

COHEMIS REPORT  
JULY 1996 - JUNE 1999



**THE COHEMIS CONSORTIUM:  
AN INTERAMERICAN NETWORK FOR COMPETITIVENESS  
AND SUSTAINABLE DEVELOPMENT**

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**THE COHEMIS CONSORTIUM:  
AN INTERAMERICAN NETWORK  
FOR COMPETITIVENESS AND  
SUSTAINABLE DEVELOPMENT**

CENTER FOR HEMISPHERICAL COOPERATION IN RESEARCH  
AND EDUCATION IN ENGINEERING AND APPLIED SCIENCE:  
COHEMIS

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June 1999  
University of Puerto Rico, Mayagüez Campus

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## ACKNOWLEDGEMENTS

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Today, the Center runs as efficiently as ever under coordinator Blanca N. Colón-Mercado, supported by secretaries Arlene Astacio-Sánchez and Karen J. Rodríguez-Gerena; with enthusiastic collaboration from the support staff of the UPRM R&D Center. Many UPRM graduate and undergraduate students have worked for the Center during these years, taking care of the anonymous tasks that nobody sees but are nonetheless essential. We want to thank specially Jesús Ramos, William Alers, Ajay Asundi, Moraima de Hoyos, Ivonne A. Delgado, Roger Hernández, Yakaira Pérez, and Yesenia Pumarada who worked in the period covered by this report.

As before, during these last three years we have been favored by several UPRM professors' collaborations in projects and proposals. We hereby thank Dr. Manuel Hernández Avila, Dr. Roque Román, Dr. William Frey, Dr. Fernando Gilbes, Dr. Walter Silva, Dr. Houssam Toutanji, Dr. Eduardo Schröder, Dr. Jorge González, Dr. Luis Godoy, Dr. Jorge Rivera-Santos, Dr. Manuel Valdés-Pizzini, Ms. Andrea Torres, Eng. Víctor Díaz, Prof. Carmen V. Santiago, Dr. José Luis Zayas, Prof. Lucy Morell, and Dr. Miguel Torres.

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Department of State, Office of the Governor, and Office of the Resident Commissioner for their collaboration.

A center such as CoHemis depends on the voluntary collaboration of many persons geographically separated, who believe in hemispheric solidarity, embodying our motto, "*Overcoming through cooperation*". These persons are mostly those who serve as delegates in the CoHemis Consortium institutions and as contacts in the various national science and technology organizations who network with us, share and forward information, identify and refer experts, and organize joint activities. Among these very valuable persons we can not defer mentioning by name: Dr. Néstor Ortiz, from Sandia National Laboratories; Dr. Emir Macari, who just moved from Georgia Tech to a chair at Louisiana State University (LSU); Argonne's Dr. Anthony Dvorak; Dr. José Centeno, from the Armed Forces Institute of Pathology; Dr. Juan Villalvazo, from the University of Guadalajara; Dr. Paul Thompson, from the University of Florida; Eng. Daniel Comarazamy, from INTEC; Dr. Graciela Sosa, formerly with Venezuela's CONICIT; and Dr. Numa Capiati, from Argentina's PLAPIQUI-PIDCOP.

Many other persons constantly contribute to CoHemis' success: UPRM professors who provide technical expertise, opportunities for developing initiatives, and occasionally help with translations; Puerto Rico public officials who receive our guests and trust us with their needs, assistance and in-kind contributions; federal and national laboratory personnel who volunteer to participate in our activities with their own funds; visitors who go back and speak well of our performance and capabilities; and those who over the years, have agreed to lend us their prestige and guidance as individual advisers.

Finally, we also want to acknowledge the efforts of those who made possible the preparation of this report, editor Laura Cotte and the CoHemis staff.

## SUMMARY

Funded by the Office of the President of the University of Puerto Rico, the CoHemis Center and its CoHemis Consortium have been networking and facilitating North-South collaborations in science and technology within the Americas for several years before organizing the Summit of the Americas and before the publication of the document *Science in the National Interest* converted such collaborations into official US policy. Through its eight-year trajectory, CoHemis has demonstrated beyond doubt that it can contribute significantly to the attainment of the objectives of hemispheric integration in ways in which no other center or organization is capable of.

Our Center has been able to get support and collaborations from the government, academia and the private sector to organize many activities, both in Puerto Rico and in Latin America. Between July 1996 and June 1999, we have brought 55 presenters from continental US and Latin America and 39 from Puerto Rico, together with over 1,449 attendees in Puerto Rico and overseas convening for workshops, conferences, and short courses on such themes as energy, environment, civil infrastructure, waste disposal, and ethics. During this period, CoHemis has organized two hemispheric conferences, and three short-course series in various Latin American cities reaching more than 450 persons. This has been achieved through collaboration with universities, private firms and national science and technology organizations in 18 countries in our hemisphere. Our Center has accumulated eight years of goodwill, ties and collaborations with most of the national science and technology organizations in the hemisphere and is treated as a Latin American organization in Latin America.

In 1992, CoHemis began to form a hemispheric network which currently embraces 30 institutions in 16 countries, all committed to fostering research and educational collaborations. The CoHemis Consortium is a growing, active network that constitutes a comprehensive, unique pool of resources for North-South collaborations in science and technology. It aims to include at least one university teaching science and technology from every country of the Americas specializing in these areas.

Thanks to the vision of NSF's, Dr. John B. Scalzi, and the support of UPR, CoHemis has become the hemispheric cooperation center for science and technology. CoHemis' personal and electronic linkages with most national science and technology organizations in the Americas and its partnerships with key universities in many Latin American and Caribbean countries, complemented by a consistent newsletter and an eight-year record of successful activities and satisfied clients, make it a valuable means to reach the hemispheric science and technology community. Its setting within the University of Puerto Rico provides it with a unique advantage for achieving its objectives.

The University of Puerto Rico is the only institution under US jurisdiction that teaches mostly in Spanish and has a graduate school which covers engineering, natural, marine, medical, and agricultural sciences, business administration, planning, social sciences, environmental sciences, and public health. Its Mayagüez Campus has a faculty that is 80% Latin and Spanish-speaking in a Land Grant university. In addition, UPR-Mayagüez is fully accredited, fully bilingual, has an

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international faculty and student body, and is located in a Spanish-speaking Caribbean island with a diverse community that is ethnically and politically tolerant.

Puerto Ricans, specially Spanish-speaking Island residents, share language and culture with other Latin Americans. Unlike most other members of the US scientific community, Puerto Ricans and Latin Americans can smoothly and effectively discuss issues with the advantage of no information or meaning being lost in translations or cultural differences, as they both teach, learn and think in the same language. Puerto Rican institutions such as the University of Puerto Rico and CoHemis can be very effective collaborators in getting the hemispheric science and technology integration goals achieved. CoHemis can participate in US delegations in hemispheric meetings on science and technology, and as a Latin American institution in Latin American organizations. The most significant long term, contribution that UPR, CoHemis, and the CoHemis Consortium can make to hemispheric integration and sustainable and equitable development is the establishment of the applied research center as outlined at the 1991 Conference.

Presently, the mission of CoHemis is to facilitate 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, while working towards the creation of the research center outlined by the 13 country delegates who participated in the 1991 NSF-sponsored conference that created our Center. These delegates recommended the eventual creation of a multinational applied research center, with headquarters at the University of Puerto Rico science and engineering campus and out of this center coordinate the work carried on at this site and at other collaborating institutions. This organization would bring together Latin American graduate students and researchers for periods of six-months to two-years to work with US investigators on research funded by contributions of member countries and by international and North American sponsoring agencies. Research projects conducted at the University of Puerto Rico will contribute to expand graduate programs in Puerto Rico, thus greatly increasing the number of Hispanic Ph.D.s in the US and at the same time facilitating the integration of the scientific communities of the Americas.

The following pages include an overview of the Center since its inception and a presentation of CoHemis' achievements during the last three years. This report also features the amounts of the contributions that were received, as well as the Center's expenses. Pending projects, strategic opportunities and future plans are also presented.



LOCATION OF COHEMIS' CONSORTIUM MEMBERS



### GIS-SPRING COURSE FOR THE CARIBBEAN



*Participants of GIS SPRING Course for the Caribbean, celebrated at the Mayagüez Campus during February 23 to 27 of 1999. From the left: Dr. Jorge I. Vélez-Arocho, CoHemis co-director; Dr. Eduardo Banus from IAI-Brazil; Blanca N. Colón, CoHemis Coordinator, and behind her, Prof. Marisa Da Motta, from the Brazilian Space Studies Institute (INPE), course instructor.*

*IAI is the Global Change Research Institute for the Americas, sponsored by US-NSF and based in Brazil. SPRING is an excellent, competitive GIS software developed by Brazil's INPE which has been donated to Caribbean institutions interested in collaborating with Global Change Research.*

## INTRODUCTION

### THE 1991 PLANNING CONFERENCE

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 Mayagüez Campus (UPRM) to organize an hemispheric conference for planning a center for promoting joint research activities in the Americas. The original grant awarded to Dr. Luis F. 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 producing 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.

The conference was held in Mayagüez in 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 the National Institute of Standards and Technology (NIST), the Department of Energy (DOE), the Environmental Protection Agency (EPA), as well as the National Science and Engineering Research Center (NSERC-Canada), the US Department of State, the American Association for the Advancement of Science (AAAS), and the Scientific Division of the Organization of American States (OAS) also participated. The United Nations' Environmental Program for the Caribbean contributed by covering 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. Many key persons and organizations in the science and technology community sent letters ratifying the conference objectives. These included the United Nations' Science and Technology Division, UNESCO, Hon. George Brown, Chairman of the House Committee for Science, Technology and Space Affairs, and Dr. Allan D. Bromley, Science and Technology Adviser to then US' President George Bush. Congressman José Serrano expressed his solidarity in writing.

Papers presented by the participants described the current situation of research and development activities and of advanced technological education in their countries and suggested how a multinational research center could help 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 the presentations, the participants were divided into groups which discussed how the creation, development and establishment of a hemispheric research center could be most effective for the countries of the Americas. In addition, each participant was shown those UPRM research and educational facilities in which he expressed interest.

