



CoHemis... Update



Overcoming through cooperation

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New directory steering CoHemis

**Dr. Fernando Gilbes
steps up to Director and
Mrs. Gildreth Gonzalez
joins as Co-director**

Dr. Fernando Gilbes is the new Director of the CoHemis Center after the resignation of Dr. Luis Pumarada-O'Neill, who had been its founder and Director since November, 1991. On the date of Pumarada's resignation, July 31, 2003, Gilbes had spent one year as Co-director. The center's previous Co-director, Dr. Jorge Ivan Velez-Arocho, had left that position after being named Chancellor of the Mayagüez Campus. The new Co-director is Mrs. Gildreth Gonzalez (see page 6).

Dr. Pumarada remains in UPRM as Professor of the General Engineering Department, and will continue to collaborate with CoHemis. At present, he is in charge of this newsletter and of coordinating UPRM's collaborative effort with Panama's Ciudad del Saber for the creation of the International Sustainable Development Center.

As reported in the previous *CoHemis... update*, Dr. Gilbes, an expert in remote sensing, belongs to the faculty of the Department of Geology, and his main research field is oceanographic bio-optics. He arrives at the center's main position with ample international experience both in research and education efforts, and has already produced a series of plans for the center (see page 6).

Successful NSF workshop on urban transportation at UPRM



A panel of participants representing diverse perspectives discusses suggestions made in the workshops about an agenda for research and collaboration. Nigel Wilson, Hani Mahmassami, Rodrigo Torres, Sergio Gonzalez, Garrone Reck, Srinivas Peeta and Luis Willumsen,

The "Pan-American Seminar and Workshop on the Interface between Automobile Traffic Networks under Dynamic Traffic Assignment and Bus Rapid Transit Systems", organized by CoHemis for UPR-Mayaguez and its Department of Civil Engineering was held on March 20-22, 2003 at the Caribe Hilton Hotel, San Juan, Puerto Rico. It was sponsored by National Science Foundation (NSF) and the Federal Transit Administration (FTA), with the collaboration of the Puerto Rico Highway and Transportation Authority. Since its objective was to foster linkages between both disciplines mentioned in the event's title, and these topics have been developed in different Americas, the sponsors provided funds for inviting researchers, engineers, system operators and decision-makers from both continents. Several interesting benefits from DTA-BRT linkages were identified during the two full days of sessions.

The metropolitan areas of the Americas are continuously looking for efficient and effective ideas to improve the mobility of their citizens. One of these ideas, pioneered in Curitiba, Brazil, is Bus Rapid Transit (BRT, see page 10), a system of buses moving on exclusive highway lanes and tendered by passenger stations. BRT has been operating for years in various cities of South America, and it has proved able to deliver a level of service only slightly below heavy

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ALSO IN THIS EDITON:

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Dr. Luis Pumarada's farewell**

UPRM Chancellor joins a US delegation to Cuba

UPRM Chancellor Jorge I. Velez-Arocho visited Cuba as part of a delegation of 14 university chancellors from the United States and Puerto Rico. The purpose of this visit was to identify potential collaborations with Cuban universities in the areas of academics, science and culture. Organized by the American Association of State Colleges and Universities (AASCU), it took place in September 7-12, 2003 and encompassed Havana and the province of Matanzas.

The group was greeted by Dr. Fernando Vecino, Cuba's Minister of Higher Education, and several university chancellors. On the first day there was a morning plenary session in Havana's Hotel Nacional with presentations on the education systems of Cuba and the United States, followed by conferences on culture, computers and society in Cuba, and biotechnology research in this Caribbean island.

In the afternoon they visited the Escuela de Medicina Latinoamericana (ELAM) where its chancellor Juan D. Carrizo-Estevez spoke about his university and Dr. Jorge Gonzalez-Perez, Chancellor of Havana's Instituto Superior de Ciencias Medicas, described the health and health education systems of Cuba. "I met two ELAM students who are Puerto Ricans who live in the United States", declared Dr. Velez-Arocho. "Both were born in Mayagüez and have study grants from the Cuban government. There are altogether 13 American students in ELAM, and to get their grants they had to promise to return to work in poor US communities after finishing the seven-year career."

In a visit to Universidad de la Habana, the institution's Historian, Dr. Delio Carreras, guided the group in a tour through

the most important buildings. The Chancellor, Dr. Juan Vela-Valdez, explained in the Aula Magna his institution's tradition in education and research. "In this visit we met with a group of students from the United States who were participating in exchange programs in Cuba and listened to their interesting experiences," mentioned Dr. Velez.

The US chancellors were also able to visit two important Havana research centers, Centro de Sintéticos y Antígenos (vaccines) and Centro de Ingeniería Genética y

Velez-Arocho explained that in the past Cuban researchers have visited the University of Puerto Rico to present works on such topics as history, global climate change, medicine, and others.

Biología. In the latter, they were guided by Dr. Jose M. Miyar Barrueco, Secretary of Cuba's State Council.

At Universidad de Matanzas (UM), its Chancellor, Jorge Rodriguez, spoke about possible areas of scientific collaboration among the US universities and UM, particularly in agricultural sciences. "Collaborating in such areas as cattle management, ecology and agricultural production systems appeared very interesting", said Dr. Velez.

