CoHemis...update

Overcoming through cooperation

Founded with the support of the National Science Foundation (NSF)

5th Anniversary

February 28, 1997 | **University of Puerto Rico at Mayagüez (UPRM)** | Vol. 7, No. 1

The success of the 1996 courses launches legislation (page 5)

New Series of Caterpillar Courses in the making for 1997

Other short courses available for LA&C

(page 3)

The success of the CoHemis-Caterpillar short course series conducted in 1996 in Guadalajara, Santo Domingo, Lima and Bogota has produced positive results. On one hand, Caterpillar and its representatives in seven countries are preparing to fund a third series on landfill waste disposal technology. CoHemis, on the other hand, has received the collaboration of professors and some high level researchers and consultants who are offering to travel to Latin America and the Caribbean to present short courses on different areas of technology for institutions willing to organize them. In addition, the

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Agreement between CONCYTEC-Peru and UPRM

Dr. Stuart J. Ramos, Chancellor of the UPR's Mayaguez Campus, signs a bilateral agreement with Peru's CONCYTEC, while CoHemis director Luis Pumarada looks on. (More information on page 4.)

"Vital Issues Process"

NEW APPROACH TO INFRASTRUCTURE ANALYSIS

The availability of drinking water is a major concern for Puerto Rico and many other countries in the world. Sandia National Laboratories, CoHemis, and the Water Resources and Environment Research Center of the University of Puerto Rico are working together in the application of a planning tool that can support water resource management in Puerto Rico and can be replicated in Latin America and the Caribbean for the

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Seminar-workshop with NSF, LUZ and CYTED in Maracaibo

Repair and Rehabilitation of Concrete Structures

NSF and the Iberoamerican organization of Science and Technology for Development (CYTED) are the main sponsors of the international seminar and exhibition "The-State-of-the-Art in the Repair and Rehabilitation of Reinforced Concrete Structures". This seminar is being organized by NACE—Latin American and Venezuelan Sections, the CoHemis Center, the Venezuelan Corrosion Association (ASVENCOR), and the Center for Corrosion Studies of the University of Zulia (LUZ). It will take place in Maracaibo, Venezuela, April 29 - May 1

The objective of this international seminar is to present the state of practice, current research and future developments in the repair and rehabilitation of concrete structures. Prevention and remediation techniques for the corrosion of steel reinforcement will be given special emphasis. The invited

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INSIDE:

Maracaibo...

speakers will present and discuss the current practice in their respective countries and exchange information with participants. Among themselves, they will discuss future research priorities and collaborative projects.

The main topic of the seminar will be the following: Corrosion of Steel and Concrete Structures, Durability, Long-Term Performance and Service Life models, Non-Destructive Evaluation and Inspection, FRPC Composites, New Materials and Methods for Repair, Materials and Characterization. There will also be presentations on both successful and unsuccessful projects.

This seminar will be a unique opportunity to learn from presentations by fifteen top experts from Europe, United States and Latin America. They will share their experiences and knowledge with the participants during a series of 40-minute presentations with simultaneous translations. A panel with the invited speakers will be held after the conference sessions to discuss issues of interest for the attendees and priorities for research and development. The event will also feature private exhibitions of materials and services. The last day will feature a visit to the rehabilitation and repair works being conducted on Maracaibo's Rafael Urdaneta Bridge, a world landmark.

Interactions between experts and participants from different countries, climates, environmental conditions and practices will allow a very useful exchange of information for all the engineering community. The papers presented at the Seminar, the relevant discussions, conclusions and recommendations will be included in a proceeding, which will be distributed to the attendees.

Practicing engineers, contractors and government officials involved in repair and rehabilitation of reinforced structures are invited to assist. Professors of Civil Engineering and investigators who work in the development and application of new technologies in this field will also benefit from the conferences and scheduled discussions.

The seminar's fee is $250; it covers registration, proceedings and lunches.

For more information, you may contact Dr. Walter F. Silva at CoHemis or Prof. Oladis de Rincón in Venezuela (oladis@luz.ve).•

PATENT AND TRADEMARK DEPOSITORY LIBRARY NOW AT UPR-MAYAGUEZ

The Library of the University of Puerto Rico at Mayaguez (UPRM) is now bringing a new service to the scientists, engineers, inventors, students and researchers of the hemisphere. A U.S. Patent and Trademark Depository Library (PTDL) became operational on November 13, 1996. This is the only such library within a Spanish-speaking context, and will be of great value to Puerto Rican, Caribbean and Latin American inventors, industry, and business people.

The objectives of a PTDL are: making information and copies of U.S. patents and trademarks readily and freely accessible; and providing quality services to all who request them. Its mission is to support public and private organizations and individuals interested in innovation, economic development and enterprise by facilitating technological information and fomenting the activities of inventors.

UPRM's PTDL will be managed by Mr. Franklyn Irizarry, a professional librarian. One may contact him from 8:00 AM to 4:00 PM, Monday through Friday, at (787) 832-4040, ext. 2022, by fax (787) 834-3080, or by e-mail: *franklyn@rumlib.upr.clu.edu*.

People from outside the Mayagüez area needing assistance in patent and/or trademark searches are advised to make an appointment ahead of time. The patent librarian will be more than happy to train users in the effective use of search tools. However, neither he, nor any other member of the staff, is permitted to do searches for users. There are no fees for allowing patent or trademark searches.

SERVICES

Reference Services:

General information on patents and trademarks is provided as well as assistance in using the library and its resources. The library provides all the necessary search tools, reference materials and equipment so that interested parties may conduct patent and trademark research locally. However, the library's staff is not authorized to conduct searches for any individual or organization. A wide-range of informational literature in the form of books, brochures, pamphlets, guides, newsletters, and booklets is available. CD-ROM workstations are available for research and searches in electronic format.

Copies of Patents:

Summaries of patents and trademarks are available from 1932 on. Copies of full patents are available in microfilm from 1975 on.

Duplication and printing:

There are facilities for photocopying patents and trademarks from hard copy, microfilm and microfiche. Laser printouts of patents and trademarks from CD-ROM are also available. Downloading from CD-ROM products to diskettes is free of charge (users must bring their own diskettes). The only charge to users is for copies and printouts. Costs range from five to fifteen cents per page.

