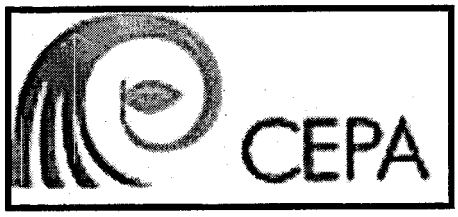
CONSORCIO EDUCATIVO PARA LA PROTECCIÓN AMBIENTAL/ EDUCATIONAL CONSORTIUM FOR ENVIRONMENTAL PRESERVATION (CEPA)



A REPORT ON THE 2002 CEPA ACTIVITIES

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A REPORT ON THE 2002 CEPA ACTIVITIES

INTRODUCTION

This report summarizes the instances of scientific, educational, and institutional cooperation on environmental issues and other activities the Educational Consortium for Environmental Protection / *Consorcio Educativo para la Protección Ambiental (CEPA)* completed in 2002.

This year's main focus was the identification of new resources to continue the work of the Consortium. There were three key initiatives for this purpose: the identification of collaborations with other federal agencies that could enhance the on-going activities and assist in the development of other initiatives, the institutionalization of the Consortium, and the identification of funding and collaboration in the private sector. The alternatives we have considered are delineated in the Institutionalization section of this report.

To be able to continue the development of new research activities, we had discussed the possibility of securing an IPA from EPA who would act as the CEPA coordinator. Even though we did sign an agreement and identified a possible candidate, we did not secure the person. As a result of this, we were not able to move the CEPA research agenda as we had planned for this past year. The lack of a full time CEPA coordinator also forced us to halt some of the new activities that had been planned.

The two main activities CEPA coordinated during this period were possible thanks to the award received from the US- EPA as part of the CEPA-EPA MOU signed in 2000. These were: the EULA International Environmental Summer School- Universidad de Concepción, Chile and the summer student internship programs at the federal laboratories.

OVERVIEW OF CEPA'S MISSION AND GOALS

CEPA is a collaborative international consortium that brings together higher education institutions with governmental agencies, research laboratories, and private sector entities. CEPA's mission is to strengthen the technical, professional, and educational environmental infrastructure in the United States and Latin America. The CEPA program consists of a true partnership between participating groups and includes curriculum development, student exchange, faculty development, and creation of educational materials, joint research, and other cooperative activities. Human resource development and the creation and leveraging of sustainable programs provide CEPA the medium to achieve its mission. This is accomplished by actively working with Hispanic-serving institutions of higher education in the United States, in collaboration with institutions of higher education in Latin America and, other Consortium members to deliver competitive environmental programs.

The current CEPA goals are the:

- Development of bicultural environmental training programs at the undergraduate, graduate and professional levels,
- Training Hispanics in the fields of environmental science and technology,
- Increasing access to educational programs for the study of the environment,
- Promotion of cross-sector research and development projects,
- Incorporation of the National Research Laboratories unique scientific capabilities to strengthen the capacity of Hispanic-serving institutions to address environmental priorities and,
- Development of a bilingual Internet-based CEPA information system on environmental issues that could be used throughout the hemisphere

CEPA 2001-2002 ACTIVITIES

GENERAL ACTIVITIES

1. EULA- International Environmental Summer School at the Universidad de Concepción (UCCh), Chile. ERC worked with the CEPA member institutions to identify students that qualified to participate in this seminar.

The students were selected after evaluating their resumes, letters of recommendation and short essay explaining why they wished to benefit form this opportunity. The logistics of the program were finalized by mid-December as the students would need to travel to Chile on January 2, 2002 to start the one-month seminar.

The seminar included three courses with classroom and fieldwork programs: *Integrated Hydrographic Basins Management: Scientific and Applied Basis, Water Quality Assessment and Monitoring: Scientific Basis and Study Cases, and Environmental Modeling: Water Quality Models*

The UCCh provided grants for 6 students to cover student registration and housing and CEPA reimbursed Consortium universities for costs incurred in airfare, meals and other incidentals. *(see CEPA 2001-2002 Activities section).*

2. Identification of environmental programs in non for profit organization that could be interested in having CEPA students work in their summer programs. ERC also identified the CEPA students that could benefit from these activities.

3. Two professors from Universidad Austral de Chile had the opportunity to attend a bioremediation course hosted by the Smithsonian Institution.

CEPA SUMMER INTERNSHIP PROGRAM- SUMMER 2002

The 2002 Summer Internship Program at DOE National Laboratories provided research experience for 6 students from the following CEPA institutions: Marisol Bracamontes from UPAEP, Fernando González, Samuel Camacho and José R. Tormos from USH and Mariano Ruiz from UTB.

Ms. Miriam Cruz president of Equity Research Corporation set up a meeting among students from Consortium institutions participating in the Argonne National Laboratories internships and their mentors to dialogue about their adaptation process and learning curve during their term at ANL. Dr. Harold Myron, Director of the Department of Educational Programs at Argonne, along with other staff members and student mentors provided and oral activity progress report. The high quality of the students selected by CEPA for the summer internships impelled some researchers to inquire about the possibility of having the same group of students return the next summer to continue their outstanding work in the respective research areas.

(The students invaluable experiences are summarized on the next page.)

DOE-CEPA Summer Internship Program - Summer 2002

STUDENT	UNIVERSITY	NATIONAL LABORATORY	PROJECT	STUDENT REPORT ABSTRACT
Manuel A. Arce-García	**Sacred Heart University of Puerto Rico**	**Oak Ridge Environmental Science Division** **DOE/NAL Mentor: Mr. Thomas Bowden**	**AmeriFlux Web Site Database Design Update**	Ameriflux is a network of roughly 80 sites in North, Central and South America making year-round measurements of carbon dioxide, water vapor, and radiation using eddy-covariance techniques. CDIAC is the central archive for all Ameriflux data performing a variety of tasks such as analyzing, documenting and disseminating data. CDIAC is also responsible for designing and maintaining an Ameriflux website to provide this information to students, policy-makers, and scientists across the globe. The internship focused on improving the layout of the Ameriflux site descriptions and on improving the completeness and accuracy of the information. To accomplish this it was necessary to modify an existing ColdFusion® program and to enter information into the centralized Microsoft® Access database. Information and data were sought and extracted from various sources resulting in approximately 1,500 new database records and more complete site descriptions.
Samuel E. Camacho-Sánchez	**Sacred Heart University of Puerto Rico**	**Argonne** **DOE/NAL Mentor: Dr. Margaret McDowell**	**Environmental Risk Assessment & Community Involvement**	Environmental risk is based on the idea that depending on environmental conditions, a harmful event may occur. Risk is a combination of hazards, exposure and toxicity; communicating these aspects to the public poses a challenge. To achieve a successful program, establishing trust and understanding between environmental researchers, their work and the community is essential. The United States is home to a large percentage of Spanish-speaking communities who often reside in areas where environmental risk assessments are being completed or needed. The creation of a general environmental risk assessment fact sheet published in English and Spanish will help accomplish this goal.
Fernando González-Illán	**Sacred Heart University of Puerto Rico**	**Argonne** **DOE/NAL Mentor: Dr. Giselle Sandi**	**Material for Electrochemical Storage**	Lithium batteries are used in a number of appliances that range from portable computers to cordless telephones and wireless equipment. It is considered one of the best ways to store energy to be used along extended periods of time. These batteries have several important components: the cathode provides positive output while the anode provides the negative input. The electrolyte, another important component is responsible for conducting the electric charge between a cathode and the anode. In the batteries to be tested in the laboratory, the cathode is made of a transition metal containing lithium in its structure, and the anode is made of a clay material called "Sepiolite". The objective using this material is to obtain a carbon with specific properties.

José R. Tormos	**Sacred Heart University of Puerto Rico**	**Argonne Chemical Technology Division** **DOE/NAL Mentor:**	**Cathode Materials for Lithium Ion Batteries**	ANL has been focusing on developing advanced positive and negative active materials for high-power, high-energy and high capacity lithium ion batteries. Both materials are designed to give high electrochemical performance and high stability to achieve a good calendar life for the proposed applications. Olivine phosphate ($LiFePO_4$) is a very promising cathode for such applications since it largely satisfies the requirements of long life and is much more stable than conventional cathodes. $LiFePO_4$ has a flat voltage at 3.5V that allows getting about 90% of the theoretical capacity at cut-off voltage, significantly enhancing the life of the battery. This material is also non-hazardous and non-toxic which makes it a friendly, safe, easy to handle and harmless to living organisms. The results from the cycling data, safety study and aging tests concluded olivine phosphate is a more efficient lithium compound to make high capacity lithium ion batteries.
Mariano Ruiz	**University of Texas at Brownsville**	**Argonne** ***DOE/NAL Mentor:*** **Dr. Paula Moon**	**The Effects of Electrical Current and Ion Exchange Resin Mixture Ratios on Continuous Electro-deionization**	Continuous electro-deionization (EDI) is a procedure consisting of the transfer of ions from an ionic solution by the use of ion exchange resins, ion-permeable membranes, and current, enabling the separation of ions from a dilute solution. It is based on electro-dialysis and ion exchange resins. The purpose of this procedure is for resin regeneration and mainly, the removal of salt impurities and other similar products from refined products in a cost effective manner. It is used for low concentration solutions. In this study, current and ion exchange resin ratios were varied to determine the most efficient. The experiment concluded that 6 amperes of current are the most suitable for the potassium chloride solution; reduced. In addition, earlier EDI experiments were analyzed with computer software. Future work will encompass EDI experiments with different resin ratios, currents and solution concentration comparisons.
Marisol Bracamontes	**Universidad Popular Autónoma del Estado de Puebla, Puebla, Mexico**	**Argonne Energy Systems Division** **DOE/NAL Mentor:** **Dr. Paula Moon**	**Esterification of Lacitic Acid**	Lactic acid has been an intermediate - volume specialty chemical used in a wide range of food-processing and industrial applications. Lactic acid is the most widely occurring hidroxycarboxylic acid. However, it is considered a pollutant in waste water and must be removed. Two different reactions are being studied, cracking of ammonium lactate and esterification of lactic acid. To obtain kinetics of these reactions, samples are analyzed by ammonia titration and high performance liquid chromatograph (HPLC).

EULA International Environmental Summer School

The main objectives of the Center of Environmental Sciences, EULA at the University of Concepción, Chile are the development and execution of postgraduate courses on current environmental sciences issues. The teaching activities are designed with an interdisciplinary approach and are intended for students, professionals and young researchers from American and European countries, to facilitate the transfer and exchange of experiences on relevant academic topics.

The Center of Environmental Sciences, EULA at the University of Concepción, Chile under the general coordination of Dr. Oscar Parra, sponsored six students from CEPA member institutions to participate in the International Environmental Summer School at the Center's facilities from January 2-31, 2002. Once the selection process was completed, Consortium institutions were represented by students from México, Puerto Rico and the United States: Raciel Flores Quijano (UPAEP), Sylvia Castro (Tlaxcala, MX), Fernando González (USH), María L. Salazar (UTB), Joanne Hamilton (UTB) and Claudia Iglesias (TAMU-CC).

They enrolled in an intensive program with each of three courses counting for 3 credits, corresponding to 32 theoretical hours and 48 field work and seminar hours. Final student evaluations consisted of two forms of evaluation for each course: (1) individual test and (2) group work (a research proposal) through oral presentation. The class averaged 70% A and 30% B in the individual test and 75% A and 25% B for the group grade. Upon completion, interns received credits and certificates corresponding to each teaching activity according to norms established by the Graduate School Regulations of the University of Concepción.

The courses taught at the Summer School 2002 were specifically directed at studying all phases of aquatic resources management and behavior as follows:

- *Integrated Hydrographic Basins Management: Scientific and Applied Basis* (January, 2-10), Coordinator: Dr. Oscar Parra.
- *Water Quality Assessment and Monitoring: Scientific Basis and Study Cases* (January 11-20), Coordinator: Dr. Ricardo Barra.
- *Environmental Modeling: Water Quality Models* (January 21-31), Coordinator: Dr.Claudio Zaror.

The students received instruction from a team of highly qualified staff from the following sponsor institutions: University of Concepción, Chile; Umweldt Forschung Zentrum (UF Z), Germany; University of Siena, Italy; University of Córdoba, Spain; International Cooperation Agency, VVOB, Belgium, UNESCO/EOLSS Chair; Educational Consortium for Environmental Protection (CEPA); (USA, México, Puerto Rico, Chile); Project Fondef N° DOOI 135, CONICYT-Chile.

CEPA-EULA Summer School Participants Reflect on their Experiences

This year's student interns from CEPA institutions volunteered the comments listed below, they clearly attest the value this opportunity will represent in their future as professionals and as citizens duly committed to safeguarding the environment; and why we believe CEPA Consortium coordinated activities must continue. These students will bring back to their countries a more holistic vision of environmental resources management; the exposure to other cultures and traditions is also a very significant component of this experience.

The multidisciplinary background of the lecturers that shared their personal experiences helped us attain a better understanding of environmental issues in different countries and how they relate to water resources management. *Fernando González Illán, SHU, Puerto Rico*
Acquiring an integrated perspective to watershed management allows us to value how the aquatic, terrestrial, air, natural and community resources interact to modify the environment in favorable or unfavorable ways. Its gives us tools for professional growth that will help us emit a more technical judgment as opposed to an emotionally charged one, in a particular issue once we join the work force. *María L. Salazar, UTB, U.S.A.*
The opinions expressed by the highly capable professors at the school, provides elements to reach a higher level of thinking conducive to the development of new knowledge. *Joanne Hamilton, UTB, U.S.A.*
The adequate balance between the theory taught in the classroom by a professional, and the filed experience was very valuable to reinforce the lessons learned in the three courses at the EULA Center. *Claudia Iglesias, TAMU-CC, U.S.A.*
The advantage of obtaining an official certificate with grades and post-graduate credits is an excellent opportunity for personal growth, more so because of the marked difference between a mere attendance diploma and the official accreditation certificate coupled with formal evaluations in the classroom and in the field of work. *Raciel Flores Quijano, UPAEP, México*
The opportunity to learn how to manage environmental issues in other countries, including legislation (especially in Chile), inevitably leads to establishing comparisons between our country of origin and the one we are visiting. *Sylvia Castro, Tlaxcala, México*

INSTITUTIONALIZATION OF THE CEPA CONSORTIUM

To continue with the institutionalization process, ERC met with several of the federal agencies which participated in the last annual meeting to identify possible collaborations with them. A key meeting took place with the Department of Interior (DOI) to discuss a research project with the Division of Fish and Wildlife. We are also looking at the possibility of signing a memorandum of understanding with DOI.

ERC also provided information regarding the EPA-ECO program participation for SHU students to continue their community outreach initiatives. Since 1992, the Office of Environmental Justice (OEJ), at the U.S. Environmental Protection Agency (EPA), has sponsored a Summer Intern Program through a cooperative agreement with the Environmental Careers Organization (ECO), a non-profit organization located in Boston. Approximately, 2,000 students from all parts of the U.S., from diverse ethnic backgrounds, and all academic levels (undergraduate, graduate and doctoral) have participated in this educational program. The students have received training on challenging science, engineering, management, education and policy-related projects at EPA. In 2000, OEJ initiated the Community Intern Program, through which more than 75 students, experienced environmental protection at the grassroots level. Due to the program's success student participation has been increased, we are working in this direction to secure placement of USH student interns in local community organizations.

Foundations and corporations that could be interested in funding CEPA activities or in collaborating with its programs were also identified. One such organization is the Tinker Foundation, whose institutional grants are awarded to organizations and institutions that promote the interchange and exchange of information within the community of those concerned with the affairs of Spain, Portugal, Ibero-America and Antarctica. (For the Foundation's purposes, Ibero-America is defined as the Spanish and Portuguese speaking countries of the Western Hemisphere.) Programmatically, the Foundation funds project addressing environmental policy, economic policy or governance issues. Projects should have a strong public policy component, offer innovative solutions to problems facing these regions, and incorporate new mechanisms for addressing these programmatic areas. Activities may include, but are not limited to, research projects and conferences related to the Foundation's areas of interest. The Foundation encourages collaboration between organizations in the United States and Iberia or Latin America and among institutions in these areas. We are also in the process of writing a proposal to be submitted to the Ford Corporation.

Consortium members were also sent information on funding opportunities through the U.S. Department of Education, Fund for The Improvement of Post-Secondary Education (FIPSE) Program, especially the NAFTA initiative to promote partnerships among the U.S., Canada and México, a program that could assist in the expansion of CEPA to Canada; and about the environmental sciences doctoral program at Jackson State University in Mississippi, interested in securing candidates form CEPA member institutions. We are looking at the possibility of having JSU join CEPA.

CEPA member institutions submitted five proposals to be considered as Consortium projects. Once these are circulated among all member institutions and consensus is achieved we will start organizing the proposal to be submitted to the Tinker Foundation. For the next funding cycles CEPA member institutions propose the following projects:

The ISEE in the Americas Project: Information System for Environmental Education in the Americas
Dr. Jaime J. Cornejo, Universidad de Santiago de Chile

We propose to develop ISEE in the Americas, a powerful Internet-based knowledge representation and information platform that will allow users in industry, schools, academia and the society at large in CEPA member countries to easily obtain information, knowledge and methods for high quality education and training on environmental protection and sustainability.

The system will be the result of a cooperative effort among CEPA member institutions, who will share resources and expertise in an ambitious and unprecedented effort to develop Internet-based information, management, knowledge and methodologies in regards to environmental education programs, course design, and specialized workshops and seminars. Specifically, ISEE will make possible to carry out, -across the various fields of knowledge and across any curriculum-, a multidisciplinary approach to environmental sciences, environmental protection and sustainability.

Since currently there is no such system on the Internet, this proposal provides the means to make it a reality. Indeed, the implementation of ISEE will mark the consolidation of a novel intellectual tool which we have recently validated in Chile. The new tool, -which has been very successfully applied to a site we created for the Chilean Ministry of Education to administer an array of state-of-the-art environmental education resources for school teachers where none or very little existed, provides a structured connectivity among the components of any environmentally-related intellectual task..

Specifically, ISEE's brand of knowledge representation and management of environmental information will be constructed on the basis of the new tool and the four (4) components of any environmentally-related intellectual task, namely,

- The main environmental concern or topic (e.g. global climate change, resources, water)
- The level of expertise or intellectual background of the user (e.g. college professor, school teacher, practicing professional, government official, university student)
- The field of knowledge in which the user is a scientist, expert or practitioner, or has a specific interest (e.g. biology, chemistry, engineering, sociology, economics)
- The educational domain, that is, the sphere of knowledge and influence that contains the specific activities or assignments and their contexts (e.g. seminars, field work, project design and implementation, demonstration experiments, information gathering).

The Environmental Observatory: Sustainable Development on Campus for institutions in CEPA
Dr. Jaime J. Cornejo, Universidad de Santiago de Chile

Central to CEPA's philosophy is that the practice of environmental protection should achieve ethical awareness and promote behavior consistent with the sustainable use of natural resources and sustainable development. Since CEPA members are mainly universities and research centers, the realization of sustainable development on campus appears as the most appropriate concept to develop in the pursuit of that philosophy. However, to be effective, it should deal with the dynamics of the physical/biological environment and human development, be integrated in all disciplines, and employ all formal and non-formal methods and adequate means of communication.

We propose here to implement the Environmental Observatory, a facility which will become a model construction, an intelligent building, to be maintained in each campus via sustainable operations and improvements. The environmental observatory, which should be easily replicated and adapted in other campus surroundings, will house operations directed to:

- Develop sustainability indicators, and methodologies to implement sustainable development on campus, including multidisciplinary approaches to apply environmental knowledge.
- Become the training facility on campus for practicing professionals, as well as university and school teachers, in regards to environmental education, environmental science principles, and environmental management methodologies,
- Monitor the environmental quality of itself, the surrounding campus physical environment and its population, and the specific operations and activities, such as laboratory work.
- Make extensive use of the Internet and related information technologies to function as a depository of quality information on environment and sustainability in regards to the observatory itself, all campus operations and facilities and surroundings, the city, the region, the country and the rest of the world.
- Evaluate, and communicate about, environmental situations as they happen on campus, acting as an instant radiography of the campus environmental quality and sustainability conditions.
- Become a knowledge environment with approaches that facilitate the learning of environmental protection methodologies, sustainability principles, monitoring practices, environmental science knowledge, information technologies and educational methodologies

Environmental City: Structured Environmental Information, Education and Management Methodologies for Different Users
Dr. Jaime J. Cornejo, Universidad de Santiago de Chile

We propose to develop an Environmental City, -- a metaphor for accessibility and structured knowledge representation -- as a model environmental information platform which will provide CEPA member institutions with tools for environmental management and sustainability for every sector and major environmental theme involved.

Environmental City will make relevant environmental information easily available to all sectors of society, will make full use of the power of the Internet, will help solve real-life environmental and sustainability problems, and will facilitate the efficient incorporation of environmental knowledge, methods and information by anyone involved. In this regard, the proposed platform has no equivalent Internet-based or similar precedent that can provide highly structured and up-to-date environmental information tailored to specific users with particular environmental needs.

Environmental City users from different backgrounds will become able to find methodologies and strategies for environmental protection, education and sustainability. Potential users include members of the community, environmentally-oriented professionals, university professors, university students, school teachers, and government officials and its employees. Environmental City has been conceived as a virtual urban design with neighborhoods representing environmental concerns or problems. These include all environmental themes that can go across many fields of knowledge and are thus amenable to a multidisciplinary approach. Typical neighborhoods include environmental education, sustainable development on campus, environmental management, green chemistry, environmental risk assessment, environmental measurement and monitoring. Each virtual neighborhood harbors buildings containing structured environmental knowledge, with each building tailored to each user's effective operational level or actual expertise.

Upon entering "the" building, the user finds an information space which is both very specialized and local, and which houses on-line programming that activates a powerful intellectual tool. This tool is a generalization of a successful application which we have recently validated and published, and provides connectivity among the four variables that define the intellectual task that relates the user with his particular environmental quest, namely,

- The main environmental Topic (e.g. global climate change, natural resources, water, biodiversity, air, soil, energy, environmental health)
- The level of expertise or intellectual background of the user (e.g. college professor, school teacher, practicing professional, government official, university student, member of NGO)
- The field of knowledge in which the user is a scientist, expert or practitioner, or has a specific interest (e.g. biology, chemistry, engineering, sociology, economics, art)

- The educational domain, that is, the sphere of knowledge and influence that contains the specific activities or assignments and their contexts (e.g. seminars, field work, project design and implementation, demonstration experiments, information gathering).

Environmental City will be built on the basis of the main environmental themes (neighborhoods) and multidisciplinary trends (buildings) that are of interest to CEPA institutions and their professionals.

A Proposal on the Arts and the Environment
Universidad Popular Autónoma del Estado de Puebla- UPAEP

CEPA recognizes that cultural diversity must be considered when addressing environmental preservation. Cultural heritage and conservation are connected to societal and economic needs and environmental preservation. This concept offers promise for all the participating groups. The interests of environmental preservation are best served with a knowledgeable public that is able to understand the technological and environmental systems at various levels of society.

Since environmental issues impact not only natural resources but also include the preservation of historical resources, a cultural component is being introduced as part of the program at the CEPA Mexican Universities: *Universidad Popular Autónoma del Estado de Puebla and Universidad de Tlaxcala.* All other CEPA members are welcome to participate in this activity to develop a program component for each of the 4 regions where CEPA institutions are located.

This component will be co-designed by the Universidad Popular Autónoma del Estado de Puebla (UPAEP) and the Universidad de Tlaxcala. Involving a local Puebla artist, with expertise in historical murals, UPAEP and Tlaxcala will conduct three educational lectures on the preservation of archaeological treasures and the environment.

The lectures will be prepared at each of the institutions and we are looking at the possibility of securing the participation of Mexican muralist, Desiderio Hernández. Mr. Hernández' outstanding work has been reviewed in a New York Times article (July 7, 1991) as worthy of international recognition. Puebla's uniqueness has also been cited as worthy of worldwide attention.

Two major outcomes are expected from this project activity:

- To help scientists and engineers involved in environmental activities in developing nations expand their knowledge of the socio-cultural impact of their work, and
- To give additional opportunity to Mexican American/Hispanic immigrants for linking their ethnicity to their academic work as a career development advantage.

