



CoHemis...update

Overcoming through cooperation

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University of Puerto Rico at Mayagüez (UPRM)

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INTERNATIONAL CONFERENCE ON ENGINEERING EDUCATION

The International Conference on Engineering Education (ICEE '98) was held in Rio de Janeiro on August 14-21, 1998. Dr. Luiz Scavarda do Carmo, Dean of the Center for Science & Technology of Pontificia Universidad Catolica do Rio de Janeiro (PUC-Rio), was the General Chair of this important international gathering. PUC-Rio is a member of the CoHemis Consortium.

CoHemis Co-director Dr. Jorge I. Vélez-Arocho and Professor Lueny Morell attended ICEE '98 on behalf of UPRM and were invited to participate in pre-conference and post-conference activities. They offered a pre-conference workshop, "ABET 2000 and the Learning Factory." Prof. Morell, in conjunction with Mr. Wayne Johnson and Mr. Juan Bujosa from Raytheon Corporation, and Luis Rodríguez, a UPRM student, presented the paper "A Decade of Part-

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JOINT PROJECT WITH COSTA RICA AND SANDIA NATIONAL LABORATORIES



EARTH
College's
main
administration
building in
Costa Rica.

The CoHemis Center will develop a joint project with Costa Rica's EARTH College, Sandia National Laboratories (SNL) and Michigan State University (MSU). Using SNL's Vital Issues Process (VIP) in Costa Rica, Puerto Rico and Michigan to identify consensus issues and priorities, a set of parallel proposals on watershed management and information systems for specific watersheds in the three countries will be developed and submitted.

Dr. Héctor Medrano, Admissions Director and Professor at EARTH College in

Costa Rica, visited UPRM on April 14, 1998 to discuss collaboration on this project. Dr. Medrano, a graduate of UPRM and the University of Florida, is a former Agricultural Economics professor from UPRM. Last November, CoHemis Co-director Dr. Velez-Arocho, Dr. Carlos Hernandez of EARTH, Dr. Scott Witler of MSU, and Dr. Theresa Brown of SNL met at EARTH's office in Atlanta, Georgia. They discussed the final details of the VIP sessions which Dr. Velez will chair in Costa Rica and the proposals which will follow.

EARTH and MSU will develop their projects around the experience of the

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Global Change Initiatives in Caribbean Continue Strong

Researchers of the effects of global climate change on the Caribbean region mobilized in 1998 and are hoping to make great strides in the coming year. The Steering Committee for Initiatives in the Caribbean Region, which is a subcommittee of the Interamerican Institute on Global Change Research (IAI), held its first meeting in February 1998 in the Dominican Republic. At the meeting, coordinated by CoHemis, members established a working plan for the future. A major outcome of the meeting was a decision to pursue a survey of Global Change Research in the Caribbean islands.

Following the February meeting, Dr. Fernando Gilbes from the UPRM Marine Sciences

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INSIDE:

CETEM (Brazi)-UPR join for research
Energy & Environment in Trinidad
Dominican Republic Exchange
Ethics Workshop
Toxic Metals in the Environment
Ecoefficient Products and Businesses
Graduate Study in Civil/ Ocean Eng.
New Consortium member

COLOMBIAN SCHOOL OF ENGINEERING JOINS CoHEMIS CONSORTIUM

A Memorandum of Understanding is being signed between the Escuela Colombiana de Ingeniería and the University of Puerto Rico at Mayaguez (UPRM) within the framework of the CoHemis Consortium. UPRM Acting Chancellor Dr. Fred Soltero-Harrington and the Chancellor of the Escuela Colombiana de Ingeniería, Eng. Eduardo Silva-Sánchez, have expressed their interest in making this a reality.

A main objective of the CoHemis Consortium is to enhance the technological capabilities of Latin America and the Caribbean and, hence, their social, economic and commercial development. The Consortium identifies areas in science and technology in which the faculty and facilities of the institutions complement one another to make it feasible to conduct joint research and technology assessment projects. Those projects are expected to produce results with potential benefits for more than one country in the Western Hemisphere.

The persons to contact to develop activities according to the clauses of this agreement are Dr. Javier Botero-Alvarez in Colombia and Dr. Luis F. Pumarada-O'Neill, in Puerto Rico.

Global Change...



Department and Dr. Jorge I. Vélez-Arocho, CoHemis Co-director, wrote a proposal to the National Science Foundation titled "A Better Understanding of Global Change in the Caribbean Region." The proposed project is divided into three independent but interrelated phases: first, the development of a survey of research to date on/or related to global change; second, the publication of a book on global change initiatives in the Caribbean; and third, the translation of that book from English into Spanish. A budget of \$58,189 is requested to carry out the project.

Brazil's CETEM - CNPq and the University of Puerto Rico Initiate Joint Research

Parallel research on remediation of contaminated soil was just one of the projects to come out of a four-day visit to Brazil's Center for Mineral Technology (CETEM) by Dr. Arturo Massol, Professor of Biology at the University of Puerto Rico, Mayaguez campus. In March, 1998, Dr. Massol, who specializes in bio-remediation of contaminated soils and often works in collaboration with engineering researchers, traveled to Rio de Janeiro, sponsored by the Brazil's National Research Center (CNPq), carries out applied research on mineral extraction, processing and related environmental issues in that scenic city.

Dr. Massol's visit was coordinated by the CoHemis Center and sponsored by UPRM's Sea Grant Program. It was the outcome of a previous visit to CETEM by UPRM Civil Engineering professor, Dr. Ivonne Santiago, as well as of a visit to UPRM a year ago by CETEM's former director, Dr. Roberto Villas Boas, and researcher Antonio da Costa. Those activities, also coordinated by CoHemis, were sponsored by CETEM and by UPRM's departments of Biology, Chemistry, Civil and Chemical Engineering, and the Dean of Engineering.

