CoHemis...update

Overcoming through cooperation

Founded with the support of the
U.S. National Science Foundation (NSF)

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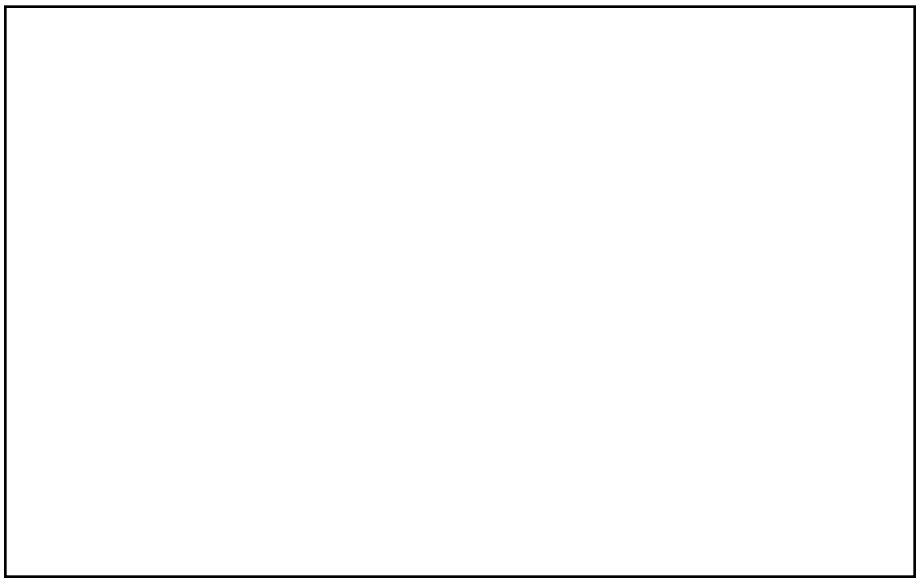
CoHemis Visits Brazil, Bolivia, and Paraguay



Main building of CETEM, Rio de Janeiro. There came up several possible collaborations with UPRM in environmental areas, and with other members of the Consortium in mineral processing. In keeping with the well-known Brazilian hospitality, CETEM celebrated CoHemis' visit by displaying the US flag.

CoHemis' co-directors, Dr. Luis Pumarada-O'Neill and Dr. Jorge I. Vélez-Arocho, traveled to South America from May 21 to June 2, 1996, to visit universities and research centers in Brazil, Bolivia, and Paraguay. Their purpose was to establish contacts with key persons in science and technology affairs; to facilitate collaboration opportunities in research and development; and to recruit members for the CoHemis Consortium in countries where there are still none.

In Rio de Janeiro, thanks to the arrange-

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In Lima, Santo Domingo, Guadalajara and Bogota

Second Caterpillar-CoHemis Short Course Series

Caterpillar Inc. will be sponsoring the Second Caterpillar-CoHemis Short Course Series in four Latin American countries. This year the courses will focus on the design, construction, assessment, and operation of landfill waste systems. Dr. Emir Macari, associate professor of Civil Engineering and CoHemis Consortium adviser on behalf of the Georgia Institute of Technology; Dr. Roque Román, from UPRM's Department of Civil Engineering; and Eng. Javier Ruiz, from BFI of Puerto Rico, will present the courses in Spanish in Santo Domingo (Dominican Republic), Guadalajara (Mexico), Bogota (Colombia), and Lima (Peru). CoHemis director Dr. Luis Pumarada-O'Neill is the international coordinator of this series and will be present at the course sites.

The activity is being organized as a result of the success of the short course

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For International Journal

Articles Requested on Environmental-Industrial Topics

The CoHemis Center is requesting papers from Latin American countries on topics related to "environmentally conscious manufacturing designs and processes," to be published in a special number of the *International Journal of Environmentally Conscious Design and Manufacturing*. The papers can be on: characterization of priorities in a specific country; recent achievements in the country's key industries; dissemination of research results.

These topics are an alternative for the development of treatments and disposal methods for toxic or polluting effluents or emissions: changing to a manufacturing process or product design that produces a similar or equivalent finished or intermediate product, with a smaller or negligible production of polluting wastes.

This interest has now a greater scope. The

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INSIDE:

The Consortium Collaborates with Water Resources Efforts in PR

CoHemis Organizes Sandia National Lab Visits and Panel Series

Dr. Dennis Engi, manager of the Strategic Initiatives Department at Sandia National Laboratory (SNL), a member of the CoHemis Constortium, visited Puerto Rico last April to present a planning technique for structuring information systems for water resources management. He was accompanied by Dr. Néstor Ortiz, Director of Sandia's Nuclear Energy Technology Center, and Dr. Paul Davis, a water resources researcher.

CoHemis coordinated a series of meetings with the top executives from the local offices of the US Geological Survey and the US Environmental Protection Agency, the PR Natural Resources and its Environmental Quality Board, the PR Aqueducts and Sewer Authority, and UPRM professors and researchers. The objective of these meetings was to discuss the possibility of conducting in Puerto Rico a Vital Issues Process to provide design criteria to support decision-making related to Puerto Rico's water resources management in the next century. The Vital Issues Process is a tool developed by Sandia that identifies programmatic activities aimed at defining institutional goals and objectives by means of multi-sector discussion panels.

Dr. Engi presented the results of the similar water resources initiative and process of the Middle Rio Grande Basin conducted in New Mexico. This case showed the usefulness of the process for establishing a working goal statement for a comprehensive research program and identifying criteria for the evaluation and ranking of candidate water resources management issues in order to develop an advanced information system to support decision-making. As a result of these meetings and the enthusiasm shown by federal agencies, Sandia decided to hold the process in Puerto Rico, and the first panel was conducted on June 19th in Mayagüez.

Puerto Rico - Argentina

Collaboration Between Consortium Institutions

Dr. Eduardo Schröder, from UPRM's Agronomy and Soils Department, will be advisor to the project entitled "Interaction Among Microorganisms and Plants of Agricultural Interest: Biotechnological Management of Rizosphere." This project is a follow-up of a previous investigation called "Nitrogen Biological Fixing and Biotechnological Management of Rizosphere for Soybean and Corn," conducted by Universidad Nacional de Río Cuarto (UNCR), Argentina with UPRM collaboration.