An overall expectation for this project is to reaffirm the good will already expressed by the intent of the CEPA members by sharing in a cultural and historical experience.

Trans-Disciplinary Education, Practical Training and International Exchange for Highly Qualified Undergraduate and Graduate Students in Environmental Studies and Sustainable Human Development
Dr. Charlotte Lovengreen, Universidad Austral de Chile

In the context of international agreements such as NAFTA, this project aims to contribute to promote common grounds of understanding concerning the protection of the environment and sustainable development among graduate and undergraduate students from universities associated to CEPA. Through the exchange of highly qualified graduate and undergraduate students in environmental studies and sustainable human development, this project creates a network for mutual support in action and research, while attending the academic needs both of students and graduate candidates, and strengthening the academic ties between the universities affiliated to CEPA.

The project invites students to participate in academic activities (including seminars and fieldwork) concerning environmental studies and sustainable development in universities affiliated to CEPA. For the purposes of this project, the Universidad Austral de Chile Honors Program in Environmental Studies and Sustainable Development hosts the exchange program and supports the exchange network.

The Honors Program offers trans-disciplinary courses focused on practical environmental issues. These courses are taught by Research Teams that integrate students in ongoing research projects. The Honors Program also supports and encourages the pursuit of undergraduate and graduate dissertations. This is a new, innovative initiative that obtained a three-year grant from the Chilean Government, and is expected to establish new standards for higher education in Chile. Its goals encourage trans-disciplinary learning based on experiential grounds with specific references to environmental issues. The program fills a gap concerning highly qualified students who rarely find means in the traditional classroom for meeting their personal goals. Moreover, most of these disciplinary trained students lack the systemic approach required for a suitable intervention in sustainable human development. Nonetheless, they are the most likely decision makers in the public, private and third sectors and, therefore, an environmental and sustainable human development approach in their training should furnish them with the tools required for a better management of natural and social resources.

The Honors Program may both greatly benefit from international academic exchange and may contribute to set up an appropriate environment for students aiming to improve their educational training. By creating an exchange program for international students and by providing them with a working environment and with the technical support, this project contributes to the Universidad Austral de Chile Honors Program and to CEPA.

The project objectives are to stimulate the search for common grounds in understanding environmental problems among highly qualified students from universities associated to CEPA, to promote collaborative dissertations in environmental studies among international students from universities associated to CEPA, and to maintain an updated database of student's ongoing research in environmental issues.

Efforts to secure funding from other federal agencies like the U.S. Department of Interior, Fish and Wildlife Service and the U.S. Department of Commerce, National Oceanic and Atmospheric Administration and private foundations will be continued as the future of CEPA depends on securing the funds necessary to support the core programs.

- **APPENDIXES**
  - **EULA SUMMER SCHOOL REPORT**
  - **EPA MOU**

UNIVERSIDAD DE CONCEPCION

Cátedra UNESCO/EOLSS
Gestión de Recursos Naturales. Planificación Territorial y Protección Ambiental

EOLSS

CENTRO EULA-CHILE

FINAL REPORT

SUMMER SCHOOL ON THE ENVIRONMENT 2002

UNIVERSITÀ DEGLI STUDI DI SIENA

CEPA

UNIVERSIDAD DE CÓRDOBA

VVOB

CONICYT

FONDEF

PRESENTATION

The EULA-Chile Center in Environmental Sciencies was created by the University of Concepción in March 1990, as the result of a cooperative project (the EULA Project) with the Government of Italy, dealing with the management of the water resources of the Biobío river basin and the adjacent marine coastal shelf. Thereby, the Center has developed until nowadays an intense and fruitful teaching and research within the framework of environmental sciences with the collaboration of chilean and foreign universities.

The Summer School on the Environment 2002, which has been functioning during January for three years, is a genuine expression of compromise and vocation, maintaining permanent academic activities to be acquainted with up-to-date knowledge and exchange of experiences with international universities and centers, well-known by their relevant development in the environmental area. We have been strict regarding our interuniversity relationships, and we have seeked the collaboration of academicians from other universities, whom would share our approach to how to meet the environmental problems and how to develop environmental education at high education level. Thus, it is of utmost importance for us to have as a reference, a conceptual framework to generate knowledge and to form qualified human resources at a postgraduate level in environmental matters. This framework was established at the "International Conference on Environmental Education", held in Tbilisi convened by PNUMA-UNESCO, whose results and orientations are summarized below.

- The Environment is not only a physical-biotical medium but also a social-cultural medium and relates the environmental problem with development models adopted by Man.
- The Environmental Education is defined as the result of a reorientation of diverse disciplines and educative experiences, facilitating the integrated perception of the environment.
- Regarding the university education, the difference between environmental education and traditional education is established. It is recommended the interdisciplinary approach (method), which requires a close cooperation among the varied academic units, based on "the relationships which keep among themselves the nature, the technique and the society" (Tbilisi; Recommendation 13).

The requirement for incorporating the environmental dimension has not been understood yet by the university system (PNUMA, 1985). It can be assured for certain that the University maintain the traditional educationl methodologies and, above all, the compartmented division of the disciplines in Faculties and Departments, which makes extremely difficult the needed interdisciplinary exercise for the analysis of reality. Furthermore, the University Assembly appears as an island separated from the public community and from the inherent policy decisions of development. This is an universal phenomenon and not only occurring in Chile or

Latin América. The interdisciplinary programes are being initiated in the university systems and, in general, it is noted a wide and increasing interest on developing interdisciplinary programes. However, the rigidity of the compartmented university structure presents a critical problem to be solved. In the university medium exists diverse expressions of interdisciplinarity, among them research projects and teaching. In the field of interdisciplinary education, the most frequent case is the compartmented chair and as permanent institutional forms of interdisciplinarity, it has been considered a Center modality, either as a general environmental thematic or especific problems such as pollution topics. The EULA-Chile Center is the academic unit of the University of Concepción, which is structured and realize its academic activities through the interdisciplinary approach. The Summer School 2002 is an illustrative example.

The three courses, whose central problematic is the water, were characterized in their thematic contents, academic staff, participant students, development of lectures, theoretical and field activities and mode of evaluation, by the application of the holistic concept and the interdisciplinary approach on the analysis and discussion of the corresponding environmental thematics (integrated management of hydrographic basins; monitoring and evaluation of aquatic pollution and models of water quality). Both the lecturers and students found atractive and novel the multi- and interdisciplinary dialogue among engineers, mathematicians, economists, lawyers, geographers, biologists, biochemists, chemists, sociologists, etc., each of them contributing to their analyses and reductionist approaches and, all of them together, building a more integrated and holistic vision, without resigning the profound and rigourous treatment of the corresponding environmental thematic.

From the above context, we can genuinely say that each new year we feel more realized and enthusiastic to confirm a positive advancement in the development of the education in environmental sciences. The Summer School is also an excelent opportunity for lecturers and researchers participating in ongoing scientific projects, to revise the advancement of diverse doctorate theses of the Program in Environmental Sciences, in order to think in new ideas dealing with education and research and to assure the strengthening of future scientific collaboration with national and foreign institutions. As a matter of fact, the Summer School in Environment 2002 has become a final corolary of each academic year, during which we have been working in a conjunct and permanent manner.

Finally, we gratefully acknowledge that the success of the Summer School would have not been possible without the support of the following organizations and institutions: Environment Chairs UNESCO-EOLSS, CEPA, CONICYT; UFZ, (Germany), VVOB (Belgium), University of Siena (Italy),University of Córdoba (Spain) and University of Concepción (Chile) represented by diverse scientists, whom have been intensely cooperating in these types of activities. We do expect to maintain the Summer Schools for representing an innovative and pertinent expression of postgraduate activity and fruitful opportunity of international cooperation.

EXECUTIVE SUMMARY

The objectives of the Summer School on the Environment 2002 were to give theoretical-practical courses involving multi- and interdisciplinary characteristics and other complementary activities (seminars, working and discussion groups, field work, etc.), addressed to postgraduate students, professionals and young scientists from american and european countries, to promote the transference and scientific experience exchange on selected environmental topics.

The sponsors of the event were: University of Concepción (Chile); Research Center on the Environment- UFZ (Germany); University o Siena (Italy); University of Córdoba (Spain); International Agency of Cooperation (VVOB, Flandes, Belgium); UNESCO/EOLSS CHAIRS; Consorcio Educacional para la Protección Ambiental (CEPA); Proyecto Fondeff N° D001135, CONICYT-Chile.

Three courses were given at the EULA-Chile Center in Environmental Sciences (located in the University Campus) during January 2002, namely:

1. Integrated management of hydrographic basins: Scientific basis and applicative aspects; January 2-10. Coordinator: Dr. Oscar Parra.
2. Monitoring and evaluation of aquatic pollution: Scientific basis and case studies; January 11-20. Coordinator: Dr. Ricardo Barra.
3. Environmental Modeling: Water quality models; January 21-31. Coordinator: Dr. Claudio Zaror.

The General Coordinator of the Summer School was Dr. Oscar Parra, Director of the EULA-Chile Center in Environmental Sciences.

The courses were given in Spanish and English languages. Credits and certificates corresponding to each teaching activity were those established by the regulations of the Graduate School of the University of Concepión. Each course equated 3 credits, which correspond to 32 hours of theoretical lectures and a total of *ca.* 48 hours of practical hours (seminars, working and discussion groups, field work, etc.).

The evaluation of the courses was realized through two modalities:

- Individual tests
- Working group with oral presentations

The 15 vacancies originally established had to be doubled (*i.e.*, 30) for the great demand of applications. Thereby, the number of registered students per course was the following:

- Integrated management of hydrographic basins: Scientific basis and applicative aspects 36
- Monitoring and evaluation of aquatic pollution: Scientific basis and case studies 31
- Environmental Modeling: Water quality models 32

Students from 11 countries participated in the Summer School 2002 and according to the following statistics: U.S.A. (4); México (2); Puerto Rico (1); Panamá (2); Nicaragua (1); Brasil (1); Perú (6); Spain (1); Uruguay (3);Argentina (1); Chile (27). Furthermore, magíster and doctorate students of chilean universities (21) and professionals from the public sector (Cattle and Agriculture Service, National Forest Corporation) and private enterprises from the forest sector also participated.

A total of 18 fellowships were awarded for the costs of mobility, stayings and/or university fees, prior to a selection of candidates based on their academic antecedents.

A total of 29 scientists of varied disciplines from Germany, Italy, Spain, United States of America, Belgium and Chile participated in diverse academic activities. The institutions and the corresponding names of the lecturers are presented as follows (the number (s) within the parenthesis indicates the title of the course (s) given):

Umweldt Forschung Zentrum, UFZ, Germany:
Dr. Peter Fritz (2); Walter Geller (2); Dr. Karl-Erich Lindeschmidt (1); Dr. Bernard Karrasch (1,2); Dr. Wolf von Tuempling (2); Dipl. Engin. Margarete Mages (2).
University of Siena, Italy: Dr. Silvano Focardi (2); Claudio Leonzio (2); Dr. Cristina Fossi (2).
University of Insubria, Italy:
Dr. Antonio di Guardo (2,3).
University of Córdoba: Spain:
Dr. Eugenio Domínguez (1)
Superior Council of Scientific Researches, Spain:
Dr. Begoña Jiménez (2)
International Agency of Cooperation (VVOB, Flandes, Belgium):
Eng. Patrick Debels (1,3)
Pennsylvania State University, USA:
Dr. © Robert O. Strobl (1).
Austral University of Chile, Chile:
Dr. Anton Huber (1); Dr. Carlos Oyarzún (1); Dr. Stefan Woelfl (2).
University of Concepión, Chile:
Dr. Oscar Parra (1,2,3); Dr. Claudio Zaror (2,3); Dr. Hugo Romero (1); Dr.Claudio Valdovinos (1,2,3); Dr. Roberto Urrutia (1,2); Dr. Andrés López (1); Dr. María Mardones (1); Dr. Ricardo Barra (1,2); Dr. Gabriel Gatica (3); Dr. Rodolfo Araya (3); Dr. José Vargas (3); Eng. Claudia Vega (1, 3).

Application requisites were Curriculum vitae, certificate of prior studies, two letters of recommendation, a personal letter justifying the interest to take one specific course or more.

The Registration fees were the followings: graduate students of the University of Concepción were exempted. Students of national and international universities and professionals: US$ 250.

The term of the applications was 30 November 2001, addressed to:

Academic Secretariat, EULA-Chile Center in Environmental Sciences, University of Concepción. University Campus. P.O.B. 160-C; FAX: 56/41/242546; e-mail: eula@udec.cl

General information on the course contents and related activities and further diffusion of the Summer School on the Environment 2002, were presented in the web site: www.eula.cl and through publications in varied informatives and pamphlets of scientific societies.

The inaugural lecture was made by Prof. Dr. Eugenio Domínguez, Rector of the University of Córdoba, Spain, who addressed a conference entitled "The Protected Natural Spaces. An Abstraction of the Human Mind".

A guide or manual was distributed among the students, containing teaching materials dealing with both the theoretical aspects and the field work, including a CD containing all the lecturers presentations.

An inquiry was made to each and all the students to know their comments about the courses activities and lecturers, which were later analysed and evaluated. The results obtained showed a degree of satisfaction corresponding to over 80%.

NOMINA DE ALUMNOS

N°	Nombre	Profesión	Institución	País
1.	Araneda Castillo, Alberto	Biólogo Marino	Alumno Programa Doctorado en Ciencias Ambientales, Centro EULA-Chile	Chile
2.	Ayala Luis, Karina	Bachiller en Ciencias, Mención en Química	Pontificia Universidad Católica del Perú	Perú
3.	Barozzi Grandi, Azelio	Ingeniero Agrónomo	Servicio Agrícola y Ganadero	Chile
4.	Boccardi Hughes, Lucía	Licenciado en Ciencias Biológicas	Universidad de la República	Uruguay
5.	Castro Hernández, Silvia	Licenciada en Química Industrial	Universidad Autónoma de Tlaxcala	México
6.	Castro Avilor, Sulema	Bióloga	Universidad de Texas, en Brownsville	U.S.A.
7.	Celis Hidalgo, José	Ingeniero Agrónomo	Alumno Programa Doctorado en Ciencias Ambientales, Centro EULA-CHILE	Chile
8.	Charbonier Geymonat, Esteban	Licenciado en Ciencias Biológicas	Universidad de la República	Uruguay
9.	Chirinos García, Luis	Ingeniero Mecánico	Pontificia Universidad Católica del Perú. Alumno Programa Doctorado en Ciencias Ambientales	Perú
10.	Contardo Perinetti, Claudia	Ingeniero Agrónomo	Servicio Agrícola y Ganadero	Chile
11.	Flores Quijano, Raciel	Ingeniero Químico	Universidad Popular Autónoma del Estado de Puebla	México
12.	Franco Cruz, Noriel	Licenciado en Tecnología Sanitaria y Ambiental	Universidad Tecnológica. Alumno Programa Doctorado en Ciencias Ambientales, Centro EULA-CHILE	Panamá

N°	Nombre	Profesión	Institución	País
13.	González Illán, Fernando	Bachiller en Biología	Universidad del Sagrado Corazón	Puerto Rico
14.	Hamilton, Joanne	Bachiller en Biología	Universidad de Texas en Brownsville	U.S.A.
15.	Hernández Santander, Víctor	Licenciado en Biología	Alumno Programa Doctorado en Ciencias Ambientales, Centro EULA-CHILE	Chile
16.	Iglesias Rivero, Claudia	Ingeniería en Ecología y Protección Ambiental	A&M Universidad Corpus Christi, TX.	U.S.A.
17.	Junod Montano, Julio	Laboratorista Químico	Alumno Programa Doctorado en Ciencias Ambientales, Centro EULA-CHILE	Chile
18.	Letelier Araya, Eduardo	Ingeniero Comercial	Universidad de Chile Alumno Programa Magister en Economía de Recursos Naturales y Medio Ambiente, Universidad de Concepción.	Chile
19.	Matos Reyes, Mariela	Licenciada en Química	Pontificia Universidad Católica del Perú	Perú
20.	Monreal Araya, Zandra	Médico Veterinario	Servicio Agrícola y Ganadero	Chile
21.	Navarrete Ugarte, Pedro	Ingeniero Civil Químico	Celulosa CMPC	Chile
22.	Nieto Juarez, Jessica	Licenciada en Química	Universidad Nacional de Ingeniería, Perú.	Perú
23.	Noriega Zevallos, María	Licenciada en Química	Pontificia Universidad Católica del Perú	Perú
24.	Orccosupa Rivera, Javier	Ingeniero Civil Hidráulico	Universidad Nacional de San Antonio Abad del Cusco. Alumno Magister en Gestión y Planificación Ambiental, Universidad de Chile	Perú
25.	Palma Troncoso, Rodrigo	Profesor de Biología	Servicio Agrícola y Ganadero	Chile
26.	Pincheira Santander, Rafael	Ingeniero Agrónomo	Alumno Programa Doctorado en Ciencias Ambientales, Centro EULA-CHILE	Chile

N°	Nombre	Profesión	Institución	País
27.	Priego González de Canales, Carlos	Licenciado en Ciencias Biológicas	Universidad de Córdoba. Alumno Programa Doctorado en Ciencias Ambientales, Centro EULA-CHILE	España
28.	Rivas Arenas, Patricia	Ingeniero Agrónomo	Servicio Agrícola y Ganadero	Chile
29.	Romero Quispe, Delia	Ingeniero Químico	Pontificia Universidad Católica del Perú	Perú
30.	Salazar, María Lourdes	Ingeniero Mecánico	Universidad de Texas en Brownsville	U.S.A.
31.	Sánchez Vega, René	Licenciado en Biología	Universidad Nacional de Colombia. Alumno Programa Doctorado en Ciencias Biológicas, Universidad de Concepción	Colombia
32.	Sandoval Estrada, Marco	Ingeniero Agrónomo	Alumno Programa Doctorado en Ciencias Ambientales. Centro EULA-CHILE	Chile
33.	Somarriba Chang, Matilde	Ingeniero Agrónomo	Universidad Nacional Agraria	Nicaragua
34.	Teixeira de Mello Ramírez, Franco	Licenciado en Ciencias Biológicas	Universidad de la República	Uruguay
35.	Uribe Pérez, Camilo	Ingeniero Forestal	Servicio Agrícola y Ganadero	Chile
36.	Visitación Figueroa, Lizardo	Químico	Pontificia Universidad Católica del Perú	Perú

DIPLOMA

Centro EULA-Chile
Universidad de Concepción
Escuela de Verano en Medio Ambiente

EL CENTRO DE CIENCIAS AMBIENTALES EULA-CHILE

CERTIFICA QUE :

.....

Ha participado en el Curso de Postgrado **"Gestión Integrada de Cuencas Hidrográficas: Bases Científicas y Aspectos Aplicativos"**, realizado en el marco de la Escuela de Verano en Medio Ambiente, 2002, desde el 02 al 10 de enero 2002.

Concepción, Enero de 2002

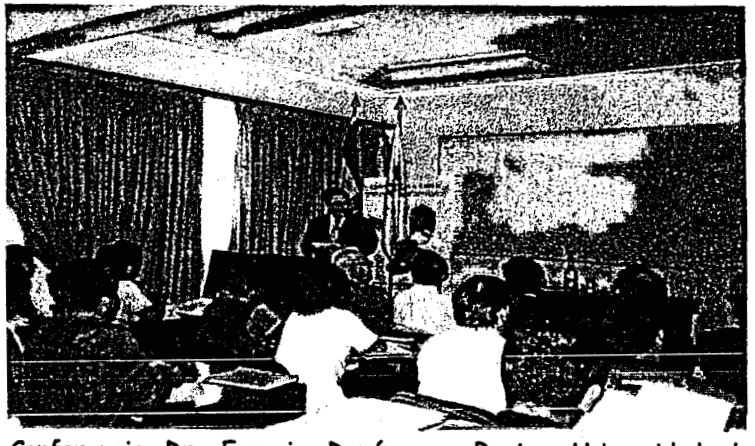
Dr. Ricardo Barra
Director Programa Doctorado

Dr. Oscar Parra B.
Director
Centro EULA-Chile

"UN APORTE UNIVERSITARIO AL DESARROLLO SUSTENTABLE"

CENTRO UNIVERSITARIO INTERNACIONAL EUROPA-LATINOAMÉRICA DE INVESTIGACIÓN Y FORMACIÓN EN CIENCIAS AMBIENTALES - UNIVERSIDAD DE CONCEPCIÓN

FOTOS



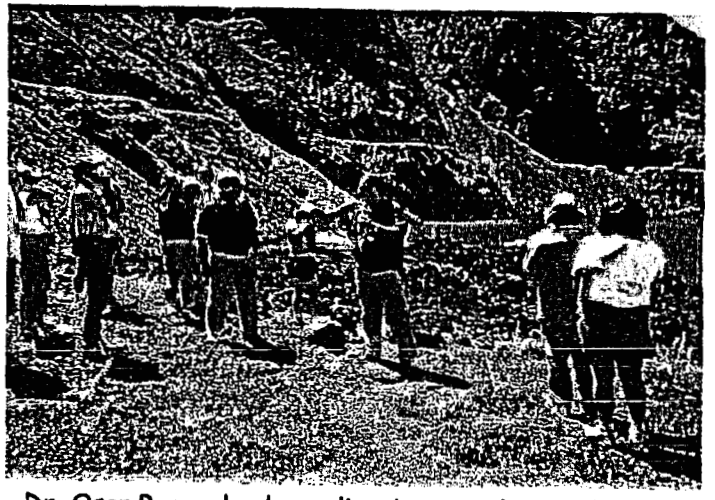
Conferencia Dr. Eugenio Domínguez, Rector Universidad de Córdoba, España, en clase inugural.

Clase Inaugural. Decanos, Sergio Lavanchy, rector U. de Concepción; Eugenio Domínguez, rector U. de Córdoba, España; Vicerrector U. de Concepción

Prof. Lindenschmid trabajando con alumnos en sala de computación

Entrega de Diplomas: Joanne Hamilton, U.S.A.; Mariela Matos, Perú; Sulema Castro, U.S.A.; M. Lourdes Salazar, U.S.A.; Silvia Castro, México; Claudia Iglesias, México.

Dr. Roberto Urrutia dando instrucciones en terreno. Río Laja



Dr. Osar Parra dando explicaciones en Laguna Laja

Curso 1 en puente Rucúe, recibiendo explicaciones

Clausura curso 1 en frontis edificio 3 del Centro de Ciencias Ambientales EULA-Chile

DIPLOMA

Centro EULA-Chile
Universidad de Concepción
Escuela de Verano en Medio Ambiente

EL CENTRO DE CIENCIAS AMBIENTALES EULA-CHILE

CERTIFICA QUE :

.....

Ha participado en el Curso de Postgrado "**Evaluación y Monitoreo de la Contaminación Acuática: Bases Científicas y Casos de Estudio**", realizado en el marco de la Escuela de Verano en Medio Ambiente, desde el 11 al 19 de enero, 2002.

Concepción, Enero de 2002

Dr. Ricardo Barra
Director Programa Doctorado

Dr. Oscar Parra B.
Director
Centro EULA-Chile

"UN APORTE UNIVERSITARIO AL DESARROLLO SUSTENTABLE"

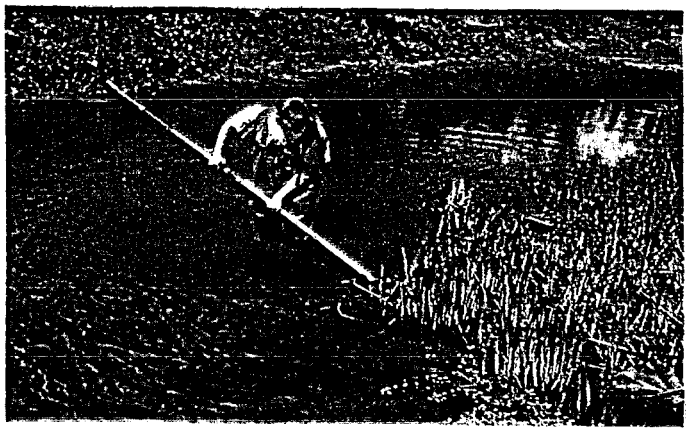
CENTRO UNIVERSITARIO INTERNACIONAL EUROPA-LATINOAMÉRICA DE INVESTIGACIÓN Y FORMACIÓN EN CIENCIAS AMBIENTALES - UNIVERSIDAD DE CONCEPCIÓN

FOTOS

Profesores Karrash y Barra dando explicaciones en terreno.