Dr. Massol and CETEM researchers identified three CETEM projects in which paral-

lel UPRM research could benefit both institutions and help in the remediation of contaminated sites in Puerto Rico and Brazil. Dr. Massol will be sending mercury-contaminated Puerto Rican soil to CETEM for parallel experiments. In addition, arrangements are being made for a UPRM biology graduate student to receive an internship in CETEM this Summer, and for a joint UPRM-CETEM paper to be delivered at a future conference on mercury remediation technologies.

Rio Conference ...

nership: A success story of the University of Puerto Rico at Mayagüez and Raytheon." Prof. Morell and Dr. Vélez-Arocho presented the paper "Curriculum Innovations Outcomes Assessment and ABET 2000."

Based on numerous inspiring post-conference workshops, several universities from Brasil proposed the creation of a Coalition of Brazilian Universities, similar to NSF-sponsored U.S. coalitions such as Succeed, Foundation and Excel, to collaborate on engineering education innovations. CoHemis congratulates PUC-Río, and especially Dr. Scavarda do Carmo, for organizing such an outstanding engineering conference.

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Trinidad & Tobago Symposium: “Energy and the Environment”

On September 1-4, 1998, the University of the West Indies (UWI) at Trinidad, a member of the CoHemis Consortium, held the international symposium “Energy and the Environment.” Faculty and professionals from Puerto Rico, United Kingdom, the United States, Guyana and other countries attended this event. The UWI, under the theme “Celebrating the past . . . charting the future,” celebrated this meeting as part of its 50th anniversary. This university was founded in Jamaica as a College of the University of London serving the British Caribbean. Today it has additional campuses in Barbados and Trinidad.

At the symposium’s opening ceremony, Dr. Guru Kochhar, Dean of Engineering, emphasized that, “the next challenge of the engineering profession will be understanding community needs and providing the necessary tools for the new society.” Mr. W. Dookeran, Governor of the Central Bank of Trinidad - Tobago expressed that “the challenge of shaping economic change is enormous and urgent.” The Hon. Finbar Gangar, Minister of Energy and Energy Industries, summarized the challenges facing governments as:



Hon. Finbar Gangar, Minister of Energy and Energy Industries of Trinidad and Tobago, opens the seminar’s exhibition area. To his right are Prof. Guru S. Kochhar, UWI Dean of Engineering, Department of Chemistry professor Winston A. Mellowes, and Prof. Winston Rajpaulsingh, manager of the UWI Institute of Engineering.

- promoting development that is environmentally sound, and
- developing national energy models within a proactive plan for environmental protection.

Dr. Jorge I. Vélez-Arocho, Co-director of CoHemis and professor of Business Administration at UPRM, presented the paper, “The Vital Issues Process, from Antago-

nism to Consensus.” The paper discussed the use of the VIP as an effective tool for public policy development in critical and controversial infrastructure areas.

UPRM faculty members Dr. Anand Sharma, Director of the General Engineering Department, and Dr. Alan Phillips, from Agricultural Engineering, attended the Symposium as well.

SUSTAINABLE DEVELOPMENT AND BIOTECHNOLOGY

Dr. Purushottam Khanna, Director of the National Environmental Engineering Research Institute of India, presented the paper Sustainable Development and Environmental Biotechnology: Prospectus and Case Studies during the Energy and Environmental International Symposium and Exhibition at the University of West Indies. The following is a summary of Dr. Khanna’s interesting thesis.

The sociocultural roots of our present environmental crisis lie in the paradigms of scientific materialism and economic determinism which fail to recognize the physical limits imposed on economic activity by ecological systems. Economies work within ecosystems which have limited regenerative capacities. Contrary to the neoclassical theory of continuous material growth, large-scale economic activities directly undermine the potential for economic development through over-exploitation of natural resources and compromise future production through the discharge pollution of residuals. The axiomatic belief that continuous economic quantitative growth is a major instrument of social well-

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HEAVY METAL BIOREMEDIATION

Environmental clean-up is not all expenses, it may produce some revenues. Environmentally-minded civil engineers at Trinidad’s University of the West Indies (UWI) and the Indian Institute of Technology (IIT) in Kharagpur, India, are searching for ways to remove heavy metal pollutants being discharged in wastewater and reconstitute them into valuable metals.

The use of microorganisms to help clean up our environment is the focus of a joint research effort being carried out by Dr. Ligy Philip (IIT) and Dr. C. Venkobachar (UWI). Their research is motivated by the increasing threat of heavy metals in the environment due to the discharge of industrial effluents. Removal as well as recovery of strategic and precious metals from wastewater is one of the most important current environmental and economic issues. Of the multitude of treatment options, alkaline precipitation, ion exchange, solvent extraction and reverse osmosis are the most common. But these methods are either ineffective in the presence of complexing agents or are extremely expensive. One of the recent developments in environmental biotechnology is the utilization of microorganisms in the management of hazardous wastes.

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RUTGERS DELEGATION VISITS UPRM

In another step in the long-time working relationship between the University of Puerto Rico (UPR) and Rutgers University (RU), a delegation from the New Jersey institution visited the Mayagüez Campus of the University of Puerto Rico last May. The visit was organized by the Central Administration of the University of Puerto Rico, with coordination assistance from CoHemis.