Schröder has been working with UNRC's project directors Dr. Susana Rosas and Eng. Néstor Correa, who came to UPRM for an internship in February-March 1996. Schröder had visited UNRC's Plant Physiology Laboratory in 1995 to bring rhizobacteria for soybean and corn roots and advise in their sampling, cultivation, and treatment.

CoHemis Seminar:

Landfill Waste Operation in Puerto Rico

Eng. Javier Ruiz, from BFI of Puerto Rico, and Dr. Jorge Rivera-Santos, Director of the PR Water Resources Research Institute (WRRI) and professor at the UPRM Civil Engineering Department, presented a seminar on "Landfill Waste Disposal Operation." The one-day seminar, organized by CoHemis' associate co-director Dr. Walter Silva, was held twice: on June 27 at the Colegio Universitario Tecnológico de Bayamón (CUTB) and on June 28 at UPRM.

Javier Ruiz, who will also be participating in the Second Caterpillar Short Course Series (see page 1), reported on landfill waste disposals facility characteristics and current practices in their operation and control. Dr. Rivera-Santos discussed the environmental impacts of this type of waste disposal system. The conference was attended by landfill waste operators, representatives from the environmental and health sectors, and engineers related to waste disposal management in Puerto Rico. The activity was co-sponsored by the PR Association of Engineers and Surveyors, the PR Water Resources Research Institute, Colegio Universitario Tecnológico de Bayamón, and the University of Puerto Rico-Mayagüez.

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CoHemis-NSF:

Planning Workshop on Ethics at UPRM

The CoHemis Center organized a "planning and scoping" workshop entitled "Interdisciplinary Research and Training Program in Ethics for Business, Science, and Engineering in the Puerto Rican Context." It was held on April 25-26, 1996 at UPRM, sponsored by the National Science Foundation (NSF), and co-sponsored by UPRM and its Center for Philosophy in Its Interdisciplinary Function.

This workshop brought together experts in the fields of ethics and ethics-and-values studies to review a proposal submitted by CoHemis to NSF. The proposal seeks the implementation of a program that will promote faculty development by integrating ethics and values courses within the business, science, and engineering curricula. This would result in interdisciplinary studies oriented at improving the practice of future professionals and detecting certain relevant, particular aspects of Latin American culture, and disseminating the results among Latin American academia. Dr. Jorge Vélez-Arocho, CoHemis Center's co-director, is the principal investigator for this proposal.

Participating as speakers were: Robert Ashmore, Center for Ethical Studies at Marquette University; Deborah G. Mayo, Department of Philosophy of Virginia Polytechnic Institute and State University; Vivian Weil, Center for the Study of Ethics in the Professions at Illinois Institute of Technology; Michael S. Pritchard, Center for the Study of Ethics in Society, Western Michigan University; and Michael Rabins, Texas A&M. Also participating were Néstor R. Ortiz, Director of the Nuclear Energy Technology Center of Sandia National Laboratory; Mauricio Ramos, from the Center for Development Studies at the Central University in Venezuela; and John Perhonis, Associate Program Director of the NSF Science, Technology and Society division. Many UPRM department heads and faculty members attended the workshop.•

Observer in ALADI Meeting

CoHemis at Cartagena de Indias

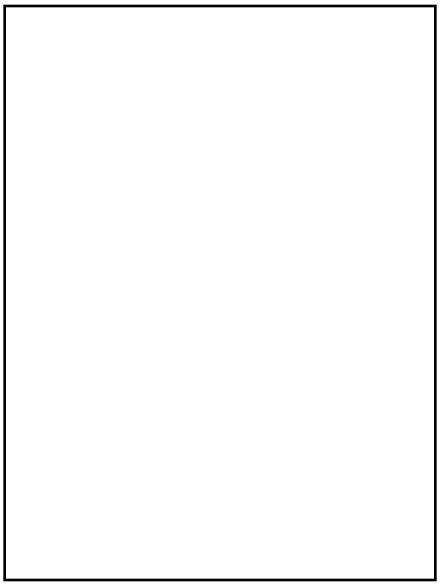
CoHemis Director Dr. Luis Pumarada-O'Neill traveled to Cartagena, Colombia on March 26-29, 1996 to participate as observer in a meeting of the science and technology division of the Latin American Association for Integration (ALADI). He was invited by Dr. Domingo Liotta, Secretary for Science and Technology of the Argentine Republic. In this same meeting, Dr. Liotta was chosen to preside over this entity. Pumarada also met with the Argentine delegation that participated in the Conference of Science and Technology Ministers of the Americas.

In these meetings, Pumarada renewed contacts with Dr. Martín del Campo, Director of ORCYT-UNESCO, Dr. Fernando Chaparro, President of Colciencias, Dr. Olga Lucía Turbay, Director of Colciencias' International Division and advisor to CoHemis, Dr. Guillermo Ramírez, Executive Director of Chile's CONICIT, and Dr. Santibáñez, from FUNDACIT-Chile. Pumarada had the opportunity of meeting the Uruguayan delegation, headed by Dr. Jorge Servian-Tata, Science and Technology Director of the Culture and Education Ministry, and Sub-Director, Dr. Homero Cabañas. Pumarada also met the new International Affairs official from Mexico's CONACYT, Dr. Sylvia Ortega-Salazar; and the Cuban delegation, consisting of the Environment Vice-Minister for Science and Technology, Dr. Carlos Gómez-Gutiérrez, and a specialist from the Ministry International Collaboration Division, Eng. Araceli Mateo de Acosta. Dr. Sylvia Ortega will be representing Mexico in the CoHemis advisory council. As a result of this meeting, contact betweeen Co Hemis and the Cuban delegate to the Center, Dr. Daniel Piedra, was reestablished.

In the meeting with Dr. Liotta and the Argentine delegation which included the newly appointed head of CONICET, Dr. Florencio Aceñolaza, the possibility of Puerto Rico joining ALADI or its Science and Tecnology division as an observer was discussed. Dr. Liotta, Aceñolaza, and Pumarada also talked about a possible agreement with CONICET to facilitate student and faculty exchanges, internships and assistantships between Argentine institutions and the University of Puerto Rico system.