## **CREATION OF THE COHEMIS CENTER**

In the final session, the delegates unanimously recommended the immediate creation at UPRM of a Center for Hemispheric Cooperation in Research and Education in Engineering and Applied Science (CoHemis). Its mission would be to facilitate, support, and conduct collaborative applied research 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. They also created a five-delegate advisory committee to assist in this mission. CoHemis received mandates to: promote the participation of the least-developed countries affiliated to the center, and to focus on projects that have a potential for short term benefits and development impacts for more than one country.

## **CURRENT MEMBERS OF THE ADVISORY COMMITTEE**

These advisors have been named by their respective national science and technology organizations.

- Numa Capiati, Argentina
- Carlos R. de Faria e Souza, Brazil
- Mauricio Sarrazín, Chile
- Maureen Manchouck, Trinidad & Tobago
- Sylvia Ortega Salazar, México

## **OUR LONG-TERM GOAL: A MULTINATIONAL APPLIED RESEARCH CENTER**

The format and mission recommended by conference participants for the proposed applied research center is in the nature of a multidisciplinary, world class institution governed and partly supported by member countries, open to all nations and territories in the Western Hemisphere. This center, headquartered in the University of Puerto Rico's Mayagüez Campus, would coordinate the work carried out at the institution and at other collaborating sites. This organization would bring together Latin American graduate students and researchers for periods of six-months to two-years to work with American and Canadian researchers on research funded by contributions from member countries and by international and North American sponsoring agencies. It would have approximately 75 rotating visiting researchers and 25 resident researchers, and provide assistantships to 200 graduate students from different countries of the Americas who would be enrolled at UPRM and other Consortium Institutions. These activities will contribute to support graduate programs at the University of Puerto Rico, thus greatly increasing the number of Hispanic Ph.D.s in the US and facilitating the integration of the scientific communities of the Americas.

An advanced science and technology center operating in Puerto Rico, linking 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

scientific establishment. At present, the well-funded and publicized international collaboration programs of the European Community and of individual European countries and Japan are being very well received in the region.

Puerto Rico, a Latin American culture within the US political, economic and academic systems, can be the most effective vehicle for transferring technology between the US and Latin America, and make it work effectively on behalf of the importing countries within the corresponding socioeconomic and sustainability context. The future research center's joint applied 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 creation of such a center and of a support and participatory network remain as the primary long-term goals of the CoHemis Center. Its implementation looks more promising every year within the context of the CoHemis Consortium and the mechanisms provided by the Summit of the Americas, such as the meetings of science and technology minister.

**NSF-CYTED WORKSHOP-SEMINAR OF  
REPAIR AND REHABILITATION ON REINFORCED CONCRETE STRUCTURES,  
HELD AT MARACAIBO, VENEZUELA,  
FROM APRIL 28 THROUGH MAY 1<sup>ST</sup>, 1997.**



*From left to right we have, Dr. Walter F. Silva, CoHemis/UPRM; Dr. John B. Scalzi, NSF; and, Dr. Oladis de Rincón, (fifth from left to right) who organized the event at the University of Zulia with the sponsorship of NSF aided by Spain's CYTED, and the collaboration of CoHemis/UPRM.*

## **THE CoHEMIS HEMISPHERIC COOPERATION CENTER**

### **MISSION**

Promote human resources development programs, technology assessment, and joint applied research with potential benefits for more than one country in the Western Hemisphere, 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. Bring about the creation of a hemispheric applied research center in the context of the CoHemis Consortium.

The Center's priority areas are:

- energy,
- environment,
- infrastructure,
- natural resources,
- process and manufacturing technologies.

CoHemis currently receives its basic funding from the University of Puerto Rico. It receives funding for specific projects from government agencies from the U.S. and Puerto Rico, and from the private sector. It also benefits from collaborative efforts with Consortium members, international agencies, and entities from other countries of the hemisphere.

The Center publishes the newsletter *CoHemis... update*, free of charge, in English and Spanish, which is distributed to persons and institutions interested in scientific and technological cooperation between the Americas. It has also published proceedings of its activities funded by the National Science Foundation and reports of the Center's activities, among other publications.

### **OBJECTIVES**

- Increase the global competitiveness of Western Hemisphere industry.
- Enhance the technological and human resources capabilities of Latin America and the Caribbean, and hence, their social, economic and commercial development.
- Foster the protection of the hemisphere's environment and natural resources.
- Bring high priority regional problems to the attention of researchers and sponsoring agencies across the different countries.
- Promote the advantages of Puerto Rico, its University, and its Mayagüez Campus for facilitating and conducting effective technology transfer and educational efforts in key areas of sustainable development.

- Increase opportunities available in Puerto Rico for quality graduate studies in science and engineering to boost the number and quality of Hispanic-American Engineering and Applied Science Ph.D.s.
- Promote the creation of a multinational hemispheric education and joint research network headquartered at the University of Puerto Rico – with the participation of the CoHemis Consortium – which can provide research funds, student assistantships, and high technology services to its member countries according to their priorities.
- Link universities, S&T institutions, and research centers throughout the hemisphere.

### **THE COHEMIS CONSORTIUM**

During the two years following the 1991 Conference, CoHemis worked preparing proposals and gaining visibility with the objective of securing funding at the scale required to accomplish its long-term goal, the establishment of the hemispheric research center outlined by the delegates. CoHemis found other receptive institutions from North and South America that adhered to its objectives and were willing to join UPRM in what became known as the CoHemis Consortium. This network, which has grown to 30 institutions in 16 countries, has allowed the center to become a very effective hub for hemispheric collaborations and to organize successful hemispheric meetings, courses, and workshops in Puerto Rico and Latin America. CoHemis has vastly multiplied its capacity for serving the technological development of the hemisphere through the growth of the Consortium.

Member institutions, up to recently limited to universities and research centers, have received benefits by participating in activities coordinated through CoHemis, either in Puerto Rico with paid by covering their participation expenses, or by hosting and providing support to activities at their own premises. They also have contributed to and benefited from networking and information exchanges, and have been exposed to opportunities for presenting short courses. They receive CoHemis publications, notices, and announcements. CoHemis organizes, facilitates, and/or hosts their visits to Puerto Rico and helps to organize interactions with entities in Puerto Rico and the Caribbean. During the period covered by this report the national science and technology organizations of Perú and Bolivia have joined the Consortium. This umbrella-type of Consortium members extends the reach of our network to the majority of a country's researchers and institutions.

The mission of the CoHemis Consortium is to enhance the science and technology capabilities of the Americas, foster the integration of its scientific community, and promote its effectiveness in advancing sustainable development. There is no cost involved in consortium membership. The Consortium uses a set of bilateral agreements for each member with UPRM to facilitate exchanges of faculty and students, assistantships, participation in hemispheric activities, joint research, and research facilities sharing. In the last three years, the following institutions have joined the Consortium: Consejo Nacional de Ciencia y Tecnología (CONCYTEC, Perú), Universidad de Guadalajara (México), Pontificia Universidade Católica do Rio de Janeiro (PUC-

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Rio, Brazil), Universidad del Zulia (Venezuela), Universidad Mayor de San Simón (Bolivia), Instituto Geográfico Agustín Codazzi (Colombia), Universidad de Piura (Perú), University of the West Indies (Trinidad and Tobago), Université Quisqueya (Haiti), Escola Politécnica da Universidade de São Paulo (Brazil), Escuela Colombiana de Ingeniería, and Bolivia's Consejo Nacional de Ciencia y Tecnología (CONACYT).



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*CoHemis Report*

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In the first meeting of Consortium delegates held in Mayagüez on June 16, 1994, it became clear that there is much to be gained from the collaborations, exchanges, and joint programs initiated in all directions. The member institutions comprise a magnificent pool of diversity and committed expertise in countless fields.

CoHemis activities in Latin America and the Caribbean are carried on preferably with Consortium institutions. This includes inviting Consortium experts to meetings sponsored in Puerto Rico, U.S. or elsewhere, as well as hosting the short courses, workshops, conferences and other activities in the Consortium institutions.

INTEC University has hosted a weeklong course on environmental impact evaluation and has sent professors and laboratory technicians for training or to discuss issues with peers at the UPRM. Researchers from Universidad Nacional de Río Cuarto (Argentina) have used UPRM agricultural laboratory facilities in relation to rhizobacteria research. A UPRM researcher has been a visiting instructor on satellite image applications for coastal management at Colombia's IGAC. CoHemis has collaborated with international meetings in the University of the West Indies, Guadalajara, PUC-Rio, and University of Zulia. CoHemis has submitted proposals and organized panels for Sandia National Laboratories, and has been its representative in meetings in Latin America. Consortium members in São Paulo, Lima, La Paz, Guadalajara, San José, Santo Domingo, Córdoba, Bogotá, and México City have hosted CoHemis-Caterpillar short courses. In the first meeting of Consortium delegates held in Mayagüez on June 16, 1994, it became clear that there is much to be gained from the collaborations, exchanges, and joint programs initiated in all directions. The member institutions comprise a magnificent pool of diversity and committed expertise in countless fields.

**ADDITIONAL COLLABORATING INSTITUTIONS**

Argonne National Laboratories	National Institute of Standards and Technology (NIST)
Armed Forces Institute of Pathology (AFIP)	National Science Foundation (NSF)
Browning Ferris Industries (BFI)	Ponce School of Medicine, Puerto Rico (PSM-PR)
Caterpillar Corporation	PR Department of Natural and Environmental Resources
Centro de Tecnologia Mineral (CETEM), Brazil	PR Economic Development Administration
Ciencia y Tecnologia para el Desarrollo (CYTED Network)	PR Economic Development Bank
EARTH College-Costa Rica	PR Electric Power Authority
Federal Reserve Bank of New York (FRBNY)	PR Planning Board
Instituto Nacional de Pesquisas Espaciais (INPE), Brazil	PR Department of State
Instituto de Geofisica de Perú	PR Telephone Company
Instituto Geográfico Agustín Codazzi (IGAC), Colombia	Rohm & Monsanto
Interamerican Institute for Global Change Research (IAI), Brazil	Sandia National Laboratories
International Association of Technology Assessment and Forecasting Institutions (IATAFI)	UPR Sea Grant College Program
International Conference on Engineering Education (ICEE-Brazil)	Tropical Center for Earth and Space Studies (TCESS), UPRM
Michigan Transtech	US Patent and Trademark Depository Library (PTDL), UPRM
	US Geological Survey (USGS)
	USIA-USIS, Bolivia

## INDIVIDUAL ADVISORS

The following persons collaborate with CoHemis as individuals committed to the enhancement of hemispheric collaboration activities.