An Internet connection to the Patent and Trademark Office and other sites at the central offices of the Commercial Department in Washington, D.C. is available. The library has its own home page, listing its services and resources. You can access it through: *http://mayaweb.upr.clu.edu/rum/campres/patlibra*

The Home page of the U.S. Patent and Trademark Office in Washington, DC is *www.uspto.gov*.•

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CoHemis posts Short Courses Offerings

CoHemis has created several short courses which address the need which most Latin American and Caribbean countries have for high-level courses in key fields of engineering and applied science conducted in their native languages. Institutions interested in organizing the courses in their respective countries, preferably CoHemis Consortium universities, should contact CoHemis for more information.

These additional course offerings deal with environment, management of tropical forests and hydrological basins, GIS and remote sensing, manufacturing, lubrication and geotechnics. Most of the instructors are faculty with doctorates who speak both Spanish and English and come either from UPRM or other Consortium institutions. The majority of them teach and do research and usually have consulting experience. The personal contacts ensuing from the presentation of these courses will create opportunities to initiate information sharing and research projects involving the presenters and the host institutions.

In all cases the host institution will have to provide the instructors' travel costs, accommodations and per diems. Some of the instructors will charge honorariums as well. A well-managed presentation should generate more than enough to cover its own costs. If necessary, CoHemis is willing to participate in directing and producing proposals seeking funds for presenting one or more courses.

View of Guadalajara's Club de Industriales, *site of the CoHemis-Caterpillar short course on Sanitary Landfill in August, 1996.*

Environment-related courses:

The environment-related courses seek to share the knowledge and experience that Puerto Rico has accumulated in three decades of compliance with US environmental regulations. These courses will enhance endogenous capacity to enforce and to comply with environmental laws and regulations which aim to protect a country's public health and natural resources.

The course Environmental Impact Assessments has a duration of 4 days, including classroom training and workshops. Presently, this course is currently being sought by Bolivia, Costa Rica, Mexico and Dominican Republic.

Its goal is to enable engineering and science professionals to produce their first EIAs with satisfactory results. It will present methods for identifying, forecasting, and measuring impacts on such elements as air, surface and underground water, ecology, and cultural and socioeconomic settings.

Additionally it will cover such topics as: decision-making tools, producing reports, and monitoring environmental variables. The workshops will deal with actual cases and EIAs. The course will also introduce various aspects of environmental legislation and its enforcement.

The course primarily targets professionals who have to deal with environmental problems in industry, government agencies, solid waste disposal, water works, agriculture, civil works, ecology, and public recreation. It is very desirable that the participants posses basic knowledge of environmental science.

The course instructors are UPRM's Jorge Rivera-Santos and Fernando Quiñones. Rivera obtained his doctorate in hydrological modeling from the University of Colorado, and has solid professional and teaching experience. He has been an environmental consultant to the government of Puerto Rico and to private firms. Eng. Quiñones, MS, worked for many years with the United States Geological Survey and is currently a successful environmental consultant with many American and Puerto Rican clients.

The course Bioremediation Technology for Contaminated Environments is offered by Dr. Arturo Massol-Deyá, Biotechnology and Microbiology Professor at UPR Mayagüez. Its scope can include, according to host needs and allocated time: environmental evaluation; biogeography and biodiversity of contaminant degrading bacteria; selection of remediation technologies; degradation of primary contaminants and cometabolic transformations, biostimulation and bioaugmentation, stochiometrics and systematic reaction evaluations; and actual case histories. Massol-Deyá holds a doctoral degree from Michigan State University and works together with other UPRM professors from different fields of engineering and applied sciences on the bioremediation of leachates and contaminated water and soils.

Dr. Luis Perez-Alegria is available to offer the following courses: Management and disposition of Agricultural or Rural Domestic Wastes (low-tech and low energy biological treatment systems; oxidation ponds; aerobic and anaerobic systems; constructed wetlands; surface application systems; etc.); Management of Water Basins (use of Geographic Information Systems; soil and water conservation practices; soil erosion measurement; design of vegetation channels, vegetation barriers, and conservation terraces; GIS-related modeling of cultivation systems). Each course covers 15 hours of classroom, plus an optional 15 hours of workshop training and laboratory work.

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Caterpillar...

Dominican Republic is on its way to regulate waste disposal through environmental legislation.

This year, the course series will include Mexico City, Lima, Asuncion, Buenos Aires, La Paz, Bogota and Sao Paulo. The course in Brazil will be in April 2-3. It will be organized by the prestigious University of Sao Paulo, and it will include simultaneous translation and course materials in Portuguese. Once the dates for the other courses are set, they will appear in CoHemis' page: http://exodo.upr.clu.edu/~signal/cohemis and in our next newsletter.

Caterpillar sponsored a second series of courses in 1996 as a result of the success of its first series in 1995. In 1996, the course was offered in Spanish by Dr. Emir Macari from Georgia Tech, Dr. Roque Román from UPRM, and Eng. Javier Ruiz, landfill operations manager for BFI-Puerto Rico. Jim Drury, John Lecoq and William Ordaz presented the equipment manufactured by Caterpillar for these applications. Caterpillar's Mike Smithers and Carlos Caetano were in charge of the courses. The sites chosen were Lima, Santo Domingo, Guadalajara and, for a second time in a row, Bogota. The course focused on the design, construction, monitoring and operation of this environmentally friendly system.

CoHemis presented the courses in collaboration with member institutions of the CoHemis consortium in the host cities. These were the INTEC universities in Santo Domingo and UNIANDES in Bogota. Where there were no consortium members, the University of Guadalajara and CONCYTEC-Perú took over the organization of these events. In Guadalajara and Lima, these links served as a means to establish partnerships with these and other local entities.

Dr. Luis Pumarada, CoHemis' Director, was the international coordinator of this series and attended the presentations. He took advantage of this opportunity to establish ties with universities and research centers interested in interacting with UPRM and the CoHemis consortium.