On the last day, the group visited several urban restoration projects in Old Havana, the Fine Arts Museum, the Education Complex for Blind and Handicapped Children, and, to culminate the visit, signed a Memorandum of Understanding linking Cuba's Ministry of Higher Education and the AASCU.

Velez-Arocho recalled that in the past the UPR has received visits and hosted presentations from Cuban researchers from areas such as medicine, global climate change, and

history while UPR professors from different fields, such as Architecture and Engineering, have visited Cuban universities. "In this case, we must emphasize exchange possibilities dealing with music, sculpture and painting," he argued.

Other Hispanic chancellors in the US delegation included Dr. Francisco Javier Cevallos from Kutztown University and Puerto Rico born Carlos Hernandez-Flores, from New Jersey's City University.

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Antofagasta, Catolica del Norte, and Kutztown: Three new members for the Consortium

Two Chilean universities, Universidad Catolica del Norte and Universidad de Antofagasta, as well as Pennsylvania's Kutztown University, have recently signed Memorandums of Understanding with the Mayagüez Campus of the University of Puerto Rico within the framework of the CoHemis Consortium. This brings the number of members of this hemispheric network to 42.

Universidad de Antofagasta (UA) is an independent and autonomous government-supported institution, created in 1981 as a legal successor and continuation of Univer-

sidad de Chile and Universidad Tecnica del Estado. In the agreement signed, UA was represented by its Chancellor, Eng. Pedro Cordova-Mena. This link came about after a visit to UA by UPRM's Chemical Engineering Professor Dr. Luis Antonio Estevez. At that time, doctor Estevez met with Cordova-Mena and his Dean of Engineering, Dr. Miguel Alvarez-Chavez, with the Chancellor suggesting the creation of a joint agreement between both universities. UA has named Dr. Luis Cisternas, Director of

Graduate Studies, as its official liaison for Consortium matters, while UPRM has named Dr. Fernando Gilbes, Director of the CoHemis Center to be the official liaison for this and all other Consortium MOUs.

Kutztown University (KU), established in 1893, has 8,500 students. In one of the meetings between UPRM Chancellor Dr. Jorge I. Velez-Arocho and Kutztown President Dr. Javier Cevallos, they decided to arrange an MOU between their respective institutions. The CoHemis Center was entrusted with the implementation of that decision, and thus KU became the fifth US university to join the Consortium. Several joint activities held since. One of the most recent has been a presentation at KU's theater by UPRM's Concert Choir as part of a cultural exchange. Dr. Wendy Ryan, Director of KU's Marine Sciences Program and a researcher who works with dolphins, recently visited UPRM and presented KU's graduate and undergraduate programs in Marine Sciences and Biology. Other Kutztown professors have visited UPRM's Faculty of Business Administration as well as its Department of Humanities.

Universidad Catolica del Norte (UCN) has been focusing on its internationalization. As part of that effort, it undertakes actions that seek to incorporate international dimensions into university teaching, research and other matters. Its Consortium's liaison is Dr. Dania Tristán, who belongs to UCN's Directorate for Institutional Relations. She is the person who initiated correspondence with CoHemis' past director, Dr. Luis F. Pumarada, telling him about her university's strong interest in concerting a collaboration agreement with UPRM. Dr. Misael Camus-Ibacache signed the agreement on behalf of UCN as its Chancellor.

Additional agreements are underway with Universidad del Norte, at Barranquilla, Colombia, which will be represented in the Consortium by Dr. Juan Carlos Ortiz, Professor of its Department of Mathematics and Physics. He visited UPRM on November, 2003, and had the opportunity of discussing the terms of the agreement personally with CoHemis Director, Dr. Fernando Gilbes and Dr. Mildred Chaparro, UPRM's Dean of Academic Affairs and its Acting Chancellor at the time of his visit.

1st National Meeting on Remote Sensing and Geographic Information Systems



Dr. Luis J. Olivieri, Director of UPRM's PaSCoR Program, was one of the presenters in the First National Meeting on Remote Sensing and GIS. Photo by Carlos Diaz - UPRM Press Office

The CoHemis Center organized on May 27, 2003 in Mayaguez the "First National Meeting on Remote Sensing and Geographic Information Systems of Puerto Rico". This meeting was a first step in the creation of a plan and a working group which encompasses the development and the coordination of efforts and initiatives and promotes the export of services in this field.

CoHemis' Director, Dr. Fernando Gilbes, a specialist in applications of remote sensing to the study of water bodies, presided the event. According to him, it was the growing interest in Remote Sensing and Geographic Information Systems (GIS) and the existing dispersion with respect to both of the affiliation of their users and their professional fields, that motivated the organization of this encounter.

The meeting's assistants interacted with presenters from UPRM research centers such as the Tropical Center for Earth and Space Studies (TCESS) and PaSCoR, as well as government agencies such as the Information Center for the Evaluation of Land of the Puerto Rico Planning Board and the Information Transfer Center of the Puerto Rico Highway Authority. There were also presentations on satellite images as instruments of

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Transportation workshop...

rail transit at a fraction of the cost. In addition, BRT causes minimum social and economic disruptions in the construction phase, which is also very much shorter, and increases the benefits provided by the existing infrastructure resources. Several cities around the world, guided by the FTA in the case of the United States, are adopting the idea.