- Anthony Dvorak, Argonne National Laboratory
- Manuel Gómez, Universidad de Puerto Rico
- Rafael Brás, Massachusetts Institute of Technology
- Carlos I. Pesquera, PR Department of Transportation and Public Works
- Emir J. Macari, Louisiana State University
- Juan F. Facetti, Universidad Nacional de Asunción (Paraguay)

## TYPES OF ACTIVITIES CONDUCTED

CoHemis conducts activities related to education, research, dissemination, and service. Its main activities are:

- Organize, promote and/or propose short courses conducted by UPRM resources, or by Consortium resources with UPRM participation, to be presented in Puerto Rico or Latin America.
- Organize, promote and/or propose seminars, workshops, and conferences conducted by UPRM resources, or by Consortium resources with UPRM participation, to be presented in Puerto Rico or Latin America.
- Organize presentations, panels or discussion forums in Puerto Rico on current topics related to science and technology with the participation of Consortium and other resources.
- Disseminate general information or any other topic of interest to UPR/PR and overseas by means of the newsletter *CoHemis... update* and the Internet. Promote UPRM activities and programs overseas.
- Answer requests, from Puerto Rico and overseas, for specific information on UPR/PR and topics within the Center's scope. Offer information on the Center and its activities upon request from different UPR or UPRM programs and divisions.
- Participate in conferences, workshops and forum discussions in Puerto Rico and overseas.
- Meet key government and academia representatives in the United States and other countries.
- Receive visitors related to the Center's mission or consortium members; coordinate their meetings in UPR/UPRM or in government agencies of Puerto Rico.
- Serve as facilitator for overseas entities in the process of sending students with external scholarships to the UPRM Graduate School.
- Stimulate and help UPRM professors prepare proposals for joint research projects and to organize activities of hemispheric scope. Facilitate and support those activities once approved.
- Promote and facilitate faculty and student internships and exchanges with institutions overseas, mainly with Consortium members.

*CoHemis Report*

- Collaborate with Puerto Ricans and other Hispanics and Latin Americans in the US in matters concerning education and research.
- Propose and produce inter-institutional agreements that facilitate PR/UPRM/ CoHemis hemispheric objectives.

**NUMBER OF ACTIVITIES BY TYPE, 1996-1999**

<b>KIND OF ACTIVITY</b>	<b>TOTAL OF ACTIVITIES</b>
Conferences, workshops and seminars organized by CoHemis in Puerto Rico	42
Conferences, workshops and seminars co-organized by CoHemis overseas	7
International events in which CoHemis has participated	20
Trips overseas	43
Countries visited	13
Proposals submitted	13
Proposals resulting from CoHemis activities	3

**PARTICIPATION AND OUTREACH, 1996-1999**

<b>Kind of Activity and Participants</b>	<b>TOTAL OF PARTICIPANTS</b>
Conferences, workshops and seminars organized by CoHemis in Puerto Rico	964 persons
Conferences, workshops and seminars co-organized by CoHemis overseas	485 persons
Co-sponsoring institutions or firms	35 institutions or firms
International guest resources participating in the activities	55 persons
Puerto Rico guest resources participating in the activities	39 persons
Co-sponsoring countries	14 nations
Host countries	9 nations



**COHEMIS' BENEFITS FOR THE US, PUERTO RICO AND THE HEMISPHERE:  
GLOBAL COMPETITIVENESS AND SUSTAINABLE DEVELOPMENT**

CoHemis' activities benefit the Americas in many ways. The meetings and workshops enhance hemispheric human resources to achieve global competitiveness and sustainable development. The Consortium partnerships between institutions in the US and Latin America foster integration and cooperation towards common goals. CoHemis' activities facilitate the region's eventual economic integration and the protection of its environment and natural resources. They work as a training center in cultural diversity, global perspective, and inter-American relations for participants from both North and South America.

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

Technology improvements help break the vicious circle of underdevelopment: this is a statement that most countries in Latin America and the Caribbean believe in, and it is the reason why they participate in many regional and international S&T collaborative programs with European countries and Japan. It is the reason why many of them have S&T at a cabinet level.

CoHemis 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 which may be actually spent in US territory. Through the CoHemis Consortium, key US universities and national laboratories participate in these activities.

The Center's activities reinforce the efforts of the government of Puerto Rico to stimulate the export of consulting services to Latin America and the Caribbean. CoHemis conveys a positive image of Puerto Rico and fulfills the model of the island as a bridge between the Americas. The conferences, research projects, and continued education courses which the CoHemis Center stages in Puerto Rico provide many growth opportunities for the Puerto Rican science and engineering community, as well as for the hemispheric participants.

CoHemis collaborates also with many institutions in Puerto Rico, such as the PR Department of State, PR Economic Development Administration, PR Department of Natural and Environmental Resources, PR Planning Board, PR Telephone Company, PR Electric Power Authority, and the PR Economic Development Bank. It promotes activities focused on enhancing important sectors of the economy of Puerto Rico, such as manufacturing, conference-tourism, resource management, and sustainable development.

**MAIN COHEMIS ACHIEVEMENTS FROM JULY 1996 TO JUNE 1999**

- Transforming CoHemis and UPR into familiar institutions in the hemispheric scientific community and in Washington's science funding establishment.
- Enhancing the interaction between UPR and UPRM with government and industry in Puerto Rico with multinational firms.
- Publication of a quarterly newsletter in Spanish and English that has reached a circulation of 1,000 copies, for eight years.
- Keeping a CoHemis homepage on the INTERNET, and creating homepages for the Ethics and VIP projects.
- Consolidation of a growing Consortium of collaborating institutions, with UPRM as its hub.
- Publication of 3 proceedings and several reports.
- Presentation of 3 papers at international meetings.
- Presentation of UPRM as an international site for continuing graduate studies in sciences and engineering in Spanish within the US system of higher education, especially suited for environmental studies and technologies and remote sensing applications.
- Presentation of short courses, seminars, and resource management sessions throughout Latin America.

COHEMIS' BENEFITS FOR THE US, PUERTO RICO AND THE HEMISPHERE:  
GLOBAL COMPETITIVENESS AND SUSTAINABLE DEVELOPMENT

CoHemis' activities benefit the Americas in many ways. The meetings and workshops enhance hemispheric human resources to achieve global competitiveness and sustainable

development. The Consortium partnerships between institutions in the US and Latin America foster inter-organizational cooperation and information exchange, which are essential for the region's eventual economic growth and the attraction of foreign investment and natural resources. The

**THIRD SERIES OF CATERPILLAR-COHEMIS COURSES  
ON LANDFILL WASTE TECHNOLOGY, 1997.**

The CoHemis Consortium provides a vehicle for researchers, universities, and research



*Opening of the course at La Paz, Bolivia, on August 11 and 12, 1997. At extreme left, Eng. Carlos Caetano, who organized the series for Caterpillar; at the center, Dr. Emir Macari, then at Georgia Tech and principal course instructor; on his right, Mr. Willie Johnston, BFI consultant and co-presenter of the course.*

*A few months after this presentation, the Sanitary Association of Bolivian Municipalities, sponsored by Germany's ATZ, brought Mr. Johnston to Bolivia to inspect the waste practices of nine of the main cities of the country and to conduct a seminar on correct landfill operations. In 1997, the Caterpillar-CoHemis seminar was also held in Bogotá, São Paulo, Asunción and México City coordinated by CoHemis and consortium institutions.*

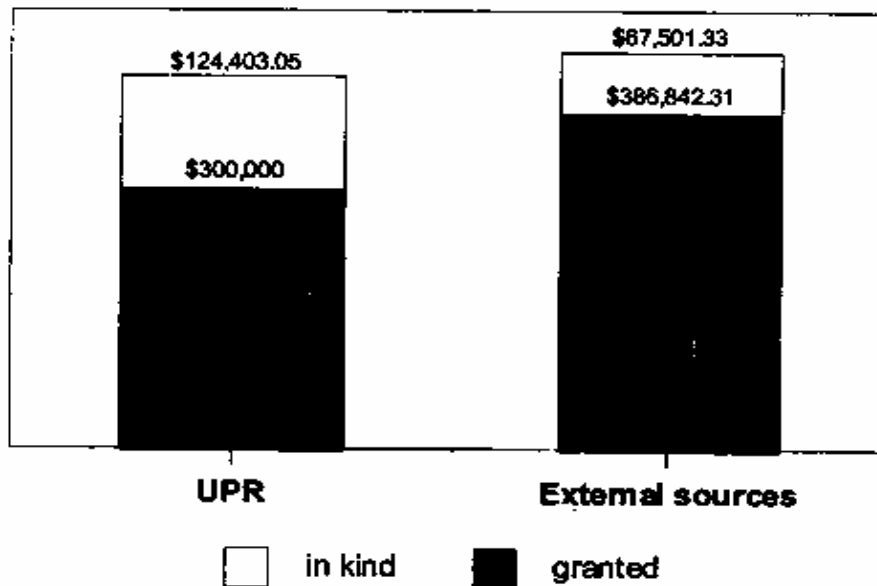
CoHemis is a consortium of the Caterpillar Company, PR Electric Power Authority, and the PR Economic Development Bank. It promotes activities focused on enhancing important sectors of the economy of Puerto Rico, such as manufacturing, conference-tourism, resource management, and sustainable development.

## FUNDING

### CONTRIBUTIONS RECEIVED FROM JULY 1996 TO JUNE 1999

During the past three fiscal years, the Center has received support and collaboration from the academic, private and public sectors, adding up to \$878,746.69. These contributions have allowed CoHemis to staff and operate its office, serve the Consortium and conduct activities, events, and projects in Puerto Rico, Latin America, the Caribbean and the United States.