The 330 participants of these courses came from industry, government, academia and environmental organizations. The course's success was mostly due to the performance of the local organizers and media exposure. The latter helped to increase public awareness about the environmental and health costs of open waste dumps and the benefits of sanitary landfills. •

International Student Exchange Program at UPRM

UPRM recently joined the International Student Exchange Program (ISEP), a membership organization of more than 225 higher education institutions around the world that are committed to international exchange. ISEP was established in 1979, under the Fullbright-Hays Act of the United States. The program is administered by a central office at Georgetown University in Washington DC and by a designated coordinator at each member institution. The organization is supported by member and participant fees.

ISEP is dedicated to the principle that a period of study abroad ought to be valuable and affordable to all students, no matter what institution they attend or what their financial situation may be. With ISEP, this is possible because the program is based upon a reciprocal exchange of benefits. Each member institution determines the ISEP program fee that they will charge their outgoing ISEP participants. This fee covers the costs of regular tuition, fees, room and board at the home institution, which in turn enables the institution to host an incoming participant. By paying the program fee, each participating student creates a "place" and a set of benefits for a foreign student.

Each year, member institutions nominate participants for the program. The ISEP staff, who are familiar with the academic systems of the participating countries, carefully match the qualifications and site preferences of nominees with available openings at each institution. There are more than 100 study sites worldwide, including Africa, Asia, Eastern Europe, Latin America and the South Pacific.

Exchanges can be at both undergraduate and graduate-level studies, can last one semester or a full-year and can take place in almost any field, including technical ones. The exchanges include tuition, fees, room and board throughout the length of the exchange. Most forms of financial aid can be applied towards participation in ISEP.

In general, ISEP student participants must be enrolled and in good academic standing at an ISEP member institution, have completed at least one academic year of study prior to the exchange, and have a strong academic background with a minimum of 2.75 (out of 4.00). In addition to these general requirements, each member institution may establish its own criteria for participation in ISEP. The participant must meet first with the coordinator of the program in his institution to get this information. Participants can be students, researchers, faculty or staff of a member institution

For more information, go to: http://www.isep.org/. •

AGREEMENT BETWEEN CONCYTEC-PERU AND UPR

As a by-product of the CoHemis-Caterpillar short course in Lima, an agreement was signed at the *Museo de la Nacion* by CoHemis and CONCYTEC. The Lima press publicized the agreement signed by Dr. Luis Pumarada, as CoHemis Director, and the late Executive Director of Peru's National Council for Science and Technology (CONCYTEC), Eng. Pedro Villena-Hidalgo.

Before the eyes the participants of the course which had been organized jointly by their two respective organizations, Villena and Pumarada declared their intention to promote and facilitate exchanges and joint projects among UPRM, CONCYTEC and Peruvian educational and research institutions. This agreement was subsequently made official by the signature of Dr. Stuart Ramos, UPRM Chancellor, and graciously approved by the president of the University of Puerto Rico, Dr. Norman Maldonado.

The next step will be the designation of contact persons by interested Peruvian organizations to discuss consortium issues and to identify topics and mutual interest collaboration actions to be implemented or to find financial support. One possibility mentioned was supporting Peruvian students who go to Puerto Rico for their graduate studies, where they could receive a high level education in Spanish within the US university system. This would represent significant savings for Peru in tuition payments as will as in preliminary semesters studying English and adaptation problems. •

PR State Department collaborates with their visit

Visiting Dominican Legislators to enact Environmental Legislation

On Tuesday, October 15 Puerto Rico received a visit from a High Level Legislative Commission from the Dominican Republic. The Commission travelled here to see the way in which Puerto Rico has managed its solid waste problem and the costs and benefits thus produced. This visit was organized jointly by the CoHemis Center and the International Exchange and Technical Cooperation Division of the PR State Department.

The visit included meetings in the Solid Waste Authority; with the Vice-president of the Natural Resources Committee of the Puerto Rican House of Representatives, Hon. Angel Cintron; in the U.S. Environmental Protection Agency and the PR Environmental Quality Board; with private landfill and garbage collection operators, as well as with the city hall officials who supervise them. It ended with a field trip to landfill facilities at Salinas, Santa Isabel and Ponce.

The Dominican legislators visit the University of Puerto Rico's main headquarters: *Near the center of the photo we see on the right Eng. Tonty Rutinel, President of the High Level Dominican Legislative Commission. To his left we have Dr. Norman Maldonado, President of the University. On the upper right hand corner there is Ken Oliver, PR's Assistant Secretary of State, who accompanied the group to all of its meetings in Puerto Rico.*

The Dominican legislators also met with experts from the Mayagüez Campus. They received an official welcome from Puerto Rico's Secretary of State, Hon. Norma Burgos, and were greeted by UPRM Chancellor, Dr. Stuart Ramos, and by UPR president, Dr. Norman Maldonado.

This visit resulted from the course on sanitary landfills that the CoHemis Center had offered on August 21-23, in partnership with INTEC University of Santo Domingo and Caterpillar Americas. Among its 76 participants was Eng. Tonty Rutinel, a Dominican legislator.

Course presenter Dr. Roque Román emphasized the magnitude of the solid waste problem and the benefits of the landfill solution in terms of land use, air, water and ground pollution, as well as concerns for public health. Soon after, legislator Rutinel presented a resolution to begin developing laws to protect public health and the environment in the context of the disposal and collection of solid waste. The unanimously approved resolution would initiate this process with the visit of a High Level Legislative Commission to Puerto Rico.

The specific objectives of this visit were to: learn about Puerto Rico's laws and regulations on waste management and the process of developing these laws; to learn the consequences of these laws and the difficulties of their enforcement; to witness the daily operations of landfills; to learn about the quantities and types of waste that are being transported and their costs; and about the impacts of these laws on such areas as economics, environment and public health.•

For UPR, Argonne and Sandia

CoHemis endorses Technological Forecasting for Latin America

The co-directors of CoHemis, Drs. Luis Pumarada and Jorge Ivan Velez-Arocho, represented UPR and Sandia and Argonne National Labs at the Expert Meeting on Technological Foresight and Forecasting for Latin America, held at Santa Cruz, Bolivia, December 11-13, 1996. They were invited by the Bolivian National Council on Science and Technology (CONACYT). This important meeting was organized by the United Nations' Industrial Development Organization (UNIDO) with the support of the Iberoamerican Information Center of the Spanish Agency of International Cooperation and CONACYT-Bolivia.