Profesora Mehrens haciendo demostraciones en terreno.

Instrucciones en terreno del profesor Juan Francisco Gavilán, acerca de la manipulación de peces para bioensayos.



Alumna tomando muestras de peces en río Biobío.

Profs. Parra y Barra dictando clase.

Grupo de alumnos preparando seminario.

Exposición de seminario.

Entrega de Diplomas: Luis Chirinos, Perú; Joanne Hamilton, U.S.A.; Carlos Priego, España; Esteban Charmonier, Uruguay; Claudia Iglesias, México; Silvia Castro, México; Claudia Oviedo, Chile.

DIPLOMA

Centro EULA-Chile
Universidad de Concepción
Escuela de Verano en Medio Ambiente

EL CENTRO DE CIENCIAS AMBIENTALES EULA-CHILE

CERTIFICA QUE :

.....

Ha participado en el Curso de Postgrado **"Modelación Ambiental: Modelos de Calidad del Agua"**, **realizado en el marco de la Escuela de Verano en Medio Ambiente**, desde el 21 al 30 de enero, 2002.

Concepción, Enero de 2002

Dr. Claudio Zaror
Coordinador del Curso

Dr. Oscar Parra B.
Director
Centro EULA-Chile

"UN APORTE UNIVERSITARIO AL DESARROLLO SUSTENTABLE"

CENTRO UNIVERSITARIO INTERNACIONAL EUROPA-LATINOAMÉRICA DE INVESTIGACIÓN Y FORMACIÓN EN CIENCIAS AMBIENTALES - UNIVERSIDAD DE CONCEPCIÓN

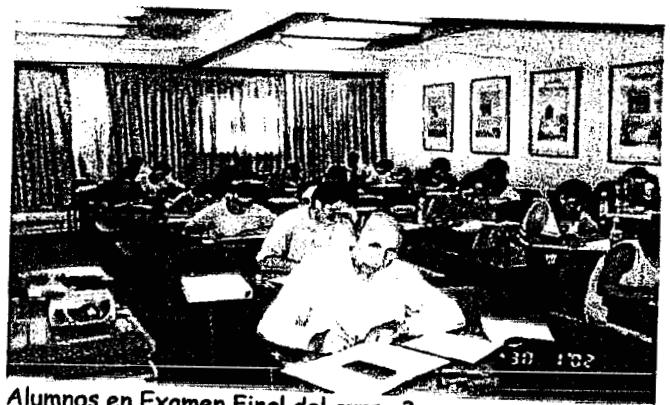
FOTOS

Alumnos en clases del curso 3

Alumnos en trabajos de ejercicios de modelación

Salida a terreno del curso 3. Río Chillán

Prof. Patrick Debels demostrando proceso de obtención de datos para modelación



Alumnos en Examen Final del curso 3

Entrega de Diplomas

Entrega de Diplomas

Grupo de alumnos de Modelación Ambiental al finalizar el curso

CEPA

Memorandum of Understanding and Intent
On the
Educational Consortium for Environmental Protection
(Consorcio Educativo para la Protección Ambiental, or CEPA)
Appendix 1

Participation by the Unites States Environmental Protection Agency

The recognized need for effective environmental protection, environmental training, and education in the Americas led to the creation of the Consorcio Educativo para la Protección Ambiental (hereafter referred to as CEPA or the Consortium). The CEPA vision is to strengthen the technical, professional, and educational environmental infrastructure in Latin America and the United States. CEPA recognizes that cultural diversity must be considered when addressing environmental preservation. Cultural heritage and conservation are connected to societal and economic needs and environmental preservation.

The United States Environmental Agency (EPA) relies on qualified professionals trained in fields as diverse as environmental policy, forestry, geology, economics, statistics, computer modeling, and information management to accomplish its primary mission of protecting public health and the environment on which all life depends. The students and faculty of CEPA's member universities represent an invaluable resource for EPA as it continues to explore more effective and innovative approaches to environmental and public health protection. Moreover, EPA's participation in CEPA will help accomplish several priority objectives, including support of the Agency's awareness-raising and outreach activities focused on the nation's Hispanic community, enhancement of EPA's ongoing efforts to recruit and retain qualified graduates, and the strengthening of ties to local communities served by CEPA's member institutions.

The original Memorandum of Understanding and Intent (MOU) established a collaborative program in environmental science, education and research, with the following partners:

CHILE

Universidad de Concepción
Universidad de Chile
Universidad de Santiago de Chile
Comisión Nacional del Medio Ambiente de Chile

MEXICO

Universidad Popular Autónoma del Estado de Puebla (UPAEP)
Universidad Autónoma de Tlaxcala

UNITED STATES

Texas A & M University at Corpus Christi
The University of Texas at Brownsville
Argonne National Laboratory
Oak Ridge National Laboratory
Sandia National Laboratory
United States Department of Energy
Equity Research Corporation
Institute for Regulatory Science
Boricua College

PUERTO RICO

Universidad Interamericana de Puerto Rico
Universidad Politécnica de Puerto Rico
Universidad del Sagrado Corazón de Puerto Rico

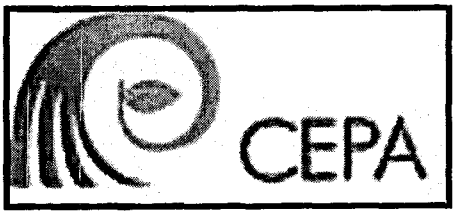
The U.S. Environmental Protection Agency joins the CEPA memorandum of understanding and intent with the consensus of all other parties.

April 7, 2000

Romulo L. Díaz, Jr.
Assistant Administrator for Administration
And Resources Management
U.S. Environmental Protection Agency

Date

CONSORCIO EDUCATIVO PARA LA PROTECCIÓN AMBIENTAL/ EDUCATIONAL CONSORTIUM FOR ENVIRONMENTAL PRESERVATION (CEPA)



A REPORT ON THE 2001 CEPA ACTIVITIES AND ANNUAL MEETING

BY

EQUITY RESEARCH CORPORATION
5 THOMAS CIRCLE, NW
WASHINGTON, DC 20005
TELEPHONE: (202) 387-3331
FAX: (202) 797-1344

THE 2001 CEPA ANNUAL MEETING IN SAN JUAN, PUERTO RICO

INTRODUCTION

The Educational Consortium for Environmental Protection / *Consorcio Educativo para la Protección Ambiental (CEPA)* held its 2001 annual meeting from April 22-25, 2001 under the auspices of the U.S. Department of Energy. CEPA member institutions from Puerto Rico, Sacred Heart University, Polytechnic University and Inter American University convened the summit this year. As in previous years, CEPA members came together to report on this past year's accomplishments and prepare the plan for Academic Year 2001-02. To achieve such cooperation across national boundaries among academic, government, and private sectors is part of CEPA's mission. This report summarizes the instances of scientific, educational, and institutional cooperation on environmental issues that CEPA is making possible, as they were presented at the 2001 annual meeting.

The meeting in Puerto Rico assembled 80 participants from CEPA member institutions, government agencies, and private organizations from the host country, the United States, Mexico and South America. Thirteen universities and sixteen agencies and organizations were represented attesting to the success of CEPA initiatives and the commitment of the members and other participants that year after year come together seeking to establish new collaborations in the field of environmental sciences. This year's turnout confirms CEPA goals are being successfully met and point to new directions and networking opportunities among its actual and potential CEPA members. For a consortium of its size and scope, and it's relatively modest financial resources CEPA is yielding remarkable gains in strengthening its member institutions in research and environmental education areas. A continued investment in CEPA is a sound administrative and environmental decision, therefore, the future expansion of this venture is an essential business item in the 2001 annual meeting agenda.

I. OVERVIEW OF CEPA'S MISSION AND GOALS

CEPA is a collaborative international consortium that brings together higher education institutions with governmental agencies, research laboratories, and private sector entities. CEPA's mission is to strengthen the technical, professional, and educational environmental infrastructure in the United States and Latin America. The CEPA program consists of a true partnership between participating groups and includes curriculum development, student exchange, faculty development, and creation of educational materials, joint research, and other cooperative activities. Human resource development and the creation and leveraging of sustainable programs provide CEPA the medium to achieve its mission. This is accomplished by actively working with Hispanic-serving institutions of higher education in the United States, in collaboration with institutions of higher education in Latin America and, other Consortium members to deliver competitive environmental programs.

The current CEPA goals are the:

- Development of bicultural environmental training programs at the undergraduate, graduate and professional levels,
- Training Hispanics in the fields of environmental science and technology,
- Increasing access to educational programs for the study of the environment,
- Promotion of cross-sector research and development projects,
- Incorporation of the National Research Laboratories unique scientific capabilities to strengthen the capacity of Hispanic-serving institutions to address environmental priorities and,
- Development of a bilingual Internet-based CEPA information system on environmental issues that could be used throughout the hemisphere

II. ANNUAL MEETING PARTICIPATION AND MEETING ACTIVITIES

The 2001 meeting in Puerto Rico was held at three CEPA member institution university campuses in the San Juan metropolitan area, hence providing a unique opportunity for meeting students, faculty and visiting the facilities further promoting the establishment of new collaborations between local universities and visiting CEPA members, government and private organizations. These institutions were the University of the Sacred Heart, Inter American University and Polytechnic University.

At the inaugural reception, CEPA Coordinator, Ms. Miriam Cruz introduced the Honorable, Dr. Carlos Padín, recently appointed Secretary of the Department of Natural and Environmental Resources of the Commonwealth of Puerto Rico by Governor Sila M. Calderón, as the keynote speaker. In year 2000, Dr. Padín, then Dean of the School of Environmental Affairs at Universidad Metropolitana of Puerto Rico, expressed his interest in collaborating with CEPA resulting in his participation along with Dr. Cecilio Ortiz from UTEP in the *University and the Environment Colloquium* in Valdivia, Chile regarding their experiences establishing and managing environmental centers at their institutions. It was very inspiring to listen to his remarks and to have someone with an understanding and belief of the CEPA vision for environmental preservation, undertake this endeavor.

Other notable keynote speakers were Dr. César A. Rey, Secretary of Education for the Commonwealth of Puerto Rico, who exposed his views on the importance of a multidisciplinary approach for incorporating environmental science topics and rethinking curriculum organization to teach this discipline; Eng. Carl Soderberg, Director of the Puerto Rico EPA Office, who presented an environmental profile of Puerto Rico, emphasizing the island's most pressing environmental issues like water quality, urban sprawl, deforestation, marine ecosystem degradation and regulations enforcement, to name a few; and Ms. Gloria Rodríguez, President and CEO of MAPA Communications, her presentation focused on engaging the private sector in providing financial resources to continue the development of CEPA programs. One potential organization she advised to tap into is the Ford Corporation, with an established fund to develop programs to ameliorate environmental problems. The Education and Global Outreach Program is a component of the Corporation's environmental initiatives, whose objectives are very much in line with CEPA objectives.

This year's agenda was devised with two main goals: expanding the CEPA network to strengthen and formalize our current partnerships with the federal government and to establish new alliances with other government agencies and the private sector; and institutionalizing the Consortium. (*Annual meeting agenda and list of participants are included in Appendix # 1.*)

Once the meeting goals were established, the items on the agenda proceeded with individual progress presentations and proposals for future activities from Consortium members. Representatives from the U.S. Environmental Protection Agency, U.S. Department of Energy (ORL & ARNL), U.S. Fish and Wildlife Service, U.S. Department of Agriculture, National Science Foundation, Smithsonian Institution, MAPA Communications, Organization of American States, Pennsylvania State University, Carnegie Mellon University, and University of Texas at El Paso addressed options for expanding the CEPA network through collaborations with other institutions, federal agencies and the private sector, as a means of diversifying CEPA's initiatives and ensuring adequate funding as well as research and educational opportunities for a broader academic community.

Invited speakers offered their presentations in a panel discussion format with time for questions and answer sessions; an hour was set aside each day to promote interaction between participants and panel members. Among them Dr. Paul D. Robillard, from Pennsylvania State University, presented the Sustaining Earth Systems (SES) Program aimed at providing bilingual educational opportunities and management tools to science educators as well as local and international conservation efforts. The SES uses creative use of an international expert knowledge base which includes CEPA member, Dr. Oscar Parra, Director of EULA Environmental Research Center at *Universidad de Concepción, Chile;* the World Campus Project, the Environmental Resources Research Institute (ERRI) and the Inter American Distance Education Consortium (CREAD). Dr. Irasema Coronado, Assistant Professor from the Dept. of Political Sciences at UTEP discussed the graduate and undergraduate environmental career options and research centers and opportunities available at the institution.

Mr. Robert Cleary, from the Office of Human Resources and Organizational Services, served as EPA's panel coordinator and recognized Mr. Rómulo Díaz, the agency's former Assistant Administrator for Administration, for conceiving EPA's National Hispanic Outreach Strategy advocated by signing a Memorandum of Understanding between the agency and the CEPA Consortium in April of 2000 (*see MOU copy in Part D of this report*). Mr. Orlando González, from the Office of International Affairs, manages EPA's involvement in international policies and programs dealing with negotiations on trade and environment, marine pollution, technology diffusion and technical assistance in Mexico, Canada and other priority countries. He also explained the role of several capacity building programs under this EPA division such as the International Training Program, the Office of Environmental Education- Border XXI Program, Distance Learning Course on Urban Quality Management in Latin American Cities, the Environmental Information Program, the Technical Information Packages (TIPS), the Spanish Language Resources website, GIS Project and the Commission for Environmental Cooperation (CEC), among others.

The U.S. Department of Energy panel presentations focused on the collaborations between CEPA and the DOE's national research facilities at Oak Ridge National Laboratory in Tennessee

and Argonne National Laboratory in Illinois. Dr. James P. Loar, Head of the Environmental Analysis Section, ESD-ORNL, commented on past and present collaborations with CEPA members from the *Universidad de Santiago* and the *Universidad de Concepción in Chile*. On going collaborations since 1996, have brought together U.S. and Chilean scientists whose research interests centers principally on environmental studies, risk assessment and materials science to develop raw materials that will increase the efficiency of energy production processes. Dr. Loar shared his ideas for future collaborations: to identify areas of mutual interest for scientists at ORNL and CEPA universities, collaborate on proposals, to seek funding to support education and training initiatives and the commitment of all to build on past successful experiences. Dr. Frank Vivio, Assistant Director of the Division of Educational Programs at ANL, described participation programs for faculty, graduate and undergraduate students at ANL, the Student Research Participation programs and the research capabilities at the 17 national laboratories specifically in fundamental science, energy technologies, research facilities and national security.

Dr. Luis F. Rico, Visiting Assistant Professor from the School of Architecture at Carnegie Mellon University, shared the institution's experiences procuring funding from the private sector. The Robert L. Preger Intelligent Workplace™ is a product of this effort. The project was made possible by an unprecedented collaborative effort between industry, government and the university. This initiative seeks to integrate advanced energy-efficient building technologies with innovative distributed energy systems, such that most or all of the buildings energy needs for heating, cooling, ventilating and lighting are met on-site, maximizing the use of renewable energies. His advise for soliciting funding from private sources is to find a niche, be one of the best or one of the few; research foundations well, they have become investors in regional development; understand the different funding structures and giving traditions present in the U.S. and Latin America. One last thought, corporate philanthropy is driven by marketing strategies. Corporations may invest in specific research initiatives if they understand having contact with cutting-edge research and talent provides insight about future market trends, or if the results could help curtail operation costs.

The National Science Foundation was represented by Ms. Ana Ortiz, Program Manager, Office of Equal Opportunity Programs and Ms. Linda Allen-Benton, Deputy Director, Human Resources Management. In their presentation they described NSF's outreach efforts and areas of collaboration that CEPA can take advantage of to advance its program goals: Intergovernmental Personnel Act (IPA) appointments, Visiting Scientist, Engineer and Educator Program (VSEE), proposal review services, and affiliation to NSF Advisory Committees.

The 2001 CEPA Annual Meeting activities concluded with a planning session and discussion of alternatives for institutionalization to be discussed in detail in section VII.

CEPA Member Reports

◎ Sacred Heart University (USC)

At the 2001 CEPA Annual Meeting, USH faculty members, Dr. José F. Córdova, Prof. Carmen P. Rodríguez and Prof. Mayra Rolón presented updates on the six research projects dealing with environmental issues currently active at the institution.

Bacteriological Analyses of the Waters of the Martín Peña Channel and the Los Corozos Lagoon: Detection and Quantification of Coliforms

Eleven students enrolled in the General Microbiology course under the supervision of Prof. Mayra Rolón, carried out the study to detect coliform bacteria in the waters of both sites. The investigation was conducted during the fall semesters of academic year 2000-2001. The professor and students engaged in this scientific work as part of the community linkage initiative of the curriculum developed at USH. Bacteriological analyses have been continued in the Introduction to research course, they have revealed a high degree of coliform concentration above microbiological standards.

Physical and Chemical State of the Piñones Lagoon

Dr. José Córdova and three students conducted a preliminary study to determine the ecological state of the Piñones Lagoon and its effect on the bioluminescent organisms. The physical and chemical parameters studied were dissolved oxygen, pH, salinity, temperature and nutrient levels (nitrites and phosphates). Samples were taken at different points in the lagoon. Even though all parameters were within the water quality limits for designated use of the Piñones Lagoon, nutrient levels at some of the sampling sites were high for optimum development of bioluminescent organisms. The high nutrient levels promote excessive growth of bacteria, consistent with the low dissolved oxygen value that was obtained.

Bioluminescence at Piñones Lagoon, Taxonomic Classification at the Interpretative Trail and Cayman Population Status in the Piñones area

Eighteen students participated with Prof. Carmen P. Rodríguez in these three projects. The Piñones Interpretative Trail is located in the Piñones Forest, the largest mangrove plantation in Puerto Rico. Taxonomic classification of the flora and fauna along the 157 m trail offers valuable information to the researcher and to the visitor who comes to just enjoy the area's natural beauty. We intend to label the path especially so that visitors may leave with a recreational and educational experience at once.

USH laboratories are in need of the following equipment to complete their research facilities: microscopes for college lab (4X, 10X, 40X and 100X oil objectives) monocular and binocular head; pH meters, Orion model 420A; electrodes for pH meters Orion 91-57 triode; portable electrocardiograph, one channel 12 lead selection; spectrophotometer UV and visible light for conventional labs; spectrophotometer atomic absorption with capacity to detect petroleum derivatives, Ca, Mg and lead lamps; hydrometers sea water; Sedgewick rafter counting cell; calibrated Secchi disk line; graphic calculators T1 33 plus and projector to use with Texas Instruments graphic calculator.

BARRANQUITAS CAMPUS

IAU-BC presented the ongoing research projects status in four areas: ONL internships, research, environmental education and composting. Professors Sara Vélez and José M. Ortiz completed a summer internship at ONL in year 2000. During this visit a collaboration plan was developed to address the following: information technology infrastructure, environmental research projects and internship availability.

The educational and research activities as they relate to the ecological assessment of the San Cristóbal Canyon continue along with seven new projects. An inventory of fish species present in the Usabón River, has detected no native species. The exotic species that make up the inventory will be studied to asses their impact on the Canyon's ecosystem. Chemistry and Biology classes have incorporated a component to evaluate the physical and chemical factors of the Usabón River. Student Yaritza Alicea is conducting a study on fish parasites at the Usabón River and Víctor M. Burgos is involved in a bioinformatics as a tool to detect environmental human health problems. One project funded by EPA, the Environmental Education Program, have offered more than 10 conferences to area schools and to the community in general. One last project stimulates active student participation. The Composting Project at IAU-BC includes organic fertilizer production, aluminum and paper recycling.

IAU-BC expressed interest in expanding CEPA alliance activities to actively work with other institutions in the Consortium, completing an inventory of other organisms beside fish in the San Cristóbal Canyon, water analysis of the Usabón River, continue work with genetic markers and faculty development. Other projects include improving the composting facilities and marketing the by products, continue the community environmental education program and the development of a trail for environmental interpretation at IAU-BC.

SAN GERMÁN CAMPUS

Dr. Arlene Toro described the environmental sciences programs at IAU-SG. The campus offers a masters degree in Environmental Sciences with majors in Water Resources, Environmental Biology and Environmental Chemistry. Two other offerings include bachelor degrees in Biology and Environmental technology.

Current research projects involve:

Chemistry:

- The effect of polymers in the reduction of trihalomethanes in potable water,
- Development of a method for the determination of Selenium in underground water using GCMS,
- Quantification of Selenium with 1,2-phenildiamine in underground water using GCMS and atomic absorption.

Biology:

- Designing vegetal (grass) filter to retain atrazine,
- Correlation between attenuation of light and growth of *Thalassia testudinum*

- Study and characterization of physical, chemical and biological parameters of the Bioluminescent Bay and the *Parguera* Natural Reserve
- Effect of temperature in marine turtle development.

Water resources:

- Distribution of vibrios and fecal coliforms in *Boquerón* Beach,
- How vibrios populations in an estuary are impacted by various types of contamination
- Correlation between attenuation of light and sedimentation and growth of *Thalassia testudinum*

METRO CAMPUS

Dr. William Arias' presentation focused on academic aspects of the institutions Environmental Engineer program directed at preparing professionals capable of designing and implementing corrective strategies in order to attend situations related to the evaluation and protection of the environment.

PONCE CAMPUS

Dr. Angel M. Ríos presented his campus Bachelor of Science in Environmental Sciences curriculum designed to serve the demand of professionals with a technical training that will increase their opportunities to join the environmental field work force. The program emphasizes the skills necessary for the adequate description and analysis of environmental systems, protection of human and ecosystem health, pollution control and natural resources management.

BAYAMÓN CAMPUS

Dr. Armando Rodríguez informed of a Mitigation Project in a 2.9 acres field, a wetlands information and dissemination program with other IAU campuses over a 5-year cycle, U.S. Corps of Engineers and wetlands information available to the general community on all campuses. Research projects include: Characterization in the Pin-tailed Whydah, *Vidua macroura*, Bats in Urban Areas, Characterization of Soil-dwelling Microorganisms, Nutrient Cycle in a Mitigation Wetland and Characterization of Microorganisms in Aquatic Systems. Future project interests are: Long-term of Hurricanes on Bat Populations, Population Estimates and Habitat Description of the Endangered Puerto Rican Boa and Impact of Invasive Species on the Native Ant Fauna.

© POLYTECHNIC UNIVERSITY (PUPR)

A report on the Polytechnic University of Puerto Rico efforts in Environmental Protection Education was presented by professors, Reinaldo Torres and Ismael García as well as advances in the concept of ecological terraces. Their principal areas of study are: interdisciplinary projects led by the Department of Civil and Environmental Engineering and the School of Architecture, the study of PR Highway 53, Puerto Nuevo River Canalization, bioclimatization and naturation, heat islands, development the ecological terraces course, sustainable development, intelligent buildings, among others.

Dr. Agamemnon G. Pantel, Director of the School of Architecture, informed of the newly inaugurated Tropical Center for the Study of Humans and the Environment. Its primary vision is to provide mechanisms for students and researchers to examine the interaction of humans and their environment within the tropical and sub-tropical regions of the world. The Center will also be oriented towards primary research and conducting environmental impact assessments and compliance documents for actual development projects. This future capability is geared towards providing a mechanism through which the Center can offer "hands-on" training to students as well as generate revolving funds.

◎ BORICUA COLLEGE

Dr. Irving J. Ramírez, Associate Professor at Boricua College gave an overview of his institution's Environmental Health Program, a Bachelor of Science degree program. The 4-year program at Boricua College deals with issues in the context of the historical, social and scientific developments of the western world and gives special emphasis to the role of the individual as part of the solution to current environmental programs.