### Contributions received during this period



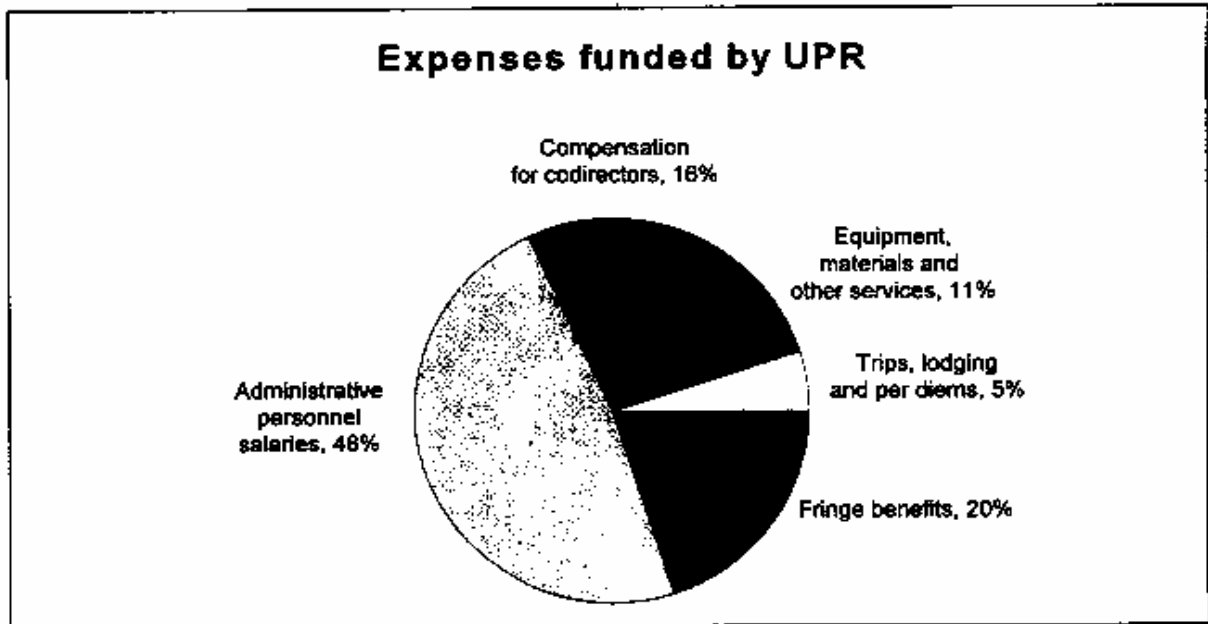
### CATEGORIES AND TOTAL CONTRIBUTIONS RECEIVED

#### UPR funds granted to the Center: \$300,000.00

The Office of the President of the University of Puerto Rico grants CoHemis \$100,000 per year. A high percentage of these funds have been used to cover administrative expenditures such as administrative personnel salaries, compensations for co-directors and their respective fringe benefits.

**UPR in-kind funds: \$124,403.05**

In fiscal year 1998, the Office of the President of the University of Puerto Rico granted funds to CoHemis for the purchase of a personal computer Pentium 200, a laptop, a color printer, a data display, an overhead projector and to install an optic fiber LAN. Every year, UPR-Mayagüez Campus grants academic release time to CoHemis' Director and has provided the office space and utilities.

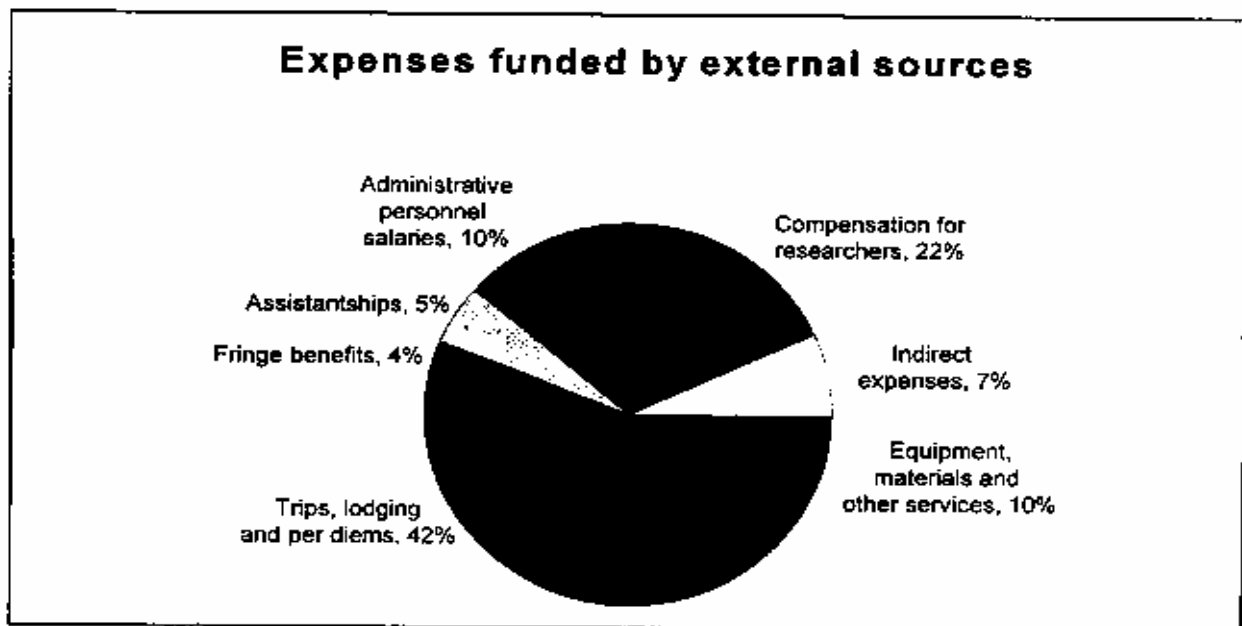


**External funds granted to the Center: \$386,842.31**

These funds are destined for specific projects as established in the proposals. Some of the entities with whom CoHemis has had projects are: National Science Foundation (NSF), Environmental Protection Agency (EPA), Caterpillar Corporation, Sandia National Laboratories (SNL), CETEM from Brazil, UPR Sea Grant College Program, and ICEE-Brazil among others.

**External in-kind funds: \$67,501.33**

These are estimated contributions made by organizations that participated in the Center's activities. These contributions can be classified in two: travel sponsorships for the Center's co-directors and UPRM professors; and participation in CoHemis events, donating time and covering their own travel expenses. Some of the contributors are: Sandia National Laboratories (SNL), Argonne National Laboratories (ANL), Tropical Center for Earth and Space Studies (TCESS), CETEM-Brazil, Caterpillar Corporation, IGAC-Colombia, IATAFI, USIA-USIS from Bolivia, Federal Reserve Bank of New York, IAI-Brazil, INPE-Brazil, Armed Forces Institute of Pathology (AFIP), and U.S. Geological Survey.



### LEARNING FACTORY WORKSHOP



*Learning Factory Workshop at the University of Guadalajara, México, on April 1 to 3, 1998. The workshop, developed by the NSF-sponsored Manufacturing Engineering Education Partnership (MEEP), was presented by: from left to right Dr. Jens Jorgensen, University of Washington, Dr. José L. Zayas, UPRM, Dr. Jorge I. Vélez-Arocho, CoHemis co-director, Dr. Miguel Torres, also from UPRM, first holding the CoHemis emblem and Prof. Lueny Morell, (holding emblem).*

## SUMMARY OF ACHIEVEMENTS JULY 1996 – JUNE 1999

### PUBLICATIONS

- *CoHemis... update*: Our newsletter began as an update on conference preparations, that later became a biannual publication after the creation of the Center. Produced in English and Spanish *CoHemis... al día* keeps about 1,000 key persons and institutions in the Americas informed on the activities of the Center. "CoHemis... update" relays information on opportunities for collaborative research and on relevant UPRM events and discusses current issues.
- INTERNET homepages: The Center keeps a homepage with information on CoHemis' activities, newsletter, upcoming events, and links with Consortium institutions, etc. The Center has created and keeps homepages for Values in Ethics and Vital Issues Process projects. <http://www.ece.uprm.edu/cohemis/>, <http://www.ece.uprm.edu/cohemis/etica/>, <http://www.ece.uprm.edu/cohemis/vip/>.
- Pumarada, Luis; Vélez, Jorge; Silva, Walter (eds.). *CoHemis June 1994-June 1996 Report and Strategic Outlook: Facilitating Collaborations for Competitiveness and Sustainable Development in the Western Hemisphere*. UPRM, 1996.
- Macari, E. and Azevedo, R. "Projeto de revestimentos impermeáveis para aterros sanitarios" in *Saneamiento Ambiental*, July/August, 1997, pp. 35-39.
- Gilbes, Fernando and Vélez-Arocho, Jorge. *Proceedings of the Conference/Workshop on the Caribbean Countries and the Inter-American Institute for Global Change Research (IAI)*, UPRM, 1997. The papers, deliberations and conclusions which resulted from the conference/workshop held in Mayagüez, Puerto Rico.
- Pumarada, Luis. The Intergovernmental Meeting of Hemispheric Environment Technical Experts 11/95-Some of the Projects and Priority Issues in *Environmental Quality, Innovative Technologies, and Sustainable Development: A NAFTA Perspective*, edited by Macari and Saunders, ASCE, 1997.
- Silva, Walter (ed). *Proceedings of the CoHemis-NSF International Workshop and Seminar on the State of the Art of the Repair and Rehabilitation of Reinforced Concrete Structures*, ASCE, 1997. A compilation of the papers, deliberations and conclusions which resulted from the conference/workshop held in Mayagüez, Puerto Rico.
- Vélez-Arocho, Jorge (ed.). *International Journal of Environmentally Conscious Design & Manufacturing*, ECM Press, Albuquerque, New Mexico: Volume 6, Number 4: 1998. Special issue on Latin American initiatives.