The first day began with an effective introduction by UNIDO's Dr. Peter Ellwood. Following this, experts who have played key roles in the TFF processes in Japan, Germany, UK, Holland and Italy described and discussed methods and experiences.

During the second day, Renato Dagnino, from Brazil, described a first Latin American TFF initiative in which he played a starring role. His exposition was followed by presentations from Chile, Brazil, Argentina, Mexico and Bolivia about their respective national realities concerning science and technology, and mentioning some attempts at forecasting. Hemispheric organizations such as OAS, the Latin American Economic System (SELA), CoHemis, and ECLAC, reacted to those presentations.

The third day was dedicated to delineating a framework for a regional initiative for the development of TFF in Latin America. The draft produced will be redefined by UNIDO with the aid of other participants at the meeting, and presented to individual countries and prospective donors. It was proposed that CoHemis and some members of the Consortium participate in one or more phases of this project.

What is TFF? What could be its Latin American framework?

TFF is a valuable tool for developing policies for encouraging and facilitating sustainable and equitable development at a national level. It was conceptualized in the U.S. and developed in Japan, where it has served for two decades to identify major priorities and investments in research and education. It is currently being adopted in

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Computing Research Conference

The Center for Computing Research & Development (CECORD) of the Electrical and Computer Engineering Department of the University of Puerto Rico and the National Science Foundation (NSF) will sponsor a computing research conference, on April 18, 1997 at UPRM. This conference aims to present original works in basic and applied research performed by graduate and undergraduate students in all areas where computers play a significant role. Proposals for conferences and project demonstrations should be received not later than March 21, 1997. Four copies of the complete manuscript (camera-ready) are to be received by Dr. Domingo Rodríguez prior to this deadline.

For more information you can consult Dr. Domingo Rodriguez at crc97@exodo.upr.clu.edu, or visit:

http://mayaweb.upr.clu.edu/CECORD/CRC/crc.html •

Bryology Symposium

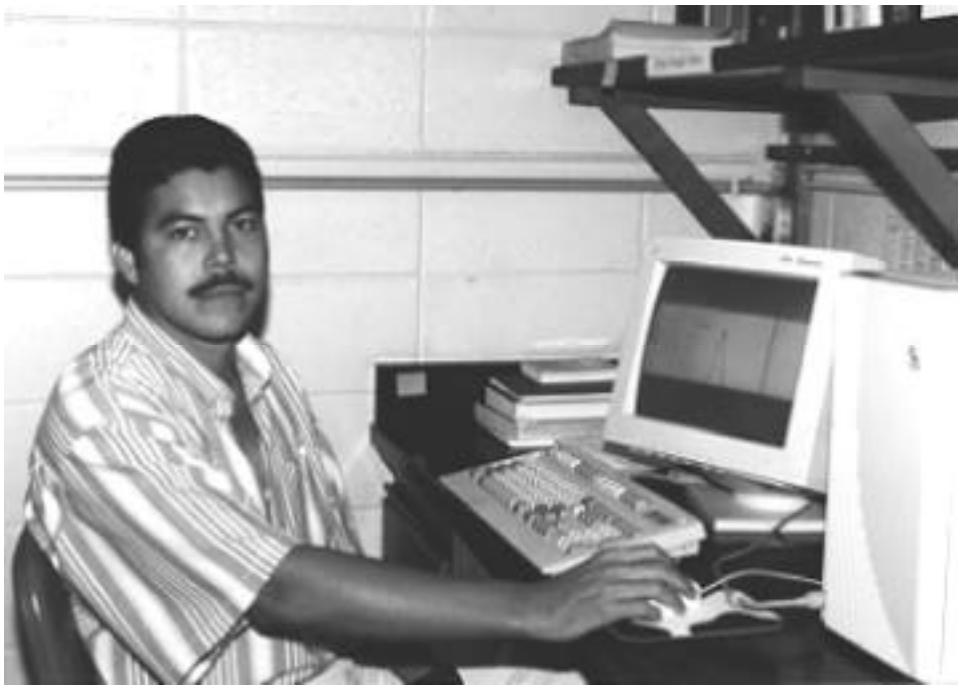
The Latin American Bryology Society, presided by Dr. Ines Sastre from UPRM, will celebrate its Fifth Symposium in 1998 as part of the Latin American Botany Congress in Mexico City. Work sessions and workshops related to the application of multivariate methods in bryophyte systematics are being organized for the Symposium. The Latin American Bryology Society promotes the study and conservation of Neotropical mosses, liverworts, and hornworts. Among the activities that the Society supports are the assessment of the management of bryophyte herbaria, information exchanges, and exchange and identification of species. Besides these activities, it publishes every three months the bulletin *Briolatina* every three months, which includes announcements of bryological activities in each country. At present, the Society does not have participants from Uruguay, Bolivia, Paraguay, Ecuador, nor Chile.

For more information, please contact Dr. Sastre directly through e-mail at: l_sastre@rumac.upr.clu.edu, or through the Biology Department, University of Puerto Rico, Mayagüez, PR, 00681-5000.•

UPRM's Latin American students:

One of our Central American students

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



Jorge sits in front of his computer in the Graduate Student's Room of UPRM's Department of Physics.

Jorge Ivan Rangel-Stokes is part of a group of brilliant students from Central America who are pursuing their graduate studies in UPRM. Jorge has been working in his master's degree in the Physics Department for two years.

Jorge received a degree in Physics from the University of Panama in 1992. He came to Puerto Rico after a friend recommended to him the UPRM master's program. He is presently immersed in his thesis work, which deals with the generalized Trallis statistical mechanics through a numerical simulation of an anomalous diffusion process. Together with his mentor, Dr. Carlos Condat, he is working on the calculation of the Coefficient of Anomalous Diffusion with the new theory and verifying its theoretical equations.

His experiences in Physics have been varied. He was a secondary school Physics and Mathematics teacher in Panama, as well as a laboratory assistant in the University of Panama. In Puerto Rico, he works as an undergraduate Physics laboratory instructor. According to Jorge, this has been a very fulfilling experience, because it requires teamwork involving the other laboratory instructors.