Among the members of the visiting group were Dr. Emmett A. Dennis, Dean of Rutgers University College and Professor at the Department of Cell Biology and Neuroscience; Mr. Clinton Crocker, of the Board of Trustees; Dr. Richard Merritt, Professor of Plant Sciences and Director of the Killog's Project; Dr. Robert Rosen, Professor and Associate Director of the Center for Advanced Food Technology; Dr. Edward Kirby, Chair of the Department of Biology; and Mr. Carlos T. Kearns, Director of the New Jersey Division of International Trade and Economic Development.

This delegation met with UPRM faculty and administrators to explore opportunities for collaboration in joint projects in the short and long term.

Bioremediation...

The research objective was to isolate different types of bacteria from soil contaminated with effluents from electroplating, and to assess the potential of those bacteria for removing a variety of heavy metals from aqueous phases. From among an array of bacterial isolates, a strain identified as *Bacillus polymaxa* exhibited excellent uptake capacity for copper and cadmium. *Pseudomonas aeruginosa*, a pure culture obtained from IMTECH, Chandigarh, India, provided maximum uranium uptake.

Immobilizing the bacteria on a suitable solid matrix circumvented the difficult separation of metal-laden microbes from a liquid phase. Activated alumina (AA) was found to be the most promising among the nine commonly available matrices screened. Continuous flow studies using *Bacillus polymaxa* immobilized on AA yielded up to 80% enhancement in copper removal efficiency compared to a control column.

Puerto Rico will host "Frontiers in Education 1999"

Plans for FIE 1999 have already begun! On March 11-12, 1998, Dr. Dan Budny of Purdue University, chair of next year's Frontiers in Education (FIE) Conference, visited the Puerto Rico local organizing committee to begin coordinating details for the November 1999 events. This important international event, to be held for the first time in Puerto Rico, will bring together educators from all over the world to discuss—and create—trends in engineering and science education. CoHemis has been invited to coordinate local arrangements and social activities for this meeting.

Alert your undergraduate students! Dr. Budny has proposed organizing a Graduate Studies Fair as part of FIE '99. One hundred science students from private and public universities in Puerto Rico will be invited to attend sessions of FIE '99. Participants will have the opportunity to meet with representatives of U.S. graduate schools to explore possibilities for beginning graduate studies in the year 2000. For more information, look in the Internet page: [http:// fairway.ecn.purdue.edu/~fie/fie99/Index.html](http://fairway.ecn.purdue.edu/~fie/fie99/Index.html).

Biotechnology..

being is thus quite paradoxical.

The emergence and acceptance of the concept of sustainable development in recent years has brought to the forefront the general realization that societal perceptions must shift towards ecological determinism so that we may achieve qualitative growth within the limits of our ecosystems' carrying capacity. A carrying capacity-based planning process, innovative technologies for enhanced material and energy efficiency in production and consumption processes, structural economic change towards less resource-intensive socioeconomic sectors, and preventive environmental management through ecologically-benign policies are some of the strategies for reconciling developmental goals with ecological capabilities.

The challenges that we will have to meet before the year 2030 are:

U&BT SUMMIT AT DOMINICAN REPUBLIC

Dr. Jorge I. Vélez-Arocho, Co-director of the CoHemis Center, attended the University and Business Technology Summit Survey held in the Dominican Republic on May 28-30, 1998. The event was sponsored by the Dominican Republic's Presidential Commission for Modernization and State Reform, the National Office for Promotion of Foreign Investment, and the Dominican Institute of Industrial Technology (INDOTEC). Dr. 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.

The purpose of the meeting was to facilitate an exchange between the Americas of research and development information regarding existing and new technologies. The summit addressed important technology requirements related to the Dominican Republic's need to modernize and enhance its infrastructure. At a roundtable, local leaders from industry, academia, and government discussed with U.S. government policy leaders about technological advances in the areas of energy, environment, building materials, agriculture, textiles, and information technologies. The long-range goal of the summit was to help build a stronger economy for the Dominican Republic through the modernization of its infrastructure.

- implementing solar technology
- developing efficient systems
- developing policy and technology geared to "nothing to waste"
- feeding eight billion people
- developing a healthy respect for our forests
- achieving economic progress within a sustainable framework
- establishing a new set of values

Toxic Metals Hidden in Everyday Life Examined in Two-Day Course

Common sense tells us that motor oil, pesticides and other chemical products can be hazardous to our health if used or disposed of incorrectly. But it is still a chilling surprise how the toxic metals and trace elements contained in these and other products that we use and discard every day make their way into our water supplies, agricultural products, aquatic life, and livestock.

Attending a special two-day course last August, health and environmental sciences professionals updated their knowledge of the dangers of trace elements and toxic metals, such as arsenic, lead, mercury, cadmium and others, that are present in our everyday environment. The course, entitled "Trace Elements and Toxic Metals: Impact on the Quality of the Environment and the Development of Illness," was held at the Medical Sciences Campus of the University of Puerto Rico, and was sponsored by the UPR Sea Grant Program, the Armed Forces Institute of Pathology (AFIP), and CoHemis. Additional sponsors included the Medical Association of Puerto Rico, the American Registry of Pathology, the U.S. Geological Survey, and the University of Puerto Rico, Mayaguez Campus.

Designed to increase awareness and understanding of often-hidden health risks that may accompany the production, use and disposal of metal-containing products ranging from batteries to fertilizer, the course left no stone unturned. Its 14 topics identified man-made and natural sources of dangerous metals in our environment, examined their pathological effects on living tissue, discussed methods for recognizing the presence of toxicity, and stressed the urgent need for developing scientifically sound environmental regulations to minimize toxic-level exposure and for ensuring environmentally proper production, use and disposal of metals.