**CONFERENCES, WORKSHOPS, AND SEMINARS ORGANIZED IN PUERTO RICO**

- June 17, 18; July 15, 16, 1996     **Vital Issues Process Panels I-II** on Puerto Rico Water Management.  
Sponsor: Sandia National Laboratories
- October 2, 1996     Presentation: **"Opportunities in Latin America"** for UPRM professors.
- October 15-18, 1996     **Coordination of a visit by Dominican Congressmen**. A visit to meet their Puerto Rican counterparts and concerned agencies and firms associated with the topic of waste disposal facility operation and regulation.
- October 24, 25, 1996     **Vital Issues Process Panel III** on PR Water Management.  
Sponsor: Sandia National Laboratories. Site: San Juan, Puerto Rico.
- January 2, 1997     **Presentation at PACAM V Congress**: "The CoHemis Center of the University of Puerto Rico: A North-South Avenue for Knowledge Sharing".  
Site: San Juan, Puerto Rico.
- January 23, 1997     **"HACU Internships at Federal Agencies"**  
Site: UPRM.
- February 10-14, 1997     **National Conference on Weights and Measures** Sponsor: National Institute of Standards and Technology (NIST)  
Site: UPRM.
- February 18, 1997     Panel: **"The Role of Puerto Rico in Hemispheric Integration"**. 5th Anniversary of CoHemis with Dr. Norman Maldonado, UPR; Dr. Carlos Pesquera, PR-Department of Transportation and Public Works (PR-DTPW), and Dr. Néstor Ortiz, Sandia National Laboratories.  
Co-sponsor: Sandia National Laboratories. Site: UPRM.
- March 18-23, 1997     **Visit of Prof. Alfredo Abel** from INTEC (Dominican Republic) for training in hydraulic laboratory management.  
Site: UPRM.
- April 16-17, 1997     **Visit of Dr. Carlos da Costa** from CETEM to lecture and meet UPRM researchers. Co-sponsored by: CETEM, UPRM. Site: UPRM.

- April 17, 1997                    **Conference: "The Use of Biotechnology for the Removal of Heavy Metals.** Co-sponsored by: CETEM (Brazil), UPRM. Site: UPRM.
- April 17, 19, 22, 23, 1997      **Series of conferences: "Incubating Technology-based Enterprises",** by Dr. Juan Villalvazo. Co-sponsor: University of Guadalajara, México. Sites: UPRM, UPR-Río Piedras, PUC-Ponce.
- June 12, 1997                    **Visit of Dr. Adalberto Noyola, UNAM, and FEMISCA (México),** to meet UPRM researchers.
- July 9-11, 1997                    **Conference-Workshop on Caribbean Countries and the Inter-American Institute for Global Change Research.** Site: Mayagüez, Puerto Rico. Sponsors: IAI and NSF.
- November 20-21, 1997              **Patent Law Seminar.** Site: UPRM. Sponsors: Office of the President UPR, Office of the Chancellor UPRM, College of Business Administration UPRM, Patent and Trademark Depository Library Program, Rohm & Monsanto, Michigan Transtech Corporation.
- March 11-12, 1998                **Visit of Dr. Dan Bndny from Purdue University** to coordinate the conference **Frontiers in Education 1999.** Site: San Juan.
- April 14, 1998                    **Conference: "Entrepreneurial Development in the University Career, the Experience of EARTH College at Costa Rica"** by Dr. Héctor Medrano Vaquero. Site: UPRM. Sponsored by: EARTH College, Costa Rica and UPRM.
- April 15, 1998                    **Collaboration in organizing a visit by a delegation from the University of Rutgers.** Site: UPR-Central Administration. (Visit to UPRM on May 7, 1998)
- April 20-24, 1998                **Visit of Dr. Luis Gonzaga Sobral from the Center of Mineral Technology (CETEM) of Rio de Janeiro.** Site: UPRM. Sponsored by: CETEM and UPRM.
- April 28, 1998                    **Conference by the Federal Reserve Bank of New York: "Programs for High School Teachers",** by Lloyd Bromberg. Site: UPRM.
- April 28-29, 1998                **Conference by the Federal Reserve Bank of New York: "Series of Lectures on Current Economic and Financial Issues",** by Dr. Steven Malin. Site: UPRM.

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- April 29, 1998                      **Meeting of the PR Intergovernmental Committee for Climate Change Action Plan.**
- May 7, 1998                        **Participation in meetings with a Rutgers University delegation to discuss and explore closer collaboration and hemispheric initiatives. Site: UPRM.**
- June 3, 1998                        **Conference: "Abastecimiento de Agua y Saneamiento en la República de Cuba" by Lic. Joaquín Gutiérrez Díaz. Site: UPRM**
- August 26-27, 1998                **Seminar on: "Trace Elements: Environmental Impacts and Development of Diseases". Site: Cardiovascular Center, Río Piedras, Puerto Rico. Sponsors: Sea Grant College Program of the University of Puerto Rico and the Armed Forces Institute of Pathology (AFIP). Co-sponsors: Puerto Rico Medical Association, American Registry of Pathology, the US Geological Survey (USGS) and the University of Puerto Rico at Mayagüez.**
- August 28, 1998                    **Conference: "Human Health Impacts of Geologic Materials: A New Role for Physical Scientists" by Dr. Robert B. Finkelman. Site: UPRM. Sponsor: US Geological Survey**
- September 11, 1998                **Vital Issues Panel I: *Comprehensive Integrated Management Plan for the Mayagüez Bay Watershed.* Site: UPRM. Participants: government agencies, industry, academia and ONGs for example: USEPA, Eli Lilly Industries, Inc., Junta de Calidad Ambiental, Mayagüezanos por la Salud y el Ambiente, UPR Sea Grant Program, COMPASS. Sponsor: EPA.**
- November 12-13, 1998              **Conference: "Intelligent Systems Center" by Dr. Vittal S. Rao, University of Missouri-Rolla. Site: UPRM. Sponsor: University of Missouri-Rolla.**
- November 24, 1998                **Conference: "Flexible Doctoral Program" by Dr. Bopaya Bidanda, from the University of Pittsburgh. Site: UPRM. Sponsor: University of Pittsburgh**
- December 9, 1998                 **Vital Issues Panel II: *Comprehensive Integrated Management Plan for the Mayagüez Bay Watershed.* Site: UPRM. Participants: government, industry and academia, for example: USEPA, PRASA, Department of Natural and Environmental Resources, UPR Sea Grant**

Program, EARTH Costa Rica, Caribe General Electric, USDA-NTCS, EPA, Mayagüez Municipality, U.S. Fish & Wildlife Service, COMPASS. Sponsor: EPA

December 14-19, 1998

**Workshop-retreat: Interdisciplinary Research and Training Program in Ethics for Business, Science and Engineering in the Puerto Rican Context.**

Site: Copamarina Hotel, Guánica.

Advisors: Dr. Vivian Weil from Illinois Institute of Technology; Dr. Michael Rabins from Texas A&M, and Dr. Michael S. Pritchard from the Center for the Study of Ethics in Society. Participants: 21 professors from Engineering, Sciences, Business Administration and Humanities from UPRM, three persons from industry and Dr. Lilliam Gayá, Dean of Science and Technology from the Interamerican University. Sponsor: NSF.

February 4, 1999

**Follow-up meeting on the Ethics Workshop.**

Site: UPRM. Sponsor: NSF (Ethics Workshop).

February 17-18, 1999

Conference: **"Research Opportunities at the University of Kentucky"** by Dr. Eric Grulke, delegate of the University of Kentucky. Site: UPRM. Sponsors: University of Kentucky, the Office of the President of the University of Puerto Rico.

February 23-27, 1999

**GIS SPRING Seminar-Workshop for Caribbean Islands**, conducted by Prof. Marisa Da Motta, from INPE, and Dr. Eduardo Banus, from IAI (Interamerican Institute on Global Change Research) in Brazil. Site: UPRM. Sponsors: IAI, Instituto de Pesquisas Espaciais (INPE) – Brazil, UPR Sea Grant Program.

February 26, 1999

**Workshop: The Incorporation of Ethics in Business Administration Courses.** Site: UPRM. Sponsor: NSF (Ethics workshop).

March 3, 1999

**Vital Issues Panel III: Comprehensive Integrated Management Plan for the Mayagüez Bay Watershed.**

Site: UPRM. Participants: government agencies, industry, academia: EPA, Eli Lilly Industries, Inc., Environmental Quality Board, UPR Sea Grant Program, COMPASS and NGOs like: Mayagüezanos por la Salud y el Ambiente. Sponsor: US EPA.

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- March 24-27, 1999      **Dr. Deborah Johnson from Georgia Tech visits UPRM** as an advisor for the workshops on Engineering Ethics, and to advocate an interdisciplinary course on ethics on computer use. Sponsors: Dean of Engineering and departments of Mathematics and Humanities.
- March 25, 1999      Conference: **"Computer Ethics"** by Dr. Deborah Johnson, Georgia Tech. Site: UPRM. Sponsors: Dean of Engineering and departments of Mathematics and Humanities.
- March 26, 1999      Workshop: **The Incorporation of Ethics in Engineering Courses.** Site: UPRM. Sponsor: NSF (Ethics workshop).
- April 23, 1999      **Vital Issues Final Panel: *Comprehensive Integrated Management Plan for the Mayagüez Bay Watershed.*** Site: UPRM. Sponsor: US EPA.
- April 30, 1999      Workshop: **The Incorporation of Ethic in Arts, Science and Agriculture Courses.** Site: UPRM. Sponsor: NSF (Ethics workshop).

**OVERSEAS ACTIVITIES**

**SHORT COURSES**

***Caterpillar-CoHemis Second Course Series in Latin America:  
Landfill Waste Disposal Technology and Operations***

- August 5-6, 1996      Site: Guadalajara, México (UAG)
- August 8-9, 1996      Site: Lima, Perú (CONCYTEC)
- August 12-13, 1996      Site: Santafé de Bogotá, Colombia (UNIANDES)
- August 22-24, 1996      Site, Santo Domingo, Dominican Republic (INTEC)

Main speakers: Emir Macari (Georgia Tech) or Roque Román (UPRM); Javier Ruiz (BFI-Puerto Rico). This course series was attended by about 330 participants from industry, government, academia and environmental organizations. It received excellent press coverage in Perú and the Dominican Republic, and also in Guadalajara.