Aceñolaza showed interest in the integration of the Universidad de Tucumán—one of Argentina's best universities—to the CoHemis Consortium. He also discussed possible collaborations with UPR and UPRM in areas such as medicine, remote sensing, and genetics. Aceñolaza proposed the possibility of CoHemis serving as a bridge between CONICET and other Caribbean organizations, and in return, CONICET providing CoHemis contacts with other Argentine entities and even with organizations from Mercosur.

At the social gathering of the Conference of Science and Technology Ministers of the Americas, Pumarada met the Executive Director of the National Commission on Science and Technology Secretariat of Jamaica, Dr. Sandra M.E. Wint, as well as Dr. Enrique D'Etigny, Director of CONICYT-Chile and Dr. Maureen Manchouk, President of NIHERST in Trinidad and Tobago. These last two persons have been collaborating with CoHemis since its creation. Pumarada renewed ties with the Executive Director of the Guatemalan CONICIT, Atty. Magaly Morales, and greeted its delegate to CoHemis, Ms. Rocío Blanco-Pinto. He also met the Director of the Dominican Republic's ONAPLAN, Pedro J. Bona-Prandy; the Deputy Director of the US-OSTP, Dr. Kerri-Ann Jones; and Dr. Pedro Villena-Hidalgo, President of the National Science and Technology Council (CONCYTEC) from Peru. Villena-Hidalgo and Pumarada talked about the CoHemis-Caterpillar Second Short Course Series to be held in Peru, which is reported on this issue (see page 1).•



Angelo Rodríguez, Assistant Director of the Puerto Rico Federal Affairs Admisnistration Office, talks to the participants during his conference in UPRM.

Conference at UPRM:

An International Perspective for a Professional Education

On March 5, 1996, the Assistant Director of the Puerto Rico Federal Affairs Administration Office in Washington, DC visited UPRM to present the conference "The Importance of the International Perspective for a Professional Education." Mr. Angelo Rodríguez shared with UPRM faculty and students his experience as international relations executive in Washington and in various European countries as a result of an invitation by CoHemis.

Angelo Rodríguez earned a B.A. in Finance from the University of Maryland and a degree in European Integration from the Catholic University of Louvain in Belgium. He has a master's degree in international transactions from George Mason University in Arlington, Virginia. Between 1985 and 1986, he lived in Germany, sponsored by a student exchange program. In 1991 he participated in research work in Sweden. In 1992 he traveled trough it to learn its culture and study its efforts toward implementing a capitalist economy after its separation from Yugoslavia. Rodríguez speaks four languages — Spanish, English, German, and Portuguese— and is currently learning Russian.

Rodríguez's professional and academic experience in the field of international relations and finances encouraged the CoHemis Center's co-directors to invite him to UPRM to talk about the importance of integrating an international perspective to any pro fesional activity.

Caterpillar...

series on the same subject presented in June 1995 in Mexico, Costa Rica, Colombia, Ecuador, Chile, and Argentina. This first series reached 431 persons from industry, government, academia, and environmental sectors.

CoHemis is coordinating the activity in collaboration with other Consortium member institutions at the host countries. The preliminary agenda for the short courses is as follows:

First Day: Landfill Siting, Design, and Construction
(Dr. Macari in Lima, Bogota, and Guadalajara; Dr. Román in Santo Domingo)

Selection of Site and Feasibility Report
Leachate, Gas Treatment and Collection
Water and Hazardous Materials' Characterization
Natural Attenuation Landfills: Mechanisms and Design
Containment Landfills: Types and Considerations
Liner Materials: Clay, Synthetic Membranes and Others
Design of Landfill Components
Construction
Landfill Monitoring: Leachate Head, Leaks, Groundwater, Gases, Leachate Tanks, and Final Cover Stability

Second Day, Morning: Daily Operations of a Landfill Facility
(Eng. Javier Ruiz, BFI of Puerto Rico)

Waste Characterization
Current Practices: Waste Systems without Monitoring
Landfill Waste Daily Operation: Access Control and Disposal; Active Disposal Area; Daily Cover
Gas Assessment and Operation
Leachate Generation and Characterization: Definition of Leachate; Factors Affecting Leachate Quality and Quantity
Groundwater: Monitoring
Runoff Water: Regulations and Control
Shut Down and Post-Shut Down

Second Day, Afternoon: Equipment Selection
(Instructors and audiovisuals to be provided by Caterpillar Americas.)

For more information on the courses in their respective countries, please contact the local organizers at:

Colombia: Dr. Eugenio Giraldo / Ing. Zandra Mantilla (UNIANDES)
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Peru: Ing. Pedro Villena Hidalgo (CONCYTEC)
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Venezuelan CONICIT'S Paper in Cartagena Meeting:

"SCIENCE, TECHNOLOGY, AND INNOVATION FOR SOCIAL DEVELOPMENT

Within the Hemispheric Meeting of Science and Technology Ministers held in Cartagena, the Venezuelan CONICIT presented a paper on the interface between science, technology and social development. This paper discusses on the importance of the local social-economic-cultural context when implementing new technologies for development. The following ideas are drawn from this paper.

The Importance of the Context

The new elements that define the current techno-productive revolution should be studied carefully, because this revolution comprises an unprecedented transformation of the production process that generates changes in the collective identity. The social changes that this implies should become an important part of our main concerns. In fact, there are many experiences in which modernizations lacking ethical considerations for the social majority have curtailed its growth and development and reinforced social inequity.

Globalization and Fragmentation

Recent events show us that the process of globalization leads more and more frequently to phenomena of fragmentation. Since the dynamics of a global system are far from being lineal, the homogenization of lifestyles and expectations stresses the need of clinging to the local culture, and strengthens the valorization of what is autoctonous and particular. It thus becomes necessary to keep in mind the continuous interaction among economic activity, value systems, and local culture when applying new technologies.

At the local level, the dynamics of the relationship between social development and scientific-technological development rely on the capacity of innovation and information. The paper refers to these as developing new socioeconomic structures that allow different production systems and diverse manifestations of the economy. It is here where innovation is a product of the cultural, social, and productive capacities of local systems.

"It is certain that, when trying to understand the role of science and technology in the search for sustainable development, the democratization of education, the fight against poverty, etc., standard definitions should not necessarily be followed as guidelines, for they may be absent from the socio-cultural context into which the technology will be implemented. The guides to follow should not necessarily be emulations of the paths taken by the more developed nations. We cannot refer to the simple transition from traditional to modern as "development." The transformation is much more complex, and its success may depend more upon an adequate combination of both phases than in the substitution of one for the other."