The development and implementation of Intelligent Transportation Systems (ITS—mainly information technologies for drivers) have led to the development of new modeling tools for the prediction and evaluation of alternatives that take into account the dynamics of transportation systems. These tools are known as Dynamic Traffic Assignment (DTA), and they can help ITS subsystems to reduce congestion while improving productivity, safety and the environment. However, most existing DTA models are limited to the dynamics of automobile traffic in urban highway systems, and do not integrate information on BRT and other transit strategies.

Several benefits of BRT-DTA linkages were identified in the workshops. If DTA-type models are adapted to BRT, and real-time traffic information and corresponding DTA projections are fed to BRT operators, then the latter can foresee changes in demand and have an adequate and efficient number of vehicles in service without having to react to congestion-induced delays. On the other hand, if BRT information is fed to DTA traffic models, then intermodal effects and alternatives can improve traffic management as well as the overall effectiveness of ITS on urban transportation. The more time it takes to develop such linkages, the longer will urban transportation be delayed in improving mobility and efficiency in metropolitan areas. Operating independently, BRT and automobile traffic using ITS strategies modeled under DTA would be competing with each other.

The stated objectives of the event were to assess the respective state-of-the-art and the state-of-the-practice and suggest research priorities in the integration of BRT and DTA-based automobile traffic systems in the Americas. It brought together leading researchers and practitioners from north and south to exchange ideas and information and to join efforts concerning the integration of BRT and other transit systems with automobile traffic networks under DTA and other ITS systems. The participants came from: Brazil, United States, Colombia, Chile, Ecuador, Mexico, Dominican Republic, United Kingdom, Venezuela and Puerto Rico.

The seminar-workshop was organized by: Dr. Didier Valdés-Díaz, UPRM-Civil Engineering, Scientific Director; Dr. Luis F.

Pumarada-O'Neill, Organizer; and Mrs. Ileana Rodriguez, Coordinator of the CoHemis Center. Local attendees included graduate and undergraduate transportation students, as well as agency officials and transit experts. The opening ceremony featured Dr. Fernando Fagundo, Secretary of Transportation and Public Works, and Dr. Jack Allison, Executive Director of the Highway and Transportation Authority. A group of transportation students under the supervision of Dr. Didier Valdés are working on the seminar's proceedings. For more information one may inquire at dvaldes@ce.uprm.edu and visit the event's home page, dtabr.com, which includes paper summaries and some presentations, photos and other information.

ALLIANCE WITH KUTZTOWN UNIVERSITY EXCHANGE STUDENT PARTICIPATES IN AN UPRM RESEARCH CRUISE



Aboard the R/V Chapman, with UPRM's island marine laboratory in the background: Jorge Corredor, Gildreth González (Exchange Student Program Director and CoHemis' Co-director), David Pecora, Julio Morell, Fernando Gilbes, and José M. López.

The University of Puerto Rico - Mayaguez recently completed an alliance with new Consortium member Pennsylvania's Kutztown University. The alliance includes the creation of a joint Global

MBA program, in which students from both institutions will take courses in different parts of the world. In addition, it encompasses the exchange of students and

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CoHemis visits Colciencias and Fundacyt-Ecuador

In his last official trip as Director of the CoHemis Center on April 20-23, 2003, Dr. Luis Pumarada visited Quito and Bogota. His purpose was to renew linkages with the new officials in charge of the respective national science and technology organizations located in these capital cities. His visits took advantage of a sponsored research trip to both capitals with the purpose of gathering materials and information on their pioneering transportation systems (see pages 1 and 10).

In Bogota he met with executives from Colciencias, Dr. Carlos Mauricio Nupia, Chief of the Division for the Internationalization of Science, Dr. Zully Ojeda, from the Division for the Development of Human Resources, and Ms. Ingrid Rueda, Dr. Nupia's assistant. They expressed a strong interest in both UPRM and the CoHemis Center, especially Dr. Ojeda when the numbers in Dr. Pumarada's presentation showed that UPRM provides more scholarships and assistantships to graduate students from Colombia than Colciencias itself. Moreover, at present more than half of the international graduate students at UPRM come from Colombia. Colciencias has a joint program with Fulbright-LASPAU that allows it to provide graduate study grants to about 10-12 Masters and Ph.D. students every year at universities in Europe and in the United States, at total costs which are several times higher than those at UPRM.

Nupia was interested in interacting with the Microsoft and Hewlett Packard corporations, both of which collaborate with CoHemis and UPRM, because there is a Colciencias institutional objective which calls for establishing linkages with industry,

especially in relation with the Colombian centers for electronics and communications technologies, CATI and CINTEC. He declared Colciencias' willingness and capability to facilitate equipment donations to Colombian educational and scientific institutions by firms such as Microsoft, which has sometimes met with agencies wanting to collect taxes on their donations. Dr. Pumarada agreed to mail brochures on UPRM's graduate programs to Dr. Ojeda, and to see that Colombian graduate students and faculty at UPRM join the SCIENTI program through the internet. This program is a data base of researchers and research centers in Latin America and the Caribbean which is strongly backed by Colciencias.