◎ TEXAS A & M UNIVERSITY- CORPUS CHRISTI (TAMUCC)

Dr. Patrick Louchouarn of the Trans-lingual Earth System Science Education Center (TESS) presented the scientific and educational paradigms to teaching earth sciences in our day. The scientific paradigm emerges from an outdated model based on single discipline to multiple disciplines teaching; from Biology to Ecology in the first format and from Ecology to Biogeochemistry on the second. The multidisciplinary approach then leads us to scientific integration, from bio-geo-physical-chemical processes to Earth Systems sciences. We are no longer mere spectators of the world's saga; we partake of the changes, in the present and in the future. On the other hand, the educational paradigm viewed from the standpoint of CEPA's evolution, at its inception it was an idea born out of necessity that later became a formal proposal offering monolingual courses. In 2001, CEPA becomes real; a product devised to offer unlimited geopolitical and linguistic knowledge comes to life: the TESS project. Dr. Louchouarn went on to praise the advantages of learning without linguistic or space barriers, and invited other CEPA members to participate in this project.

◎ UNIVERSITY OF SANTIAGO, CHILE (USACH)

Dr. Jaime Cornejo, IMA Academic Director, provided a progress report on the status of current USACh-CEPA activities for the year 2000-2001.

1. Research Collaboration with the Oak Ridge National Laboratory (ORNL)

• Ongoing collaboration on phytoremediation research, with Dr. Art Stewart, Environmental Sciences Division. A new joint paper based on recent, 2000/2001 results needs to be discussed prior to submission to *Ecotoxicology*. Also, a new proposal is being prepared in which we will stress a multidisciplinary approach to establish the biochemical and genetic basis of how green plants affect phytoremediation of volatile organic compounds in air.

• Ongoing collaboration on cantilever sensor technology and its applications to the direct analysis of organic pollutants in air and water, with Dr. Thomas Thundat, Life Sciences Division. A paper on a new sensor for benzene in ambient air is being submitted to Analytical Chemistry. A new project needs to be defined.

• Applications of Atomic Force Microscopy (AFM) to help finding out how leaf morphology influences the decontamination ability of live plants, with Dr. Laura Riester, Ceramics and Materials Division. Recent, original results on plant morphology studies should lead to an immediate, joint paper. A very important issue here derived from the existing collaboration is the transfer (September 2000) of an AFM from ORNL to IMA. We need to establish a technology transfer and professional training agreement to ensure a productive use of the AFM equipment at USACh in research and technical assistance in a variety of fields.

Meeting on Tools for Sustainable Development at USACh

• The meeting, organized by IMA, was held at USACh Santiago in July, 25-26, 2000. Practicing professionals, university professors, government representatives and students were invited to participate in this very important gathering. The supporting documents and conclusions, in Spanish, can be found at *www.usach.cl/ima* link "*Encuentro Desarrollo Sustentable*".

2. Complementary and Projected Activities

Education and Environmental Information

• "*My House in America*" is an outgrowth of an Internet-based collaboration -started in 1999- between IMA and the University of the Sacred Heart, Puerto Rico, which initially led to an environmental information platform for communities in San Juan, Puerto Rico. A specific proposal already exists to expand this collaboration to include a bilingual, English-Spanish, Internet platform for the exchange of high quality environmental information among Latin American and Developed Countries of America, Europe and Asia.

• We are finalizing an environmental education project for the Chilean Ministry of Education. It involves a specialized Internet portal (www.usach.cl/mineduc) which provides school teachers with educational resources that allow the incorporation of environmental principles across the curriculum. The exchange takes place via *Enlaces* which is a national Internet-based network that connects all Chilean schools. We will adapt the prototype to host an Internet-based effort directed to university faculty and practicing professionals which will provide state-of-the-art environmental education resources across the curriculum to every major and every course on campus as well as to environmental trainers in industry. Conceptually speaking, this effort bears a close connection with the bilingual platform described above.

• We will pursue collaboration on a CEPA wide Master Program on Environmental Science.

Collaborations with the EPA

We will pursue *technology transfer* on:
• Modern techniques to handle environmental information over the Internet.

• The EPA's Labs 21 Initiative on cleaner, sustainable chemistry labs. At present we have chemical engineering students working on a replication of the concept.

• Instrumentation and management for model environmental measurement labs, including the issue of 1S025 accreditation.

• Green chemistry research and applications, which has also been pursued with ORNL. The sustainable (green) chemistry concept has become the basis of the IMA 2000/2001 development plan. Areas of interest are solvent replacement for organic transformations and development of technology for clean energy sources. We currently conduct research on applications of ionic liquids to increase the lifetime of key intermediates and the overall efficiency of organic an inorganic syntheses. We will confirm previously established contacts in order to define specific projects on green chemistry between IMA and the EPA and/or ORNL.

Transfer of Modern Environmental Concepts

We are locally adapting recently developed concepts with the aim to bridge the science and technology gap that appears widening between Chile and developed countries in regards to advances in knowledge and resources for environmental protection and sustainable development. Areas of concentration include;

- Sustainable Development on Campus. We wish to establish model management and sound environmental practices at the USAch campus. Campus environmental problems and needs will become the object of specialized research and educational programs
- Adaptation of the EPA's Labs 21 initiative
- Green Chemistry Research and applications
- Education for chemistry-based majors using the green chemistry paradigm
- Technical Assistance on Cleaner Production for Chilean industry
- Applications of the Internet2
- State-of-the-art software to solve environmental problems.

© UNIVERSITY OF CONCEPCIÓN, CHILE (UCCH-EULA)

Dr. Oscar Parra, director of EULA provided an activities report for academic year 2000 and proposals as described below.

1. To implement a Program on Environmental Sciences at the university level addressed to neighboring countries through scholarships and fellowships in order to reinforce the program of postgraduate studies (M.S. and Ph.D.) in Environmental Topics at the University of Concepción. It is expected that after two years the number of postgraduates will reach 20 students (10 per year). Otherwise, two specific activities were carried out: a postgraduate course on "Environmental Management of Water Resources" and a postgraduate course on "Evaluation and Monitoring of Water Pollution".

2. Development of Research in Natural Resource Management, Land Planning and Environmental Protection. A joint research work was initiated with German and Italian researchers in the *Laja* river watershed, which is an area located in the Central South Region of

Chile, presenting a number of varied environmental problems related with land planning, water uses (hydroelectric power, irrigation projects, forestation, erosion, etc.).

3. To assist the organization of environmental courses for teachers and other professional careers (e.g., Economy, Sociology, Civil Engineering, Chemical Engineering, Forestry Engineering, Agronomy Engineering, Chemistry, Journalism, Nursery, etc.). In this context several courses on diverse environmental topics were developed: Introduction to Environmental Sciences, Land Planning of Multi-use territory, Protection and Conservation of Biodiversity, GIS Applied to Land Use and Nature Conservation, Environmental Problems of Modern Society and Natural Resources Management. The objective, content, equipment facilities and field activities were discussed among the teaching staff of the EULA Center and foreign scientist collaborators from Spain, Italy, Germany, Belgium and Peru.

4. To promote the incorporation of environmental concepts in education and in other sectors such as industry, business, public services and private sector. During the second year and through the Environmental Education and Public Participation Unit of EULA Center, it is expected to create environmental education teaching tools, aimed to incorporate environmental concepts dealing with environmental management and protection in industries, business, public services and private sectors.

5. To establish links concerning Environmental Sciences with American and European Universities and other Environmental Institutions or Agencies (Canada. USA, Mexico, Cuba, Spain, Brazil, Peru, Italy, Portugal, Albania, Belgium, Germany). In order to reinforce the current EULA-Center international collaborative activities with American and European universities and other Environmental Institutions or Agencies, it will be considered the following actions: to exchange teaching and scientific experiences through internet, in this context EULA Center within the LTNESCO/EOLSS Chair has created a web site as a tool for worldwide communication, with particular emphasis on environmental education; and to invite scientists and students from universities of foreign countries to participate in the teaching and research activities related to environmental topics.

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Representatives from the *Universidad Austral*, Dr. Charlotte Lovengreen and Dr. Mario Pino offered the progress update which centered on existing environmental development areas. The university has an excellent curriculum for graduate and undergraduate career options in Environmental Studies and Impact Assessment, Rural Development, Economy and Regional Development, Sustainable Use of Forest Resources, Water Resources, Ecology, and Systems and Ecology. Basic and applied research is conducted in the following areas: Forest, Land and Waterways Interaction; Climatic Global Change; Water, Soil and Air pollution; Natural Ecosystem Degradation; Native Forest Management; Environmental history and Culture; and Environmental planning.

After the conclusion of the *University and the Environment Colloquium* celebrated in 2000 in Valdivia, Chile; Austral proposes to establish the *Centro Transdisciplinario de Estudios Ambientales y Desarrollo Humano Sostenible*, a multidisciplinary center for studying the

environment and sustainable human development. The Center's mission would be to prevent new environmental problems and minimize the existing by developing coherent environmental strategies to deal with the causes of environmental problems and not only with the symptoms. As a result, the focus of environmental research and administration will change in the private and public realm of the region; will graduate ecosystem focused professionals that possess a holistic conception of their surroundings; and deliver methodologies for evaluating the global, national and local environmental status. The operation of the Center will concentrate in the areas of research, education and outreach.

© UNIVERSITY POPULAR AUTÓNOMA OF ESTADO DE PUEBLA, MÉXICO (UPAEP)

Mr. Vicente Pacheco Ceballos, Executive Vice President of UPAEP was in charge of presenting the program of the School of Ecological Engineering and Environmental Preservation. Two projects are dedicated to measuring the concentration of air suspended particles to determine possible health risks due to vehicular circulation and emissions from the *Popocatépetl* Volcano; and of the pH of water to identify atmospheric pollution problems caused by industrial activity, automobiles and the emissions from the volcano.

The Marine Turtle Conservation project carries out morphological measurements and tagging of female sea turtles, searching and checking out nests, beach surveys to avoid depredation, location, collection and incubation of eggs, seasonal population census, nesting sites, direct counts, sample collection at 2 sites in Oaxaca: La Escobilla and La Cruz.

In December 2000, one professor and three students attended a workshop on the different environmental management aspects in banana plantations, *Corporación Bananera Nacional* (*CORBANA*) served as the study site. The workshop included training in entomology, nematodes common in banana plantations, agro-physiology, plant pathology and environmental protection. Other research initiatives concentrated their efforts on solving local environmental problems.

DOE-CEPA
2001 SUMMER INTERNSHIP PROGRAM AT THE NATIONAL LABORATORIES

The 2001 Summer Internship Program at DOE National Laboratories provided research experience for 11 students from the following CEPA institutions: Rafael M. Berríos and Aníbal J. Ortiz from IAUPR-Barranquitas, Juan M. Amador, Orlando Sánchez and Raúl Vélez from PUPR, Angela Maldonado and Mayra A. Rosario from USH, Anthony Lehman Jr. from UTB and Fernando Meléndez, Enrique Sánchez and Erika Rodríguez from UPAEP. Their research experiences are summarized in the table below.

Two other students from CEPA member institutions, Víctor Martín from UTB, and José B. Rivera from PUPR completed their summer internships at EPA and ERC respectively. Víctor Martín worked under the supervision of Ms. Delta Valente, Program Manager at EPA's Office of Environmental Justice. He was assigned the project of translating the Office of Enforcement and Compliance Assurance (OECA) website to create a Spanish language version. This task involved the translation of over 400 screens during a two-month period. As the internship period was

coming to an end, Mr. Martín was offered a part-time job to complete the project while still attending school at UTB.

Mr. José B. Rivera was assigned to work at Equity Research Corporation in the administration department. Through this experience and under the supervision of ERC President, Ms. Miriam Cruz, he was able to experience first hand sound business management practices and understand how a corporation operates. In the case of ERC, he was exposed to how the organization networks with other corporations, universities and colleges across the nation, government agencies, public and private organizations, foundations and other non-profit organizations. He assisted with CEPA program document organization and had the opportunity to visit the Argonne National Laboratory and Morgan State University. **(The DOE – CEPA Internship List and Abstracts are on following page.)**

Laboratory equipment required to complete water quality and other environmental assessments were transferred from DOE Oak Ridge National Laboratory to *Universidad de Santiago*, Chile.

DOE-CEPA Summer Internship Program 2001

STUDENT	UNIVERSITY	NATIONAL LABORATORY	PROJECT	STUDENT REPORT ABSTRACT
Rafael M. Berrios-Berrios	**Interamerican University of Puerto Rico-Barranquitas**	**Oak Ridge** **DOE/NAL Mentor: Dr. Olivia R. West**	**Permeable Reactive Barrier**	Specific objectives of this study were to (1) evaluate geochemical and hydraulic performance of permeable reactive barriers (PRB), (2) develop guidelines for geochemical and hydraulic characterization/monitoring, and (3) devise and implement long-term monitoring strategies through the use of hydrological and geochemical models. Accomplishing these objectives will provide valuable information regarding the optimum configuration and lifetime of barriers at specific sites. It will also permit development of site-specific monitoring and performance plans, thus optimizing operation and maintenance (O&M) costs while increasing confidence of both regulators and end users in applying the barrier technology for determining effectiveness in precipitating contaminants in ground water.
Anfbal J. Ortiz-Rivera	**Interamerican University of Puerto Rico-Barranquitas**	**Oak Ridge** **DOE/NAL Mentor: Mark S. Greely, Jr.**	**Biological Monitoring using Medada (*Oryzias Latines*) fish embryo**	Ambient water samples were tested to assess its effect on fish embryo development processes utilizing Medaka eggs and determine its toxicity. The objective was to determine the causes of death (microorganisms vs. chemical factors) in a specific area. The experiment was part of the Biological Monitoring and Abatement Program (BMAP) conducted in streams located near power plants or factories discharging wastewater into the waterway. The monitoring provides valuable information about the effects of water quality in the growth and propagation of aquatic life.
Juan M. Amador-Gutierrez	**Polytechnic University of Puerto Rico**	**Argonne – Chemical Technology Division Waste Material Research Dept.** **DOE/NAL Mentor Dr. Luis Nuñez**	**The Development of Gel and Foam Processes for the Decontamination of Ferrous Metals with HEDPA**	The study encompassed showing progress in the formation of a gel or foam loaded with hydoxyethane-1, 1-diphosphonic acid (HEDPA) for clean up applications. The goal is to either form a gel or foam that serves as an efficient HEDPA carrier for decontamination of ferrous metals. HEDPA was chosen for this project because of its ability to protect the base metal and for its high decontamination factor. Both gels and foams have been effectively used as carriers for different decontamination agents. The objective of this project is to minimize waste in the application of decontamination and decommissioning processes for nuclear facilities. The development of either as carrier can reduce the waste generated to one seventh of that generated by an aqueous process.
Orlando Sanchez-Vazquez	**Polytechnic University of Puerto Rico**	**Argonne Chemical Technology Division** **DOE/NAL Mentor: Dr. Luis Nuñez**	**LDL Separation from Various Food Products by means of Magnetic Particles**	Cream, egg yolks and milk are the raw materials for the production of cheese. These food products are known to have a high content of cholesterol or lipoproteins that carry cholesterol. Lipoproteins are macromolecular complexes of lipids and globular proteins held together by non-polar and electrostatic forces. Lipoproteins are usually divided into broad categories defined historically by their density: very low-density lipoprotein (VLDL), low-density lipoprotein (LDL) and high-density protein (HDP). LDLs are the major carriers of cholesterol in the circulation, and are intimately involved in artherogenesis or clogging of heart arteries. The separation of LDL particles from food products will enable the production of LDL cholesterol free products.

Rail Vélez-Zayas	**Polytechnic University of Puerto Rico**	**Argonne Chemical Technology Division** **DOE/NAL Mentor Dr. Luis Nuñez**	**Development of a Plutonium Model for the Uranium Extraction (UREX)**	The development of the ATW (accelerator transmutation waste) technology deals with: (1) separation of U, Tc, I and TRU metals from light water reactor spent fuel and (2) their use by the accelerator to generate electricity. The baseline process combines aqueous uranium solvent extraction (UREX) process as well as electrometallurgical (EM) processes in order to separate the elements. Resulting from the EM process are the TRU elements in the metal form that are then used by the accelerator to generate electricity and the fission products that are disposed as waste.
Angela Maldonado Galarza	**Sacred Heart University of Puerto Rico**	**Oak Ridge** **DOE/NAL Mentors:** **(1) Dr. Charles Coutant Dr. Mark Bevelhimer** **(2) Dr. W. Kelly Roy** **(3) Dr. W. Kelly Roy**	**(1) Longevity of Dissolving Sutures for Fish Tags** **(2) Storm Drain Monitoring Using Clams** **(3) Waterfowl Monitoring – Canada Geese**	(1) Longevity of Dissolving Sutures for Fish Tags Determine the life of dissolving sutures utilized to attach light emitting tags on fish in short-term fish behavior studies. Different water compositions will be tested to assess suture longevity. Dissolving sutures are proposed for use in attaching the tag so that it will fall off the fish after the light has been exhausted, these tags are very inexpensive compared to electronic tags. (2) Storm Drain Monitoring using Clams Caged Asiatic clams (*Corbicula fluminea*) were placed near various outfalls in Mitchell Branch, K-1007-P1 pond, and the K901 sites for four weeks. Caged clams are used near the outfall to evaluate input of contaminants such as PCBs because of the advantages they present over other monitoring methods such as water sampling. Clams are effective sampling tools because they : 10 provide a time-averaged measure of effect of exposure, 2) accumulate and concentrate contaminants of concern not routinely detected in water, and 3) provide a biologically-meaningful assessment of outfalls where other suitable organisms are often not present, providing an opportunity to detect localized sources of contaminants. (3) Waterfowl Monitoring – Canada Geese Two of the primary objectives of the Oak Ridge Reserve Waterfowl Program are to monitor the number and distribution of waterfowl on the ORR and to determine concentrations of gamma-emitting radio-nuclides accumulated by waterfowl that feed and live in the reserve. Canada geese are rounded up each summer and subjected to non-invasive, gross radiological surveys.
Mayra A. Rosario-Fuentes	**Sacred Heart University of Puerto Rico**	**Oak Ridge Environmental Science Division** **DOE/NAL Mentors: Ms. Tammy W. Beatty, Mr. Robert W. Allen, Ms. Lisa Olsen, and others.**	**(1) GIS Facilities Web Page Design & Development** **(2) Robert Washington Web Page Design and Development** **(3) Upgrades of various Web Pages** **(4) Fossil Fuel CO2 Emissions CDIAC Arc View Map** **(5) NPP Clickable Maps** **(6) GIS Facilities Inventory** **(7) DAAC Manuels – MODIS Manuals**	During the internship I was assigned to several projects having to do with revising, editing, updating and designing web pages at the ESD programs and learning to utilize new software and computer systems such as: GIS software-Arc View, PRISM, Visual Basic Code, used and wrote seven MODIS manuals, change HDF code to ANSII code, Adobe Photoshop 6.0, and attended several seminars.

Anthony Lehman Jr.	**University of Texas at Brownsville**	**Argonne Energy Systems Division** **DOE/NAL Mentor: Dr. Doug Longman**	**Pollution and Emission Control of Diesel Locomotive Engine**	Diesel locomotive engines emit certain types of pollution created when the fuel and air are mixed and burned at extremely high pressures and temperatures to generate the energy that powers the locomotives. Locomotives can produce incredible amounts of torque at very low rpm that help the machine pull hundreds of cars along the railroad tracks. Unfortunately, several types of pollution are produced that harm the environment such as hydrocarbons, carbon monoxide and nitrogen oxides, otherwise known as NOx. The latter type of emission is where the research is mostly concentrated on in this study. It is very well known that NOx is a powerful greenhouse gas. By reducing the amount of this gas as it escapes through the engine's exhaust system, the threat of harming the environment can be reduced.
Fernando Melendez-Vazquez	**Universidad Popular Autónoma del Estado de Puebla, Puebla, Mexico**	**Argonne Energy Systems Division** **DOE/NAL Mentor Sreenath Gupta and Raj Sekar**	**Particulate Measurements on Diesel Exhausts**	The study involved an effort to measure particulate emissions from a modern light duty CIDI engine equipped with a common-rail fuel injection system, an EGR system and a state-of-the-art after treatment system. Particulate emissions both upstream and downstream of the catalyst were measured using an SMPS system and a TEOM while operating the engine at various steady-state conditions. The trends observed are discussed in terms of previously established particulate formation and destruction mechanisms.
Enrique Michel-Sanchez	**Universidad Popular Autónoma del Estado de Puebla, Puebla, Mexico**	**Argonne Energy Systems Division** **DOE/NAL:Mentor: Dr. Jamie A. Hestekin**	**Membrane Pervaporation Process using Hydrophillic Membranes and Adsorption-Assisted**	Abstract: Industries of today are looking for the most efficient processes in order to save resources; this efficiency is reflected in energy and time saving. The membrane pervaporation process is a separation process in which a liquid feed is selectively separated into 2 streams: the liquid retentate and vapor permeate; it is considered a less-energy unit operation and this is due to the membrane selectiveness for one of the compounds in the mixture. By testing two different poly-vinyl alcohol membranes denominated 2210 and 2216 we will know which membrane works better for an ethanol/water system, we will notice this observing the flux through the membrane.
Erika A. Rodriguez-Huesca	**Universidad Popular Autónoma del Estado de Puebla, Puebla, Mexico**	**Argonne – West Division of Nuclear Techonlogy** **DOE/NAL Mentor: Dr. J. Rory Kennedy and Mr. Kevin Carney**	**The Disposition of Contaminated HEPA Filters**	Air is a gas mixture composed of approximately 21% oxygen, 78% nitrogen, and 1% argon and other gases. Everyday anthropogenic sources of air pollution increase, the use of industry filters can help minimize the rise of air pollution. HEPA (High Efficiency Particulate Air filters) or "absolute" filters were developed during WWII for the filtration of radioactive particles in the nuclear industry. Since then, significant developments have been made to meet increasing demands for higher filtration efficiency of even smaller particulates. HEPA filters are used in homes and industries such as schools, hospitals, and certain production processes where particulate-free or sterile air is required.

DEVELOPMENT OF FUTURE ACTIVITIES

The following tables outline the future activities suggested by CEPA member institutions from the U.S.A., Puerto Rico, Chile and México. Project development and implementation has been stalled due to lack of funding. This situation makes evident the urgency of reaching a final agreement to resolve the uncertainties caused by financial instability. It is imperative to continue the dialogue initiated at the Annual Meeting intended for evaluating alternatives for the institutionalization of the CEPA Program.

CEPA Action Plan 2000-2001 EPA Activities

Table 1.

Identified Activities of CEPA - USA Universities

University	Initiative
Universidad Interamericana – Barranquitas (IAU-Bar)	**(1) Guidance and Support for the Environmental Assessment of the San *Cristobal* Canyon, including water analysis of the water streams, inventory of aquatic animals, list of pollutants found, and ecological and human health risk assessments.**
Universidad Politécnica de Puerto Rico (PUPR)	**(1) Assistance in lab development in support of Environmental Engineering.** **(2) Identification of associated laboratory equipment.** **(3) Identification and development of joint research projects.**
Universidad del Sagrado Corazón (SHU)	**(1) Continued development of their "Environmental Education Data Information Dissemination Management Plan" titled: *Mi Casa en America.*** **(2) Identification of laboratory equipment.** **(3) Identification and development of joint research projects.**

Table 2.

Identified Activities of CEPA - MEXICO & CHILE Universities

University	Initiative

Mexico: • **Universidad Popular Autónoma del Estado de Puebla (UPAEP)** • **Universidad Autónoma de Tlaxcala**	**(1) Support in environmental analytical laboratory infrastructure.**
Chile: • **Universidad de Concepcón (EULA)** • **Universidad de Santiago (USACh)** • **Universidad Austral de Chile**	**(1) Support in environmental analytical laboratory infrastructure.** **(2) Encounter between EPA, CONAMA, and CEPA-Chile with the objective of developing a joint collaboration program in issues of common interest.** **(3) EPA support in the tele-distance teaching of the EULA-UNESCO lecture appointment: Environmental Management of Water Resources in collaboration with EULA.**

INSTITUTIONALIZATION OF THE CEPA CONSORTIUM

The 2001 Annual Meeting agenda reserved a two-hour period to convene the CEPA representatives to discuss the outstanding items from the previous annual meeting held in UTB. The group would be responsible for leading the efforts to institutionalize the CEPA Program. The items on the agenda of April 25, 2001 were:

- How to institutionalize the Consortium
  - Board of Directors (Term & institution approval)
  - Advisory committee
  - By-laws

- Development of a Business Plan
  - Suggested term
  - Assumes requirements of $400,000/year (includes CEPA Coordinator's Salary)
  - Resources to be contributed by U.S. government, corporate, foundations and member institutions.