Conferences were presented by Dr. José Centeno, Senior Researcher of the Armed Forces Institute of Pathology, Dr. Florabel Mullick, Director of the AFIP's Center of Advanced Pathology, and Dr. Robert Finkelman, Coal Quality Coordinator at the U.S. Geological Survey. Diagnosing over-exposure, understanding trace element distribution and ingestion, particularly in environments containing coal-fired electric utility power plants, and recognizing the spe-



From left to right, holding plaques: Dr. Florabel Mullick, Dr. Robert Finkelman, and Dr. José Centeno. To their left is CoHemis' Coordinator Luz Vega.

cial vulnerability of children to metal poisoning were among the wide range of topics covered.

The course, which offered 10 hours of

"Human Health Impact of Geological Materials"

Dr. Robert B. Finkelman, research chemist with the U.S. Geological Survey in Reston, Virginia, visited the University of Puerto Rico's Mayagüez Campus last August. A speaker at the CoHemis-sponsored trace elements seminar held in San Juan, Dr. Finkelman traveled to the island's west coast to make a presentation at UPRM.

The subject of his talk, "Human Health Impact of Geological Materials," is a new and challenging topic being addressed by today's physical scientists. For more information on this subject, you may contact Dr. Robert B. Finkelman at (703) 648-6412, fax (703) 648-6419 or e-mail rbf@usgs.gov.

continuing education credit, was praised by the attendees and its sponsors and generated enthusiasm for future presentations of this highly relevant and accessible course to more physicians, nurses, government officials, educators and others in Puerto Rico and other countries which may be willing to host it in our hemisphere. Last year CoHemis arranged for a similar presentation in Zacatecas, Mexico within a meeting of the Mexican Federation of Sanitary and Environmental Engineers (FEMISCA). Any institution in Latin America or the Caribbean interested in hosting and organizing such a seminar, in Spanish or English, by the aforementioned experts may contact the CoHemis Center.

Cuban Hydrology

"Water Supply and Drainage" was the topic of discussion at a June, 1998, seminar by Joaquín Gutiérrez-Díaz during a visit to UPRM coordinated by CoHemis. He is Associate Director of Cuba's Center for Hydrological Studies of Basins and Waterways. The seminar, sponsored by the Puerto Rico Water Resources Research Institute and the University of Puerto Rico, was well received by its attendees, who included members of the Puerto Rico Environment Board and the Aqueduct and Sewer Authority of Puerto Rico.

LATIN AMERICAN STUDENTS AT UPRM: Cooperative Grant Program Puts Outstanding Haitian Student on the Road to Master's Degree

In every issue, *CoHemis...update* includes an interview with one of the hundreds of Latin American graduate students in engineering or sciences at UPRM.

Myrtho Pierre is a Haitian graduate student currently working on her Master's degree in Horticulture at UPRM. Along with four of her fellow countrymen, Myrtho is studying under a cooperation agreement among the Agriculture Department of the State University of Haiti (UEH), the Haitian Ministry of Agriculture, and UPRM the Office of International Programs.

According to the terms of the agreement, Haiti pays for the tuition two students and the University of Puerto Rico (UPR) pays for a third. The agreement, which is to continue until the year 2001, benefits up to three new Haitian graduate students each year. Joint activities with Haiti have been a priority of the Office of the President of UPR for several years.

After receiving her Bachelor's degree in Vegetable Production from UEH, Myrtho worked for six years with the Haitian Ministry of Agriculture in remote areas of her country. "I very much enjoyed my environment-related work at the Ministry and the interesting places I worked, in the forest and mountain regions of the Island," expressed Myrtho in a Spanish colored by the French accent and idioms of her homeland.

Myrtho's work in the remote Haitian areas of Fort des Pins and Pic Macaya involved helping community and feminist organizations to use investment capital for achieving their long-term goals of creating small businesses that are stable and profitable. The environmental goal of this project is to improve the economy of the region, thus reducing the destructive raiding of the Haiti's wooded areas. Today, poverty and a lack of alternatives force the inhabitants of those areas to cut down trees both to sell the wood and to use it themselves, further reducing the already shrinking Haitian forests and causing dire consequences to plant and animal life, increasing sedimentation in the rivers and worsening soil erosion.

Myrtho's work experience and her outstanding undergraduate academic record won her a grant for graduate studies at the university, and in the country, of her choice. "I chose UPRM because it gave me the opportunity to learn both English and Spanish, and



to attend a solid, demanding university," she explained.

"All the Spanish I know I've learned here. It was difficult at the beginning—for the first month I hardly understood anything the professors said, since we [the Haitian students] were not given any Spanish instruction prior to the beginning of classes. But that's all behind me and now I'm doing well in my classes. On Saturdays I take an Intensive English class."

Although she is still taking graduate courses, Myrtho has begun working on her thesis, entitled, "Dispersion and Control of Pythium Ultimum Fungus in Geranium Plants Cultivated in a Closed System." Under the direction of Dr. Maria del Carmen Librán, a specialist in floriculture and ornamental plants, Myrtho has completed a literature review and is currently isolating the Pythium Ultimum fungus in the laboratory. Later, in one of the University's greenhouses, she will carry out experiments for controlling the fungus in geraniums, comparing physical, chemical and biological techniques. Although there are some advantages to cultivating ornamental plants in closed systems or greenhouses, such plants can, nonetheless, be plagued by fungi such as Pythium Ultimum. Her work will seek to control them by means of low cost techniques that cause little or no damage to the

environment and yield economic benefits.