In Quito, Pumarada met with doctors Luis Romo, National Secretary of Science

and Technology and President of FUNDACYT, and Renato Valencia, Scientific and Technical Director of FUNDACYT. Dr. Romo informed Pumarada that FUNDACYT is about to receive a loan from the Interamerican Development Bank for a four year program to foster technology innovation which is expected to begin in 2004. They discussed the feasibility of having UPRM's R&D Center, through the coordination of FUNDACYT and CoHemis, collaborate with Ecuadorean institutions and firms on R&D projects related to technology innovation.

TRANSPORTATION SYSTEMS

While in Quito, Dr. Pumarada met with Arch. Rodrigo Torres, General Manager of the city's transportation authority, EMSAT.

Later, guided by Eng. David Astudillo, he witnessed the efficiency and photographed the most important elements of the city's two modern systems: Trole and Ecovia. In Bogota, he held a meeting with Angelica Castro and Eduardo Tovar, respectively the Directors of Planning and Operations of the ultramodern TransMilenio system. He was led through its most representative parts and was permitted to take photos by Eng. Alejandro Obregon.



At the headquarters of Fundacyt in Quito, Ecuador: doctors Renato Valencia and Luis Romo, with Luis Pumarada, CoHemis' director at that time, at center.

First National Meeting...

remote sensing, the use and value of digital teledetection for social sciences and the application of a GIS for city planning and other urban applications. Another presentation dealt with the work conducted by the Ordenación Territorial Office of the City of Ponce and the Municipality of Bayamón for the US Geologic Survey in the identification of flood-prone areas.

Other participants included Dr. Angel D. Cruz, from the Geography Department of the Río Piedras Campus of the University

of Puerto Rico; surveyor Renán López de Azúa, president of RLDA Geo-Métrica, a company that conducts studies of photogrammetry, hidrography, topography and the localization of underground infrastructure, among others. Carlos Paniagua and Pedro Gelabert, both from the US Environmental Protection Agency (EPA), explained the role of the agency in the UN's Environment Program (UNEP), through which a demonstration program on a GIS which encompasses the northwestern Caribbean and

includes the Dominican Republic, Puerto Rico and the US and British Virgin Islands.

Doctor Gilbes trusts that this meeting has set the basis for the realization of similar subsequent events in which more emphasis to the importance of remote sensing and GIS for fields as different and as important as health, agriculture and planning. For this purpose, For this purpose, CoHemis has been providing follow-up by means of an internet group for discussing ideas and announcing events in the field.

CoHemis plans its future

CoHemis' mission has been to collaborate in the development of human resources, to promote joint international research and to facilitate technology transfer among the countries of the Western Hemisphere. We aim to serve the needs of the Americas with the participation of engineers and scientists from the different countries of the Hemisphere.

Since its foundation in November, 1991, CoHemis has been working toward the fulfillment of this mission and looking for ways to carry out the mandates established by the founding international delegates in the conference that it was created. However, during its twelve-year existence there have occurred

Our vision is to become the largest and most active network of science and technology in this hemisphere, with representation of all the countries.

many changes in research and education of engineering and applied sciences. Particular needs have evolved in the different countries requiring improved methods to promote interdisciplinary collaboration.

We are beginning a new stage in CoHemis, but we want to continue our mission with the development of mechanisms that promote collaboration in science and engineering throughout the Hemisphere. Our future plans include renewing the motivation of the members of the CoHemis Consortium, elaborating new strategies for developing interdisciplinary research among our countries, continuing to organize seminars and workshops on relevant topics, and helping consortium members to disseminate their

activities internationally. In order to develop and implement these ideas and others that may be suggested by members of the group, we want to hold a meeting of CoHemis Consortium members in 2005 in Puerto Rico. This will provide an opportunity for developing a working plan for the next ten years that shall help us all to work more efficiently and with better coordination towards common goals.

At the local level, we can do much to help the University of Puerto Rico's international profile. For this purpose we want to become an international collaboration center catering to the needs of those UPR professors and researchers who want to carry out activities involving other countries. We will be developing mechanisms for obtaining international information, travelling and writing proposals, all within the legal and political framework of the particular countries. Our present institutional agreements will be of great help in attaining this objective, but we want to expand our relations with all the countries of the hemisphere through new collaboration agreements and improved relations with their national science and technology organizations.

Our vision is to become the largest and most active science and engineering network in this hemisphere with members in every country. We aim to become the most important and efficient international link for transferring the rapid changes of knowledge and technology. In order to accomplish that goal we are presently working with global scale activities such as the Engineer of the Americas, the Global MBA, the International Center for Sustainable Development, the application of Remote Sensing and GIS Tools, and the Learning Factory. We know that new ideas and possibilities will flourish in our journey toward a more complete hemispherical collaboration, not only in science and engineering, but also in the cultural aspects of our countries.

New CoHemis Co-director: Gildreth Gonzalez

The Chancellor of the University of Puerto Rico-Mayagüez Campus (UPRM) Dr. Jorge Velez-Arocho, and Dr. Fernando Gilbes, Director of the CoHemis Center, named Ms. Gildreth Gonzalez (see photo in facing page) as CoHemis' new Co-director in August 2003.

Her duties include seeking new proposal opportunities and providing follow-up to ongoing projects, in addition to coordinating initiatives which involve international students.