After finishing his master's degree, Jorge hopes to enter a doctoral program. His goal is to become a professional academic and to dedicate himself to teaching and research.

Even though he wishes that the UPRM had a computer center for the exclusive use of Physics students, Jorge is very pleased with the freedom which this institution allows its graduate students and the economic support and space which they receive for their projects.•

New short courses...

Perez-Alegria holds an Agricultural Engineering Ph.D. from Pennsylvania State University and is an experienced researcher and consultant.

Dr. Emir Jose Macari, from Georgia Tech, a member of the CoHemis Consortium, is willing to offer the course **Design and Construction of Sanitary Landfills** (feasibility and location; leachates; natural attenuation; containment; liner materials; component design; construction; control and monitoring—10 hours, 40 persons). Within the area of Geotechnics, Macari could offer: **Advanced Soil Mechanics Applied to Road Construction** (load carrying capacity of soils and pilings; soil thrust; retaining walls; soil stability—10 hours, 40 persons); **Advanced Concepts in Soil Dynamics** (vibration theory of one or various degrees of freedom; dynamic properties; liquefaction of soils; vibration of equipment on Slabs—12 hours, 30 persons); **Advanced Theories of Soil Elastoplasticity and Mathematical Models** (12 hours, 30 persons). Macari has a Ph.D. from the University of Colorado, and has been awarded a Presidential Faculty Fellow by the National Science Foundation. He is an instructor in the CoHemis-Caterpillar course series.

Among the resources available for courses in English or Spanish related to the management and regeneration of forest products and their sustainable production are:

John Thomlinson. He holds a Ph.D. in Biology from the University of North Texas and Masters degrees from the Imperial College and University of Cambridge, UK. He belongs to the Institute for Studies of Tropical Ecosystems of the University of Puerto Rico and offers courses in remote sensing applications. He works with GIS and remote images in the study of changes in land uses, land forms, soils and related ecological processes.

Edgardo Gonzalez. He holds a Master's degree from the School of Forestry and Environmental Studies of the University of Yale, and has doctoral courses in biology and sustainable development from the University of Colorado. He is currently the director of the Management and Production Division of the 14 State Forests of Puerto Rico. Gonzalez has also worked in Costa Rica. He is an expert in sustainable logging operations.

T. Mitchell Aide. He holds a Ph.D. from the University of Utah and has done post-doctoral work in Colombia (UNIANDES, by Fullbright) and Panama (through the Smithsonian Tropical Research Institute). Among his specialties are: the ecology of tropical plants; biogeography; molecular evolution; and interaction between plants and herbivores. Most of his work has dealt with the spontaneous and/or managed regeneration of secondary forests.

Other professors and researchers have expressed their interest and availability to design courses, seminars or workshops within their specialties according to the interests of the host institutions. These are:

Aurelio Mercado, one of the most successful researchers and oceanographers of the UPRM Marine Science Department. He is a consultant to the governments of Puerto Rico and the United States and to private enterprise in topics related to the Erosion of Shore Lines and the Risk Mitigation of Erosion by Extreme Wave Action, among others.

Jose A. Centeno. He is a Ph.D. in Chemistry and conducts research at the widely recognized Armed Forces Institute of Pathology, Washington DC, which has a bilateral collaboration agreement with UPRM. He specializes in consulting, training, research and applications of microspectroscopy and atomic spectrometry as tools in the diagnosis of body fluids and tissues and of environmental and biomedical samples. He has taught courses in Mexico and Puerto Rico on Environmental Toxicology and Analytical Methods.

Gary Toranzos. A Professor of the Biology Department of UPR, Rio Piedras. He holds a Ph.D. in Microbiology from the University of Arizona, specializing in Food Science and Virology. He has published chapters and edited various books and manuals related to Environmental Microbiology and Molecular Genetics. He has conducted workshops and seminars on these topics in Bolivia, Colombia, Chile, Mexico, Panama, Venezuela and Puerto Rico.

Other resources and possible courses are:

Dr. Miguel Velez-Reyes, of the UPRM Department of Electrical and Computer Engineering, is willing to provide three courses of 15 to 20 hours each: **Introduction to Remote Sensing** (electronic sensors on airplanes and satellites; physical principles; radiative transfer; inverse problems; signal and image processing); **Estimation, Detection and Stochastic Processes** (introduction to the fundamentals of communication, control, and signal processing; probabilities; detection and estimation of signals and parameters in noisy receptions); **Introduction to Automation and Robotics** (fundamentals of automation; binary and continuous sensors; electromechanical and pneumatic actuators; discrete state controllers; programmable controllers; step logic; industrial robotics; manufacturing applications). Velez-Reyes holds a doctoral degree from MIT in the area of algorithms and their application to signals and controls.

Dr. Jayanta Banerjee, from the UPRM Department of Mechanical Engineering, has a Ph.D. in Mechanical Engineering specializing in tribology from the University of Waterloo. He has been visiting professor at the University of Vermont, University of Florida, Queens University, *Universidad Nacional Experimental de Tachira* (San Cristobal, Venezuela) and *Universidad de los Andes* (Merida, Venezuela). He has been an international consultant and is willing to offer 20-hour courses in the following topics: **Principles and Applications of Tribology, Plasticity in Engineering**; and **Lubrication.**

Dr. Jose R. Deliz is willing to offer the seminar **Introduction to ISO 9000 and other industrial standards.** Directed primarily at industrialists, managers, and engineers, the course will extend for three days, workshops included. Topics will encompass: requirements of ISO 9000 and QS 9000; quality assurance systems; documentation; implementation plan; registers; and internal and external audits. Dr. Deliz is a professor of Industrial Engineering at UPRM and has a doctoral degree in Industrial Engineering from New York University. He frequently offers seminars on quality, and manufacturing management and develops projects for the private sector in Puerto Rico.

