clear commercial viability and potential military applications
- Regional Technology Alliances Assistance Programs (\$90.5 million)—to support regional efforts to apply and commercialize critical dual-use technologies
- Defense Advanced Manufacturing Technology Partnerships (\$23.5 million)—to encourage research and development of advanced manufacturing technologies with the potential for a broad range of military and dual-use applications
- Manufacturing Extension Programs (\$87.4 million)—to assist small manufacturers in upgrading their capabilities to serve both commercial and defense needs
- Defense Dual-Use Assistance Extension Program (\$90.8 million)—to assist businesses economically dependent on DOD expenditures to acquire dual-use capabilities through a variety of assistance mechanisms
- Manufacturing Engineering Education and Training Program (\$43.6 million)—to support the enhancement of existing programs and the establishment of new programs in manufacturing engineering education and training
- Manufacturing Experts in the Classroom (\$4.6 million)—to support teaching, curriculum development, and other activities of manufacturing experts with practical experience at institutions of higher education
- Small Business Innovation Research (SBIR) (\$7.2 million)—to provide the mechanism and the incentive to small business for the development and deployment of dual-use technologies that address any TRP technology focus area and that deal with technological innovation and new commercial products or processes.

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E-Beam Systems Success Story

NSF-supported research using an electron beam accelerator to process hazardous organic substances is being credited for helping to develop a new marketing product.

High Voltage Environmental Applications, Inc., a corporation formed to provide services and to market electron accelerators for use in environmental engineering applications, is a direct result of an award from ENG's Environmental Systems in 1987, according to Dr. Edward H. Bryan, the Program Director. He reports that the corporation founders attribute their expertise to experience gained from NSF-supported research conducted at an engineering scale in Miami on treatment of water, wastewater, and sediments containing hazardous organic materials.

The corporation founders—an interdisciplinary research team—are University of Miami Professors Thomas D. Waite (a civil engineer) and Charles N. Kurucz (an industrial engineer) and the Director of Florida International University's Drinking Water Research Center, William J. Cooper (a chemist).

The large electron beam accelerator used in their research was installed 10 years ago at the Miami-Dade wastewater treatment plant on Virginia Key to evaluate its potential for disinfection of sludge produced during wastewater treatment. Installation of the accelerator resulted from research started with NSF support in 1974 by Dr. John Trump at MIT and at the Metropolitan District Commission's Deer Island Wastewater Treatment Plant in Boston.

The electron accelerators that the corporation plans to market will be produced by Vivirad High Voltage Corporation of Billerica, MA. Vivirad also manufactured the Miami accelerator and the earlier prototype used by Trump at MIT.



(Photo by Edward H. Bryan)

Discussing E-Beam capabilities at the oxidation symposium are (from left) Drs. Cooper, Peter Gehring (of the Department of Chemical Engineering, Austrian Research Center in Seibersdorf, Austria) and Kurucz.

CO-HEMIS to Spur Joint Research

The University of Puerto Rico, Mayaguez, recently established a Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CO-HEMIS). CO-HEMIS encourages joint research projects, dissemination, and educational programs that are of common interest to a large group of countries within the Western Hemisphere.

The establishment of the Center, headquartered at Mayaguez, is the result of a conference attended by representatives from the North and South American continents. More than 30 researchers and scientists attended the initial conference held in Mayaguez in November 1991. The countries participating included Argentina, Chile, Costa Rica, Cuba, Guatemala, Mexico, Peru, Republic of Domingo, Trinidad and Tobago, Uruguay, Venezuela, Puerto Rico, Brazil, and Paraguay.

Canada was represented by persons from the Science and Engineering Research Council of Canada and Queen's University. The U.S. conferees represented the Department of State-Latin American Affairs, American Association for the Advancement of Science, National Institute of Standards and Technology, Environmental Protection Agency, Worcester Polytechnic Institute, University of Miami, Virginia Polytechnic Institute and State University, and Massachusetts Institute of Technology. The Organization of American States was represented as well.

The conferees presented papers discussing their views related to the objectives and mission of a possible center for cooperation and outlined the research interest areas of specific countries. This exchange was followed by group actions to study various aspects, activities, and administration for the proposed Center for Cooperation. After a unanimous decision, the University of Puerto Rico was asked to formalize the Center.

NSF Headquarters to Move to Virginia

The National Science Foundation is moving its headquarters from downtown Washington, DC, to a new building in Arlington, VA.

The move is being accomplished in phases and should be completed by early autumn. This move culminates a process begun several years ago and caps negotiations among the NSF, General Services Administration (GSA), and Office of Management and Budget.

NSF is consolidating its current four separate locations into the single new site. Beyond improved office spaces and meeting rooms, the building is designed to accommodate present and future computer and communication requirements.

P.R. to have hemispheric research center

Co-Hemis conference votes UPR Mayaguez campus ideal site for international engineering and applied science experts

by EDGAR ESTRADA
 CARIBBEAN BUSINESS Reporter

The first phase of the Center of Hemispheric Cooperation for Engineering and Applied Science Education and Research (Co-Hemis by its Spanish acronym) was finalized at the Co-Hemis annual conference, held recently at the University of Puerto Rico, Mayaguez campus (RUM). The new center, with an estimated \$15 million annual budget, will conduct information and technological exchange programs between Puerto Rico and several countries of the Western Hemisphere.

According to Luis Pumarada, co-

director of the Co-Hemis conference and engineering professor of RUM, the center will enjoy the participation of visiting experts from several Western Hemisphere countries to conduct research about common technological problems.

One of the main goals of the Co-Hemis conference, sponsored by the University of Puerto Rico and the National Science Fund, is to establish a research center to enable these Western Hemisphere countries to improve and develop their technological capabilities, which would in turn stimulate economic development and global competitiveness.

At the conference, delegates from all participating countries unanimously

voted Puerto Rico and RUM as the perfect location for the new technological research center because of the island's privileged geography and favorable political and cultural circumstances.

Pumarada, Carlos Pesquera, civil engineering professor of RUM, and the Co-Hemis Advisory Committee — composed of delegates from participating countries — will be in charge of developing the center's first phase.

The first phase of the center — the establishing of the office -- will be funded by the National Science Foundation, which has made a commitment to finance the office until December 31, 1992. During this time, the office will be looking for ways to finance the center's second phase, which consists of initiating the research.

"We will be offering intensive presentations of the basic concept of the center to federal and local government officials as well as private sector executives in order to obtain the required funds with

which to operate it," Pumarada said.

Participants in this year's Co-Hemis conference included researchers and scientists from Argentina, Canada, Mexico, Venezuela and the U.S. as well as representatives from the Science Division of the Organization of American States and diverse scientific research programs and institutions from North and South America and the Caribbean. The conference also included representatives from the White House Office of Political Technology and Strategy, the technological research divisions of the United Nations and the United Nations Educational, Scientific and Cultural Organization.

Several entities, such as the Puerto Rico State Department, the Puerto Rico Tourism Company, Food & Spirits, Mendez & Co, E. Franco, Avon of Puerto Rico, Sanders Coffee, Cafe Yaucono and the Retirees Association of RUM, collaborated in the organization and celebration of the Co-Hemis conference. ■

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