Since 1993 Gildreth has been UPRM's Director of Student Exchange Programs and of its International Student Services. She is responsible for UPRM's participation in prestigious student exchange consortia, such as the National Student Exchange Program, the International Student Exchange Program, the Global Engineering Education Program, and the Institutional Bilateral Exchange Agreements. She also coordinates services for all of UPRM's international graduate students. Between 1994 and 1997, as a member of the National Student Exchange Council, she first represented the Southeast Region, and later became the first and, up to now the only, Latin woman to be Council Chairperson.

Ms. Gonzalez, who had collaborated in joint efforts with CoHemis from her position in the exchange programs, has a B.A. in Social Sciences with a Major in Psychology from the Cayey Campus of the University of Puerto Rico awarded in 1978. In 1980-81 she was the Assistant Director of the Center for Youth Services of Rochester, New York, then returned to Puerto Rico as a Guidance Office counselor, first in the Cayey Campus and then until 1987 at the Humacao Campus. In 1987 she became director of Humacao's Student Exchange Program.

She now brings her enthusiasm and years of experience in dealing with international universities and students to the CoHemis Center and its Consortium. She mentions that one of her priorities in this new position will be to "contribute to the development of new initiatives to continue the successful work that has characterized the CoHemis Center."

LATIN AMERICAN STUDENTS IN UPRM:

CoHemis...update includes in each issue an interview with one of the hundreds of Latin American science and engineering graduate students in UPRM.

PERUVIAN MASTER'S STUDENT IDENTIFIES BACTERIA SUITABLE FOR THE BIO-REMEDICATION OF GASOLINE-CONTAMINATED SOIL

Silvia Liliana Ara-Rojas born in Cajamarca, Peru is currently working for her Master of Science degree in Microbiology at the Mayaguez Campus under Dr. Arturo Massol, renowned researcher in the field of bioremediation of polluted soils. She belongs to the faculty of Universidad de Tacna in southern Peru, where she had

having finished his MS degree at UPRM. Her B.S. degree is in Biology from Universidad de Trujillo in 1992. Trujillo is a coastal city of Peru.

Her masters thesis is titled Community of Gasoline Degrading Bacteria in a Fluidized Bed Bio-Reactor. Her work consists in identifying, and otherwise classifying, the species of bacteria that are lodged in a fluid-

bacteria, the water is allowed to return into the soil. The bacteria picked-up by the water then keep acting underground. The reactor has been highly effective, since the water contains 95 percent less gasoline as it flows out.

The gasoline-degrading bacteria are first established in the surface of the activated carbon particles, through which the oxygenated water flows slowly. Some of these bacteria were planted in the bed when the reactor was built, but others have come with the water from underground or perhaps have arrived spontaneously, responding to the presence of what, for them, is food. Some of them decompose gasoline completely, while others do one step that is complemented by other bacteria that act on their output to finish the job.

The species are identified by means of molecular techniques, comparing the nature and sequence of the molecules in their DNA chains with those of previously identified similar bacteria. Using a special enzyme, the chains are multiplied to ease their identification in a DNA Sequentiator. When a bacteria's DNA results do not match those of any known species, the new micro-organism is classified and its chain is added to the data banks. Sylvia has also been classifying the bacteria physiologically in terms of the substances that they degrade and the products that result therefrom.

When asked about what things she has found most positive about Puerto Rico and UPRM, she mentions the fabulous beaches and the warm and friendly attitude of its people, respectively. On the negative side, she frowns on the daily midday rainpours and the long distances between university buildings and parking places.



Silvia Liliana Ara in between the co-directors of the CoHemis Center, Gildreth Gonzalez and Fernando Gilbes.

been teaching Biology as an Auxiliary Professor since 1995.

Silvia came to Mayaguez in January 2002, a year after her husband, Peruvian Eder Vicuña, who is at present a Doctoral Candidate in UPRM's Department of Chemical Engineering. She brought with her their four year old son Ederito, who presently attends preschool in Mayaguez. She met Eder in Tacna, where he was teaching after

ized bed bioreactor which has been used experimentally under the guidance of Dr. Massol for treating soil contaminated with gasoline. The procedure used is as follows: a jet of water is first pumped through contaminated soil, then it is forced to flow up through the six-foot high vertical cylinder which houses the activated charcoal bed with the bacteria. After having flowed through the carbon bed, losing gasoline and picking up

UPRM collaborates with industry and government: Demonstrating the advantages of biodiesel fuel for Puerto Rico

The University of Puerto Rico – Mayaguez (UPRM) is leading a joint industry-government-academia effort which seeks to facilitate the creation in Puerto Rico of an industry for the manufacture of a sustainable alternative to diesel fuel. As a part of that effort the University is studying the transesterification process used to convert waste greases, used cooking oil, and animal fats into fatty acid methyl esters (FAMES). FAMES are a type of alternative diesel fuel known as biodiesel.

This project has the support or collaboration of the US Department of Energy's National Renewable Energy Laboratory, Panzardi-ERM, the city governments of Caguas, Isabela and Vega Baja, and Puerto Rico's Energy Affairs Administration and Senate Energy Committee.