Once she has concluded her degree, Myrtho plans to return to work in her country. "I would have liked to have done my graduate studies in Haiti, but they are not yet offered there. I would like to do a doctorate later on, but my family situation will make it very difficult," she told us.

In order to study in Puerto Rico, Myrtho had to separate herself from her husband, who is an agronomist working in Haiti, and from her five-year-old son, who is being cared for by her retired parents. After completing her degree, Myrtho is required by the terms of her grant to teach for two years on the Agronomy School of UEH, following which she will decide whether to remain in the tropical warmth of Haiti's capital city of Port-au-Prince or return to work in the pleasant coolness of the Haitian mountains.

Myrtho confided to us both what she has liked and disliked about her stay at UPRM. She spoke of the support and friendship of her Haitian classmates; of the natural beauty of Puerto Rico, which is both similar to and different from her native land; of the friends she has made on this island; and of the guidance of her thesis director. On the negative side, she mentioned a lack of flexibility and support in the Program and the problems that the grantees have had due to the higher cost of living in Puerto Rico.

A PROPOSAL ON THE DEVELOPMENT OF ECOEFFICIENT BUSINESSES AND PRODUCTS

As a response to Puerto Rico's population growth and the spread of a garbage-intensive lifestyle which are placing a high level of stress on the island's limited natural resources and environmental carrying capacity, UPRM researchers have written a proposal entitled "The Development of Ecoefficient Businesses and Products in an Island Economy". The co-investigators of the proposal are Dr. Iván Baigés, from the Mechanical Engineering Department, and Dr. Jorge I. Vélez-Arocho, from the School Business Administration. The proposal was submitted to the US National Science Foundation with a budget of \$99,392.

It has been widely recognized that most large scale human activity has a serious impact on the environment. With that in mind, the 1992 Rio de Janeiro Summit on the Environment defined the now strongly supported concept of sustainable development as "all industrial progress that meets the needs of the present without compromising the ability of future generations to meet their own needs."

"Ecoefficiency," a fundamental concept of the above proposal and a pillar of sustainable development, characterizes a product, process or service that simultaneously meets cost, quality and performance goals while minimizing adverse environmental impacts and maximizing the conservation of valuable resources. The development of ecoefficient products, processes and services is essential for the creation of a sustainable society, where the needs of present and future generations are equally respected and satisfied

This proposal addresses the technical, managerial and policy issues related to the creation of ecoefficient products and processes in an island economy. Its immediate primary goal is to identify industries that can be created to provide economic growth while at same time improving waste disposal systems.

The objectives of this proposal are to: explore "end of life" management issues related to consumer products and their manufacturing; formulate strategies for the cre-

ation of businesses in the end of life management industry; develop technical tools for assessing the ecoefficiency of existing products and processes; develop technical tools for creating ecoefficient products and processes; formulate business decision criteria for the evaluation and creation of ecoefficient industries; and create a decision analysis framework for the creation of an ecoefficient economy.

To fulfill the project's goals and objectives, the researchers proposed to develop two academic courses to teach: "design for the environment", the development of ecoefficient products and processes, and exploring methods for evaluating the environmental impacts created by the disposal of refrigerators. The course will include projects involving the development of guidelines for the design of ecoefficient refrigerators.

Federal Reserve Bank of New York Sponsors Course in Economics

A series of visits to Puerto Rico by Dr. Steven Malin, Assistant Vice President in Public Information and Mr. Lloyd Bromberg, Director of Educational Programs, of the Federal Reserve Bank of New York (FRBNY), have produced an exciting new educational program. Called "Puerto Rico's Economic Education Program", it seeks to promote education in economics in the island. It includes teacher training sessions, ten student lessons, and a final competition among the selected participating schools.

The Federal Reserve Bank of New York is sponsoring this \$30,000 pilot project to teach economics to approximately 1,200 students in 40 in Puerto Rican high schools. Forty teachers from public and private high schools are currently being trained at the Sacred Heart University in San Juan, the University of Puerto Rico at Mayaguez, and Ponce's Catholic University.

Graduate Study Opportunities in Civil and Coastal and Oceanographic Engineering

The departments of Civil Engineering and Coastal and Oceanographic Engineering of the University of Florida (UF), located in Gainesville, Florida, are currently seeking new graduate students, with a strong interest in receiving applications from Latin America and Puerto Rico.

UF has strong Master's and Ph.D. programs in: Structural Engineering; Transportation; Water Resources/Hydraulics/Hydrology; Construction Engineering/Engineering Management; Geotechnical Engineering; Public Works; Civil Engineering Materials; Geomatics (Surveying and Mapping with GPS, GIS, Airborne Laser Swath Mapping, and such); Coastal Engineering; Off-shore Structures; Ocean Engineering; and GeoHydroEnvironmental combined programs. There are graduate assistantships available for highly qualified students.

There is internet information available at: www.ce.ufl.edu, and www.coastal.ufl.edu. Interested applicants should contact Dr. Kirk Hatfield for Civil Engineering (khatf@ce.ufl.edu), Dr. Ashish Mehta for Coastal/Oceanographic Engineering (mhoit@ce.ufl.edu), or, for both, UF's CoHemis Coordinator Dr. Paul Thompson (pyt@ce.ufl.edu), who chairs both departments.

CoHemis, part of the program from its inception as one of FRBNY's initial contacts in Puerto Rico, is proud to have been involved in the development of this idea, which will benefit many Puerto Rican students. "It's very gratifying to see this idea become a reality. This initiative is important for Puerto Rico and has potential for replication in other countries," commented CoHemis Coordinator, Luz Leyda Vega-Rosado

For more information about this project, please contact FRBNY's Coordinator in Puerto Rico, Prof. Rafael Luis Llompart at the Sacred Heart University at (787) 727-6144.