- Member contributions
  - What is an appropriate level of contributions?

- Relation to "Majority" institutions
- Coordination of CEPA activities
- Web-site

Summary Report to Members

How to "institutionalize" the Consortium?

- Operational Plan to be based on mission clarification.

- Board of Directors: Need to define tenure, but 3 years seems appropriate; Member Institution approval to be provided by CEO/Chancellor/Rector, as appropriate.

- Advisory Committee: Need to define expectations and size constraints; should include representatives from NGO, corporate, federal government sectors.

- Bylaws: Are there practical limits to growth? Yes, but allow San Juan meeting participants to join. How to provide for additional support requirements and keep focus on universities and capacity development? Any additional members should be considered in terms of commitment to CEPA mission, not just whether they bring additional resources.

- Establish committees to follow up on recommendations:

(1) CEPA mission (Jaime Cornejo, Vicente Pacheco, Patrick Louchouarn, Jose Martin);

(2) Membership criteria (Linda Cain, Bob Cleary and Delta Valente, Evelyn Torres);

(3) Private sector participation (Amuary Boscio and Zoila Giron).

Outcomes from CEPA Mission Committee will drive deliberations of the other committees. (NB: Committee memberships to be further developed.)

Development of a Business Plan

- Suggested Term: 3-5 years.

- Assumes requirements of approximately $400,000 annually, which will include salary of CEPA Coordinator.

- Resources to be requested from U.S. government agency, corporate, foundation and member institution donors.

Member Contributions

- What is appropriate level of contributions? $4-5 thousand annually per institution, including money and in-kind contributions; corporate contributions may be higher.

Relationship with "Majority" Institutions and private sector will be pursued, as well as with additional CEPA members.

Improved Communications

- Need better coordination of CEPA project proposals and student participation.

- Web site should have two purposes: an internal network that will be password-protected, as well as an external, marketing focus. To be developed based on offer from Penn State.

- CEPA "seal of approval" has value, but needs to be marketed.

ACTIONS TAKEN:

(1) Accept offer by EULA Center, beginning Jan 2002, to provide two scholarships per CEPA country annually for five years, which will cover in-country expenses for environmental summer school; CEPA will pay for transportation.

(2) Accept offer by National Science Foundation to consider funding three-day workshop to agree on the recommendations to be developed by the CEPA committees and: communication improvements. Format will allow for preparatory work by committee members over first two days, and approval by CEPA Member representatives on third day. (Anna Ortiz and Patrick Louchouarn will assist in the identification of possible funds.)

(3) All presenters should transmit presentations to Equity Research by May 9 for posting to Equity Web site.

- **APPENDIXES**
  - **ANNUAL MEETING AGENDA**
  - **LIST OF PARTICIPANTS**

Consorcio Educativo para la Protección Ambiental (CEPA)
Educational Consortium for Environmental Protection
Agenda for 2001 CEPA Summit
April 22-25, 2001
San Juan, Puerto Rico

Sunday, April 22, 2001

6:30 - 9:00pm *Inaugural Reception*
Wyndham Old San Juan
100 Brumbaugh St.
Old San Juan

Welcome:
Mr. Ernesto Vázquez
President, Polytechnic University

Opening Remarks and Introduction of Participants
Ms. Miriam Cruz
President, Equity Research Corporation
CEPA Coordinator

Keynote Speaker
The Honorable Carlos Padín
Secretary, Department of Natural
and Environmental Resources of Puerto Rico

Monday, April 23 Sacred Heart University - SHU

(Location: Faculty Lounge)
Calle Rosales I. San Antonio
Parada 26 1/2 Santurce

7:45 am Pick-up at the Wyndham Old San Juan Hotel

8:30 - 9:00 Continental Breakfast at University

9:00 - 9:15 Welcome:
Dr. José Jaime Rivera, President

9:15 - 10:00 Updates about CEPA and/or Environmental Initiatives at SHU

Dr. José F. Córdova "Parámetros Físicos y Químicos de la Laguna Piñones"
Student's Presentations:
Prof. Carmen Pura Rodríguez
"Determinación de la Presencia de Bioluminiscentes en la Laguna Piñones" Fase I y II
Ecology students - BIO - 302
"Determinación de la presencia de coliformes fecales en las estaciones de muestreo para organismos bioluminscentes en la Laguna Piñones"
"Clasificación Taxonómica de Flora y Fauna de la Vereda Interpretativa de Piñones"
"Estatus Poblacional de Caimanes de la Laguna Torrecillas y sus Canales"
Student Presentation:
Prof. Mayra Rolón
"Análisis Bacteriológico del Agua del Caño Martin Peña
Detección de Coliformes" - Students BIO-206
Center for Personal Development – "Jugando y Reciclando"

10:00 - 11:00 Report on Funded and Mediated Activities by other CEPA Member Institutions

1) Gestión IMA - Universidad de Santiago de Chile
2) Texas A & M, Corpus Christi
3) Universidad Popular Autónoma del Estado de Puebla
4) Universidad Autónoma de Tlaxcala, México

Monday, April 23 **Sacred Heart University -SHU (continued)**

11:00 - 12:00 Panel Presentation

Articulations with Other Institutions - Expanding the Network
Moderator: Dr. Oscar Parra
Director, Centro Ambientales - EULA, Chile
Dr. Paul Robillart, Director, Center for Artificial Intelligence
in Water Quality Control Processes, Pennsylvania State University
Dr. Cecilio Ortiz-García, Program Coordinator, Center for Environmental
Resource Management, University of Texas at El Paso
Mr. Christopher Ros, Assistant Director for Education and Training,
Monitoring and Assessment of Biodiversity Program, Smithsonian Institution
Dr. Irasema Coronado, Department of Political Science, University of Texas at El Paso

12:00m - 1:30 Luncheon SUM B y C

Keynote Speaker:
The Honorable César Rey,
Secretary of Education, Commonwealth of Puerto Rico

1:30 - 2:45pm Panel Presentation

EPA as a Partner of the Consortium
Moderator: Mr. Arturo García-Costas,
Senior Environmental Protection Specialist, EPA
Mr. Robert Cleary, Office of Human Resources and Organizational Services
Dr. Myriam Medina-Vera, National Exposure Research Laboratory
Mr. Michael Youngblood, EEO Diversity Programs,
Office of Research and Development
Dr. María Gómez-Taylor, Office of Science and Technology
Mr. Orlando González Office of International Activities
Training Programming Manager
Ms. Delta Valente, Senior Federal Inter Agency Group Program Manager
Office of Environmental Justice

2:45 - 3:00 Afternoon Break

3:00 - 4:00 Networking with the Federal Agencies and other Partners

6:45pm Pick-up at Wyndham Old San Juan Hotel

7:30 Reception and Dinner:
Sacred Heart University Room SUM B y C

Tuesday, April 24 Inter American University of Puerto Rico - IAU

Oficina Central Multiusos 2 y 3 /(Central Office Multi-purpose room # 2 & 3)
Calle Gallileo (Final), Urbanization Jardines Metropolitanos
Río Piedras

7:45 am Pick-up at Wyndham Old San Juan Hotel

8:30- 9:00 Continental breakfast at University

9:00 - 9:10 Welcome:
Mr. Manuel Fernós, President

9:10 - 9:25 **Updates about CEPA and/or Environmental Initiatives at IAU**

CEPA Environmental Initiatives
Dr. Juan Negrón

9:25 - 9:40 CECIA
Dr. Graciela Ramírez

9:40 - 10:00 **Report on Academic Environmental Initiatives**
Metropolitano: Dr. William Arias
San Germán: Dr. Arlene Toro
Ponce: Dr. Angel Ríos
Bayamón: Dr. Armando Rodríguez

10:00 -11:00 **Report on Funded and Mediated Activities by other CEPA Member Institutions**
1) EULA - Universidad de Concepción, Chile
2) Universidad Austral, Chile
3) University of Texas at Brownsville
4) Boricua College

11:00 - 12:00m **Panel Presentation**

Collaborations with the DOE National Laboratories
Moderator: Dr. Linda Cain,
MK Technologies Consultant
Dr. Frank Vivio, Assistance Director, Division of Educational Programs
Argonne Laboratory, Illinois
Dr. James Loar, Head, Environmental Analyses Section,
Environmental Sciences Division, Oak Ridge Laboratory, Tennessee

12:00m- 1:30 **Luncheon**
Keynote Speaker:
Ms Gloria Rodríguez, President and CEO, MAPA Communications

Tuesday, April 24 **Inter American University of Puerto Rico - IAU *(continued)***

1:30 - 2:45 **Panel Presentation**

Diversifying Collaborations with the Private Sector
Moderator:
Mr. Rómulo Díaz, Jr.
Former EPA Assistant Administrator for Resources and Management
Ms. Ida Rodríguez, Non Profit Management School (invited)
Ms. Astrid Jiménez, Staff Director HACER
Dr. Luis Rico, Andrew Carnegie Mellon University

2:45 - 3:00 Afternoon Break

3:00 - 3:30 **Presentation:**
Developing Coalitions for Sustainable Development in the Americas
Dr. Zoila Girón, Unit of Sustainable Development,
Organization of American States

3:30 - 4:30 Networking with the Federal Agencies and other Partners

6:45pm Pick-up at Wyndham Old San Juan Hotel

7:30 Reception and Dinner
La Arcada de la Compañía de Turismso Paseo La Princesa, Old San Juan

Wednesday, April 25 — Polytechnic University of Puerto Rico - PUPR

Sala de Convenciones (Biblioteca - 3er Piso)
(Conference Center - Library 3rd Floor)
377 Ponce de Leon Ave. (Antigua Clínica Juliá)
Santurce

7:45am Pick-up at Wyndham Old San Juan Hotel

8:30 - 9:00 Continental breakfast at University

9:00 - 9:15 Welcome
Mr. Ernesto Vázquez, President

9:15 -9:45 Keynote Speaker:
Mr. Carl Soderberg, Environmental Protection Agency - Puerto Rico
"Environmental Profile of Puerto Rico"

10:00 - 11:00 Updates about CEPA and/or Environmental Initiatives at PUPR
Environmental Programs at PUPR:
Arq. Reinaldo Torres "Ecological Terraces"
Mr. Ismael García "Material Conservation Laboratories"
Ing. José Borrageros
Dr. Emilio Colón

11:00 - 12:00m **Panel Presentations**

Collaborations with other Federal Agencies and Departments
Mr. Pedro De Jesús, EEO Manager, Fish and Wildlife Service,
U.S. Department of the Interior
Ms. María Patterson, National Hispanic Program Manager,
U.S. Department of Agriculture (invited)
Ms. Ana Ortiz, Program Manager, Office of Equal Opportunity Programs
National Science Foundation
Ms. Linda Allen-Benton, Deputy Director Human Resources Management,
National Science Foundation

12:00 - 1:00 **Luncheon**

1:30 - 3:30 **Roundtable Discussion and Planning Session**

CEPA 2001 Annual Meeting
April 22 - 25
San Juan, Puerto Rico
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Consorcio Educativo para la Protección Ambiental/ Educational Consortium for Environmental Preservation (CEPA)

A Report on the CEPA Activities for 1999-2000 and its Annual Meeting

by

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THE CEPA 2000 ANNUAL MEETING IN BROWNSVILLE, TEXAS

Introduction

The Educational Consortium for Environmental Protection / *Consorcio Educativo para la Protección Ambiental (CEPA)* held its 2000 annual meeting on April 5 - 8, 2000 under the auspices of the U.S. Department of Energy. This year's host was the University of Texas at Brownsville. As in previous years, CEPA members came together to report on this past year's accomplishments and prepare the plan for Academic Year 2000-01. To achieve such cooperation across national boundaries amount academic, government, and private sectors is part of CEPA's mission. This report summarizes the instances of scientific, educational, and institutional cooperation on environmental issues that CEPA is making possible, as they were presented at the 2000 annual meeting.

The Brownsville meeting confirmed that this year CEPA not only met but also surpassed expectations. This was evidenced by the presentations on applied environmental research and institutional capacity building underway at CEPA institutions; by the enthusiasm of the participants and by the endorsement of high government officials in the new Chilean administration. Even though almost all of the CEPA international university members changed chancellors, the new leadership has agreed that their participation in CEPA must continue. The new head of CONAMA (Chilean National Commission for the Environment) in Chile voiced the same support. For a consortium of its size and scope, and it's relatively modest financial resources CEPA is yielding remarkable gains in strengthening its member institutions in research and environmental education areas. A continued investment in CEPA is a sound administrative and environmental decision.

I. Overview of CEPA's Mission and Goals

CEPA is a collaborative international consortium that brings together Higher Educational Institutions with governmental agencies, research laboratories, and private sector entities. The CEPA mission is to strengthen the technical, professional, and educational environmental infrastructure in the United States and Latin America. The CEPA program consists of a true partnership between participating groups and includes curriculum development, student exchange, faculty development, and creation of educational materials, joint research, and other cooperative activities. Human resource development and the creation and leveraging of sustainable programs provide CEPA the medium to achieve its mission. This is accomplished by actively working with Hispanic-serving institutions of higher education in the United States, in collaboration with institutions of higher education in Latin America and, other Consortium members to deliver competitive environmental programs.

The current CEPA goals are the:

- Development of bicultural environmental training programs at the undergraduate, graduate and professional levels,
- Training Hispanics in the fields of environmental science and technology,
- Increasing access to educational programs for the study of the environment,

- Promotion of cross-sector research and development projects,
- Incorporation of the National Research Laboratories unique scientific capabilities to strengthen the capacity of Hispanic-serving institutions to address environmental priorities and,
- Development of a bilingual Internet-based CEPA information system on environmental issues that could be used throughout the hemisphere.

II. Annual Meeting Participation and Meeting Activities

The main goal of the 2000 annual meeting was to present reports of ongoing projects, discuss future activities, and start the discussion of institutionalization of the consortium. (The annual meeting agenda and list of participants are included in appendix # 1.)

The highlight of the annual meeting was the incorporation of the Environmental Protection Agency (EPA) as a new member of the Consortium. Mr. Rómulo Díaz, Assistant Administrator for Administration and Resources Manager, signed the MOU on behalf of the agency. (A copy of the MOU is in appendix # 2.) At the same time EPA presented some excellent workshops. They also discussed the agency's National Hispanic Outreach Strategy and the Laboratory for 21st Century Initiative. (Information on the workshops can be found in the annual meeting agenda, and on the two projects in appendix # 2.) A presentation of the Equity Mentoring Program for Children of Farm Workers was also a part of the meeting. This is a pre-college program conceptualized by Equity Research Corporation (ERC), developed by the University of Texas at Brownsville, in collaboration with EPA's Office of Pesticides Programs. (See appendix # 3.)

The Consortium members presented individual reports of ongoing projects and future activities. The reports were followed by the plenary Session that opened the forum for discussion of the future activities and the institutionalization of the Consortium. Section III of this report includes a summary of the CEPA Member presentations.

Other presentations were given by Dr. C.W. Minkel, Dean of the Graduate School, University of Tennessee at Knoxville to discuss their possible support of CEPA's faculty development programs. The University of Tennessee has been a strong supporter of CEPA through its ORNL participation. Dr. Carlos Padin, Dean of the School of Environmental Affairs, Universidad Metropolitana of Puerto Rico, discussed curriculum development. Mr. Christopher Ros, a representative of the Mentoring and Assessment Division of the Bio-diversity Program, at the Smithsonian Institution, discussed the Smithsonian Environmental Leadership Course. Mr. Ros offered scholarships for those CEPA members interested in participating. A representative from the Universidad Austral de Chile will take advantage of this opportunity.

III. CEPA Member Reports

➢ Sacred Heart University (USC)

Development of a fall 1999 collaborative project between the University of Santiago Chile and the Sacred Heart University in Puerto Rico.

This project involved technology transfer from Gestion IMA to Sacred Heart University in regards to the implementation of a novel Internet platform for environmental information to benefit specific communities in San Juan, Puerto Rico, which are served by the university. The project was conceived during Dr. Jaime Cornejo's visit to USC to deliver a technical conference in February of 1999.

The technology transfer effort produced the web site *Mi Casa en America* (My house in America) that intends to be a "hub" to access bilingual environmental information impacting Puerto Rico, starting with the immediate communities that Sacred Heart is serving. The site is structured to: 1) Contain links for environmental and human health data repositories and major environmental sites such as EPA, and Puerto Rico Natural Resources office among many other links. 2) Provide translation of environmental regulations. 3) Conduct public outreach. 4) Serve as a platform that may connect government, academia, public and private sectors to address environmental issues affecting Puerto Rico. (A copy of the *Mi Casa en America* Proposal can be found in appendix # 4.)

Scientists from the University of Santiago Chile who lead this effort included Dr. Jaime Cornejo, team leader, Dr. Franz Muñoz, software and subject matter consultant and Mr. José Villarroel, software expert, geographer and epidemiologist.

➢ Interamerican University, Barranquitas Campus (IAU-BC)

IAUPR-BC presented a proposal that would support the strengthening of the IAUPR-BC academic programs through the incorporation of modern technological and educational elements, encouraging research and development in collaboration with other CEPA institutions. IAUPR-BC expects to gradually accomplish that objective. They requested support and guidance in the following areas: 1) Development of Information Technology Infrastructure and 2) Fostering Environmental Projects. In the area of Information Technology Infrastructure, the university expressed interest in having a scientist visit to model technology as a teaching medium. Regarding the fostering of environmental projects, the university is interested in developing the following: 1) Environmental Assessment of the San Cristobal Canyon, in Barranquitas, 2) Identification of Genetic Markers related to Human Susceptibility to Environmental Pollution and, 3) Community Environmental Education. Faculty, undergraduates, high school students, teachers and community groups as appropriate will carry out the delineated activities. (For more information on this project, see appendix # 5.)

➢ Polytechnic University of Puerto Rico (PUPR)

PUPR is currently offering a Bachelor of Science Degree in Environmental Engineering. A presentation describing their program and needs was given at the Summit. They are currently developing and improving their laboratory facilities. PUPR requested from CEPA assistance in laboratory development activities and identification of Associated Laboratories equipment from DOE, EPA or other source to accoutre their facilities.

➢ University of Texas at Brownsville (UTB)

The specific technical interests of UTB are the establishment of 1) a Biomarker Laboratory to determine Aquatic Contamination and 2) Monitoring program of Aquatic Contamination for the Rio Grande River in collaboration with International University Center Europe-Latin America for Research and Education on Environmental Sciences (EULA-Chile). For these two initiatives UTB requested the support of DOE and EPA.

Dr. José Martín, Dean of Natural Science Faculty at UTB, stated that the university's biliterate capabilities enable their institution to be a bridge that facilitates technology transfer joint research and truly bilingual teaching.

➢ Texas A& M University - Corpus Christi (TAMU-CC)

Translingual Environmental Education

At the Summit TAMU-CC presented the success achieved in the CEPA sponsored project Translingual Environmental Education. The 1999-2000 academic year represented a major transition for TAMU-CC CEPA initiatives. First an foremost was the completion of the pilot phase of the Translingual Environmental Education program. Initially funded by CEPA in 1998, this project created a web site in which an introductory Environmental Science college-level course at TAMU-CC was placed on-line with streaming audio and Power Point video slides in either of two languages: Spanish or English or any combination of the two. The success of the initial translingual pilot project was used to leverage the CEPA funds into a larger NASA-sponsored grant through the Texas Center for Excellence in Teacher Preparation (TxCETP) that is just getting underway. The translingual pilot has become the NASA-sponsored Translingual Earth System Science Education Center (See appendix # 6.) TAMU-CC expects the support of CEPA in this effort.

In addition, TAMU-CC requested from CEPA the identification of two scientists that would come to their campus for a period of one or two weeks to consult, teach short courses or give seminars. The following topics will be taught: atmospheric transport processes of particulates, outreach and graduate scholarship opportunities for minority

students in the sciences and transboundary initiatives and environmental problems related to NAFTA and U.S.-owned *maquiladoras*.

➢ University of Santiago, Chile (USACh)

USACh was represented by a delegation of two members at the Summit. Dr. Jaime Cornejo, Academic Director of IMA (Environmental Initiative/*Iniciativa del Medio Ambiente*) gave an overview of the current USACh CEPA activities and their future projections (Appendix # 7). The presentation addressed the following activities: 1) Completed and Future Research Collaboration with ORNL, 2) Education and Environmental Information, 3) Collaboration with EPA and, 4) Meeting on Tools for Sustainable Development at USACh (a culmination of the 1996 immersion visit to ORNL).

In reference to the completed and future research collaboration with ORNL, USACh and ORNL plan to continue current collaboration in phytoremediation research. On March, 1999 in a visit of Dr. Jaime Cornejo to ORNL, the scientific team completed a pre-proposal related to phytoremediation mechanisms applying atomic force microscopy and microcantilever sensor technology. The pre-proposal was submitted to DOE Energy Research. Even though the proposal did not receive DOE funding, it was used as a basis for presentation before DICYT-USACh where it was funded in May 1999. The award work is already in progress at IMA. The follow up to this research phase is the elucidation of how the process of phytoremediation works, biochemically and genetically. Also, the instrumental analysis component of the project will continue development, specifically, the cantilever sensor as the tool in conjunction with the AFM to observe and measure the morphological influences of live plants for decontamination.

Two open journal publications have resulted from this work. 1) An article relating to real time analysis of benzene using Microcantilever Sensors was requested by the periodical, *AnalyticalChemistry*, based on Franz Muñoz research at ORNL in September-October 1998 and, 2) "Studies on the decontamination of air by plants" published in June 1999 *Ecotoxicology*, **1999, 8**, 311-320.

As a consequence of this valuable and successful work, ORNL through the DOE equipment abandonment process donated an AFM to USACh to continue the valuable research that will positively influence research at ORNL. Dr. Cornejo thanked CEPA, ORNL, and DOE for the donation of an AFM to his IMA program.

Dr. Cornejo emphasized that IMA will strongly pursue the Green Chemistry concept at USACh in an integrated manner, including education, management, technology transfer and research. Green Chemistry then becomes a new area of close collaboration with other CEPA members, notably ORNL and the EPA.
Dr. Fernando Corvalán conducted the second presentation. He requested the expansion of CEPA in USACh to include the environmental initiatives of the School of

Engineering. As a follow up to his request, a scientist from ORNL met with officials from the University when he participated in another CEPA sponsored activity in Chile.

➢ University of Concepción, Chile (UCCH-EULA)

Dr. Oscar Parra, Director of EULA, gave the first of two presentations, the first of which consisted of a review of the university's activities and of two proposals. 1) Incorporation of Environmental Education to the in their Undergraduate Curricula and 2) Incorporation of the Inter-disciplinary Process in the Teaching of Environmental Graduate Programs.

Dr. Eduardo Tarifeño provided information on the EULA experience of teaching an environmental module to undergraduates. Specifically, referring to the short courses taught jointly with Dr. Juan Ferrada, an ORNL scientist.

During the plenary session, EULA articulated their interests as follows:

1) Participation of Dr. Marshall Adams from ORNL supporting research conducted at the Aquatic System Section relevant to water contamination and teaching a graduate course of "Monitoring and Evaluation of Aquatic Contamination". The course is taught by EULA annually with the participation of foreign students.
2) System Environmental Laboratory Audit by Dr. Bruce Tomkins from ORNL during the second semester of the academic year. An EULA major milestone is the acquisition of an international laboratory accreditation to conduct analytical analyses of environmental samples in Chile (Organic and Inorganic Analyses). EULA would like to conduct the audit and achieve accreditation the second semester of 2000.
3) Collaboration between the ORNL-Science Education Division and the Universidad de Concepción to develop an EULA Environmental Education Program similar to the one sponsored by DOE at the National Laboratories. The collaboration will focus in tailoring the EULA program that foster the technical knowledge and information dissemination at undergraduate, graduate, professional and public (public participation) levels. The development of and ORNL-EULA educational program for public involvement in environmental issues and education with the participation of the Chilean municipalities of Concepción and San Pedro. Professor Ana Maria Vliegenhart and Dr. Eduardo Tarifeño from EULA Environmental Education and Public Division will visit ORNL to create and develop the specifics of the project.
4) Development of an inter-institutional project among University of Concepción, Sacred Heart University (Puerto Rico) and the University of Texas at Brownsville (UTB) to address the incorporation of environmental education in their undergraduate curricula. Also the incorporation of the inter-disciplinary process in the teaching of environmental graduate programs. UTB is already developing a similar concept with EPA's support.
5) Using the CEPA framework and its UNESCO appointment, EULA will offer Consortium and other interested universities in Latin America and Europe a tele-distance course. The course is titled "Environmental Management of Water Resources" for undergraduate and graduate students.