Dr. Jose Colucci, from UPRM's Chemical Engineering Department, is the director of this interesting and useful project. His faculty collaborators included Drs. Edna Negrón (Food Technology), Arturo Portnoy (Mathematics), and Lionel Orama (Engineering), as well as professors David Muñoz, Jaime Sepúlveda and Edgar Soto. Ernesto Borrero, Fabio Alape and over thirty other undergraduate students have participated so far.

On October 2000, UPRM obtained a grant from the US Department of Energy for the project Grease Biodiesel for Puerto Rico. Its main objective is to develop a Center for Biodiesel Expertise in the Caribbean that could lead to and support a biodiesel industry in Puerto Rico using domestic feedstocks such as recycled restaurant greases and imported feedstocks. The project includes resource assessment, market assessment, and engineering design for producing and using biodiesel in Puerto Rico, identifying industry partnerships for biodiesel production, and marketing and demonstrations. The organization of workshops is also part of the scope of the demonstrations. Another key component is the development of laboratory expertise on biodiesel processing technologies and producing data for engineering design. This includes investigating a variety of raw materials and developing analytical methods and reaction engineering expertise.

Other objectives include the development of laboratory expertise on Biodiesel process technologies using available raw materials, "top down" and "bottom up" studies regarding raw material availability and potential customers in Puerto Rico, and engineering analyses for scale-up. The study includes the development of a reaction system utilizing ultrasound mixing, which results in very high conversions to biodiesel from used cooking oil and tallow. A preliminary process design tailored toward the needs, resources and opportunities available in Puerto Rico is also being developed. In addition, an ongoing aggressive demonstration component aims to develop a customer base. As of December 2003, over twenty demonstrations had been performed, including four municipalities, a state government agency, eleven companies, six private citizens and two sites in the University of Puerto Rico. In general, each of the demonstrations requires a Memorandum of

Understanding between the potential biodiesel user and UPRM. UPRM provides both technical support and the biodiesel that will be utilized. Biodiesel is purchased with funds provided by the Puerto Rico Energy Affairs Administration, while the Caguas city government and UPRM provide the necessary infrastructure modifications that may be required by the potential users, such as storage drums and fueling stations.

As part of the demonstrations, several diesel applications have been tested, including generators, trucks and boats, and boilers. Some of the comments and observations made so far by demonstration participants have been that diesel emission smells disappeared, engine noise has diminished, and acceleration has improved.

For additional information and the possibility of expanding the program to other parts of Latin America and the Caribbean and to other sources such as palm oil, please contact biodieselpr1@aol.com.

KUTZTOWN STUDENT...

of technological, library, and cultural resources. As a part of these exchanges, a marine sciences student from Kutztown participated in a research cruise conducted by UPRM's Marine Sciences Department.

David Pecora, the exchange student, joined several UPRM faculty and graduate students on board the Chapman Research Vessel during August 11-18, 2003. This research cruise is part of a NASA-funded project.

The researchers used during this trip a new and valuable instrument, called Undulating Underwater Oceanographic Data Acquisition System. According to Dr. Fernando Gilbes, an expert in the field and Director of the CoHemis Center, this sensor is designed to measure the color of oceanic waters, from which the concentration of chlorophyll-a is inferred. The latter is a parameter related to the accumulation of important one-celled organisms known as phytoplankton. By means of the aforementioned instrument, complemented by others of a similarly advanced technology, the team analyzed the discharges or mass lib-

eration from the Orinoco River which form rings of water or swirls.

"The most important feature of this cruise is that a set of instruments capable of measuring chemical, physical and biological parameters, as well as their interactions, such as bio-optical and geo-chemical properties of water, were used for the first time in this context. The results will help to understand the behavior of the swirls and their consequences in the oceanography of the Caribbean," stated Dr. Gilbes, who specializes in the application of satellite images to oceanography and the validation of its results by means of instruments such as the one mentioned above.

This project, whose principal investigator is Dr. Roy Armstrong, belongs to the Tropical Center for Earth and Space Studies, directed by professor Rafael Fernandez-Sein. The other participating faculty are doctors Jorge Corredor, José M. Lopez, Ernesto Otero, Jorge Capella, Fernando Gilbes and professor Julio Morell. They are assisted by graduate students Alvaro Cabrera, Milton Muñoz, Miguel Canals, Ángel Dieppa, Ana Lozada, Yaritza Rivera, Lumarie Perez, and Ramon Lopez.

FAREWELL MESSAGE FROM DR. LUIS PUMARADA

To: friends and collaborators of the CoHemis Center and Consortium:

I hereby announce that after more than 12 memorable years as founding director of the CoHemis Center, I am resigning effective July 31, 2003. The management of the Center and the coordination of the dozens of bilateral agreements that exist within the framework of the Consortium will be in the hands of Dr. Fernando Gilbes and Ms. Gildreth González as Director and Co-director respectively.

I have occupied this position since November, 1991 following the unanimous request of the delegates of the 13 countries represented in a hemispheric conference sponsored by NSF with the objective of delineating a North-South center for education and research in engineering and applied sciences. The performance of our center and the support of those persons, institutions and companies that we collaborated with earned for the center the support of the president of the University of Puerto Rico's system and of its Mayagüez Campus through several different administrations. Since I plan to retire from the university in about 1.5 years, it is convenient for the continued

success of the center that the time of my retirement does not coincide with my leaving the direction of the center.