Networks, Systems, and Environments for Innovation

For innovations to lead to social development, governments should invest in education, reduce the bureaucratization of the process of business creation or expansion, and decentralize power structures. A transformation in peoples' perception about work is also important, and probably the key element to support the initiatives for social and production transformation.

The challenge of innovations that lead to development may lie upon the creation of a complex institutional and social infrastructure of cultural and material resources for a new kind of production, rather than upon simple measurements of economic feasibility or mere installation of the proper technological equipment.

Recent information and telecommunications developments facilitate globalization and simultaneously encourage local processes. Information educates the labor force and thus generates a labor and social context with a more favorable attitude toward education, scientific research, and innovation.

A Democratic Digression

The consolidation of democracy is one of the main priorities defined in the Summit of the Americas. Social development depends upon government performance as well as civic culture, economy, and the social organization and its interaction with the state's powers.

"This is only possible through a strategy of sharing power between government and civil society, a strategy that neatly delineates what the government can do and what communities can do, a strategy that acknowledges that the state, the market, the political sectors, and all other social organisms should—by respecting the particularities imposed by each national situation— redistribute among themselves their actual functions and incorporate those values, attitudes and supportive behaviors that are effective and competitive."

This can also be applied to the scientific-technological domain. The definition of priorities for action cannot be reduced to a single issue where technicians manage only technical considerations. Technical change also involves ethics and values and an overview of economic and social development. The nature and scale of some scientific and technological developments of today call for civil society to assume control of much decision-making regarding their implementation, and for scientists and engineers to have a solid background on ethics and social responsibility.

"This demand for a greater social compromise in decision-making is only an acknowledgment of the need for more democracy and social control; an acknowledgment of the fact that the rules of the game should not be set by administrators, researchers, specialists, and technical

Continued on page 11

Puerto Rico selected as site

Conference of Minority Institutions

By: Peter Van der Meer, GIS Specialist, LARSIP

The UPRM Department of Electrical and Computer Engineering is organizing the First Conference of Minority Institutions to be held in the Holiday Inn at Mayagüez, Puerto Rico on July 23-28, 1996.

The conference will be chaired by Dr. Ramón E. Vásquez, Associate Director of the Electrical and Computer Engineering Department. The primary purpose of the conference is to discuss ways to attract, retain, and increase the number of US minority computer scientists and engineers. Secondary purposes include discussions of how to involve more students in research and teaching activities, and to create a special mentoring environment designed to retain students in their chosen areas of interest.

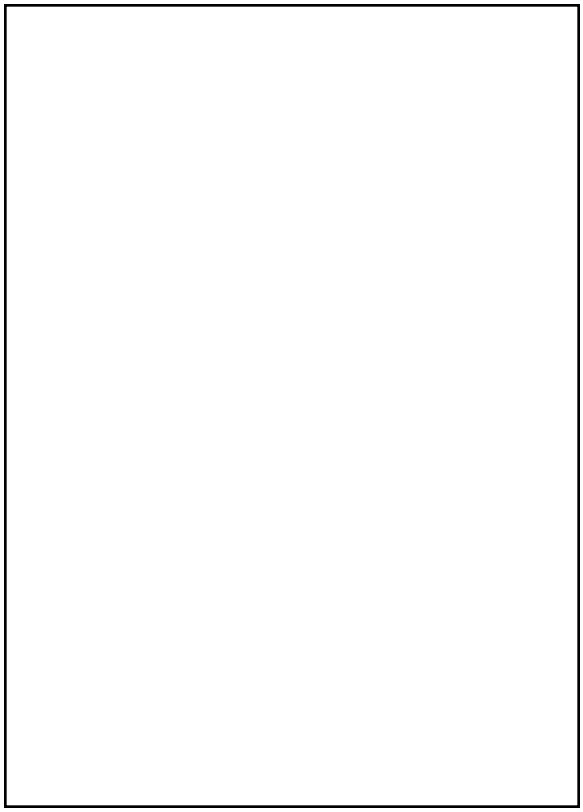
Original papers will be presented to develop, describe and present culturally sensitive environments in the institutions' facilities, teaching, research activities, and social needs. In addition, special needs relevant to minority populations will be identified, described, and presented. Other activities of the conference include discussions and ways to improve the research and teaching environment, form partnerships with major research institutions, and design enhancement activities for minority institutions faculties.

The conference is sponsored by the Association of Computer and Information Science/Engineering Departments at Minority Institutions, and co-sponsored by the Institute of Electrical and Electronic Engineers, the Computer Science Department of the University of Kentucky, and the UPRM Center for Computing Research and Development. More information about this important conference can be obtained by calling Lilliam Lorenzo at telephone 832-4040, Ext. 3753.

UPRM Latin American Students:

a second generation from Paraguay

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



Federico Arias-Carrasquillo stands in front of the mural painting which decorates the lobby of the UPRM Agricultural Sciences Faculty builiding.

Federico Arias-Carrasquillo followed his father's steps by coming to Puerto Rico to study his master's at UPRM. His father, Sergio Arias, was one of the first graduates from the UPRM's Animal Industry graduate program. He studied here from 1963 to '65, sponsored by the Inter-American Institute for Cooperation in Agriculture. After earning the degree, Sergio Arias returned to his country to work for the Paraguayan Ministry of Agriculture. Currently, Arias is an advisor to that Ministry.

Federico was born in Asunción, Paraguay in March 22, 1972. He lived in Asunción until 1994, when he moved to New York while he figured out where to continue studying. In January 1996 he came to Puerto Rico and entered the Animal Industry Graduate Program of the UPRM School of Agricultural Sciences.

Besides being encouraged by his father's experience, he had other reasons to pursue studies at UPRM, the most important one being that universities in Paraguay do not offer graduate degrees related to agriculture. "UPRM has better research facilities and equipment than are available in Paraguay. Since my parents pay for my education, I also had to consider that studying in Puerto Rico less costly than studying in the United States."