Dr. Juan Bernal is willing to offer the following courses: **Use of Geosynthetics in Civil Engineering Projects** (a general introduction—7 hours); **Application of Geotextiles and Geosynthetics in Highway Projects** (will enable engineers to apply these products to the drainage and increased durability of the roadway—15 hours); **Reinforced Soils and Containment Structures** (analysis and design of systems

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UPRM Space Laboratory

On December 2nd, 1996, UPRM's Tropical Center for Earth and Space Studies' Space Information Lab (TCESS-SIL) installed one of its most important components, the TeraScan Earth Remote Sensing System supplied by SeaSpace Corp. of San Diego. This system offers real-time data reception and in-depth analysis for the broad spectrum of polar orbiting weather satellites. TeraScan systems are used worldwide in both land-based and shipboard applications. It acquires, files, processes, and displays telemetry

By: Eric M. Guzman, Ground Station Engineer, TCESS

This map shows the great range achieved by UPRM's new antenna.

data for the TIROS-N polar orbiting weather satellite sensors. The system features a remarkably small (1.2m) tracking reflector antenna, coupled with a SUN SPARC station 20 desktop computer.

The site used for the antenna is the highest point on the Mayagüez Campus. The terrain elevation is below five degrees on all directions, with a clear ocean view to the west. This makes it ideal for low-angle data acquisition. The coverage from Northwest to Southwest is outstanding, making possible the acquisition of data at grazing angles and increasing the antenna coverage from Central America and northwestern South America down to Galapagos Islands.

Data is being collected and filed automatically. These archives can be used by researchers interested in the Caribbean, northern South America, Central America, the Gulf of Mexico, and the US east coast. Data is currently being posted on the Internet in a daily basis, but the goal is to have the system connected to the Net, so researchers across the world can access the "real-time" data. The home page is: http://exodo.upr.clu.edu/~tcess.

TCESS-SIL is expected to become the most advanced Remote Sensing and Space Communications facility in Puerto Rico and perhaps in the Caribbean. By the end of 1997, TCESS-SIL will be able to receive SAR telemetry from several satellites, including ERS-1/2 and RADARSAT. The cost of this system is over $700 thousand and is expected to strengthen the Remote Sensing activities at UPRM especially the Laboratory for Applied Remote Sensing and Image Processing (LARSIP). TCESS and UPRM will be the primary station site for the John Hopkins University's FUSE (Far Ultraviolet Spectroscopy Explorer) project, which includes a ground station valued at in $2 million starting in 1997. TCESS' director, Rafael Fernandez, can be reached at: rafaelf@exodo.upr.clu.edu. •

Research Program on Natural Plant Products

The new research program on natural plant products at UPRM is a joint effort of the Natural Products Research Laboratory, the Chemistry Department, and the Botany group of the Biology Department. It studies the plant kingdom to stimulate the development of natural plant products. The Natural Products Group is currently engaged in the isolation, characterization, photochemistry, and *in vitro* biosynthesis of natural plant products. Recently, a collaborative effort has begun with the Natural Products Chemistry Group at Rutgers University.

The group's facilities include a new plant cell and tissue culture laboratory and a nearby wet chemistry laboratory, which communicates with a spectroscopy and chromatography laboratory. An environmental test chamber has been custom manufactured to serve as a plant tissue and cell growth room. In this unit, the standard features of an environmental test chamber were added to a conventional plant cell and tissue culture room to create a truly unique environmental plant tissue test system. The environmental room is located within a room prepared as a semi-clean room, which also serves as the transfer room, equipped with two laminar flow cabinets. This room communicates through swinging doors with a culture media preparation room.

The exploitation of plants as a chemical resource requires the study and preservation of source plants due to the continuing decline in the natural habitats of wild plants. These aspects, together with the study of the biosynthetic capacity of plant cells, tissues and organs, constitute one truly important focal point for natural products research with tropical plants. Some current projects are:

Bioluminescence: Determination of ATP and other nucleotides in freshwater prawns, and applications of redox reactions involved in NAD-linked *dehydrogenase* activities.

Photochemistry and Photophysics: efficient photochemistry of alkaloid N-oxides such as *papaverine* and spectroscopic studies with *thioneine.*

Plant Cell and Tissue Culture: Photochemical studies of leaves and roots of *Randia aculeata L. (Rubiaceae)*; chemical composition of the leaves and roots of *Lepianthes peltatum (L.) Raf.*; production and biosynthesis of terpenes and terpenoids by in vitro cultures of *Lippia dulcis, Trev. (Verbenaceae).* This last project addresses the problem of controlling the production of essential oils by adequate environmental control.

Genetic transformation of *L. Dulcis* by in vitro inoculation with *Agrobacterium rhizogenes.*

Optimization of the GC-MS and GC-FID analysis of thermally labile essential oils.

This program is led by Dr. Fernando A. Souto-Bachiller, assisted by full-time researchers Lolita Rodriguez-Rodriguez and Maritza de Jesus-Echevarria. In general terms, the research program includes projects relating the biosynthesis and molecular photophysics and photochemistry of natural products derived from tropical plants. Dr. Souto's e-mail is f_souto@rumac.upr.clu.edu. His mailing address is the same as CoHemis. •

Sandia and UPR...

same and for other infrastructure problems.

Sandia has often and successfully applied this tool in many countries to address issues such as power, water and defense. The so-called *Vital Issues Process* brings together representatives from government, academia, the private sector, environmentalists and civic groups in a series of panels, usually three, structured to outline goals such as a decision-support information system that is widely accepted throughout a society and can be applied to a very complex infrastructure problem. The Puerto Rico application aims to develop a computerized system emphasizing the integration of various models and data bases to be used as an effective dialog structure by various disciplines and sectors, including government, industry, society and academia. CoHemis and Sandia are planning a water resources application for Costa Rica and another for the Dominican Republic for energy.

The first of the three Puerto Rico panels defined the overall objective and developed the criteria to determine the relative importance of issues that decision makers will have to address in managing these water resources. The second panel identified the issues and their importance. The third one developed information that is essential to address each of the issues.

Dr. Dennis Engi, from Sandia's Global Approach to Infrastructure Analysis program, facilitates one of the Vital Issues Panels held in Puerto Rico.

Sandia and the UPR are preparing a proposal to establish a decision-support system for the management of water resources in Puerto Rico. This system will provide its users structured information about the water resources to serve as foundations for decisions regarding their management. This system will also give users the opportunity to discuss the diverse priorities and that decision-makers can consider different view points through an Internet *chatroom*.