THE THIN LINE BETWEEN RIGHT AND WRONG: A WORKSHOP ON ETHICS FOR ENGINEERING, SCIENCE AND BUSINESS

Where there is business, science or engineering, there are questions of ethics. While practitioners know that all too well, students of these areas should be exposed to the ethical complexities that arise when theory clashes with the real world. A workshop on bringing issues of ethics into the University of Puerto Rico, Mayaguez Campus (UPRM) classroom's was organized through the collaborative efforts of the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (CoHemis) and UPRM's Center for Philosophy in its Interdisciplinary Function (CEPHIF). Business, science, and engineering faculty from the University participated in the workshop, entitled "Ethics for Engineering, Science, and Business," which was held as a retreat on December 14-19, 1998, at a hidden beach hotel in Puerto Rico.

The goals of the workshop were to: 1) integrate ethics into business, science and engineering (BSE) curricula, 2) integrate BSE content into ethics and value studies (EVS) courses, and 3) relate EVS/BSE teaching at UPRM firmly with Puerto Rican cultural, economic, and political contexts. Some workshop sessions were designed to help BSE/EVS faculty select and prepare case studies, while others were meant to familiarize BSE faculty with the ethical approaches and issues specific to BSE practice in Puerto Rico. The practical perspective of the issues was contributed by industry participants Paul Davis, Victor Tossas, and Ida Calero. A series of pre-retreat activities were developed to provide the foundation for a successful retreat. The 22 faculty participants are preparing a case workbook and a series of workshops as part of the proposed post-retreat activities.

The National Science Foundation approved a \$75,000 grant for the development and implementation of this important educational activity. Researchers in charge in the initiative are Doctors William Frey, Elena Lugo, and Héctor Huyke from the UPRM Humanities Department, and CoHemis Co-director Dr. Jorge I. Vélez-Arocho.

Doctors Vivian Weil, from the Illinois Institute of Technology, Michael J. Rabins, from Texas A&M University, and Michael S. Pritchard, from the Center for the Study of Ethics in Society, chaired workshop sessions and assisted the UPRM team in developing its activities. Among the workshop participants was Dr. Lilliam Gayá, Dean of Science and Technology of the Metropolitan Campus of Interamerican University



Participants in the Workshop at the hotel grounds

Electronic Forum in Manufacturing Engineering

CoHemis' Co-director, Dr. Jorge I. Vélez-Arocho, participated in a meeting organized by Dr. Jens Jorgensen and Dr. Joseph Heim of the University of Washington to discuss the creation of an Electronic Forum in Manufacturing Engineering. There is an intention to create a node in this forum through which Spanish speaking countries may participate. The University of Guadalajara and the Mexican Network of Manufacturing Engineering are very interested in this opportunity.

Dr. Vélez also attended the American Society for Engineering Education's (ASEE) Annual Conference and Exposition in Seattle, Washington on June 25 to July 2, 1998.

UPRM professor delivers two keynote lectures in South American events

Dr. Luis Godoy, from the UPRM Department of Civil Engineering, presented a keynote lecture in the International Structural Damage Conference held in Rio de Janeiro, Brazil on May 20, 1998. His keynote speech was: "Numerical Techniques to Model Damages in Structures". In the International Shape Sensitivity Analysis Seminar, held in Petropolis, Brazil one month later, Dr. Godoy presented the paper entitled "Sensitivity Analysis for Problems in Elastic Stability".

In July, 1998, Dr. Godoy delivered another keynote address, this time in the World Congress of Computational Mechanics, held at Buenos Aires, Argentina. His keynote work was entitled "Singular Perturbation /Finite Element Analysis in Sensitivity of Eigen Problems". In addition, he presented the paper "Design Sensitivity of Post-buckling States Including Materials Behavior", co-authored by graduate student Leonel Almánzar. This work will appear as a chapter in the coming book: "Computational Mechanics: New Trends and Applications".

MANAGEMENT PLAN FOR THE MAYAGUEZ BAY WATERSHED

Last July, the US Environmental Protection Agency approved a proposal by the Puerto Rico Water Resources Research Institute (PRWRI) and CoHemis to develop a Comprehensive Integrated Management Plan for the Mayaguez Bay Watershed. The co-investigators for this project are Dr. Jorge Rivera-Santos, PRWRI Director, and Dr. Jorge I. Vélez-Arocho, CoHemis Co-director.

The purpose of this project is to develop a comprehensive, integrated method for managing the watershed that allows the restoration, conservation, and protection of the quality and quantity of that natural resource, and establishes a balance between the use of the system and its ecological integrity.

To accomplish its goals, the project is divided into two phases. The first phase entails reviewing existing information on the pollution of the Bay. The second phase seeks to bring about integration and communication among the "stakeholders" in the Mayaguez Bay Watershed.

To implement the second phase, the authors of the proposal are employing the Vital Issues Process (VIP) developed by Sandia National Laboratories. The VIP consists of three day-long panels held over a period of five months. Each panel is led by a facilitator whose function is to channel discussions through certain prescribed stages, a morning qualitative session (consisting of an open, round table discussion) and an afternoon, quantitative session (consisting of comparing, ranking and prioritizing the results of the morning discussion using a "net benefit maximization method"). The panel participants are stakeholders with different perspectives on the problem.