Federico hopes to eventually finish a doctoral degree in the future, and then to work in Paraguay as a specialist in milk-cow feeding. "I prefer to go back to my country to apply what I have learned in Puerto Rico. The Paraguayan economy depends a lot upon agriculture and cattle, specifically on meat and milk production. In Puerto Rico, the average milk production per cow is considerably higher than in Paraguay because of better feeding techniques. Helping to improve milk production in my country is quite a challenge."

The young Paraguayan came to Puerto Rico with José Luis Martínez, his friend for 18 years. José Luis also studied agronomy engineering in Asunción. After reviewing UPRM information provided by Federico, he decided to enter the same graduate program. He was also attracted by the research facilities and the low tuition. Federico says that few Paraguayans pursue graduate studies: "Only six out of 130 students who graduated with me went on to study a master's."

Federico is interested in developing a thesis on pasture use for milk-cow feeding. He is currently taking a summer course related to determining the nourishing value of some pastures in the Puerto Rican cow farms. The course is part of a project conducted by Dr. Teodoro Ruiz, in which Federico works in pasture sampling.

CoHemis in NAFTA Workshop at Mexico

The Georgia Institute of Technology invited CoHemis to participate in the "Workshop for Environmental Quality, State-of-the-Art Technology, and Sustainable Development in the Context of the North American Free Trade Agreement," on February 7-11, 1996 in Mexico City. The workshop organizer was Dr. Emir Macari, Georgia Tech's advisor to CoHemis.

CoHemis director, Dr. Luis Pumarada-O'Neill, participated in three workshops: risks for health and environment, technology transfer, and environmental regulations and legislation.

During his stay in Mexico, Pumarada, who is also an industrial archeologist, visited the Universidad Autónoma de México (UNAM), where he met with the director and two professors from its Archeology and Anthropology Research Center. They discussed the possibility of developing a joint degree in industrial archeology between UPRM and UNAM.•

New Focus on Sustainable Development:

"Industrial Ecology"

Among the experts invited to the Mexico City NAFTA workshop was Brad Allenby, Research Vice President of the Technology and Environment Division at Lawrence Livermore National Laboratory. He has written books and papers on "industrial ecology." The following paragraphs summarize his presentation "Industrial Ecology Gets Down to Earth," where Allenby addresses the new challenges posed to engineering by an environmentally constrained world.

According to Allenby, integration of environment and technology is a necessary step on the road to sustainable development within all economic systems. The relevant question is how to manage it in the most efficient and least disruptive manner, and in line with existing price, performance, quality, and other competitive constraints. He defines industrial ecology as an emerging field which views manufacturing and other industrial activity as part of a larger ecological whole. Its systems view of design and manufacturing activities aims at reducing or, more desirably, eliminating the environmental impacts of manufacturing processes, technologies and products across their lifecycles, including use and disposal. Industrial ecology focuses on technology development as a key aspect of any desirable, sustainable global status.

Allenby states that environmental concerns must be integrated into all aspects of economic activity, especially product and process design. He affirms that a systems view of environmental design, or Design for Environment (DFE), is the means by which the still vague precepts of industrial ecology can in fact begin to be implemented in the real world today. One of the most important insights to be gleaned from attempts to implement DFE to date is that governments, preferably acting in concert, need to cooperate fully with private firms if these are to be enabled to systematically implement DFE. Governments must establish social tools (i.e., economic incentives and penalties, impact sudies, mitigation) to guide private firms in their evolution of environmentally preferable technologies. Such a set of tools may be thought of as what Allenby calls "DFE Infrastructure," which must be established and maintained to enable DFE activities in the private sector.

Allenby divides DFE Infrastructure into two main categories: one aspect that deals with economic scales and scope issues, and another arising because of empowerment issues. The first category of DFE infrastructure is required because no firm, however large or integrated, covers the multitude of industrial sectors involved in the lifecycle of any (even reasonably complex) article. For example, computer firms do not know the environmental impacts of energy consumption associated with the production of the various plastics that they use, or of a gram of bismuth or indium, among many others. A solution would be that governments, using the environmental and technological expertise available to them, create a materials data base system that could be operated internationally, so that material choices reflect a wide social consensus. In the United States, the Environmental Protection Agency and the National Laboratories are exploring the possibility of jointly working on such a data base.

More intractable issues arise under the empowerment category, which is based on the premise that private firms are legally and by their very nature supposed to make money, not to set altruistic values for the countrythat may affect their financial interests. There is little guidance in the United States as to which environmental concerns are more important: As a result, firms are unable to determine what their environmental design objectives should be. For instance, the superconductors that might dramatically reduce energy consumption, and therefore global climate change, all contain toxic materials. Which is more important: energy outputreduction or toxic use reduction?, wonders Allenby.

Allenby adds that we also need to balance the social desire for environmental mitigation against the policies embodied in other legal structures. The materials and products desirable for sustentability create the necessity of close collaboration among firms along a product's distribution chain, life cycle, and disposal, new production standards and possibly clashing against existing antitrust laws and international treaties. For example, the possibility that environmental goals may be in conflict with free trade agreements is demonstrated by the debate over the environmental effects of the North American Free Trade Agreement.

Dr. Allenby concludes that it is up to the governments to provide information; to develop and implement policies that create a rational system of incentives and disincentives to encourage the adoption of DFE and similar methodologies; and to determine the evolution of environmentally appropriate technologies.

UPRM Professor Participates:

Hemispheric Workshop on Time-resolved Experiments

Dr. Juan López-Garriga, from the UPRM Department of Chemistry, was invited to participate in the "Workshop on Time-resolved Experiments in Photochemistry, Photophysics and Photobiology" held in Foz do Iguazu, Brazil, on May 24-27, 1996. The workshop brought together 15 selected experts from the U.S.—including Puerto Rico—and an equal number from Latin American countries (specifically, Brazil, Argentina and Chile). Dr. López-Garriga presented a paper based on the experimental results obtained by his graduate students: Raúl López-Mejías, Angel Navarro, Yolanda Echavarría, Cacimar Ramos, and Maritza Almeida.

The 30 participants met to discuss mutual interests and the problems related to time-resolved experimentation techniques. They also developed research collaboration agendas between U.S., Puerto Rican, and Latin American scientists. Some of the experts in photochemical theory agreed to work with Dr. López-Garriga at his laser technology facilities at UPRM for further experimentation. They will visit UPRM as soon as López-Garriga moves to the new Chemistry Building that should be finished during the next months.