The evaluation criteria determined by the panels for the evaluation of water resource alternatives are: magnitude of the impact; likelihood of the occurrence of the impact; time frame of the impact; robustness or range of an impact; and the feasibility of the alternative and its likelihood of effectively solving the problem together with its costs and risks.

The vital issues of water resource management were defined as: accuracy and timeliness of data, holistic management, water use by natural ecosystems, legal and institutional framework, education, and perception misalignment.

Users and the public may access information on resources availability and the conditions of water sources in the island. Also, users can find information on ecosystems, population and water consumption, laws and applicable regulations, and relevant data on Puerto Rico's economy.

For more information, please contact Sandia's Dr. Nestor Ortiz <nrortiz@sandia.gov> or Dr. Velaz-Arocho at CoHemis. You may also visit: *www.cmc.sandia.gov/iGAIA*.•

Information on members of the CoHemis Consortium

University of Guyana

The University of Guyana is the highest academic institution in Guyana. Thus it is called upon to serve all of the other sectors of the educational system and the entire nation at large.

The University opened its doors in 1963, with programs which were designed to satisfy identified national needs in both the private and public sectors. The present enrollment comprises close to 3500 students, pursuing more than 170 full-time and part-time undergraduate programs. The University has a Environmental Studies Unit and a Biodiversity Center, among others.

Graduate studies were introduced in 1973 and are now offered in Education, Biology, Chemistry, Natural Products Chemistry, Development Studies, Economics, Guyanese and West Indian History, International Relations, Political Science and Urban and Regional Planning. Diploma programs have just been introduced in Forestry, Tourism Studies, Transport Studies and Steel Band Music.

In recent years the University has benefited from an intensive staff development program. This program was funded by the Interamerican Development Bank (IDB) and has contributed significantly in broadening the knowledge and experience of younger staff members.

Some areas of possible international collaboration that have been identified by the University are: Distance Education; Satellite Communications and Space Research; Students / Lecturers Exchange Programs; Energy Research; Engineering for Sustainable Development; and Agricultural Engineering.

The University of Guyana welcomes suitably qualified persons of all nationalities. Foreign students should provide Caribbean Examinations Council Certificate and a General Certificate of Education. Tuition ranges from US$2,600 - US$3,000 to US$4,600 per year.•

We are on the Internet:

http://exodo.upr.clu.edu/~signal/cohemis

with links to the Consortium members which have web pages: Sandia, Georgia Tech, Simon Bolivar, Univ. de Cordoba, U. Chile, U. Guadalajara, UNIANDES, Lehigh, Colorado State, U. Uruguay, Oak Ridge, Los Alamos, U. Florida, U. Costa Rica, UNAM, PUC-Rio do Janeiro.

787: New Area Code for Puerto Rico

TFF...

European countries.

Using diverse strategies, Japanese and Europeans have aggregated the opinions of national experts about the likelihood of specific events linked to the development and diffusion of new technologies in different fields, and about their probable social, economic and cultural impacts. For example: "By the year 2010, tomatoes produced by genetical engineering will have completely replaced the natural grown ones due to their lower price, more attractive appearance and healthiness." An expert may assign a probability of 60% to this event, which could significantly affect the rural sector and the overall economy of a country, but not perhaps its culture or environment. This type of information, applied to hundreds of possible events in dozens of fields is published and used as input in diverse sectors.

In the Latin American context, TFF may be required to serve sustainable and equitable development, and it implies cultural changes during decision making processes. Some of the greatest challenges for its implementation are: the scarcity of experts in many important fields, persuading government and industry to support the process and participate in it, and the management of TFF studies at a regional level to include more experts and achieve cost reductions without overlooking the differences among the Latin American countries.

TFF and TA (Technology Assessment) are among the main priorities of the CoHemis Center and of several Consortium institutions. Dr. Pumarada, Georgia Tech's Allan Porter, and Argonne's Anthony Dvorak belong to the Executive Committee of the International Association of Technology Assessment and Forecasting Institutions (IATAFI) with headquarters in Norway. They are the only representatives from the Caribbean and North America. On the other hand, Dr. Velez-Arocho and Sandia have been involved in the multisectorial development of resource and environmental management policies. (See "Vital Issues..")

Second Visit to La Paz

Taking advantage of their trip to Bolivia, Pumarada and Velez-Arocho went up to La Paz in search of new opportunities for joint collaborations involving Argonne and Sandia National Laboratories. Their meetings included Bolivian and American government offices as well as important institutions in Bolivia's civil society related to environmental concerns.

First they met with their host, Dr. Carlos Aguirre, and discussed several collaboration possibilities. They identified a forestry training activity at Beni Tropical Forest Preserve, a short course on bioremediation of contaminated soils and ground water, and a seminar-workshop for Bolivian professionals on the preparation of Environmental Impact Assessments (EIAs).

The last two activities were also of great interest to the Ministry of Sustainable Development and Environment, where Pumarada and Velez met with Sub-secretary of Environment, Eng. Raul Lora, as well as with the Director of Environmental Impact Evaluation, Eng. Gustavo Eterovic, the Consultant to the Environmental Quality Control Office, Eng. Ramiro Rodriguez, and with Eng. Javier Hanna, in charge of the National Climate Change Program.

At the USAID mission, Pumarada and Velez met with its Director, Frank Almaguer, and its environment coordinator, Michael Yates. The USAID officials stated their mission's policies and priorities regarding the environmental field. Acting on a recommendation by Yates, CoHemis met with Carlos E. Arze, Director of the Environmental Pollution Prevention Project (EP3).

There were also very interesting meetings with important NGOs. These meetings were with Andres Trepp, Director of the Energy Institute, Dr. Luis Alberto Rodrigo, Executive Director of LIDEMA, the Environmental Defense League, and Dr. Sofia Moreau, Director of ABTEMA, the Bolivian Association of Environmental Remote Sensing, supported by the French Scientific Cooperation (ORTOM). •

New short courses...

and structural components of structures created using reinforced soils—12 to 20 hours). Analysis and Design of Deep Foundations (theory, real cases, measurements, and testing) and Construction and Analysis of Drilled Shafts are two courses which can be adjusted to host needs in terms of depth and hours. Bernal has a doctoral degree in Geotechnics from the University of Texas (Austin), and a Master's from the University of Illinois (Urbana). He works in the doctoral program of the UPRM Civil Engineering Department and is a consultant to the Puerto Rico Highway Authority. He has been a visiting professor in Costa Rica.