➢ University Popular Autónoma of Estado de Puebla, Mexico (UPAEP)

Puebla presented the curriculum for a Masters of Science in Energy and Environmental Engineering Major (See Curriculum, appendix # 8.) The development of this curriculum was done in collaboration with scientists from ORNL. UPAEP also requested the continuation of internships at CEPA-DOE laboratories for the summer. CEPA supported two internships of UPAEP's graduate students during the summer of 2000 at the Argonne Laboratory.

➢ University Autónoma of Tlaxcala, Mexico

The University requested support in the environmental analytical laboratory infrastructure. To accomplish this goal we need to identify Spanish speaking scientists from both the laboratories and member universities.

IV. Contributions to CEPA by the DOE National Laboratories, and areas for future collaboration.

A.) Oak Ridge National Laboratory CEPA Activities

1) Evaluating the efficiency of household plants in reducing indoor air pollutants.
2) Refining a Master's Degree Program in Science and Engineering with specialties in energy and the environment.
3) Developing strategies for technology transfer between the various CEPA regions and the ORNL
4) Developing joint proposals on environmental security.

B.) Student Summer Internships

Eighteen students from CEPA institutions participated in the 1999-2000 summer program. (See appendix # 9 for the student's names.)

➢ Argonne National Laboratory

Four CEPA students took part in the summer 2000 internship at Argonne. They were from Universidad Popular Autónoma del Estado de Puebla in Mexico, and Universidad del Sagrado Corazón in Puerto Rico. (See appendix # 10 for the student's reports.)

V. New Initiatives

The United States Environmental Protection Agency (EPA) has an ever-increasing need for well trained, qualified professionals in environmental policy, economics, science, and information management. At the same time, there is a shortage of minorities, particularly

Hispanics, electing to pursue career opportunities in environmental areas of specialization. EPA's participation in CEPA will help accomplish several objectives, including improving the Agency's awareness-raising and outreach efforts to the nation's Hispanic community, enhancing EPA's marketing strategy and the tools it uses to recruit and retain qualified graduates, and strengthening ties to the local communities served by CEPA member institutions.

VI. Institutionalization of the Consortium

In the past years, CEPA has developed a growing relationship among its member institutions. During the UTB Summit, an understanding was reached among the Consortium members to create a CEPA Executive Committee that will work with Equity Research Corporation in the institutionalization of the Consortium. Below you will find key points which need to be discussed.

1. Develop by-laws to govern CEPA.
2. Establish CEPA long-term goals.
3. Establish a political and financial plan to develop the Consortium projects.
4. Establish an Advisory Committee consisting of representatives from key federal agencies, foundations, corporations, and research universities.
5. Develop a public relations strategy for proper CEPA recognition.

APPENDIX

1. CEPA 2000 Summit, Brownsville, Texas
   a.) Agenda
   b.) List of Participants

2. a.) CEPA Memorandum of Understanding
   b.) National Hispanic Outreach Strategy
   c.) Laboratory for the 21st Century Initiative

3. Agenda: EPA Presentation Equity Mentoring Program

4. "Mi Casa en America" Sacred Heart University

5. Interamerican University of Puerto Rico Barranquitas Campus Environmental Project

6. a.) Texas A & M - Corpus Christi: Annual report by Grady Blount
   b.) Tranlingual Environmental Science Education

7. USACh, Santiago, Chile: IMA Action Plan 2000-2001

8. UPAEP, Mexico: Curriculum

9. ORNL Student participants: "Summer 2000 Program".

10. ARL Laboratory Student Reports.
    a.) Economic Cost and Benefit of SO_2 Reductions at Yatagan Power Station
    b.) Expression and Purification of a Microbial Insoine Monophosphate Dehydrogenase
    c.) Numerical Data Research for Exposure Factors in the Project Called: "Wild Life Exposure Parameters for Arid Environments In the United States."

Appendix #1A

CONSORCIO EDUCATIVO PARA LA PROTECCION AMBIENTAL (CEPA)

AGENDA FOR CEPA SUMMIT 2000
April 5-7, 2000
University of Texas at Brownsville

Wednesday, April 5, 2000

7:00 - 9:30 Inaugural Dinner
Will be held at the home of Dr. Juliet Garcia, the president of the University of Texas at Brownsville. The group will meet at the lobby of the Holiday Inn Fort Brown at 6:30 pm to be transported to the dinner site.

Welcome	Dr. Juliet García, President, University of Texas at Brownsville
Opening Remarks	Ms Miriam Cruz President, Equity Research Corporation
Keynote Speaker	Mr. Rómulo Díaz, Assistant Administrator for Administration and Resources Management, Environmental Protection Agency (EPA)

Thursday, April 6, 2000

8:30 - 9:00 Continental Breakfast

9:00 - 12:00 Reports on CEPA funded and mediated activities:

Facilitator: Dr. Anamary Daniel, CEPA Technical Advisor

Dr. José Jaime Rivera
Universidad del Sagrado Corazón

Dr. Oscar Parra
Universidad de Concepción, Chile

Dr. Jaime Cornejo
Universidad de Santiago de Chile

Dr. Grady Blount and Ms. Claudia Iglesias
Texas A & M Corpus Christi

Ing. Vicente Pacheco Ceballos
Universidad Autónoma Popular de Puebla, México

Dr. Harold Myron
Argonne National Laboratory

Dr. Linda Cain
Oak Ridge Laboratory

12:00 - 2:00 Luncheon
Special Presentation: University of Texas at Brownsville

2:20 - 2:30 EPA's Hispanic Outreach Initiative

2:30 - 3:30 Smithsonian Institution
Monitoring and Assessment of Biodiversity Program

3:30 - 4:30 EPA: Curriculum Development Opportunities
1. Water Quality Management
2. Industrial Emissions
3. Environmental Justice
4. Questions and Answers

7:00 Dinner
At "Mi Pueblito" Restaurant in Matamoros, México. The group will meet at the lobby of the Holiday Inn Fort Brown at 6:00 pm to be transported to the restaurant.

Friday, April 7, 2000

8:30 - 9:00 Continental Breakfast

9:00 - 10:00 Curriculum Development: The School of Environmental Affairs in Puerto Rico

10:00 - 11:45 Interchange amongst CEPA Members to Establish the Groundwork and an Agenda for CEPA's Joint Ventures and Future Projects

11:45 - 12:00 Wrap-up

12:00 - 1:30	Luncheon *Special Presentation by Equity Mentoring Program for Children of Farm Workers*
1:30 - 4:00	Concurrent Workshops Domestic Grants: Proposal Writing and Technical Assistance International Grants: Briefing on EPA's Summit of the Américas
7:00	Dinner *In South Padre Island at "Scampi's" Restaurant. The group will meet at the lobby of the Holiday Inn Fort Brown at 6:00 pm to be transported to the restaurant.*

Appendix #1 b

CEPA SUMMIT 2000
University of Texas at Brownsville
April 5-7
Directory of Participants

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National Hispanic Outreach Strategy Home Page

Appendix # 2a

EPA United States Environmental Protection Agency

National Hispanic Outreach Strategy

What's New?

Grants and Fellowships

Contracting Opportunities

Employment

Community Involvement

Welcome to the Environmental Protection Agency's National Hispanic Outreach Strategy home page. This Web site is part of EPA efforts to strengthen its relationship with Hispanic Americans and better serve the nation's growing Latino community. The National Hispanic Outreach Strategy sets forth a comprehensive and detailed approach to promoting greater access to economic and employment opportunities with the Agency, increasing EPA support for Hispanic Serving Institutions or Initiatives, facilitating access to environmental information, and improving the delivery of programs and services of particular importance to the Hispanic community.

Diego Rivera, *Motherhood*, 1954, oil on canvas, Sotheby's, New York

National Hispanic Outreach Strategy

Links

La EPA en Español

EPA Search Page

Featured Website

EPA Regions / Offices / Initiatives

Hispanic Outreach Internet Conference

US-Mexico Border XXI

EPA United States Environmental Protection Agency

National Hispanic Outreach Strategy

What's New!

Grants and Fellowships

Contracting Opportunities

Employment

Community Involvement

Hispanic Outreach Strategy

Vision: EPA's National Hispanic Outreach Strategy promotes opportunities for Hispanic Americans in program development and delivery, education, funding, and employment through improved partnerships with Latino stakeholders.

The Strategy rests on four pillars:

- Employment and Professional Advancement
- Education Pipeline
- Economic Opportunities
- Community Partnerships

Employment and Professional Advancement

Goals

1. Develop recruitment strategies which identify EPA as an employer committed to fair and equal employment opportunity, and as an organization involved in issues of importance to the Hispanic community. The Agency's Diversity Actions Plans will include specific initiatives to ensure that qualified Hispanic American applicants are identified and recruited.

2. Ensure that Hispanic American employees have an equal opportunity to participate in professional development programs and opportunities by removing any barriers to such participation.

3. Adopt policies and procedures that promote the accountability of EPA managers and supervisors for achieving equal employment opportunity and fairness, particularly in critical management areas such as succession planning for senior positions in the Agency's workforce.

Education Pipeline

Goals

1. Increase the percentage of EPA funding to institutions or programs that serve Hispanic American students at all educational levels through all appropriate means.

2. Increase the ability of Hispanic Serving Educational Institutions or Initiatives (HSEIs) to compete more effectively in EPA grant programs.

3. Develop automated systems for the Agency to track its performance on funding of HSEIs.

Economic Opportunities

Goals

1. Increase outreach efforts to Hispanic-owned firms in order to expand their awareness of contracting opportunities with EPA.

2. Broaden access to EPA financial and technical assistance for community groups and other non-governmental organizations that serve the Hispanic community.

3. Develop post-award tracking systems for monitoring financial resources to Hispanic businesses and identify any barriers to awarding procurements.

Community Partnerships

Goals

1. Build effective partnerships with Hispanic organizations and communities to raise environmental awareness and to be responsive to the environmental and public health priorities of the Hispanic community.

2. Ensure effective communication of EPA program objectives and accomplishments by making widespread use of Spanish language documents and Hispanic media outlets.

EPA United States Environmental Protection Agency

National Hispanic Outreach Strategy

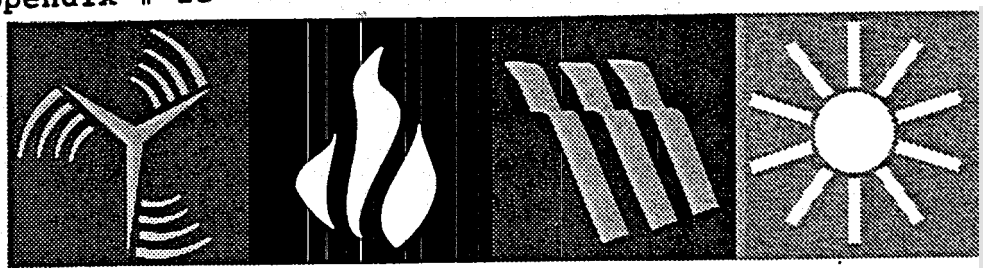
What's New?
Grants and Fellowships
Contracting Opportunities
Employment
Community Involvement

Grants and Fellowships

Grants Administration Division
Sustainable Development Challenge Grants
EPA Small Grants Guidance
Undergraduate Minority Fellowships
Science to Achieve Results Grants
Environmental Education Grant Program
Environmental Justice Small Grants Program
Research Grants

Last Modified: October 6, 1999
URL: http://www.epa.gov/hispanicoutreach/grants.html

Appendix # 2c



LABS FOR THE 21ST CENTURY

VOLUNTARY PARTNERSHIP PROGRAM FACTSHEET

What is the Laboratories for the 21st Century Partnership Program?

The Laboratories for the 21st Century (Labs21) Partnership Program is a new voluntary effort being developed by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). The Partnership Program, a key component of the broader Labs21 initiative, is being launched with a pilot phase. Both the initiative and the partnership program will focus on improving laboratory energy and water efficiency, encouraging the use of renewable energy sources, and promoting environmental stewardship in U.S. laboratories.

What are the Benefits of Becoming a Labs21 Partner?

Applying the Labs21 Approach can provide the following benefits to participating laboratories:

- Lower laboratory utility and operating costs.
- Opportunities for regulatory relief through EPA's Project XL program.
- Reduced health and safety risks.
- Improved facility management.
- Reduced pollution and greenhouse gas emissions.
- National recognition and an enhanced image.
- Access to technical assistance.

What is the Labs21 Initiative?

Labs21 is an initiative developed and sponsored by EPA and DOE to improve the environmental performance of U.S. laboratories. The initiative consists of three key components:

- ***Labs21 Partnership Program:*** EPA and DOE will establish voluntary partnerships with interested public and private sector labs. Working with the EPA and DOE Labs21 Team, each partner will set voluntary energy and water efficiency goals and measure and report the success of their efforts.
- ***Training:*** The EPA and DOE Labs21 Team will provide training or other opportunities to exchange technical information with Labs21 initiative participants, including continuing to sponsor the annual Labs21 conference.
- ***Best Practices:*** EPA and DOE will create an Internet-accessible compendium of best practices, case studies, and energy and water data documenting innovations in laboratory design and operation. It will build upon the *Design Guide for Energy-Efficient Research Laboratories* developed by the Lawrence Berkeley National Laboratory.

Quantifying the Benefits of Labs21

Using the Labs21 Approach, EPA and DOE estimate that laboratories can decrease energy consumption by 60 to 75 percent. EPA applied the Labs21 Approach to its Ann Arbor, Michigan, laboratory and is expecting to reduce its annual electric demand by 68 percent and its utility costs by almost 75 percent. Assuming that only 25 percent of U.S. laboratories achieve a 60 percent reduction in energy consumption, the United States could reduce its annual energy consumption by 84 trillion Btus, which is equal to the electricity consumed by 2.1 million U.S. households. An efficiency improvement of this magnitude would save $1.25 billion annually.

In addition to the cost savings, the environmental benefits of the potential energy savings also are significant. Conserving 84 trillion Btus of energy would decrease carbon dioxide (CO_2) emissions by 16.4 million tons, which is equivalent to removing 3 million automobiles from U.S. highways or preserving 56 million trees from harvest. Reducing CO_2 emissions can help alleviate potential human-influenced, adverse effects on the global climate.

What is the Labs21 Approach?

The goal of Labs21 is to create environmental showcase laboratories by encouraging laboratory owners, operators, and designers to adopt the "Labs21 Approach." This approach involves an initial evaluation of a laboratory's energy use from a holistic, or comprehensive, perspective when considering efficiency improvements. This requires focusing on all of a laboratory's energy systems and wastes, including its HVAC and electrical power supply, rather than focusing on specific building components.

Such an approach allows laboratory owners and operators to pursue integrated energy and water conservation measures with significantly higher efficiencies and cost savings than the traditional approach of addressing components sequentially or individually. Adopting the Labs21 Approach will include capital investment decision making based on life-cycle cost savings; pursuing advanced, energy efficient HVAC technologies; designing systems that recover and exchange waste heat and other forms of free energy; and incorporating renewable energy systems. The resulting showcase facilities will reduce emissions, streamline energy and water usage, and decrease overall costs—all while preserving the integrity of the laboratory's mission.

The Labs21 Approach includes the following:

- Establishing aggressive but voluntary energy and water reduction goals determined by life-cycle cost benefits, not upfront cost limitations.
- Reducing source emissions associated with traditional energy generation and producing an accounting process to identify ownership of the avoided emissions.
- Optimizing energy and water cost savings.
- Restoring obsolete, aging, or inefficient energy and water infrastructures.
- Minimizing, if not eliminating, energy and water waste.
- Using renewable energy sources such as photovoltaic, solar thermal, passive solar, biomass, wind, geothermal, hydropower, combined heat and power, fuel cells, and other alternative technologies where cost-effective.
- Measuring and verifying results.

How Can I Become a Labs21 Partner?

The Labs21 Partnership Program will evolve over a 4- to 5-year period through two phases: Pilot and Implementation. During the pilot phase, the EPA and DOE Labs21 Team will work closely with a select group of public and private sector laboratories to define the scope of the pilot projects, provide technical assistance, and develop a method to measure and evaluate the success of each project. Pilot Partners must be willing to commit to the following:

- Adopting the Labs21 principles for improving energy and water efficiency.
- Committing to a specific pilot project, such as using the guidelines developed by Labs21 when designing a new laboratory or retrofitting an existing facility.
- Helping the Labs21 program develop a method to measure and evaluate the success of the project.
- Participating in the upcoming Labs21 conference, which may include recognition as a Pilot Partner in conference materials as well as a brief signing ceremony.

The Labs21 Team agrees to support the efforts of the Pilot Partners by doing the following:

- Providing technical assistance, which may include developing an energy audit protocol or reviewing a laboratory design.
- Providing opportunities for education and training on laboratory energy and water efficiency.
- Facilitating opportunities for regulatory relief through EPA's Project XL program.
- Working to identify the value of associated emission reductions and applying the value to laboratory efficiency improvements.
- Helping create and promote a national database of laboratory energy and water consumption by laboratory type.
- Recognizing Pilot Partners through an awards program, publications, and the Labs21 Web site.
- Researching, writing, and distributing case studies documenting successful efforts to reduce the environmental impacts of U.S. laboratories.
- Holding an annual Labs21 conference to facilitate information exchange and recognize Partners for their participation.

What is the Relationship Between Labs21 and EPA's Project XL Program?

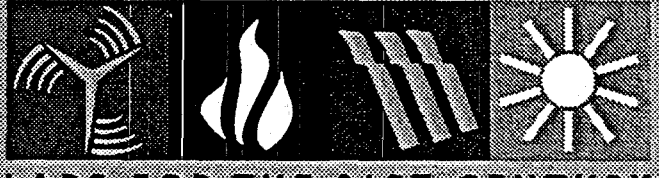
Project XL, which stands for "eXcellence and Leadership," is an existing EPA program that tests innovative ways of achieving better and more cost-effective public health and environmental protection. Project XL encourages state and local governments, businesses, and federal facilities to test cleaner, cheaper, and smarter ways to attain environmental results superior to those achieved under current regulations and policies. In exchange, EPA issues regulatory, program, policy, or procedural flexibility for specific projects. For more information on Project XL, visit <www.epa.gov/projectxl>.

Regulatory relief is already available to laboratories through the standard XL process. In addition, EPA plans to introduce an accelerated XL track for interested Labs21 partners. Through the relationships set up by this XL track, the DOE and EPA Labs21 Team will act as facilitators for compiling and reviewing the information needed by XL to process the flexibility request. The team will, in part, provide this facilitation by ensuring that any information submitted by laboratories as part of Labs21 is also utilized to the greatest extent possible to satisfy the XL participation criteria.

What Types of Projects Will Labs21 Pilot Partners Undertake?

Each Pilot Partner will have its own goals and unique needs. For some Partners, it might make sense to begin with a complete energy and water audit. The Labs21 program will help Pilot Partners find an experienced energy auditor to perform the audit. The audit would develop an efficiency baseline for the facility, document building configuration and energy use characteristics, and identify energy and water conservation measures. Other Partners might need a different level of support, which can be negotiated with the EPA and DOE Labs21 Team as part of the Pilot Partner application process.

Pilot Partners also will help define the participation requirements for future partners who join the Labs21 program at the conclusion of the pilot phase. As currently envisioned, the Labs21 program will have two participation categories: Partners and Supporters. Partners will include laboratory owners and operators that commit to the Labs21 Approach as defined by the EPA and DOE Labs21 Team and the Pilot Partners. Supporters will include any individual or group willing to promote the objectives of the Labs21 program such as energy savings contractors, trade associations, independent energy consultants, architecture firms specializing in laboratory design, and laboratory equipment manufacturers.



LABS FOR THE 21ST CENTURY

How Can I Learn More About Labs21?

Visit the Labs21 Web site at

<www.epa.gov/labs21century>

for more information on the Labs21 Partnership Program.

The Partnership Program and the larger Labs21 initiative also will be discussed as part of the annual Labs21 Conference, scheduled for

September 6 to 8, 2000, in San Francisco, California.

Additional conference information is available on the Labs21 Web site at

<www.epa.gov/labs21century>.

Appendix #3

EPA

Luncheon Agenda
12:00-1:30 p.m.
Friday, April 7, 2000

Welcome	Dr. Margie Mancias Intro. Cruz	5 min.
Remarks	Ms. Miriam Cruz Intro. Díaz	5 min.
Remarks	Mr. Rómulo Díaz Intro. Kearney	5 min.
Overview of FWA Program		5 min.

Stop serving meals prior to beginning of Children's presentation

Children's Program — 20 min.

- Welcome Representative
- Presentation: Farm Workers
- Presentation: Student's Experience with Equity Mentors Programs
- Farm Workers Poetry Reading

Introduction of Congressman Ortiz's Staff	2 min.
Remarks by Congressman Ortiz's Staff	10 min.
Presentation of Mentor's Certificates Díaz & Kearney	10 min.
Group Photo	3 min.
Total Program Time	65 min.

Appendix #4

MY HOUSE IN AMERICA

By Dr. José Jaime Rivera
President
Sacred Heart University
San Juan Puerto Rico

Proposal for "My House in America"

Summary:
The project consists of the creation of a web-based environmental educational venue, which will provide educational information about the environment and a creative participatory tool for communication between schools in four different communities in Puerto Rico, The University of the Sacred Heart and other related sources of information. This includes the designing and maintenance of the venue, training, and technical support for teachers and students in the creation of the individual sights and coordination of "on-line" events. This project is of a demonstrative character and will be the first step for the development of similar venues in all the countries in America. During this first local pilot project, four schools will participate.

GOALS:

1. Provide tools that will facilitate communication between communities, and with grassroots organizations.
2. Promote changes in environmental educational strategies and teaching of environmental issues.
3. Provide contents and relevant curriculum material for the new Department of Education computer-based classrooms.
4. Promote communication between communities, and with the agencies that provide information about the environment.
5. Promote a comprehensive interdisciplinary understanding of environmental issues and a participatory process of empowerment and responsibility.

OBJECTIVES:

1. Establish a pilot internet-based network between four schools in Puerto Rico to produce the venue.
2. Provide training and the technical support for teachers and students so that they can develop Internet web-sites about the distinctive aspects of their communities. With a focus on broad-based environmental issues.
3. Provide training that will allow the teachers to use their community as a starting point for learning about the environment.
4. Provide training for the teachers that will equip them to make the most of the tools provided by the Internet in their classrooms.
5. Promote the use of assessment criteria for the development and selection of relevant curriculum materials.
6. Coordinate, and conduct at least three "on-line" events between students in the four participating schools.
7. Coordinate, and conduct at least two "on-line" events between teachers at the participating schools.
8. Coordinate, and conduct at least one "on-line" event, that will focus on common environmental concerns between the students, teachers and representative from environmentally related organizations.

"My House in America"

Organizational partners:

San Juan Bay's Estuary Program
Metropolitan Alliance for Educational Reform
PRISMA Science Exploration Museum of Puerto Rico

Participating Schools

School in Piñones: Eco-tourism Theme
School in Cataño: (Ford Foundation)
Lincoln School in San Juan: Education Project in Sacred Heart University (USC).
School in Puerto Nuevo: (Department of Education Program in USC).