The workshop discussions focused on the results of developing fast and ultrafast laser techniques, as well as more sensitive and faster ultraviolet, visible and infrared detectors. So far, this technology has made a big contribution to understanding molecular structure and dynamics in chemical, biological and physical processes.

Many of the techniques developed for picosecond spectroscopy (ps) are based on the laser pulse width for their time resolution. The same methodology has been extended to the pulses in the femtosecond (fs) time regime.

Relevant events that may occur during these time scales include: photochemical isomerization, photo-dissociation, photoionization, electron transfer in photosynthesis, energy transfer in photosynthesis, intramolecular proton transfer, intermolecular proton transfer, protein internal motions, heme-ligand recombination, heme-ligand geminate recombination, and collision time in liquids. Ultrafast processes also occur in molecular crystals as consequence of neighboring molecules and delocalized excitations.

The principles associated to producing and measuring transient events in fast and ultrafast time regimes are based on the "pump and probe" architecture, where the time resolution of the system is determined by the photolysis or pump pulse. Dynamical and structural information is obtained when the duration of both set of pulses is shorter relative to the time interval between them. Thus, the time resolution is set by the pulse width of the laser systems. Similarly, when the probe is a continuous wavelength laser (cw), the time-resolution of the system is also determined by the pulse width of the perturbation laser source. In any pump-probe experiment, it is important that the intensity of both laser pulses be kept relatively weak in order that the pulse pump can induce the required photolysis or processes, while the output laser probe can leave the molecular system undisturbed.

These constraints, together with the dependence of the output signal intensity from the sample, makes the detection of transients species a function of the sample concentration and of the detector sensitivity, efficiency, and increasing time.

UPRM's Library Facilitates Bibliographies and References

The University of Puerto Rico-Mayagüez's General Library has installed a low-cost, fast and efficient document delivery system for journal articles in inter-library loans. The program, known as ARIEL, integrates personal computers (PCs), laser printers, scanners, and communication equipment to send, receive, and print document copies. ARIEL delivers the images through the Internet.

Through ARIEL, the documents are read by a scanner, then compressed and saved by a PC. The digital image can then be either sent immediately or at any other moment. The document is received by another PC, equipped with the proper software, at the soliciting library. It can be either saved or printed. The program can be adjusted to meet the desired quality, so the final result is better than a reproduction from a fax or a copy machine.

The process for remote delivery of journal articles is simple. A request is received by means of the "Online Computer Library Center," a popular electronic communication system. The article requested is taken to the Inter-Library Loan Division and then sent through the Internet to the soliciting library. For UPRM receivers, the printing cost per page is US$0.25, plus any other charge set by the library that sends the document.

ARIEL is being widely used by libraries in the U.S., United Kingdom, Australia, Belgium, Canada, Hong Kong, and Finland. It may be an effective way to speed bibliographical searches in many Latin American countries. For more information on ARIEL, please contact Mr. Luis F. Marín at the UPRM General Library, Circulation Collection, tel.: (787) 832-4040, ext.: 2159.

Request for Articles...

objective of the journal today is to contribute to the security and safety of our environment by providing manufacturers of goods and services, as well as the general public, with information on the trends, advances and research results related to the design and manufacture of products that will reduce as much as possible the negative effects on the environment of their entire life-cycle. The target stages are: raw materials selection; manufacture; consumer use; and disposal.

The journal is edited by Jeff Weinrach, of Benchmark Environmental Corp., and M. Shahinpoor, from the University of New Mexico. They have asked CoHemis to compile articles from the different Latin American countries for this special edition. If more interesting articles are received than can be published in this issue, a second edition may be published.

Those interested in submitting an article between 5 and 12 pages long for this special issue, must submit an English or Spanish summary of less than 250 words to CoHemis (the adress is in page 2) by August 30, 1996. If possible, the articles should be sent by e-mail, fax or priority mail (regular mail between Puerto Rico and Central and South America could take up to six weeks). CoHemis will notify on the acceptance of articles by September 30, and further instructions will be sent. The completed articles, which may also be either in English or Spanish, must have been received by November 30.•

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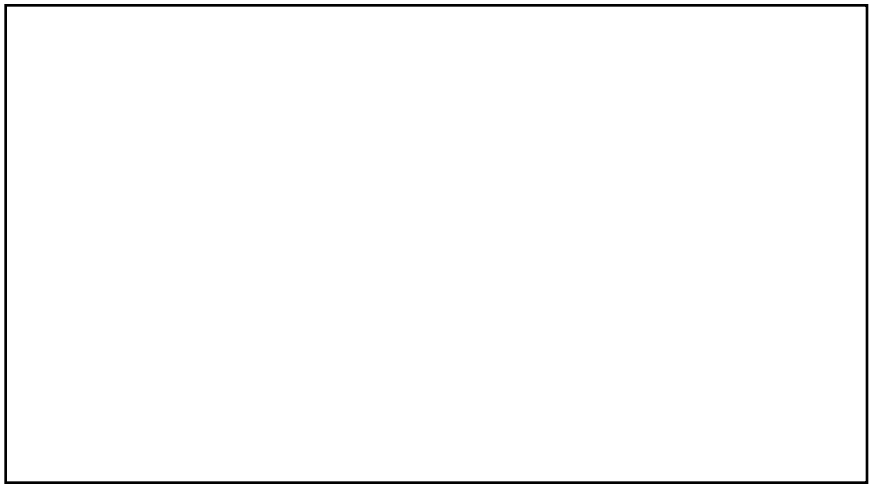
ments made by Dr. Giuseppe Guimaraes, Pumarada and Vélez-Arocho got together with Carlos Valois Maciel-Braga, Superintendent Director of FAPERJ. This Rio de Janeiro state institution provides support for research projects, travel to international meetings, and for organizing meetings in Rio, among other things. In the Pontificia Universidad Católica de Rio de Janeiro (PUC-Rio), they met with José A. R. Parise, Vice-Dean of Engineering, María Augusta Davido-vich, Vice-Dean of Graduate Studies and Research, and Dr. Guimaraes. PUC-Rio showed great interest in joining the CoHemis Consortium and participating in undergraduate exchange programs, sending professors abroad for post-doctoral degrees and sending its Ph.D. students to work in research in other institutions for short periods of time.