I will be collaborating in different ways with the center and its directors, as our former co-director and now Chancellor of the Mayagüez Campus, Dr. Jorge Iván Vélez-Arocho, has been doing. I will also continue to serve all the many friends that I have made during my years in CoHemis, for which you may contact me at lpumarada@uprm.edu or at my personal address: boricuacamba@hotmail.com. I know that you all will continue to collaborate with the center's new directors in the same enthusiastic way that you have been doing so far.

I feel very satisfied with the implementation of the Center and the Consortium because I sincerely feel that we have made a significant difference for the welfare of the Americas and made it easier for US institutions to make positive contributions at a hemispheric level. For having permitted me to do so, and for your all-important help, I thank you all!

Cordially yours,

Luis Pumarada



UPRM's International University Circle holds its initiation

The Circulo Internacional Universitario (CIU), a UPRM student association whose counselors include CoHemis' codirectors, held an initiation of new members and the investiture of its new board on September 17.

According to its new President, Dominican student Dioris A. Contreras-Bautista, CIU's objective is to "formulate strategies and foster public policy that will strengthen the professional development and promote international exchanges of students around the world." Adding, "we aim to be in contact with similar organizations and benefit together from the opportunities offered by the globalization process, while defending ourselves from its dangers."

CIU's mission is to elaborate concrete and feasible plans for the execution of public policy that will provide solutions to educational problems, especially those faced by foreign students in schools and universities in the United States, Puerto Rico and other countries.

The Vice-presidency went to Colombian Andres G. Morales. Angelica M. Figueroa, from the United States, will be the Secretary, and Puerto Rican Cristina Beras, Treasurer. Fernando Gutman from Argentina, Kevin Johhson from Haiti, and Ana Trujillo from Venezuela, were also invested as members of the board of directors. CIU's faculty counselors are doctors Fernando

Gilbes, Director of CoHemis, and Nelly Vazquez-Sotillo, Associate Professor of Social Sciences. Gildreth Gonzalez, Director of UPRM's Student Exchange Programs and of Services for International Students, and Co-director of the CoHemis Center, is also a counselor.

Students from Argentina, Colombia, Costa Rica, Chile, Haiti, Dominican Republic, Peru, Cape Verde Islands, Ecuador, Honduras, Mexico, Ukraine United States and Puerto Rico participated in the event together with their counselors. They were joined by several members of Puerto Rico's consular corps and by Teresita Cruz-Diaz, Associate Dean of Students.

IN URBAN PUBLIC TRANSPORTATION LANDMARK LATIN AMERICAN INNOVATION

“Need is the mother of invention,” translates an Ibero American proverb. The Brazilian city of Curitiba was undergoing four decades ago the problems caused by a very high rate of population growth, traffic congestion, pollution, uncontrolled development and a public transportation system plagued with fragmentation and a low level of service. Unable to afford the first world technologies of heavy or light rail transit for moving its population and helping to structure its future, Curitiba implemented an innovative transportation solution which has proven so effective and economical that today it is being copied both in the first and third worlds. Replicated with improvements in Quito and just culminated in Bogotá, the Curitiba invention has become a source of pride for all Latin America.

Seeking to secure a pleasant urban future, the capital of the Brazilian state of Paraná culminated an urban planning process with the creation in 1965 of IPPUC (Urban Planning and Research Institute of Curitiba), and charged it with leading Curitiba’s growth process according to a strategic master plan. Unlike many urban and regional planning agencies, IPPUC controlled not only land uses but highway and transportation planning as well. More important, it has had the backing of city officials when pressed by hungry developers.

IPPUC’s creation was implemented under the direction of a Curitiba with degrees in both engineering and architecture who had just graduated from the Universidade Federal do Paraná, Jaime Lerner. After five years of studying alternative futures for Curitiba, Lerner ran for mayor and was elected. With political power in his hands, he began to mold the city that he had been planning: one that guaranteed a high quality of life for its citizens, promoted development while minimizing pollution and conserving large green areas for the solace of its citizens.

Lerner lunged into achieving those objectives using as his main tool a public transportation system consisting of radial main lines interconnected by secondary transverse systems. In the area between the high density corridors corresponding to the main

lines, the city conserved forests and created city parks intertwined with low density housing. Industries with minimum environmental impacts were welcomed into the periphery of the city. Their managers were attracted by the city’s high quality of life. Today Curitiba has a combination family income and quality of life that is much higher than the rest of the country’s and much of the world’s, and it benefits all of its social classes.

TransMilenio began to operate its first four main lines only 36 months after the go-ahead decision.

Facing the choice of a primary transport system, Lerner and his team considered light and heavy rail transit, but their costs were much higher than the resources available. Instead of embarking in a mammoth loan, the type pushed by international banking that affects the budgets and the governability of developing countries for a seeming eternity, Curitiba beat its own path and embarked in the creation of a system that would operate similar to rail transit but with a cost not much higher than a fleet of buses. Thus began in 1974 the implementation of what Curitiba named its Rede Integrada de Transporte, that became known decades later in the rest of the world as “autobuses expreso” and “bus rapid transit”. This new urban transport mode is being replicated in different degrees all over the Western Hemisphere and beyond.