Salaries and benefits:	**In kind**	**Requested**
1. Program Coordinator (USC professor: 4 credits x 3 sessions, $1,800 X 3 sessions) (Part time)		$ 5,400
2. WESB Master, teacher and student trainers, technical support (communications or computer graduate student) (Full time)		24,000
3. Graphics designer (communications student) (Part time,)		12,000
4. Project Administrator and Logistics coordinator (Business Administration graduate student) (Part time,)		12,000
	Sub-Total	**$ 53,400**
Fringe Benefits 1 Full time (.225) $6,120 3 Part Time (.084) $2,470		+ 8,590
	Total	**$ 61,990**
Communications:		
Telephone, Fax, and postage stamps	$ 700	---
Transportation:		
Nine trips per month x 12 months 10 miles per trip @ .30/mile	324	---

"My House in America"

	In Kind	Requested
Equipment:		
1. Internet Connection T1	$12,000	---
2. General office materials, supplies Software and training materials		8,000
3. Server for McIntoch Internet G4 with capacity to run Quicktime and Basic monitor		5,000
4. Scanner (based at USC)		400
5. Digital Camera (based at USC)		700
6. Computer Program necessary to hook up network		1,500
7. Computer Program to develop web-sites on Internet x 4 schools		2,000
8. Digital Cameras x 4 schools		1,600
9. Computer for project personnel 2 desk top PC's and software		3,000
TOTAL	**$13,024**	**$84,190**

Appendix #5

Inter American University of Puerto Rico
Barranquitas Campus

Inter American University of P.R.-Barranquitas Campus Environmental Project to be submitted to the Educational Consortium for Environmental Protection

June 2000

Inter American University of Puerto Rico, Barranquitas Campus (IAUPR-BC), serves nearly 1,700 Hispanic predominantly first-generation college students within a rural agricultural setting. There are many environmental issues in our community, which must be addressed as part of our institutional mission. The main focus of this proposal is to strengthen IAUPR-BC infrastructure to carry out an environmental project, which involves research and education. Throughout this project, IAUPR-BC will incorporate modern and innovative strategies into the teaching and learning processes. Students will learn, among other things, how environmental scientific knowledge can be generated and used in order to understand the world around us and how this knowledge can be used to improve our living conditions.

The project components are: 1. Environmental Assessment of San Cristobal Canyon, 2. Identification of Genetic Markers Related to Human Susceptibility to Environmental Pollution, and 3. Community Environmental Education. IAUPR-BC students and faculty will carry out the activities of each these components. In addition, high school students and teachers will also take part of this project.

1. Environmental Assessment of San Cristobal Canyon

San Cristobal Canyon is the deepest canyon in Puerto Rico. It is located between the towns of Aibonito and Barranquitas. It is nine kilometers long, 200 m deep, as narrow as 200 m, and has several ponds at the bottom, intense vegetation, several falls and cliffs. Through it flow the Usabón and Barranquitas rivers. The water content of these rivers arrives at La Plata River, which in turns, nourishes the largest water deposit for human consumption in Puerto Rico. There are many endangered species living in this ecosystem, as well valuable archeological materials. In spite the ecological, archeological, and human health value, this unique natural resource has been severely polluted. Waste material from various towns from the interior of the Island was dump in the Cañón San Cristobal during the fifties, sixties, and part of the seventies. The waste dumping has been stopped, however many toxic materials remain and many others still arrive to the San Cristobal Canyon due to soil erosion.

At this moment, students and faculty from IAUPR-BC, as well as high school teachers and students are involved in an environmental assessment

project in the San Cristobal Canyon. Some of activities which are in progress includes the identification of the fishes abundant in the Usabón River, physical data such as dissolve oxygen and pH are being measured, groups of students are taken every month to the Canyon as part of the environmental subjects of their courses, presentations about this site are being prepared, which will be delivered to private and public schools and the rest of the community. Bacteriological analysis on the Usabón River is also being done. In agenda we have water heavy metals and pesticides analysis. A Web Page will be developed to publish this project and to provide information to the public about the San Cristobal Canyon.

2. Identification of Genetic Markers Related to Human Susceptibility to Environmental Pollution

Advances in molecular biology and the equipment available for research in this field have allowed the increasingly rapid sequencing of large portions of the genomes of several species. The sequence the human chromosomes has generated already huge amount of data. Popular sequence databases, such as GenBank and EMBL, have been growing at exponential rates. This information will accelerate the identification of genes associated with a number of diseases. A more elusive subject is the interaction of genes with environmental factors and its consequence in human health. There are genes whose interaction with environmental pollutants promotes diseases. This information will be crucial for risk assessment and genetic screening. The genetic susceptibility of the Hispanic community to environmental contamination has not been documented.

We initially propose to establish a database of genes whose interaction with environmental pollutants has been associated with diseases in other populations. These data will be compared with the most common pollutants in Puerto Rico, to try to identify susceptible genes in our community. Risk assessment will be documented. The genes sequence must be analyzed to determine genetic markers. Genetic screening could be considered as the next approach.

3. Community Environmental Education

This component is already in progress. IAUPR-BC faculty from the Science and Technology Department actively participate in environmental education. A series of environmental workshops and conferences are being offered to schools and to general community during the year. Faculty prepares and offers more than ten conferences a year on different environmental issues. These conferences are delivered to the Public and Private School System from Barranquitas, Orocovis, Aibonito, and Naranjito, as well as to some target communities. IAUPR-BC produces compost as an organic fertilizer. Workshops have been offered to many communities as a way to reutilize many organic materials that usually end up in the landfills. Aluminum and paper recycling workshops are also offered.

What do we need to accomplish this project?

For the Environmental Assessment of San Cristobal Canyon component, We need scientific expertise on methods and analysis of environmental assessment, especially on water and inventories of living organisms. It will very valuable for the Department of Science and Technology from IAUPR-BC if could bring a visiting scientist who could teach basic environmental courses and train faculty and students on research methods and techniques for environmental assessment. We also need basic instrumentation for heavy metal analysis and organic pollutants in water. Instrumentation such as atomic, ultraviolet, and infrared spectroscopy is needed.

To create the database for the Identification of Genetic Markers Related to Human Susceptibility to Environmental Pollution, we need a Unyx computer to download and organize the gene sequences.

Faculty and students participating in this project can get experience by having the opportunity to visit laboratories specialized in environmental assessment and bioinformatics. The gained experience will be used in this project.

Appendix # 6 a

Annual Report of CEPA Activities at
Texas A&M University-Corpus Christi
1999-2000

The 1999-2000 academic year represented a major transition in Texas A&M University-Corpus Christi (TAMU-CC) activities related to CEPA initiatives. First and foremost was the completion of the pilot phase of the Translingual Environmental Education program. Initially funded by CEPA in 1998, this project created a website in which the introductory college-level Environmental Science course at TAMU-CC was placed on-line with streaming audio and PowerPoint video slides in either of two languages: Spanish or English or any combination of the two.

In September of 1999, TAMU-CC Principal Investigator Dr. Grady Blount met with Dr. Miriam Cruz and obtained approval to utilize the CEPA network of educational institutions to create a *Translingual Earth System Science Education Center*. The success of the initial translingual pilot project was used to leverage the CEPA funds into a much larger NASA-sponsored grant which is just getting underway. Complimenting similar efforts at the Universidad del Sagrado Corazon, the *Translingual Center* was created with two distinct goals: 1) To develop and deliver an on-line version of an integrated Earth System Science course at the University level, and 2) To recruit and train multilingual Environmental Science educators to serve Spanish-speaking populations in the U.S. This later effort is being coordinated in conjunction with several National Science Foundation-funded projects in Texas, most notably, the *Texas Center for Excellence in Teacher Preparation* (aka TxCETP). Using the TxCETP model of teacher recruitment and development, the initial NASA funding in the amount of $156,000 is being provided to identify and train an initial cadre of ten K-12 educators capable of integrating a newly developed Earth System Science curriculum into multilingual classrooms in the U.S. At the same time, this curriculum will be posted online and used to supplement the initial offering of this class as a freshman core science requirement at TAMU-CC. The on-line version of the course will be made available to participating CEPA institutions starting with the Spring 2001 semester.

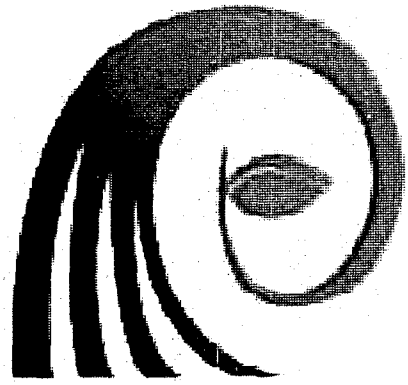
Plans for the 2000-2001 academic year center on development of the on-line Earth System Science course described above, particularly creating on-line laboratory assignments to illustrate the interconnected nature of the Earth's environment. Several of these labs will be designed to involve real-time data collection of meteorological data from participating CEPA sites. Existing CEPA-sponsored web resources at the Universidad de Santiago and Universidad del Sagrado Corazon will be integrated into the *Translingual Center* website. Tentative plans also call for the next CEPA conference to be located at TAMU-CC. If this happy event occurs then there will obviously be additional hosting activities on the calendar for next year.

Respectfully submitted, May 17, 2000

Dr. Grady Price Blount,
Dept. of Physical and Life Sciences
Texas A&M University-Corpus Christi

Appendix # 6b

Translingual Environmental Science Education



By Dr. Grady Blount, Texas A&M University-Corpus Christi

"By strengthening the technical and educational infrastructure, CEPA is making it easier for students and professionals in the Americas to access information and educational resources"

-DOE Secretary Frederico Pena to the 1998 CEPA Annual Meeting in Santiago, Chile.

Introduction: Translingual education involves teaching across the boundaries of language. The following, decidedly informal, microproposal tries to make translingual environmental education a reality. But first, some background information is in order.

The academic relationship between the countries of the Americas is one of the most neglected on Earth. From Canada to Chile, educators and scientists have historically looked to Europe for examples of how to get things done. Ironically, when the subject turns to environmental education, this misplaced mentorship is in error. Europeans may be smart and have a long history, but they are very far away.

Part of the responsibility for this neglected relationship between North and South America can be laid at the foot of Eurocentric custom, history and habit. Most of the rest is due to the barriers of language and physical distance. This document addresses the latter issues and proposes a solution.

Rationale: The Principle of Environmental Unity states that everything is connected to everything else. Implicit in this statement is the fact that environments which share a common boundary affect

one another more strongly than those at a distance. Nowhere has this been demonstrated more clearly than along the U.S./Mexico border where foreign-owned maquilladoras have successfully exported highly polluting industries from the norte into the colonias of Tamaulipas, Nuevo Leon and Chihuahua.

Indeed, a common thread of environmental damage weaves its way through the Americas. Environmental educators understand this and have worked hard to share this knowledge with their students and governments. Yet, with the exception of CEPA, they seldom share this knowledge across national borders...particularly when the border is accompanied by a change in language.

Virtual Infrastructure: Technology now gives us the opportunity to cross the borders of language and landscape to share environmental information freely. Using Interest-based class delivery, we are on the verge of an information revolution capable of uniting environmental scientists and educators throughout the Americas.

Internet-based class delivery is an extension of a well-known educational technique known as distance-learning. Although fairly common within national borders, delivery of distance-learning across national borders had remained a novelty. Until now.

The Problem: In the U.S., attempts to initiate distance-learning to foreign sites are usually accompanied by mountains of red tape, particularly at the graduate level. Entry barriers such as the TOEFL (Test for English as a Second Language), high out-of-state tuition charges, the U.S.-only Graduate Record Examination, and a host of other site-specific requirements have served to effectively quash web-based learning between foreign institutions. Add to this the multilingual barriers of the Western Hemisphere and you have a recipe for inaction.

The Solution: Remarkably, only two things are needed to overcome the barriers of bureaucracy and monolingualism: 1) A dedicated and imaginative faculty; and 2) The technical know-how to make it happen. Both of these resources exist within the ranks of CEPA institutions.

I propose that Texas A&M-Corpus Christi (TAMU-CC) work directly with the Universidad de Santiago de Chile, and Centro EULA and initiate a bold new plan for environmental education as a pilot project during the 1998-99 academic year. Ideally the pilot project described below will be followed by a two-way exchange of translingual class offerings from our colleagues in Mexico, Puerto Rico, and Bolivia.

Translingual Environmental Science Education:

A Microproposal for Delivery of an Introductory Environmental Science Course

Introduction: This proposal is to create a Web-based delivery system for the CORE curriculum course ESCI 1470 Introduction to Environmental Science at Texas A&M University-Corpus Christi (TAMU-CC). This course has been offered seven times since the Spring 1995 semester and has proven to be one of the most popular and useful courses at TAMU-CC. The lecture portions of this course have also pioneered the use of computer-assisted multimedia (e.g. PowerPoint), web-delivery of course notes, and list-servers for the students. Through continuously upgrading, all 15 weeks of lecture material exist in PowerPoint format. The continued growth of distance learning delivered by non-

traditional media such as the World Wide Web (WWW) makes this course a logical choice as our first major entry into web-delivered lectures. By utilizing bilingual faculty and readily available language translation software, we can create the first translingual model for environmental science education.

Background: This proposal has been inspired by the runaway success of a mixed delivery model (see below) of campus and WWW based instruction at my former institution, the University of North Dakota. Earlier this year, I met with a group of 14 alumni of their program in the Houston area. All had received their MS degrees in Space Studies via the WWW delivery mode. One of the key points brought home during my interviews with these students was the distinction between the terms "distance learning" and "distance education". Although commonly treated as synonyms, the former is controlled by institutions and instructors while the later is controlled by the students (i.e. distance learning is the goal of distance education). The University can facilitate the learning aspect of these paradigms by supporting broad concepts of distributed education. Indeed, we now understand that physical presence may be as outmoded as recitation. The mixed delivery mode pioneered by the North Dakota experience is proposed for this project. Under this model, the on-campus lecture will be delivered in the classroom and on the WWW. Funding for this proposal is requested to implement the WWW aspect of the delivery.

The Mixed Delivery Model: During the Fall of 1997 I had several occasions to be absent from my regularly scheduled classes. Rather than falling back on a traditional substitute (e.g. showing a video or having a guest lecturer), I choose to videotape my presentation with the lecture audio superimposed on existing PowerPoint slides. Much to my surprise, I later received anecdotal reports that many of the students in my large (≈ 265 seat) class had not realized I was absent when the videotaped lecture was being shown. This highlights the tremendous power of an effective mixed delivery model. Real-time audio coupled with well-designed graphics and illustrative video clips becomes the central focus of the learning experience. The oftentimes-distracting influence of an intimidating professor is removed.

The WWW delivery model utilizes three pieces of software: a Web-browser, Real Audio, and Internet Relay Chat to focus the learning experience on content rather than personalities. A typical student "attending" a WWW delivered class will see the visual content of the lecture via their web-browser (which shows streaming copies of the PowerPoint slides), hear the professor (via Real Audio), and be able to interact with other students (via typed message on a "Chat" window). Access to the WWW classroom is via a secure gateway in which students must obtain a username and password. This aspect is critical since an "open classroom" could be subject to devastating "Chat" intrusions, which would distract from the learning experience.

Intended Audience: Initially, the WWW delivery mode will be targeted to currently enrolled campus students who are unable to be physically present for the Tuesday/Thursday 8:00 AM starting time. The next logical step is to record the live audio during the mixed model lecture and make it available on the WWW for students with time conflicts and/or for verbatim review prior to examinations. By piloting the on-line version of the class locally, I expect to receive valuable feedback and critiques during the first monolingual semester of WWW delivery. Assuming success with this mode, we will work with appropriate TAMU-CC authorities to create administrative structures for off-campus web-based students.

Technical Issues and Requirements: The single most important technical issue is that instructors in a live classroom must deliver their lecture in the language of the students. The same is not true for the

printed material which appears on PowerPoint slides. All of my pre-produced slides will be translated into Spanish for Spring 1999 delivery. Direct e-mail communications between monolingual students and professors can be accomplished via software programs such as Systran, which allows for bi-directional translation between English and Spanish. I do not propose a technical fix for something as nuance-filled as language, rather, I suggest that software now has sufficient power to reduce the relative importance of what language a word or sentence is written in. The remainder of the software needed by a student is available as *freeware* over numerous Internet sites (e.g. Real Audio).

The minimum hardware configuration for an off-site student should be as follows:

486-33 or faster CPU (Pentium 100 preferred) running Win95/98/NT

16 MB of RAM (32 MB preferred).

SVGA graphics and sound card.

28.8 modem with PPP connection or direct Internet connection.

Assuming these conditions have been met, there are still several technical issues which will be site-specific on the receiving end. As an example, we have performed several "ping traces" between Corpus Christi and Santiago. This involves sending a signal from the TAMU-CC network to the network at the Universidad de Santiago de Chile and continuously monitoring the intermediate path of those signals. From these experiments it has become clear that the electronic path across the Americas is not straightforward. Most paths involved at least 2 uplinks to geostationary satellites...a fact which introduces a noticeable lag time. In addition, the volume of network traffic on both ends, classroom and student, can strongly affect the smooth flow of data. This aspect is known as bandwidth and is analogous to the number of lanes on a freeway. All else being equal, a freeway with more lanes can carry more traffic. Equally true however is the fact that a fixed bandwidth, like a freeway with a fixed number of lanes, will experience times of greater or lesser congestion. Optimization of class delivery as a function of these variables will be a prime goal of the first semester of operation (aka "getting the bugs out").

Excellent tutorials on the engineering aspects of Internet course delivery can be found at Michigan State University and at TAMU-CC's virtual classroom. For the time being I propose to use our first semester of operation to test several delivery modes: real-time audio and video, delayed audio and video, and preloaded audio and video. The leading commercial products for accomplishing these goals are Real Audio, Real Video, and QuickTime Movie.

Dissemination Plan: Leading by example has always been my personal style. Since the 1995 ESCI 1470 introduction of web-assisted class notes, student list-servers, and integrated multimedia, several biology courses and a new science CORE course have followed suite. In the spirit of the mixed delivery model, I propose to generate a video documenting our first two semesters of on-site/WWW delivery. This documentary will be edited into useable form with the intention of being viewed on a tutorial CEPA web page. Much of the barrier to routine WWW delivery with a mixed model is the requirement for downloading, installing, and configuring support software. The documentary of our experiences will include demonstrations of how to step through this process. In addition, a separate mini-tutorial videotape will be made available to students which will step them through the process of configuring their remote-site machines for reception of the WWW lecture.

Concluding Statement: With the age of the Internet upon us, more effective and convenient distance learning devices are being developed. Some of these, such as language translation software, allow us to accomplish goals never before dreamed of. It is appropriate, perhaps even inevitable, that the goal of environmental education in the Americas be accomplished by CEPA. It is an example for the entire world to follow.

Academic Year 98-99 Pilot Budget
Blount summer 98 preparation 1/4 release time $2,888
Graduate research assistant (300 hours @ $7/hour) $2,100
A/V encoding computer $2,600
Audio editing software $ 300
PROJECT TOTAL $7,888
Less IN-KIND CONTRIBUTION per Marinez $2,888
AMOUNT REQUESTED $5,000

For additional Information:

Contact Dr. Grady Blount, Texas A&M-Corpus Christi

Appendix # 7

IMA Action Plan for 2000-2001 under the CEPA Agreement
Prepared by Jaime J. Cornejo, IMA´s Academic Director
May 2000

Collaboration with the EPA

We will look for *technology transfer from the EPA* on:

- Modern techniques to handle environmental information over the Internet
- EPA´s Green Chemistry initiative. Indeed, the sustainable chemistry concept has become the basisof the IMA 2000 development plan.
- The EPA´s Labs 21 Initiative on cleaner, sustainable chemistry labs is of high interest to us. Atpresent we have chemical engineering students working on a replication of the concept.
- Instrumentation and management for model environmental measurement labs, including the issueof ISO25 accreditation.

Research Collaboration with ORNL

- We plan to continue with current collaboration on phytoremediation research. This time we willstress how does the process work, biochemically and genetically. The development of the research is tied to Franz´doctoral studies at UTK.. Also included is the cantilever sensor technology and applications of AFM to how plant morphology influences the decontamination ability of live plants. A very important issue here derived from the existing collaboration is the donation of an AFM from ORNL to IMA which, when operational at IMA, will undoubtedly increase productivity in the area.
  ORNL scientists involved: Art Stewart and Tom Thundat

- A new avenue of research collaboration with ORNL includes sustainable chemistry research,including solvent replacement for organic transformations and development of technology for clean energy sources. We will establish proper contacts in order to define specific projects.

Education and Environmental Information

- We will have participation in ?My house in America", an outgrowth of our Internet-basedcollaboration with U. of the Sacred Heart, Puerto Rico which started in 1999, in which now TAMU Corpus Christi and EULA-Chile can participate.
- We will propose to the EPA to collaborate on a bilingual Internet platform with high qualityenvironmental information for Latin America
- We will pursue collaboration on a CEPA wide Master Program on Environmental Science

Meeting on Tools for Sustainable Development at USACh: July 18 and 19, 2000. IMA organizes

The invitation to participate and the preliminary program for this very important gathering of Chileanscientists and environmental professionals are already at www.usach.cl/ima, link ?Encuentro DesarrolloSustentable". The meeting will be in part a continuation of the successful meeting ?Universidad yMedio Ambiente" that took place last March at EULA-U. de Concepción.

We need assistance from CEPA, as follows:

- To support the meeting with salutation messages, suggestions and documentation, and
- To secure the participation of one or two EPA experts on Cleaner Production and GreenChemistry

IMA Action Plan for 2000-2001 under the CEPA Agreement

Notes on strategy

- It is clear that we have to look for funding in the private sector. As Miriam Cruz has suggested,we will inform her ahead of time of our intentions of sending a pre-proposal to the Foundation of choice, so she can lobby ahead of time with the right people inside and only when success is clear in the horizon the proposal is to be introduced. In other words, the initiative will succeed when the power of CEPA is activated from the very beginning.
- We have defined as very important securing financing for Franz´s doctoral program at UTK. Atthe meeting in Texas, myself, Anamary, Linda Cain and the Dean of UTK ´s Graduate Division, Dr. C.W. Minkel, discussed the issue and concluded that the only issue remaining is how to finance the venture, particularly the non-resident tuition fee portion of it. Dr. Minkel recommended to start by sending in right away Franz´s application as a graduate student. I told this to Franz but he is pessimistic about it.
- If EPA experts can come to the meeting in July, we can arrange a specialized course on cleanerproduction and sustainable chemistry directed to Chilean professionals. This type of cooperation was offered by EPA at our last Summit in Texas. For one person, a week´s stay in Santiago implies $5,000

Appendix #8

Visite nuestra Homepage Sustentabilidad y Medio Ambiente www.usach.cl/ima

Universidad de Santiago de Chile Chile: Medio Ambiente

Medio Ambiente, Ecología y Salud Pública

Consorcio Educativo para la Protección Ambiental

CEPA

An Environmental Initiative for the Americas

A MASTER'S PROGRAM IN SCIENCES AND ENGINEERING WITH SPECIALTIES IN ENERGY AND ENVIRONMENT

Developed by UPAEP- ORNL-UTK. 1997
Translated from the original text in Spanish by
Dr. Jaime J. Cornejo of IMA-USACh (Jan. 1998)

Note: The original text in Spanish for Appendices I, II, III and IV was not made available for this translation.

INTRODUCTION

At Universidad Popular Autónoma del Estado de Puebla (UPAEP), a master's program is being developed with a

focus on energy and environmental management. There is an existing document which was presented in 1996 for its approval to the Mexican Office of Public Education (SPE), which has now been authorized.

In the search for academic quality, UPAEP aims at having a program with international characteristics which complies with the requirements of Mexico's National Council of Science and Technology (CONACYT), before being considered as a program with excellency.

UPAEP decided to establish contacts with leading institutions the conduct research and development on energy and environment in an integral manner, with which we can reach agreements for joint research and the exchange of visiting professors.

Under the sponsorship of CEPA, UPAEP sent three professors to Oak Ridge National Laboratories (ORNL), with the purpose of reaching those goals.