Meeting in CNPq, Brasilia. From left to right: Nelson Prugner, Carlos R. de Faria, Carlos Alberto Pittaluga, and Luis Pumarada.

The Universidad Federal Visoza, Minas Gerais, is one of the best universities in agriculture in Brazil. CoHemis met in Rio with Roberto Azevedo, from its Civil Engineering Department, to talk about Visoza's interest in joining the Consortium.

Celso de Oliveira-Santos, advisor to the Directory of the Science and Technology Ministry, received CoHemis in the *Centro de Estudios de Tecnología Mineral* (CETEM). With Oliveira-Santos and Dr. Gonzaga-Santos, among others, they discussed the possibilities of initiating joint activities and faculty exchanges between UPRM and CETEM. The environment was the topic of most mutual interest.

In Rio, they also met with Noel Weiz, from FINEP, a federal agency which provides financial support to institutions, universities and private firms. FINEP is part of the Science and Technology Ministry.

In Brasilia, they visited the *Concilio Nacional de Desenvolvimiento Científico y Tecnológico* (CNPq), where they met with: Carlos Roberto de Faria-e-Souza, Director of the International Affairs Office; Nelson Prugar, Coordinator of Informatics and Engineering; and Carlos Alberto Pittaluga, Coordinator of Engineering. CNPq is aimed at the education and support of researchers. Some of the priority areas which may profit from exchanges with Puerto Rico are environmental research, sustainable management, physical oceanography, and computer sciences.

In Sao Paulo, Pumarada and Vélez-Arocho visited the Escuela Politécnica of the Universidad de Sao Paulo (USP). There they met with Dean Dr. Celio Taniguchi, who showed special interest in environmental areas. In USP's central administration they met with the Pro-Reitor of Culture and University Extension, Dr. Jacques Marcovitch, an internationally renowned personality. They discussed the possibility that USP—which is, together with Mexico's UNAM, one of the top three or four universities in Latin America—join the Consortium, responding to the Escuela Politécnica.

In San José dos Campos, Sao Paulo, they visited the *Instituto Nacional de Investigaciones Espaciales* (INPE), where they met with Thelma Krug, Director of the Remote Sensing Division. In this meeting they identified mutual interests in areas such as education, agriculture, environment, marine sciences, and the superposition of diverse satellite images.

In Asunción, Paraguay, Pumarada and Vélez-Arocho visited the *Instituto Nacional de Tecnologías y de Normalización*, where they met with Dr. Juan Francisco Facetti, President of the Council and General Director; Dr. Andrés Vázquez; and Eng. Norberto Zaracho. They were interested in courses and workshops on technology and product quality and development, and in environmental areas. The *Instituto Nacional* is part of the Science and Technology Ministry, and is in charge of metrology and normalization in Paraguay, as well as being the country's national science and technology organization. In a second meeting, specific contamination problems were identified and pre-proposals were exchanged for possible collaborations.

They also had the opportunity to meet Dr. Facetti-Massuli, father of Dr. Juan F. Facetti. Facetti-Massuli worked as a scientist in the Mayagüez Nuclear Center three decades ago.

In the Universidad Nacional de Asunción, they met with the Dean of Engineering, Eng. Héctor Amilcar-Rojas; the Director of the Applied Engineering Department, Alejandro Blanco-Centurión; Eng. Carlos A. Guerreño, Director of the Research and Development Department, and Dr. Rafael Camperchioli, Dean of the Chemical Sciences Faculty, among others. In this meeting, the Faculty of Agricultural Sciences was represented by agronomist Oscar A. Molas, of the Animal Production Department, and Mrs. Isabel Basualdo, Research Area Director. Eng. Mirtha Caballero, who runs an energy program, also participated. In the meeting, various fields of possible collaboration with UPRM and the Consortium were identified.

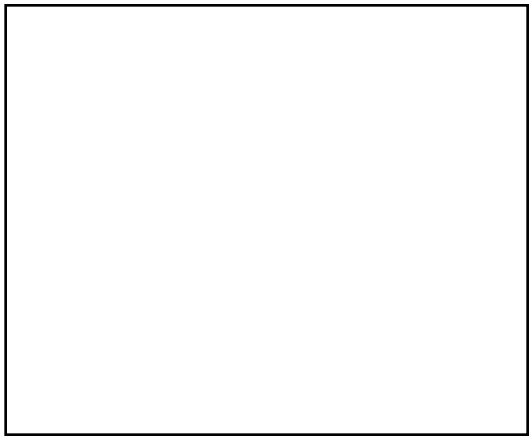
Eng. Luis A. Lima, successful businessman and faculty member at UNA, took Vélez-Arocho and Pumarada to visit his metal-forming factory. This factory has been a pioneer in establishing international quality standards in Paraguay.

In La Paz, Bolivia, they met with Eng. Antonio Saavedra-Muñoz, director of the National Academy of Sciences of Bolivia, which is presided ex-officio by the Vice-President of CONACYT, Dr. Carlos Aguirre. Saavedra put his organization at CoHemis' disposal for the dissemination of information in Bolivia. Pumarada and Vélez-Arocho also met with the Executive Committee of the Universidad Boliviana, represented by Juan Cuevas, Executive Secretary; Dr. José Tellería, National Secretary of Science and Technology; Eng. Mario Virreira-Ipone, National

Continued on page 10

CoHemis Greets New Advisers and Delegates

The CoHemis Center and Consortium welcome new delegates and advisers. Dr. Carlos Roberto de Faria-e-Souza, from Brazil's Concilio Nacional de Desenvolvimiento Científico y Tecnológico (CNPq), Dr. Olga Lucia-Turbay, from Colombia's Colciencias, and Dr. Sylvia Ortega-Salazar, from CONACYT, Mexico, have been appointed delegates to CoHemis and members of the Advisory Committee. Dr. Turbay, director of International Cooperation of Colciencias, was named by the president of this entity, Dr. Fernando Chaparro. Dr. de Faria was appointed by José Galizia-Tundinsi, President of CNPq. Dr. Ortega takes Mexico's place in the committee, replacing Dr. Fernando Rosenzweig.



Two generations of commitment to science: on the left, the President of the Consejo and General Director of INTN in Paraguay, Dr. Juan F. Facetti, and his father, Juan Facetti-Massuli, new individual adviser to CoHemis. On the right, CoHemis co-director, Jorge I. Vélez-Arocho.