With the help of renowned Brazilian transportation engineers such as Pedro Szasz, Paulo Custodio and Garrone Reck, and learning as they went, IPPUC’s planners conducted a twenty

year process that produced: passenger stations in which passengers pay upon entering the station and not the bus, featuring platforms at the level of the floor of the buses; long buses provided with several wide doors to shorten the passengers’ entrance and exit times; and terminals for transferring to and from secondary or feeder systems. The two central lanes of selected radial highways were segregated exclusively for the long buses. Crossing passengers were protected by greatly limiting the speed permitted in the general traffic lanes, while the avenues on both sides of the transit corridors were made one-way to compensate with the greater speed and capacity achieved.

Curitiba, its growth regulated by its Rede Integrada de Transporte and by courageously enforced land use policies, has won the nicknames of Ecological City and Social City as well as a dozen international awards for environmental protection, quality of life and urbanism. In addition, it has become the world’s main attraction in terms of urbanistic tourism. Thousands of persons travel every year to marvel at the urban structure, transportation network, park system, high quality of life and sustainable development of this metro area of over 2 million inhabitants.

While IPPUC was culminating a system with a uniform fare equivalent to 70 US cents, introducing bi-articulated buses ca-



A Curitiba bi-articulated bus stops at a “tube” passenger station. Ramps extend both ways to facilitate and expedite the passengers’ entrance and exit from the five-door vehicles.

pable of carrying 270 passengers each, complemented by feeder routes and regional express buses that would total 286 lines, Arch. Rodrigo Torres, an Ecuadorian who returned to Quito as head of the city's urban transportation system after having worked in Curitiba's system when a student in Brazil, convinced his bosses to go for a similar system. Thus was born, in 1996, the "Trole" line of articulated electric powered buses. Built and operated by EMSAT the city's transportation agency, its clean vehicles displaced a hundred old, contaminating buses from the crowded historic downtown district.

The line was so successful in attracting riders that in five years it was approaching the total capacity of its vehicles. Unable to buy more trolley buses, Torres divided the line into three segments during rush hours, with the majority of the vehicles serving the heavier central segment and turning around at stations adapted as transfer points, duplicating the system's capacity.

This first line was followed in 2001 by the parallel and privately operated "Ecovía", which uses articulated buses. But Quito, an elongated and undulated city has less than two million population, and the BRT system still had to prove itself in a mega city.

This came to happen when Bogotá, a city of 7.6 million inhabitants, inaugurated in 2001 the newest, advanced and impacting application of the system created in Brazil, TransMilenio. Bogotá's system has proved to be not only an excellent means of transportation, but also a very effective tool for urban development and quality of life. Its infrastructure work went beyond the transportation elements to include amenities such as wider and attractive sidewalks, bicycle paths and pedestrian facilities along its corridor avenues.

While the travel time between its end points was reduced by the expected 32 percent relative to the displaced traditional bus service, surprising numbers came up: traffic accidents, theft and hold-ups fell down between 80 and 90 percent along its routes, and pollution levels dropped appreciably throughout the urban area. TransMilenio, which benefited from the work of the Brazilian engineers and their firm Logitrans and the British consultants Steer Davis Gleaves and their Chilean transportation engineer Dr. Luis Willumsen, fast became a living



In the central aisle of this expressway, Bogotá's TransMilenio has modular passenger stations divided into local and express units serving the corresponding vehicles, which travel on double exclusive lanes. Pedestrian bridges provide access to these stations.

exhibit visited by city delegations from all parts of the world.

The three systems mentioned are integrated in the sense that the uniform fare paid by the passenger allows him to get off the system at any point desired regardless

The main advantages of these systems, pride of Latin American inventiveness, are: low infrastructure and operation costs; low fares and economic self-sufficiency; appealing street level ride; shorter distances between stations; and a much shorter time between decision and implementation.

of the direction or length of travel. Socially and economically the systems work rather similarly: the government plans the system, builds the bus yards, passenger stations and exclusive lanes, and distributes and controls the operations of the different lines. The private operators (except for Trole), who are paid by kilometer-vehicle, buy, maintain and operate the vehicles. The passenger fares pay for the system's operation, depreciation and maintenance.

Quito improves the efficiency of its

system by remote controlling dozens of key traffic lights to favor the main line buses. TransMilenio has GPS units on all buses and a control room with Spanish information technology that monitors all their positions on real time to send messages to drivers who deviate from schedule. Such pinpoint control is very necessary, since the main line buses run as close as two minutes apart in rush hour and the system's maximum waiting time is 6 minutes, with an operational speed of 26.7 km/hr. Such a high speed, only slightly below light rail, is achieved by a local-express service permitted by having two lanes for each way.

Nuevo Leon, Medellin, Lima, Santo Domingo and San Juan are among the many Latin American cities which are considering or developing similar BRT systems for specific routes or for the entire city. In the United States there are more than 15 cities, guided by the Federal Transit Administration, that either operate or are building systems with BRT components.

For more information, you may visit:

http://www.solutions-site.org/artman/publish/article_62.shtml

<http://www.ippuc.org.br>

<http://transmilenio.gov.co>

<http://www.emsat.gov.ec>

<http://www.fta.dot.gov/btr/>