The Watershed project's first VIP panel was held at the University of Puerto Rico, Mayaguez Campus, on September 11, 1998. In that panel, the stakeholders crafted the following two-part objective statement:

"The research program of the Integrated Management Plan for the Hydrographic Watershed of the Mayaguez Bay seeks to create a system that will include: (1) the



The participants of the second VIP panel on the Mayagüez Bay Watershed included UPRM faculty experts, Federal and Puerto Rican agency officials, and local interest groups. The photo shows the panel participants, the CoHemis support staff, and, on the extreme left, EARTH College's Carlos Hernandez who travelled from Costa Rica to be an observer.

collection of technical, scientific, historical and community-relevant information, (2) a process of analysis, (3) an information transfer system that will fully support this plan."

"The research program will provide information over the conditions under which the Hydrographic Watershed of the Bay exists and will recommend strategies to restore, conserve, and protect it. The research program will support the objectives and goals of the Integrated Management Plan."

Another result of the first panel was the development of criteria that will be used to evaluate the proposals that researchers will submit later on for studying different aspects of the Mayaguez Bay and seeking solutions to its problems. These criteria are:

- Responsiveness to announcement
- Cost-effectiveness
- Importance
- Time frame
- Likelihood of success
- Applicability
- Competence of the researchers

The second panel, held on December 9, 1998, continued the discussion among the watershed's stakeholders to identify and rank the vital issues for the research program using the criteria developed in the first panel.

Earth College...

similar EPA-sponsored project for the Río Grande de Añasco Watershed in Puerto Rico. This project, begun in July, 1998, is managed by Dr. Jorge Rivera-Santos, Director of the Institute for Water Resources Research of Puerto Rico and Professor of Civil Engineering at UPRM. Its VIP sessions are being organized by CoHemis and chaired by Dr. Velez-Arocho. Dr. Rivera-Santos and his UPRM colleague Dr. Walter Silva will be participating in the Costa Rica panels.

The basin to be studied in Costa Rica is the Parismina River. This project would complement a study of the contiguous Río San Juan Basin which has been conducted jointly by Nicaragua and Costa Rica's Ministry of Energy and Environment.

EARTH is an international institution devoted to agricultural sciences and the management of natural resources in the wet tropical region. It provides its undergraduate students with hands-on education by professors from around the world. UPR's connection with EARTH College goes back to the planning and development of this unique institution, in which Dr. Salvador Alemañy, Vice President of the UPR Board of Trustees, participated extensively.

For more information about EARTH College, please write to PO Box 4442-1000, San José, Costa Rica; call (506) 255-2000, or visit their home page at <http://www.earth.ac.cr>.

Sandia's Dr. Nestor Ortiz

CoHemis friend retires



One of CoHemis' most dedicated and effective supporters is retiring. Dr. Néstor Ortiz, Director of Sandia National Laboratories' Nuclear Energy Technology Center and 1994 recipient of a Hispanic Engineer National Achievement Award, will officially leave Sandia on February 26, 1999. However, he will continue to participate in that institution's University Program.

Néstor is known to many CoHemis friends through the Americas because of his participation in and support of many CoHemis activities, ranging from energy and environment to ethics and technology assessment. A dedicated believer in hemispheric solidarity and collaboration, he made Sandia one of the CoHemis Consortium's first and most active members.

Sandia has major R&D responsibilities in energy, environmental technologies, weapon development, and economic competitiveness. Nestor's main work at Sandia has been on the safety of nuclear reactors. He has headed the team directing Sandia National Laboratory's activities in nuclear energy, including major programs in commercial nuclear power, space nuclear safety, safety of nonreactor nuclear facilities, and risk and safety assessment of complex systems. His programs have a total staff of 112 to 135 professionals with postgraduate de-

Coming Environmental Events

The International Symposium "High Altitude and Sensitive Ecological Environmental Geotechnology" will be held at Nanjing University, Nanjing, China on August 24 to 27, 1999. Collaborating with the event in the Americas are the Cold Regions Research & Engineering Laboratory, from the United States and the Universidade Federal de Minas Gerais, from Brazil. English has been designated as the official symposium language. Interested authors are invited to submit, no later than February 15, 1999, an abstract of a maximum of 400 words in length to one of the symposium secretaries: Eleonor Nothelfer, telephone 1-610-758-6405 and e-mail esn0@lehigh.edu; and Mr. Baojun Wang, telephone 86-25-3596220 and e-mail shibin@public1.ptt.js.cn. They can provide additional information on the event.

The "International Symposium on Environmental Issues and Waste Management in Energy and Mineral Production" will be held in Calgary, Canada, May 30 to June 2, 2000. The official organ of this conference is the *Journal of Surface Mining, Reclamation and Environment*. To obtain more information, contact: Dr. Raj K. Singhai at telephone (403)239-3849 or e-mail singhai@agt.net.

The "Fifth International Symposium on Environmental Geotechnology and Global Sustainable Development" will be held at Belo Horizonte, Minas Gerais, Brazil on August 17-21, 2000. It will be hosted by the Escola de Engenharia da Universidade Federal de Minas Gerais. Authors should

submit abstracts to the Symposium Organizing Secretary by e-mail (cassia@etg.ufmg.br) or by fax 55 31 2381793.

grees. His team's study of probabilistic risk assessment has had its results and methodology used around the world. He and his staff have participated in several international nuclear safety efforts. Much due to his efforts, *Science Watch* magazine rated Sandia as number one among all national laboratories and universities during 1990-95 based on the usefulness of the research performed in the nuclear engineering field.