The well-known environmental chemist and professor of the Universidad Nacional de Asunción (Paraguay), Dr. Juan F. Facetti-Masuli, who worked in the 1960's in the Mayagüez Nuclear Center (today the UPRM Center for Research and Development) has accepted to become an individual adviser to CoHemis.

Dr. Virginia Vargas, professor at the Universidad Mayor de San Simón, Cochabamba, Bolivia, was named Bolivia's delegate to CoHemis by Dr. Carlos Aguirre-Bastos, Executive Secretary of CONACYT.

Dr. Rocío Blanco-Pinto, Consultant in International Cooperation of CONCYT, Guatemala, was named delegate to CoHemis by Atty. Magaly Morales, National Coordinator of CONCYT.

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Secretary of Academic Planning; Eng. Guillermo Ibañez-Flores, National Secretary of Graduate Studies, and Angel García-Ontineroz, Academic Planner. They discussed the necessity of international collaboration to update and enhance the knowledge of faculty members and to emphasize environment studies and research of the many public universities that integrate the Committee. They were extremely interested in signing a collaboration agreement with UPRM within the framework of the CoHemis Consortium. The Executive Committee serves as a coordinating body for the public universities and also includes the Catholic university.

Also in La Paz, they visited the Military School of Engineering, and met with its Director, Brig. Gen. Juan Verdúguez, and his aides. In the meeting they discussed possible collaborations. In the Instituto de Hidráulica e Hidrología of the Universidad Mayor de San Andrés, they met with its director, Eng. Freddy Camacho-Villegas. This Institute, with a strong component of German technical and financial aid, works in applied research and extension services.

Also within the framework of the Universidad Mayor de San Andrés, they met with various members of the Technical Faculty, Eng. Laurentino Salcedo-Aguirre, Dean; Eng. Gustavo Michel, Vice Dean; and Arch. Héctor López de Vega. These executives expressed their interest in benchmarking the technical education that their students are receiving with what is being thaught in "first world" countries, and in enabling their faculty members to keep up to date in technology advances. The meetings and arrangements in La Paz were organized by Lucio Rocha, CONACYT's Coordinator, thanks to Dr. Aguirre.

Dr. Pumarada also met with the directors of the Inventors' Association of Bolivia, headed by their president, Marcos A. Arellano. CoHemis offered to provide the Association with more international contacts with organisms interested in encouraging creativity and inventiveness.

In Cochabamba, Bolivia, they visited Universidad Mayor de San Simón. In a meeting arranged by Eng. Virginia Vargas, Bolivia's delegate to CoHemis, they met university Chancellor, Alberto Rodríguez-Méndez; Vice-Chancellor, Lic. Augusto Argandoña; Director of Research in Science and Technology, Dr. Luis Morales-Arlando; Director of the International Cooperation Department, Eng. Luis Artega; Eng. Rolando Garmica of the Engineering Faculty; Dr. Luis Quiroga-Moreno, Dean of Medicine; Lic. Virginia Rodríguez, Director of the Water Program; in addition to José Amurio, of the Agricultural Sciences Program; Lic. Maritza del Castillo, Director of the Ecology, Environment, and Development Center; and Eng. J. Eduardo Zambrana, Director of of the Agrochemical Center of Agroindustrial Technology.

This university has the mission of supporting the development of the productive capacity of the Department of Cochabamba, and for this they have established productive collaborations with entities of many countries, mostly European. 17 % of its budget is directed to extension services and development, for the year 2000 they expect to dedicate US$ 11 million to these activities out of a US$ 25 million overall budget. In this meeting, and in the visits to the research facilities that followed, many collaboration possibilities with the Consortium were discussed, related to various fields. Two on-going collaboration efforts already exist between UPR and UMSS.

Internet Addresses of Some Brazilian Universities and Institutions

CETEM: **http://www.redetec.org.br/inst/cetem.html**
Universidad de Sao Paulo: **http://www.usp.br**
Instituto Nacional de Investigaciones Espaciales: **http://www.inpe.br**
Concilio Nacional de Desenvolvimiento Científico y Tecnológico: **http://www.cnpq.br**
Pontificia Universidad Católica de Río: **http://www.puc-rio.br**

Innovation for Social Development..

experts alone."

Some Guidelines

Some key elements for any action plan with the objectives are:

⇒ Each country should find its own ways for taking advantage of scientific and technological opportunities.

⇒ Technology is a social process that involves people, their culture, and their history. These elements should be considered if technology is intended to have effective and long-lasting positive effects.

⇒ Social, academic, and industry institutions that by themselves are able to generate and conduct development and social change should be constructed.

⇒ Many times, the low-technology or traditional alternatives are the only feasible options, imposed by economic restrictions as well as real social demands in less-developed countries.

Programs for Action

With the main objective of strengthening and increasing hemispheric cooperation in science and technology as a way of contributing to sustainable and equitable development, the paper proposes a set of programs that integrate elements from culture, environment, education, health, and economy.

These programs are based on the premise that scientific and technological development is closely related to the other aspects of hemispheric collaboration discussed in the Summit of the Americas: strengthening democracy, free trade, economic interaction, eradication of poverty, and sustainable development. They also suppose that science and technology represent a critical element from a list of other important issues in the hemispheric agenda: telecommunications, education, health, sustainable use of energy, biodiversity, and pollution prevention, among others.

The proposed guidelines affect the following areas:

⇒ local adaptation of systems for the generation of knowledge , transmission, and application;

⇒ improvement of communication infrastructures; and

⇒ improvement of science and technology public policies and their instrumentation in the efforts for sustainable development and social equity.

COLLABORATIONS IN RESEARCH AND DEVELOPMENT

Please let CoHemis... update help you to exchange information, search for research partners and training opportunities abroad, sabbatical leave destinations, and however we may serve hemispheric solidarity and collaboration in science, technology and engineering. Feel free to send us your announcement or project for publication.

If you want to be included in our newsletter mailing list for receiving *CoHemis...update*, please fill out and return this form to: CoHemis, University of

Puerto Rico, Mayagüez, Puerto Rico 00681-5000.

You may send the same information by e-mail to: Cohemis_rum@rumac.upr.clu.edu.

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