***Course on Environmental Impact Evaluation***

June 19-21, 1997                      CoHemis and Santo Domingo's Instituto Tecnológico (INTEC), offered a very successful three-day course. Eighty-five persons registered for the course (85), including government officials, private consultants, INTEC professors, and students.  
Instructors: Dr. Jorge Rivera Santos, and Dr. Walter F. Silva.  
Site: Santo Domingo, Dominican Republic.

***Caterpillar-CoHemis Third Short Course Series in Latin America:  
Landfill Waste Disposal Technology and Operations***

April 1-6, 1997                      Site: São Paulo, Brazil (USP)  
July 10-11, 1997                      Site: Lima, Perú (CONCYTEC)  
July 14-16, 1997                      Site: Bogotá, Colombia (UNIANDES)  
July 17-18, 1997                      Site: México City, México (FEMISCA)  
August 7-8, 1997                      Site: Asunción, Paraguay  
August 11-12, 1997                      Site: La Paz, Bolivia (CONICYT)

Main speakers: Emir Macari (Georgia Tech) or Roque Román (UPRM); Mark P. Lowrey or Willie Johnston (both from BFI). This course series was attended by about 400 participants and received good press coverage by newspapers and TV media, specialty in Brazil, Bolivia, and Paraguay.

***Seminar-Workshop on Applications of Remote Sensing to Coastal Management***

July 24-25, 1997                      Short course offered by UPRM researcher Dr. Fernando Gilbes.  
Site: Bogotá, Colombia  
Sponsor: Instituto Geográfico Agustín Codazzi (IGAC), Colombia

**INTERNATIONAL CONFERENCES**

***International events organized with the collaboration and/or sponsoring of the CoHemis Center/UPRM:***

April 28 – May 1, 1997                      International Seminar, Workshop and Exhibition *The State-of-the-Art of the Repair and Rehabilitation of Reinforced Concrete Structures*  
Site: Maracaibo, Venezuela  
Sponsors: NSF, CYTED  
Organizer: University of Zulia

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- December 3-5, 1997      ***Elementos Trazas y Metales Tóxicos: Impacto en la Calidad del Ambiente y Desarrollo de Enfermedades***  
Site: UNAM, México  
Sponsor and organizer: FEMISCA
- April 2-3, 1998      ***Workshop on Manufacturing Engineering Education Partnership (MEEP)***  
Site: Guadalajara, México  
Sponsors: University of Guadalajara (organizer), Office of the Vice-president of the UPR
- August 15-21, 1998      ***International Conference on Engineering Education (ICEE '98)***  
Site: Rio de Janeiro, Brazil  
Participants: Dr. Jorge I. Vélez-Arocho, CoHemis Co-director, and Prof. Lueny Morell from UPRM.  
Sponsor: NSF and ICEE Organizing Committee.  
Organizer: Pontificia Universidade Católica da Rio de Janeiro. CoHemis participated in the organization of this activity. Dr. Jorge I. Vélez-Arocho delivered a keynote lecture about CoHemis and with Prof. Lueny Morell conducted a workshop about the Learning Factory and the MEEP Experience.
- September 1-4, 1998      ***International Symposium and Exhibition on Energy and the Environment***  
Site: University of the West Indies (UWI), Trinidad & Tobago.  
Organizer: UWI
- January 11-13, 1999      ***APETT's (Association of Professional Engineers of Trinidad and Tobago) 12<sup>th</sup> Annual Technical Conference: 2nd Latin American and the Caribbean Forum on Engineering and Technology Education***  
Site: University of the West Indies, St. Augustine, Trinidad & Tobago. Organizer: UWI
- February 1999      CoHemis Consortium collaborates with the ***International Conference on Engineering and Computer Education (ICECE)***.

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

- August 12-16, 1996      ***XXIV Convention of the Union of Pan-American Engineering Associations (UPADI)***.  
Site: San José, Costa Rica.

- September 1-6, 1996      ***Second Inter-American Dialogue on Water Management***  
Site: Buenos Aires, Argentina.  
Sponsor: Sandia National Laboratories  
Dr. Jorge I. Vélez-Arocho made a presentation on Vital Issues Process (VIP).
- September 22-26, 1996      ***IV Interamerican Congress on Engineering and Technology Education (INTERTECH '96)***  
Site: Valencia, Venezuela
- November 12-16, 1996      ***III Interamerican Congress on Environment***  
Site: San José, Costa Rica  
Sponsor: Sandia National Laboratories  
Dr. Jorge I. Vélez presented "Structuring a Water Resources Management System Using the Vital Issues Process".
- December 11-13, 1996      ***Expert Group Meeting on Technology Forecasting and Foresight Activities in Latin America***  
Site: Santa Cruz de la Sierra, Bolivia  
Sponsors: Sandia National Laboratories, Argonne National Laboratories
- March 18-21, 1997      ***Workshop on the Establishment of an Interamerican Center for Atmospheric Radar***  
Site: Piura, Perú.  
Sponsor: NSF, IAI, University of Piura, TCESS/UPRM
- July 14-16, 1997      ***First Meeting of the Network of Graduate Studies and Research in Engineering in Latin America and the Caribbean (INGENIE-Red).*** Site: Santiago, Chile
- October 27-30, 1997      ***Workshop on the Zero Emissions Concept and Technology Assessment for Sustainable Development in a Global World***  
Site: Buzios, Brazil.  
Sponsor: Argonne National Laboratories and IATAFI  
Dr. Luis Pumarada delivered the paper "A Latin American Initiative for a Regional Technology Foresight Project."
- February 17-18, 1998      ***Meeting of the Core Group for IAI Initiatives in the Caribbean Region***  
Site: Santo Domingo, Dominican Republic  
Sponsor: NSF-IAI Co-sponsoring institutions: UPRM, INTEC, Université Quisqueya (Haiti), University of the West Indies (Trinidad & Tobago), St. Maarten.



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- February 22-25, 1998      **Participation in the *NASA University Research Centers Technical Conference '98***  
Site: Huntsville, Alabama  
Sponsored by: Tropical Center for Earth and Space Studies (TCESS), UPRM
- March 24-30, 1998      ***International Workshop on National Assessment Results of Climate Change***  
Site: San José, Costa Rica. Sponsor: NSF  
Dr. Jorge I. Vélez-Arocho presented a paper.
- May 28-30, 1998      ***University and Business Technology Summit Survey***  
Site: Dominican Republic.  
Sponsor: INTEC  
Dr. Jorge I. Vélez-Arocho made a presentation about the possible role of faculty from the University of Puerto Rico at Mayagüez in the development of a plan to transfer technology.
- June 25 to July 2, 1998      **Participation in the *Annual Conference of the American Society for Engineering Education (ASEE)***  
Site: Seattle, Washington  
Participants: Dr. Jorge I. Vélez-Arocho, CoHemis Co-director. Sponsor: NSF
- November 4-7, 1998      ***Frontiers in Education 1998***  
Site: Tempe, Arizona, USA.
- April 28-30, 1999      ***Vital Issues Panel for the Management of the Basin of the Parícutina River in Costa Rica.***  
Site: EARTH College, Costa Rica.  
Participants: Dr. Jorge I. Vélez-Arocho, Co-director of CoHemis; Dr. Walter Silva, from General Engineering Department and Dr. Jorge Rivera-Santos, from the Civil Engineering Department and Director of the Puerto Rico Water Resources and Environmental Research Institute, plus participants from Costa Rican government agencies, private sector, and academia among others.  
Sponsors: EARTH College, Sandia National Laboratories and the Puerto Rico Institute of Water Resources and Environment Research.
- May 19-21, 1999      ***Vital Issues Process Panel on a Michigan Water Project.***  
Site: Michigan State University, United States.  
Sponsors: Michigan State University, Sandia National Laboratories, and EARTH College.

***Papers Presented by CoHemis at International Events:***

**Author:** Dr. Jorge I. Vélez-Arocho

**Title:** *"Vital Issues Process: An Effective Strategic Planning Tool to Integrate Stakeholders Spectrum of Objectives"*

**Conference:** Second Inter-American Dialogue on Water Management

**Date:** September 1-6, 1996

**Site:** Buenos Aires, Argentina

**Author:** Dr. Jorge I. Vélez-Arocho, Dr. Néstor Ortiz and Dr. Dennis Engi.

**Title:** *"Structuring a Water Resources Management System Using the Vital Issues Process"*.

**Conference:** Third Interamerican Congress on Environment

**Date:** November 12-16, 1996

**Site:** San José, Costa Rica

**Author:** Dr. Luis F. Pumarada O'Neill

**Title:** *"A Latin American Initiative for a Regional Technology Foresight Project"*

**Conference:** Workshop on the Zero Emissions Concept and Technology Assessment for Global Sustainable Development.

**Date:** October 27-30, 1997

**Site:** Buzios, Brazil

**Author:** Prof. Lucy Morell and Dr. Jorge I. Vélez-Arocho

**Title:** *"The Learning Factory: Implementing ABET 2000 Criteria"*

**Conference:** International Conference on Engineering Education (ICEE '98)

**Date:** August 15-21, 1998

**Site:** Rio de Janeiro, Brazil

**Author:** Dr. Jorge I. Vélez-Arocho and Dr. Fernando Gilbes

**Title:** *"Global Change Research in the Caribbean"*

**Conference:** International Workshop on National Assessment Results of Climate Change

**Date:** March 24-30, 1998

**Site:** San José, Costa Rica

**Author:** Dr. Jorge I. Vélez-Arocho

**Title:** Presentation *"Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science"*

**Conference:** University and Business Technology Summit Survey

**Date:** May 28-30, 1998

**Site:** Dominican Republic

**UPRM FACULTY VISITS TO LATIN AMERICA**

- June 8-19, 1997                      Dr. Arturo Massol (UPRM) visited *CETEM-CNPq*, as a collaborative research initiative. Site: Rio de Janeiro, Brazil
- June 15-28, 1997                    Dr. Ivonne Santiago (UPRM) visited *CETEM-CNPq*, as a collaborative initiative. Site: Rio de Janeiro, Brazil.  
Sponsors: Department of Agronomy, CRCI, Engineering College, Biology Department, UPRM.
- July 6-13, 1997                      Dr. John B. Thomlinson (UPR-Rio Piedras) visited the University of Guadalajara for lectures and joint research. Sponsors: UPR-Central Administration, University of Guadalajara. Site: Guadalajara, México.