Our Internet home page will carry updated information on these and future course offerings. •

HACU WELCOMES LATIN AMERICAN MEMBERS

Antonio Flores, president of the Hispanic Association of Colleges and Universities (HACU), announced earlier this year that three Latin American institutions have joined this organization. They are: Universidades Salgado-de Oliviera in Rio de Janeiro, Brazil, Universidad Autonoma de Tamaulipas, Mexico; and Universidad Autonoma de Guadalajara.

This Association strives to improve quality in its member institutions, and to increase their influence in the educational establishment of the United States. UPR is one of its most important members because of its quality and large number of Hispanic students and professors.

Flores mentioned in his announcement that "...with this new international membership category, we hope to strengthen relationships of higher educational institutions across international boundaries with our Hispanic-Serving Institutions in the United States". Hispanic-Serving Institutions are universities and colleges that include significant percentages of U.S. Hispanics in their student bodies.

International Members of HACU may participate in joint projects with U.S. members. They also can take part in the development of curriculum, joint faculty research, and exchange programs. These institutions will have access to data bases through HACU's Federal partnerships, training and professional development programs.

For more information about this international membership, contact HACU at (210) 692-3805. •

Luz Leyda Vega, CoHemis' Coordinator, prepares an Anniversary exposition at the UPRM Main Library.

5th Anniversary of the CoHemis Center

In February of 1991, the National Science Foundation provided funds to UPRM to organize a hemispheric conference to plan a center to promote joint research in the Americas. The conference organizers were Dr. Luis Pumarada-O'Neill and Dr. Carlos I. Pesquera. This grant, received from Program Director John Scalzi, was subsequently extended until 1993.

The conference took place in Mayagüez in November, 1991. The majority of the national organizations of science and technology of the Americas sent delegates or submitted presentations.

The United States sent delegates from academia, government and the private sector: including NIST, the Department of Energy, the Environmental Protection Agency, and the Department of State. Also present were AAAS, the Organization of American States (Scientific Division), and the National Center for Science and Engineering Investigation of Canada.

During the final session, the delegates recommended unanimously the creation of a center for hemispherical cooperation for research and education in engineering and applied sciences. Its mission was to facilitate, support and conduct applied research and to implement programs for the development of human resources with the participation of engineers, scientists, and students from different countries of the Hemisphere. The delegates decided to have this center at UPR-Mayagüez because this is a completely accredited institution with an international faculty and a long standing tradition of Latin American relations which operates in Spanish within the US education and research system, in a centrally located place which is culturally and geographically part of Latin America and the Caribbean.

CoHemis was mandated to promote the participation of the less developed countries and emphasize projects that would produce short term benefits and be multinational in scope.

To guide the conference directors on the mission given to them by the assembly, a committee of advisors was selected among the delegates. The current members of this committee are: Numa Capiati from Argentina, Carlos Rodriguez de Faria e Souza from Brazil, Mauricio Sarrazin from Chile, Olga Lucia Turbay from Colombia, Maureen Manchouk from Trinidad and Tobago, and Sylvia Ortega-Salazar from Mexico. Each one represents the S & T organization of their country.

Some of CoHemis' main objectives are: to improve the capacity of technological and human resources in Latin America and the Caribbean and thus their social, financial and commercial development; to promote protection of the environment and natural resources; to attract the attention of scientists and agencies to the fundamental problems of the region; fasten the increase of financial aid for hemispheric students; facilitate high technology services to countries; and link universities and research institutes throughout the hemisphere.•

UPRM's first Engineering Ph.D.

Luis G. Garza received the first doctoral degree from UPRM's Department of Civil Engineering on Sunday, June 9, 1996. There are currently 10 students in this program, the first and so far the only engineering doctorate program in Puerto Rico. At present, it is limited to structural topics.•

INTERTECH 96, Venezuela

CoHemis' Associate Co-director, Dr. Walter Silva, traveled to Valencia, Venezuela to the IV Interamerican Congress on Engineering and Technology Education (INTERTECH 96) on September 22 to 26. There he presented a paper on CoHemis and its Consortium and their capacity to foster educational collaborations. He also participated in a panel discussion. Dr. Silva was pleased to hear more than one presenter mention CoHemis and refer to the center as an important hemispheric network.

Taking advantage of his stay at Venezuela, Dr. Silva met with the chancellor of the University of Carabobo, Ing. Asdruval Romero. They identified areas of common interest such as the environment and image processing in medical procedures. Silva also met with Professor Marino Martinez-Miniño, from the Masters Program on Construction Management.•

UPADI-96, Costa Rica

Dr. Walter Silva, CoHemis' Associate Co-director, participated in the XXIV Convention of the Union of Pan-American Engineering Associations (UPADI) in San Jose, Costa Rica, on August 12-16, 1996. Dr. Silva presented a paper on CoHemis and attended mostly the sessions on sustainable development and engineering education.

During his stay, Dr. Silva met with Eng. Enrique Melara, who has a masters degree on Geotechnics from UPRM, is a member of the Board of Directors of the Salvadorean Association of Engineers, and represents this association in El Salvador's National Council of Science and Technology (CONACYT). He also had meetings with Eng. Edgar Venegas Ledo, Vice-Dean of Engineering of the Technical University of Oruro, Bolivia, and with Eng. Ernesto Ng Jordan, from Panama's Universidad Santa Maria la Antigua.•

Rhizobiology for Latin America

Dr. Eduardo C. Shröder, soils and agronomy professor at UPRM, attended the XVIII Latin American Rhizobiology Meeting which took place at Santa Cruz de la Sierra, Bolivia, from the 23rd to the 27th of September. He presented an oral dissertation of his work: "Fast-growing tropical *Rhizobium*: the experience in Puerto Rico."

The conference focused on four topic groups: the role of biological nitrogen fixation and other micro biological processes in the agro-ecosystem; basic studies on micro-organisms and their interaction with plants, technology transfer of biologically-induced nitrogen fixation and inoculate use; production and commercialization of high quality inoculates.•