Dr. Ortiz has a B.S. in Electrical Engineering and an M.S. in Nuclear Engineering from the University of Puerto Rico at Mayagüez. He received a Ph.D. in Nuclear Engineering in 1972 from the Massachusetts Institute of Technology.

submit abstracts to the Symposium Organizing Secretary by e-mail (cassia@etg.ufmg.br) or by fax 55 31 2381793.

Cuban Workshop on Mining and Environment

The Center for Environmental Studies of the Instituto Superior Minero Metalúrgico of Moa, Cuba announces the International Workshop PROTAMBI '99 to be held at Moa, Holguín, Cuba on June 2-5, 1999. It will cover the following topics: rehabilitation of environments degraded by mining activity, sanitary engineering and treatment of residuals, extractive metallurgy and clean technologies, monitoring and control of air, water and soil contamination, conservation and rational use of water resources, alternative energy sources and sustainable development, flora and fauna on metal-bearing soils, biodiversity and conservation, environmental studies and health, land use planning and landscaping, environmental law, geological risk and natural disasters, environmental education.

Registration fees will be US\$80 (US\$40 for students). Summaries of up to 250 words of presentations, posters and round tables may be submitted until April 20. Selected works will be published.

For additional information, please contact Eng. Josefa Mestre-Lamoru at "jmestre@ismm.edu.cu" or telephone (53 24) 6 6234, or Dr. Allan Pierra-Conde at "apierra@ismm.edu.cu" or through (53 24) 6 6678 or 6 6546.

Néstor has long been active in developing programs that increase the participation of minority students in science and engineering, developing alliances among private industry, universities and national laboratories. He has collaborated with universities in the United States with large Hispanic student bodies and with Puerto Rican universities.

CoHemis thanks Dr. Néstor Ortiz for his leadership and collaboration on behalf of all the Puerto Rican, Latin American and Caribbean institutions, educators, researchers and students who have benefited from the many activities to which he contributed. We truly feel honored by his friendship.

CoHEMIS HAS NEW STAFF MEMBERS

The CoHemis Center welcomes two new staff members, Coordinator Blanca N. Colón and Secretary Karen Rodríguez. They will be serving UPRM and the hemispheric science and technology community together with the center's codirectors, secretary Arlene Astacio, and its part-time students. Miss Colón, with a Bachelor's degree in Accounting from UPRM, will succeed Miss Luz L. Vega. Mrs. Rodríguez has a BA in Office Administration.

We bid a sad farewell to Luz L. Vega and Anna I. Alvarez and wish them well in their promising new jobs. They have indeed set a high standard to follow, but we trust that our bright new staff members will do as well.

A MESSAGE FOR CoHEMIS' FRIENDS, FROM LUZ LEYDA VEGA-ROSADO

After seven years of hard work in the CoHemis Center, another challenge comes to my hands! Starting on January, 1999 I will be the Coordinator of the External Resources Office of the Research and Development Center of the University of Puerto Rico at Mayagüez. At this point in my professional career, I have accepted a challenging position from where I can serve the University of Puerto Rico and my friends from different countries of our hemisphere.

I began to work in CoHemis when I was an undergraduate student and the Center was just starting. I sincerely appreciate the fruitful help that many of you contributed in order to do my job more effectively and efficiently. I gratefully treasure in my mind many warm, pleasant moments that we shared in conferences, seminars, workshops, and over the phone, working together for the improvement and development of our people. I have also matured as a professional and learned a lot during these years... THANKS TO ALL OF YOU!

I do not mean to say Good bye! I hope to hear from you in my new office through (787) 832-4040, extension 2408. You can also contact me by e-mail at L_vega@rumac.uprm.edu.

CoHemis Coordinator Receives Recognition

Luz Leyda Vega-Rosado, CoHemis Coordinator and Teacher of Office Administration courses at the University of Puerto Rico at Mayagüez, was named an Outstanding Young Woman by the Puerto Rico Youth Commission. This honor is based on the candidate's academic record, professional development, and community involvement. An award ceremony was held on May 14, 1998, at the Superior Education Council in San Juan, Puerto Rico.

CoHemis is very proud of Miss Vega's achievements and congratulates her upon this award. All those who have participated in CoHemis activities have witnessed Luz Leyda's efficiency and warmth and will surely agree with the Commission's choice.



Short News

UPR in Guadalajara

Last November's Guadalajara International Book Fair, Latin America's most important book fair, was dedicated to Puerto Rico. This annual event is organized by one of two CoHemis Consortium members in Mexico, the University of Guadalajara. Puerto Rico's cultural and book exhibits in FIL '98 were organized by the University of Puerto Rico, and the island's delegation was led by UPR president Dr. Norman Maldonado himself. UPR strived to present fair attendees with a representative sampling of Puerto Rico's culture and achievement, including a short film, concerts, poetry readings and conferences.

UPRM Professor presides World Aquaculture Society

Dr. Dallas E. Alston, UPRM professor of Marine Sciences, has been elected president of the World Aquaculture Society (WAS). Dr. Alston, who has worked in Ecuador, is the co-editor of two books, entitled *The Status and Potential of Aquaculture in the Caribbean*, and *Fourth Symposium on Aquaculture in Central America: Focusing on Sustainable Yield in Shrimp and Tilapia Culture*. Currently, he is member of UPRM's Internationalization Committee. This presidency, with the presence of the Research and Development Center for Commercial Aquaculture, puts Puerto Rico in the forefront of this important activity.

Visit from Dominican Republic

Eng. Daniel Comarazamy, Director of Civil Engineering in the Dominican CoHemis Consortium member INTEC University, visited the UPRM Department of Civil Engineering last June. He discussed joint research and academic collaboration possibilities with UPRM professors and graduate students.