**MEETINGS**

- August 5-6, 1996  
Guadalajara, México                      Dr. Luis F. Pumarada, CoHemis Director met in the Universidad de Guadalajara with: Ms. Adriana Ayala Rubio, Coordinator of Academic Cooperation; Dr. Juan Villalvazo, Director of the Department of Engineering Projects; and Dr. Rafael Guzmán Mejía, Executive Director of the Center for Environmental Engineering and the Manantlán Project.
- At CONACYT-Guadalajara, he met with Juan Manuel Lemus, Western Region Delegate for CONACYT-México.
- At Universidad Autónoma de Guadalajara, he met with Rodolfo Casillas-Vargas, Research Director; Miguel Angel Parra-Mena, Director of the Civil Engineering School; José Luis Arreguín-Romero, Director of International Programs; and Mauricio Alcocer, Director of the School of Natural, Plant and Animal Sciences.
- August 8-9, 1996  
Lima, Perú                                      Dr. Luis F. Pumarada visited CONCYTEC. There he met with Eng. Pedro Villena-Hidalgo, CONCYTEC's Executive Director and other officials. They held a press conference upon CONCYTEC joining the CoHemis Consortium.
- At Pontificia Universidad Católica (PUC) de Perú he met with Nicole Bernex de Falen, Director of the Environmental Studies Institute and her assistant Rocio Gordillo.

*July 1996 – June 1999*

At the Instituto Geofísico del Perú he met Dr. Louis Goodman, Director, and Hernán Montes, Technical Director.

August 12-13, 1996  
Bogotá, Colombia

Dr. Luis F. Pumarada visited the Instituto Geográfico Agustín Codazzi. There he met with General Director, Santiago Borrero-Mutis; Hugo Villota, Chief of the Center for Remote Sensing Research, and researcher Uriel Pérez.

At the Universidad de los Andes (UNIANDES) he met with CoHemis link Dr. Juan Saldarriaga and with Dr. Eugenio Giraldo.

August 12-16, 1996  
San José, Costa Rica.

Dr. Walter F. Silva, CoHemis' Associate Co-director met with Eng. Enrique Melara, member of the Board of Directors of the Salvadorian Association of Engineers; Eng. Edgar Venegas Ledo, Vice-Dean of Engineering of the Technical University of Oruro, Bolivia; and Ernesto Ng Jordan, from Panama's Universidad Santa María la Antigua.

August 22-24, 1996  
Santo Domingo, D. R.

At INTEC, Dr. Luis F. Pumarada met with CoHemis link Eng. Daniel Comarazamy, Director of the Civil Engineering Area; and Eng. Claudio Adams, Director of the Electromechanical Engineering Area.

He also met with Deputy Torty Rutinel, who was interested in visiting Puerto Rico's waste disposal landfills and speaking with government officials.

September 22-26, 1996  
Valencia, Venezuela

Dr. Walter F. Silva, CoHemis' Associate Co-director, met with Eng. Asdrúval Romero, Chancellor of the University of Carabobo; and Prof. Marino Martínez-Miniño.

November 12-16, 1996  
San José, Costa Rica

Dr. Jorge I. Vélez-Arocho met with Eng. Marco Antonio González, Vice-minister of Environment and Energy.

December 9-10, 1996  
La Paz, Bolivia

Drs. Pumarada and Vélez met with Bolivian and American government officials and with directors of three important environmental institutions.

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January 26-28, 1997  
Miami, Florida, U.S.A.

Dr. Pumarada met with executives of Beta Corporation (Evaristo Bonano), Sandia National Laboratories and the University of Florida to discuss future projects.

June 18-20, 1997  
Santo Domingo, D.R.

Dr. Jorge I. Vélez-Arocho presented to various government agencies the Vital Issues Process (VIP). He met with the executives of INTEC, the Instituto Nacional de Recursos Hidráulicos (INDRHI), the Instituto Nacional de Agua Potable (INAPA), the Corporación Dominicana de Electricidad (CDE), and the Corporación de Acueductos y Alcantarillados de Santo Domingo (CAASD).

July 10-11, 1997  
Lima, Perú

Dr. Luis F. Pumarada met with Eng. Jorge Villena-Chávez, General Director of the Division of the Environmental Health of the Health Ministry of Perú.

In the U.S. Embassy, Office of Rural Development of the Agency for the International Development (AID) he met with Harry E. Wing to discuss future collaborations.

At the Consejo Nacional de Ciencia y Tecnología (CONCYTEC) he met with its President, Dr. Juan Barreda-Delgado. Dr. Barreda designated Dr. Victorio García-Villareal as CoHemis' link.

March 20-21, 1997  
Piura, Perú

Dr. Luis Pumarada met with Dr. Antonio Mabres, Chancellor of the University of Piura, to discuss the CoHemis Consortium.

July 14-16, 1997  
Bogotá, Colombia

Dr. Luis F. Pumarada met in the US Embassy, AID, with Mr. Ernesto Barriga, its environmental counselor.

At the Instituto Geográfico Agustín Codazzi (IGAC), he met with Uriel Pérez and Hugo Villota.

At Colciencias, Dr. Pumarada met with Dr. Mercedes Rodríguez de Serrano, Director of International Cooperation; her assistant Ms. María Victoria Mejía; Beatriz Alzate from the Amazon Project; and Rafael Armendis from the Biotechnology Program.

July 17-18, 1997  
México, D. F.

Dr. Luis F. Pumarada met with Eng. G. Gustavo Rosiles-Castro, Director of the Solid Waste Direction of the Social Development Secretary; Gustavo Solorzano-Ochoa, Vicepresident of Solid Waste, and Dr. Adalberto Noyola, President, both from FEMISCA.

October 14, 1997  
La Paz, Bolivia

Dr. Luis F. Pumarada met with the president of the Bolivian Senate committee in charge of environment. He also met with Dr. Renzo Abruzzese, Vice Minister of Education and President of CONACYT, about joining the CoHemis Consortium.

October 27-30, 1997  
Buzios, Brazil

Dr. Luis F. Pumarada visited the Technology Assessment Unit of the National Oil Company Petrobras, located at their impressive Research and Development Center in Rio de Janeiro, and met its director.

June 25 to July 2, 1998  
Seattle, Washington

Dr. Jorge I. Vélez-Arocho participated in a meeting organized by Dr. Jens Jorgensen and Dr. Joseph Heim at the University of Washington to discuss the creation of an Electronic Forum in Manufacturing Engineering.

December 4, 1998

Meeting about a future joint project: EARTH University (Costa Rica) - CoHemis/UPRM-Michigan State University: "Living Watersheds Research".  
Site: Amigos de EARTH, Atlanta, Georgia.  
Sponsor: Sandia National Laboratories, CoHemis/UPRM

#### **OTHER ACTIVITIES AND ACHIEVEMENTS**

July 1<sup>st</sup>, 1998 to  
February 28, 1999

**The Cost and Market Study for a Solar Air Conditioner in Puerto Rico: A model for the Caribbean**  
Prof. Carmen Vanessa Santiago, Mrs. Moraima de Hoyos.  
Sponsor: National Renewable Energy Laboratory, USDOE.

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July, 1998 to  
June 1, 1999

**The project to develop a Comprehensive Integrated Plan  
for the Mayagüez Bay Watershed**

Co-investigators: Dr. Jorge Rivera-Santos, Director of the Institute  
of Water Resources and Environment Research of Puerto Rico, and  
Dr. Jorge I. Vélez-Arocho, CoHemis Co-director.

Sponsor: Environmental Protection Agency (EPA).

This project will be used as a model for the EARTH Project  
Costa Rica-CoHemis-Michigan State University.

February 17-18, 1999  
San José, Costa Rica

Dr. Jorge I. Vélez-Arocho traveled to Costa Rica to train the  
persons who would participate in the panels of Vital Issues  
Process (VIP) in Costa Rica in April, 1999.

Site: EARTH University, Costa Rica. Sponsors: EARTH,  
Sandia National Laboratories, Michigan State University.

## SHORT TERM PLANS

- Summer internship for a postgraduate student from the Biology Department of UTRM in CETEM, Brazil.

### VISIT OF A CONGRESSIONAL COMMISSION FROM THE DOMINICAN REPUBLIC TO THE PUERTO RICO SOLID WASTE MANAGEMENT AUTHORITY ON OCTOBER 15, 1996

- Proposal on Climate Studies



Meeting with Eng. Damaris Delgado, who has since become the Executive Director of the PR Solid Waste Management Authority, and former director, Eng. Danny Pagán, who is now Puerto Rico's Secretary of Natural Resources. Left of Ms. Delgado is Hon. Eng. Tony Rutinel, President of the Commission. To the right is Mr. Ken Oliver, Puerto Rico's Assistant Secretary of State. This visit, coordinated by CoHemis with the help of the Puerto Rico Department of State occurred as a consequence of the CoHemis-Caterpillar Short Course on Landfill Waste Disposal Technology at INTEC University, Dominican Republic, a few months before. The need revealed during the course for more effective laws regarding this matter prompted Rutinel to propose this visit, which featured meetings with municipality representatives and legislators.

Site: San Juan, Puerto Rico

Sponsors: American Registry of Pathology (ARPA), Armed Forces Institute of Pathology (AFIP), Institut International de Recherche sur les Ions Métalliques (IIRIM-Reims, France), University of Puerto Rico at Mayagüez (UPRM), U.S. Environmental Protection Agency (USEPA), U.S. Geological Survey (USGS), National Cancer Institute (NCI), National Institute of Environmental Health Sciences (NIEHS), Ana G. Méndez University System of Puerto Rico (AGMUS), Conseil Régional de Champagne-Ardenne (CRCA-Reims, France)

Co-sponsors: Federation of European Societies on Trace Elements and Minerals (FBSTEM), Center for Hemispherical Cooperation on Science and Engineering (CoHemis).



## SHORT TERM PLANS

- Summer internship for a postgraduate student from the Biology Department of UPRM in CETEM, Brazil.
- Prepare a joint presentation between UPRM and CETEM (Brazil) on remediation of soil contaminated with mercury during 1999.
- Proposal on Climate Studies in the Caribbean  
Principal Investigators: Dr. Jorge González, Dr. Nazario Ramírez, Dr. Ramón Vázquez and Dr. Amos Winter. CoHemis would disseminate announcements and the results of the project, and to organize workshops and conferences. The proposal was submitted to NSF for \$250,000.
- July 11-14, 1999  
Dr. Luis F. Pumarada and Dr. Jorge I. Vélez-Arocho will visit Guatemala to make new contacts for the Consortium.
- July 14-21, 1999  
Dr. Jorge I. Vélez-Arocho and Dr. Jorge Rivera Santos will visit Costa Rica to participate in the Vital Issues Panel for the Management of the Basin of the Parismina River. Then, they will travel to El Salvador looking for new opportunities for CoHemis.
- November 10-13, 1999  
Conference: "Frontiers in Education 1999"  
Site: San Juan, Puerto Rico  
Sponsors: American Society on Engineering Education, Methods on Educational Research Division, Electrical and Electronic Institute of Engineering, Education Society and Computer Society.  
Co-sponsors: University of Puerto Rico-Mayagüez Campus, Purdue University, Interamerican University, Turabo University, Pontifical Catholic University, Polytechnic University of Puerto Rico.
- May 7-10, 2000  
"6<sup>th</sup> International Symposium on Metal Ions in Biology and Medicine"  
Site: San Juan, Puerto Rico  
Sponsors: American Registry of Pathology (ARP), Armed Forces Institute of Pathology (AFIP), Institut International de Recherche sur les Ions Metalliques (IIRIM-Reims, France), University of Puerto Rico at Mayagüez (UPRM), U.S. Environmental Protection Agency (USEPA), U.S. Geological Survey (USGS), National Cancer Institute (NCI), National Institute of Environmental Health Sciences (NIEHS), Ana G. Méndez University System of Puerto Rico (AGMUS), Conseil Régional de Champagne Ardenne (CRCA-Reims, France)  
Co-sponsors: Federation of European Societies on Trace Elements and Minerals (FESTEM), Center for Hemispherical Cooperation on Science and Engineering (CoHemis),

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UPRM, Ponce School of Medicine-Puerto Rico (PSM-PR), Société pour le Développement des Recherches sur le Magnésium (SPDRM), International Association of Geochemistry and Cosmochemistry (IAGC), International Institute of Anticancer Research (IIAR)

- June 1 –July 30, 2000  
Collaborate with the UPR Sea Grant Program in the *Technical Assistance and Technology Transfer* Project in Honduras. A first field visit was held on April 1999.
- October 23-27, 2000  
NAFSA-Region VII Conference. NAFSA is an educators international association, of which the University of Puerto Rico is an associate member.  
Site: San Juan, Puerto Rico  
Coordinator: Department of State of Puerto Rico, with the collaboration of CoHemis.

## STRATEGIC OUTLOOK

mission of CoHemis is to promote human resources development programs, technology transfer, and joint applied research with potential benefits for more than one country in the Western Hemisphere to serve the needs of the Americas with the participation of engineering and science researchers and graduate students from different countries of the hemisphere.

### ZERO EMISSIONS WORKSHOP – BRAZIL



*Zero Emissions Workshop on October 26 to 31, 1997, at Buzios, Brazil. This workshop was organized by Brazil's CETEM and the International Association of Technology Assessment and Forecasting Institutions (IATAFI), of which CoHemis' Director, Dr. Luis F. Pumarada, is a member of the Executive Committee. This Committee met on a free afternoon during the workshop. At the extreme right is Dr. Roberto C. Villas Boas, Director of CETEM.*

2. Demand for short courses in science and engineering conducted preferably in Spanish is growing in Latin America. This demand will increase as economic integration advances and international licenses for practicing engineering are required. CoHemis has access to the resources needed to satisfy this demand and the Consortium members who may organize the courses in the different countries.
3. The Puerto Rican science and technology community has broad experience in environmental fields: measurements, assessments, environmental impact studies, regulations, modeling, and mitigation technologies, all within a tropical, Caribbean and Latin context. The UPRM faculty creates an opportunity to successfully collaborate with Latin American countries who are not as experienced in studying, assessing and regulating contamination and find themselves compelled to set and comply with effective control levels.

## **STRATEGIC OUTLOOK**

The mission of CoHemis is to promote human resources development programs, technology assessment, and joint applied research with potential benefits for more than one country in the Western Hemisphere to serve the needs of the Americas with the participation of engineering and science researchers and graduate students from different countries of the hemisphere.

Puerto Rico's science and engineering community has many years of experience in dealing with the United States' strong environmental laws and regulations within cultural, ecological, and socioeconomic settings, which are similar to most of Central America, South America and the Caribbean. This knowledge, best developed within the UPRM, Puerto Rico's main applied science campus, makes the CoHemis Center ideal for providing environmental training and technology assessment services for Latin America and the Caribbean. The University of Puerto Rico in Mayagüez has strong programs, equipment and expertise in areas, which expand beyond environmental areas, such as remote sensing, marine sciences, microbiology, chemistry and environmental engineering.

There is a growing strategic opportunity for networking with universities in our hemisphere in the area of engineering and science education. The vast experience of UPR in the successful development of alliances with institutions in the US such as NSF, NASA and the Department of Education to improve K-12, undergraduate and graduate education provides an excellent opportunity for sharing experiences and strategies.

CoHemis has identified the following strategic opportunities for UPRM:

1. Many Puerto Rico and US entities interested in science and technology look forward to entering the Latin American and Caribbean markets, and are seeking contacts to facilitate their entry. CoHemis has the knowledge and contacts they need, either at or through the Consortium institutions. CoHemis can facilitate the entry of small and medium technology-based firms into joint ventures with Latin American firms through Latin American university research or incubator parks.
2. Demand for short courses in science and engineering conducted preferably in Spanish is growing in Latin America. This demand will increase as economic integration advances and international licenses for practicing engineering are required. CoHemis has access to the resources needed to satisfy this demand and the Consortium members who may organize the courses in the different countries.
3. The Puerto Rican science and technology community has broad experience in environmental fields: measurements, assessments, environmental impact studies, regulations, modeling, and mitigation technologies, all within a tropical, Caribbean and Latin context. The UPRM faculty creates an opportunity to successfully collaborate with Latin American countries who are not as experienced in studying, assessing and regulating contamination and find themselves compelled to set and comply with effective control levels.



4. The hemispheric initiative of the Summit of the Americas and their conference series on economic integration, environmental protection, and collaboration in science and technology provide a meeting ground for the development of the multinational research center recommended in the 1991 Conference. The initiative of the Summit of the Americas provides CoHemis, UPR, and Puerto Rico the opportunity of having a significant role as bridge between the Americas in the three fields mentioned above to the benefit of all parties concerned.
5. Many US and Canadian universities are interested in opportunities for immersion into Latin American culture and Spanish language that will allow their students and faculty to familiarize themselves with the way business is done in a Latin American context.

## **PROPOSED STRATEGIES**

To achieve its objectives, the Center's management has delineated the following strategies:

- Position CoHemis through strategic networking, personal contacts, and consistent follow-up communications to take full advantage of Puerto Rico and UPR capabilities to the benefit of Puerto Rico and of all participating countries.
- Develop and implement programs for exchanging faculty, graduate students and information, and for training and research.
- Identify areas in science and technology in which the faculty and facilities of collaborating institutions complement each other to make it feasible to conduct joint research and technology assessment projects.
- Seek financial support for such projects from diverse national and international sources.
- Increase and strengthen the bonds among universities, national science and technology organizations, and other education and research entities in Latin America, Puerto Rico and the US, mainly in those areas where problem solving requires multidisciplinary research and consulting in which Puerto Rico has comparative advantages. Some areas to be considered are: manufacturing, technology assessment, environmental impact studies, metrology and standardization, remote sensing, environmental science and technology, and marine sciences.
- Extend the CoHemis Consortium in order to reach all Latin American countries and additional collaboration-minded US universities.
- Propose more activities conducted in the Spanish language in Latin America within the Consortium framework. Select UPRM top-quality experts who are willing to collaborate and travel to Latin America. Identify Consortium resources from the US who are willing and able to offer courses conducted in Spanish in Latin America.

- Increase CoHemis' participation in the initiatives of the Summit of the Americas and within the general S&T relationships between US and Latin America. This would be accomplished highlighting CoHemis' experience as an effective vehicle for North-South collaboration, which will complement US resources, funds, and initiatives.
- Disseminate the benefits of making alliances with other countries in the hemisphere. Consolidate joint ventures. Identify organizations willing to develop initiatives in Latin America and propose to be their partners.
- Become a liaison between the UPRM/PR industry incubator and its counterparts in Latin America to stimulate and support international joint ventures.
- Develop proposals for immersion short courses on relevant aspects of Puerto Rico and Latin America for US and Canadian students. This could be matched with student and faculty exchanges. Increase the presence of CoHemis' initiatives in other University of Puerto Rico campuses.
- Improve CoHemis' relationships with US and Latin American government agencies. This can be achieved by mechanisms such as inviting observers to participate in our activities.
- Take advantage of CoHemis' potential for improving the quality and quantity of Latin American students who enter UPRM.
- Develop a network of Puerto Rican professionals living in the US with outstanding professional profiles or leaders in S&T areas who may be willing to collaborate with CoHemis' objectives.
- Encourage UPRM faculty to propose initiatives regarding these strategies with CoHemis' collaboration.