SUMMARY

The original document of the Master's in Engineering and Management of Energy and Environmental Protection, included a four-semester program with 16 subjects, which are:
Module I : Basis for Energy Management and Environmental Protection
Module II : Thermodynamics and its Applications
Module III : Thermal Energy, its Generation, Distribution and Consumption
Module IV : Research Project
Module V : Electric Energy
Module VI : Water, its relation with Energy and the Environment
Module VII : Autogeneration and Cogeneration of Energy
Module VIII : Development Projects
Module IX : Productive Processes and Energy Diagnostics
Module X : Rational Use of Energy in Buildings and Transportation
Module XI : Uses of Renewable Energy and Solid Residues
Module XII : Thesis I Seminar
Module XIII : New Technologies on the Rational Use of Energy and Environmental Protection
Module XIV : Environmental Risk Management in the Generation and Use of Energy
Module XV : Environmental and Energy Audits in the Management of Projects to Save Energy
Module XVI : Thesis II Seminar

This document was submitted for consideration to different people, and although they found that the global focus seemed adecuate, the following recommendations were made:

1.- That the Master's Program be initiated with an introductory course in Environment and Energy. 2.- That they saw it as a rigid program, which should rather cover first the basic topics and later continue with optional materials that focused separately on Energy and Environment. 3.- That choosing the optional materials should rest on each the student's judgement, no matter what specialty they might select. Upon considering these opinions, a revised program was elaborated where the name of the master's stays as Master's of Science with Specialty in Energy and Environmental Engineering, and which now includes the following modules:
Module I : Energy and Environment
Module II : Thermodynamics and Heat Transfer
Module III : Energy Transformation
Module IV : Research Project
Module V : Electric Energy
Module VI : Water, its relation with Energy and Environment
Module VII : Autogeneration and Cogeneration od Energy
Module VIII : Development Projects
Module IX : Elective I
Module X : Elective II
Module XI : Elective III
Module XII : Thesis I Seminar
Module XIII : Elective IV
Module XIV : Elective V
Module XV : Elective VI

Module XVI : Thesis II Seminar

The courses considered as electives will have a concentration on Energy and Environment. Within these elective courses, the first to dictate will depend on UPAEP'S existing faculty to initiate the Master's Program. Later and according to the orientation of visiting professors the offering of new courses will be broadened, making sure that the specific subjects remain firm within the two different focuses, namely, Energy and Environment, in surch a manner that the students can easily choose courses and topics within their particular area of interest.

CHAPTER I
ORIGINAL ANALYTICAL PROGRAM OF SUBJECTS OF UPAEP'S MASTER'S IN ENGINEERING PLAN: ADMINISTRATION OF ENERGY AND ENVIRONMENTAL PROTECTION

FIRST PERIOD

MODULE 1 : ENERGY AND ENVIRONMENT General Objective: Introduction to the environmental implications associated with the production and consumption of energy (Source: Internet) Specific Objective: Impacts on the use of energy over the environment, for instance: Air, Water, and Soil.

CONTENTS : 1.- Alternative sources of energy (Nuclear energy and hydrogen-based technologies) 2.- Renewable Energy. Objective : Perspectives on the viability of technologies : hydroelectric, solar, aeolian and biomass. 3.- Future Objective : Cultural change, future policies and sustainability Content: Political cultures and sustainability.

MODULE II : THERMODYNAMICS AND HEAT TRANSFER
General objective : To determine the thermodynamic behavior of systems and equipment used in productive processes. Specific objective : To provide thermodynamic tools evaluate energy processes, its efficiency and impact on the environment.

CONTENT: 1.- Basic Concepts 1.1 Intensive and extensive properties 1.2 Gases and liquids 1.3 Thermodynamic properties of air 2.- Mechanisms of heat transfer 2.1 Conduction 2.2 Convection 2.3 Radiation 3.- Heat Transfer 3.1 Temperature and pressure measurements 3.2 Thermal Isolation 3.3 Heat exchangers 3.4 Evaporators 3.5 Dryers

MODULE III : TRANSFORMATION OF ENERGY
General Objective: To formulate balances of materials and energy at the process level, with a focus on thermal energy. Specific objective: To have tools for the energy and environmental evaluations for processes in production units and regional systems, where the aim is to determine, quantitative and qualitativelly, the situation in regards to the generation, distribution and consumption of energy.

CONTENT: 1.- Fuels, combustion and environmental contamination 2.- Atmospheric contamination 3.- Furnaces and Kilns 4.- Distribution of vapor and recovery of condensates 5.- Consumption of thermal energy

MODULE IV : RESEARCH PROJECT:
General objective: To incorporate the different stages in the process of scientific inquiry and research including the methodological and practical points of view. Specific objective: This course brings forth the theoretical and practical elements for training on research, with the aim to provide the basis to create specific projects on each subjects and to support initiating the actual thesis and/or the special graduation project.

CONTENT: 1.- The scientific method and its characteristics 2.- Forms and types of research 3.- Definition of a research job 3.1 Title 3.2 Theoretical frame 3.3 Hypothesis formulation 3.4 Work program

4.- Methodology for the recollection of data 4.1 Primary data 4.2 Secondary data 5.- Scales for the evaluation and analysis of research projects 6.- The final research report

SECOND PERIOD

MODULE V : ELECTRIC ENERGY General objective: To determine the flow and efficiency of electrical energy in

equipments, systems and production unitis and services. Specific objective: To establish the basis of the efficient application of this form of energy to different processes.

CONTENTS: 1.- Basic elements of electricity 2.- Electric installations 3.- Components of electric installations 4.- Lighting 5.- Synchronous generators 6.- Motors 7.- Motors and generators 8.- Studies on power flows 9.- Study of short circuits 10.- Power electronics

MODULE VI: WATER, ITS RELATION WITH ENERGY AND THE ENVIRONMENT.
General Objective: To propose economically and environmentally efficient systems, for the supply and use of water, at the level of unit of production or services, and at a regional level according to cases and contexts. Specific Objective: To establish how the adecuate handling of water resources offers areas of opportunities in energy savings and environmental protection.

CONTENTS : 1.- Supply sources 2.- Distribution and storage networks 3.- Water treatments 4.- Water as liquid waste 5.- Financial analysis of the various systems 6.- Environmental laws and regulations

MODULE VII: AUTOGENERATION AND COGENERATION OF ENERGY
General Objective: To select systems of cogeneration and autogeneration of energy, that are economically and environmentally efficient. Specific Objective: To establish the efficient, combined generation of electric and caloric energy in the industrial systems, with a focus on savings and on environmental protection

CONTENTS: 1.- Definitions, laws and rules 2.- Different systems of cogeneration 3.- Technical and economical feasibility of cogeneration studies 4.- Feasibility studies

MODULE VIII : DEVELOPMENT PROJECTS
General objective: To apply to a specific development project, the steps of the scientific method, according to the strategy suggested in module IV. Specific objective: To incorporate skills for the development of research and technological innovations, which is fundamental for a specialist in energy and environment.

CONTENTS: 1.- Research design. Specific Objective 2.- Elaboration on questionnaires 3.- Sampling, measurement and scales 4.- Codification and preparation of data 5.- Analysis of data 5.1 Hypothesis test 5.2 Multivariate analysis 6.- Financial evaluation 7.- Preparation on final report

THIRD PERIOD

MODULE IX : PRODUCTIVE PROCESSES AND ENERGY DIAGNOSTICS
General objective: To design a comprehensive program of energy savings and environmental protection, at the level of unit of production or services. Specific objective: Analysis of the productive processes and energetic diagnostics that give way to comprehensive programs on energy savings and environmental protection.

CONTENT : 1. Conditions and Application Parameters in Industrial Processes. 2. Quality and Technical Control. 3. Maintenance of Equipment and Installations. 4. Prediagnostics and Diagnostics at the First Level. 5. Energetic Diagnostic at the Second Level. 6. Comprehensive Programs of Energy Savings and Environmental Protection.

MODULE X: RATIONAL USE OF ENERGY IN BUILDINGS AND TRANSPORTATION
General objective: To propose efficient systems for the use of energy upon considering economical and environmental variables. Specific objective: To assess the economical and environmental importance of the use of energy in the buildings and transportation, in terms of criteria for rational administration of the energy.

CONTENTS: 1. Savings of Energy in External and Internal Illumination in Buildings, Warehouses, Houses, Hotels, Hospitals, as well as in Air Conditioning and Domestic Equipment. 2. Refrigeration Systems 3. Building Designs and Use of Building and Finished Materials, according to Criteria for a Rational Use of Energy. 4. Consumption of Energy in Transportation, and in Environmental Pollution Processes. Basis to achieve a decrease in consumption and Savings of Energy.

MODULE XI : USES OF RENEWABLE ENERGIES AND SOLID RESIDUES
General objective: To carry out financial and environmental evaluating of the diverse technologies and sources of renewable energy according to cases and local and regional contexts. Specific objective: To identify possibilities of alternate sources of energy, in the Mexican territory, in particular wastes that are a potential source of energy.

CONTENTS: 1. Solar energy, its potential actual advantages, and future protection on the national and the international Scale. 2. Aeolian energy, its possibilities of becoming a substitute how no renewable energies. The technological advances. 3. Biomass and its availability, and the technologies for its advantageous use as a source of energy. 4. Small, hydroelectric plants, the technical and economical conditions required for their installation. 5. Evaluation of the cost of energy, according to source and long-range tendencies.

MODULE XII : THESIS I SEMINAR

General objective: To apply all the incorporated knowledge to the development and defense of the work the master's degree. Specific objective: To carry out assigned work and/or special project for graduation.

CONTENTS: 1. Definition of the thesis topic or area of concentration: 1.1 Title 1.2 Contents 1.3 Activity Schedule 1.4 Bibliographic Sources 2.- Description of the problem 3.- Ellaboration of the hypothesis 4.- Ellaboration of the research protocol 5.- Dissertation on specific work

FOURTH PERIOD

MODULE XIII : NEW TECHNOLOGIES RELATED TO THE RATIONAL USE OF ENERGY AND ENVIRONMENTAL PROTECTION
General objective: To select equipment and technologies for the efficient use of energy and environmental protection. Specific objective: To develop sustainable strategies for the efficient use of energy and the associated technology for prevention and control of contamination.

CONTENTS: 1. Technology for the advantageous use of waste heat. 2. Fluidized bed and its application in different industrial sectors. 3. New technologies for the elimination contaminants in air, soil and water.

MODULE XIV : MANAGEMENT OF ENVIRONMENTAL RISK IN THE GENERATION AND USE OF THE ENERGY
General objective: To manage procedures for the understanding of the processes, the prevention of environmental risks, and the corresponding emergency plans. Specific objective: To prevent and control the risk that accompanies the use and application of the benefits of the various energy sources.

CONTENT : 1. Identification of installations that might imply the risks of accidents in order to intervene in the direction of risk prevention. 2. Risk analysis : Methodology. 3. Emergency planning. 4. Risk control systems.

MODULE XV : ENVIRONMENTAL AND ENERGETIC AUDITS IN THE MANAGEMENT OF PROJECTS OF ENERGY SAVINGS
General objective: To implement an environmental and energy audit. Specific objective: To apply the environmental and energy audit as an instrument to certify the quality of company processes and to identify areas of opportunity for energy and environmental protection.

CONTENTS: 1.- Investments that are needed, their components and programs for further development.. 2.- Analysis of recovery of investment periods, including the financial benefits for the company. 3.- Engineering procuration and installation of equipment and accesories. Guarantee assurance proofs. 4.- Project Management.

MODULE XVI : THESIS II SEMINAR

General objective: To apply incorporated knowledge the development and presentation of the required work the master's degree. Specific objective: To graduate with to carry out the research work and/or the special graduation project.

CONTENT : 1.- Specialized bibliographic search. 1.1 Clasification 1.2 Translation 1.3 Processing 2.- Measurement and data analysis 3. Style correction 4.- Presentation of the final document 5.- Preparation for oral defense exam

CHAPTER II
ANALYTICAL PROGRAM OF SUBJECTS OF UPAEP'S MASTER'S PLAN IN SCIENCES WITH A SPECIALTY IN ENERGY AND ENVIRONMENTAL ENGINEERING

FIRST PERIOD

MODULE I : ENERGY AND ENVIRONMENT

Objective: Introduction to the environmental implications associated with the production and consumption of energy (Source: Internet) Specific objective: Impacts of energy use on the environment, for example on Air, Water and Soil.

CONTENTS: 1.- Alternative sources of energy (nuclear energy and hydrogen technologies) 2.- Renewable energy Objective: Perspectives of the viability of each technology : hydroelectric, solar, aeolian and biomass. 3.- Future directions Objective : Cultural change, future politics and sustainability. Contents: Politics, Culture, policies and sustainability

MODULE II : THERMODYNAMICS AND HEAT TRANSFER
General objective: To determine the thermodynamic behavior of systems and equipment that are used in productive processes. Specific objective: To evaluate energy processes, their efficiency and their impact on the environment, using a firm base in thermodynamics.

CONTENTS : 1.- Basic Concepts 1.1 Intensive and extensive properties 1.2 Gases and liquids 1.3 Thermodynamic properties of air 2.- Mechanisms of heat transfer 2.1 Conduction 2.2 Convection 2.3 Radiation 3.- Heat transfer 3.1 Measurements of temperature and pressure measurements 3.2 Thermal Isolation 3.3 Heat exchangers 3.4 Evaporators 3.5 Dryers

MODULE III : TRANSFORMATION OF ENERGY
General objective: To formulate balances of materials and energy at the process level, with a focus on thermal energy. Specific objective: To carry out energy-based and environmental evaluations in the processes of production units and regional systems, where the object of this graduate program is to assess, quantitative and qualitatively, the situation in regards to generation, distribution and consumption of energy.

CONTENTS : 1.- Fuels, combustion, and environmental contamination 2.- Atmospheric contamination 3.- Furnaces and kilns 4.- Distribution of vapor and recovery of condensates 5.- Consumption of thermal energy

MODULE IV : RESEARCH PROJECT
General objective: To incorporate the essence and the components of the scientific method and research strategies, from both the methodological and practical points of view. Specific objective: To apply the theoretical and practical elements of systematic research to become able to carry out specific projects on each subject to start the actual degree thesis and/or special graduation project.

CONTENTS: 1.- The scientific method and its characteristics 2.- Forms and types of research 3.- Definition of a research job 3.1 Title 3.2 Theoretical frame 3.3 Hypothesis formulation 3.4 Work plan 4.- Methodology for data collection 4.1 Primary data 4.2 Secondary data 5.- Evaluation criteria and analysis of research projects 6.- The final report of the research

SECOND PERIOD

MODULE V : ELECTRIC ENERGY
General objective: To calculate the flow and efficiency of electric energy in equipment, systems and units of production or services. Specific objective: To supports the basis for an efficient application efficiency of this type of energy to the different processes.

CONTENT : 1.- Basic elements in Electricity 2.- Electric installations 3.- Components of electrical installations 4.- Lighting 5.- Synchronous generators 6.- Motors 7.- Motor and generator centers 8.- Power flow studies 9.- Short circuit studies 10.- Electronic power

MODULE IV: WATER AND ITS RELATION WITH ENERGY AND THE ENVIRONMENT.

General Objective: To propose economically and environmentally efficient systems, for the supply and use of water, at the level of unit of production or services, and at a regional level according to cases and contexts. Specific Objective: The adecuate handling of water resources offers areas of opportunities in energy savings and environmental protection.

CONTENTS : 1.- Sources of water 2.- Distribution and storage networks 3.- Water treatments 4.- Water as liquid

waste 5.- Economic analysis of different systems 6.- Environmental laws and regulations

MODULE VII: AUTOGENERATION AND COGENERATION OF ENERGY

General Objective: To select systems of cogeneration and autogeneration of energy that are economically and environmentally efficient. Specific Objective: Establish the efficient, combined generation of electric and caloric energy in industrial systems, with a focus on savings and on environmental protection

CONTENTS: 1.- Definitions, laws and regulations 2.- Different systems of cogeneration 3.- Technical-economical feasibility of cogeneration studies 4.- Feasibility study

MODULE VIII : DEVELOPMENT PROJECTS

General objective: To apply to a specific project, the steps of the scientific method to the development of projects, according to what was defined in module IV. Specific objective: To incorporate skills for the development of research and technological innovations which is fundamental for the energy and environmental specialists.

CONTENTS: 1.- Research design and specific objectives 2.- Elaboration of the questionnaires 3.- Exposition, measurement and scales 4.- Codification and data preparation 5.- Data Analysis 5.1 Hypothesis test 5.2 Multivariate analysis 6.- Financial evaluation 7.- Final report preparation

THIRD PERIOD

MODULE IX : ELECTIVE I

General objective: According to subject matter. Specific objective: According to subject matter.

CONTENTS : According to subject matter.

MODULE X : ELECTIVE II

General objective: According to subject matter. Specific objective: According to subject matter.

CONTENTS : According to subject matter.

MODULE XI : ELECTIVE III

General objective: According to subject matter. Specific objective: According to subject matter. CONTENTS : According to subject matter.

MODULE XII : THESIS I SEMINAR

General objective: To apply all the incorporated knowlodge to the development and defense of the work required to obtain the master's degree. Specific objective: To carry out assigned research and/or a special title project for graduation.

CONTENTS: 1.- Definition of the thesis topic or area of concentration 1.1 Title 1.2 Contents 1.3 Activity schedule 1.4 Bibliographic sources 2.- Problem setup 3.- Hypothesis elaboration 4.- Elaboration of the research protocol 5.- Oral defense of the research or project work

FOURTH PERIOD MODULE XIII : ELECTIVE IV

General objective: According to subject matter Specific objective: According to subject matter.

CONTENTS : According to subject matter.

MODULE XIV : ELECTIVE V
General objective: According to subject matter. Specific objective: According to subject matter.
CONTENTS : According to subject matter.

MODULE XV : ELECTIVE VI
General objective: According to subject matter. Specific objective: According to subject matter.
CONTENT :

MODULE XVI : THESIS II SEMINAR

General objective: To apply incorporated knowledge to the development and presentation of the required work to graduate with the master's degree. Specific objective: To carry out the research work and/or the special graduation project.

CONTENTS : 1.- Specialized bibliographic search 1.1 Classification 1.2 Translation 1.3 Processing 2.- Measurement and data analysis 3.- Style correction 4.- Presentation of the final document 5.- Preparation of oral defense exam

SUMMARY OF UPAEP'S MASTER'S DEGREE PROGRAM: ENERGY MANAGEMENT AND ENVIRONMENTAL PROTECTION.

SUBJECTS OF STUDY IN THE MASTER'S PROGRAM FIRST PERIOD 1.- Introduction to Environmental Sciences 2.- Thermodynamics and its Applications 3.- Thermal Energy: Generation, Distribution and Consumption 4.- Reasearch Project SECOND PERIOD 5.- Electric Energy 6.- Water and its relation with Energy and Environment 7.- Autogeneration and Cogeneration of Energy 8.- Development Projects THIRD PERIOD 9.- Elective I (*) 10.- Elective II (*) 11.- Elective III (*) 12.- Thesis I Seminar FOURTH PERIOD 13.- Elective IV (*) 14.- Elective V (*) 15.- Elective VI (*) 16.- Thesis II Seminar

THIS TABLE SHOWS THE ELECTIVE SUBJECTS FOR EACH OF THE TWO AREAS OF INTEREST, ENERGY AND ENVIRONMENT.

ENERGY	ENVIRONMENT
Productive Processes and Energy Diagnostics (*)	Management of Environmental Risk in the Generation and Use of the Energy (*)
Rational Use of Energy in Buildings and Transportation (*)	Environmental and Energy Audits in the management of Projects to save Energy (*)
Renewable Energy and Uses of Solid Residues	Biomass Energy
New Technologies in the Rational Use of Energy and Environmental Protection (*)	Life Cycle Analysis
Biomass Energy	Restoration of Damaged and Hazardous Sites
Unit Operations and Industrial Waste Processes	Unit Operations and Industrial Waste Processes
Other Special and Advanced Topics	Applied Microbiology and Bioengineering
Technology Needs	Other Special and Advanced Topics
Energy, Transportation and Environment</D	

Appendix #9

Last updated:
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ERULF Participants

Name	School	Program Term	Year
Berrios-Silva, Irma Veronica	Polytechnic University	Spring	2000
Blanco-Aponte, Awilda M.	Polytechnic University	Spring	1999
Blanco-Aponte, Awilda M.	Polytechnic University	Spring Extension	1999
De Jesus-Rivera, Javier Alejandro	Polytechnic University	Spring	2000
Edwards-Dipp, Ruben NMN	Polytechnic University	Spring	2000
Garcia, Angel Joel	Polytechnic University	Spring	1999
Garcia, Angel Joel	Polytechnic University	Spring Extension	1999
Gomez, Christopher E.	Polytechnic University	Spring	1999
Planas, Darilyn De Jesus	Polytechnic University	Spring	2000
Planas, Darilyn De Jesus	Polytechnic University	Summer	2000
Planas, Darilyn DeJesus	Polytechnic University	Summer	2000
Solivan, Jimmy NMN	Polytechnic University	Spring	2000
Sosa, Rafael Enrique	Polytechnic University	Spring Extension	1999
Sosa, Rafael Enrique	Polytechnic University	Spring	1999
Smith, Crystal Michelle	Texas A&M University	Spring	2000
Garcia, Monica Judith	University of Texas-Bro	Summer	2000
Garcia, Jr., Doroteo	University of Texas-Bro	Summer	2000
Garcia, Jr., Doroteo	University of Texas-Bro	Summer	1999
Pepi, Samuel Eric	University of Texas-Bro	Summer	2000
Salazar, Maria Lourdes	University of Texas-Bro	Summer	1999
Silguero, Miguel Angel	University of Texas-Bro	Summer	1999
Tobias, Mario Humberto	University of Texas-Bro	Summer	2000
Trevino, Arturo	University of Texas-Bro	Summer Extension	1999
Trevino, Arturo	University of Texas-Bro	Summer	1999
Zamorano, Jesus NMN	University of Texas-Bro	Summer	2000

Participant Count = 25

Appendix #10 a

ECONOMIC COST AND BENEFITS OF SO_2 REDUCTIONS AT YATAGAN POWER STATION *

By

ELVA HERNÁNDEZ HERMAN **
JUAN MANUEL LÓPEZ-ARCINIEGA HERNÁNDEZ **

UNIVERSIDAD POPULAR AUTÓNOMA DEL ESTADO DE PUEBLA
PUEBLA, MEXICO

GUENTER CONZELMANN
DECISION AND INFORMATION SCIENCES DIVISION

ARGONNE NATIONAL LABORATORY

* Work performed at Argonne National Laboratory, a contract Laboratory of the United States Department of Energy.

** Participant in the summer 2000 Student Research Participation Program. This program is coordinated by the Division of Educational Programs & Equity Research Corporation.

Abstract

In recent years, greater environmental awareness has meant increasing regulation requirements on industry for environmental control and pollution abatement. Also, many state and local agencies are developing or implementing programs to control emissions of air pollutants. To successfully carry out these programs, agency personnel must be familiar with a wide range of issues and terms related to health, exposure and risk assessment for air pollutants.

The purpose of air pollution modeling is to allow exploring the way in which airborne pollution disperses by looking at predicted ground level concentration profiles near single point sources.

This project is based on the idea of reducing the pollution originated by coal power plants around the world and to give a clear image of the damages created. Hence, the primary goal of this project was to run and test a model that allows estimating environmental externalities from power generation. Using this model to test a power plant in Yatagan, Turkey and then taking this like a base we'll try to run the model for another plant located in Mexico (Mazatlán).

One of the main issues is, after the quantification of the pollution, to see in what way we could fix or redesign the power plant with out making a big capital investment. This task is made much easier, if the comparison of the costs and the impacts can be made in monetary terms. However, often data are unavailable or difficult to interpret due to the current lack of standard methods and procedures; also, subjective judgment is unavoidable and unfortunately, most of times plays a key role in current analysis. As a result, the uncertainties associated with impact assessments are hard to quantify and typically large, but useful for policy-making and for comparative purposes.

Despite that common pollutants include: particulate matter[1], nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), carbon dioxide (CO_2), ozone (O_3), lead (Pb), mercury (Hg) nitrate and sulfate aerosols, our focus was in SO_2 and sulfate pollutants only. To determine the range and magnitude of effects of these pollutant emission reductions, we compared and contrasted two runs. The "uncontrolled run" which reflects the actual condition of the power plant and the "controlled", which refers expected conditions with the implementation of an Flue Gas Desulphurisation Unit (FGD), which removes SO_2 from combustion gas.

Through the use of exposure-response (ER) functions, risk cost and uncertainty labels derived from the scientific literature (ExternE Core data 1998), provided the basis for calculating differences in physical effects between the two conditions. For example, restricted activity days, respiratory hospital admissions, acute mortality-YOLL[2] or mortality-YOLL for population of 30 years old or more.

[1] Typically, reported as total suspended particles (TSP) or suspended particulate matter (SPM). Particles are usually identified as PMx, where x stands for the largest aerodynamic diameter of the collective group of particles, measured in microns.

[2] YOLL- mortality impacts based on 'years of life lost' approach.

In the last step: economic evaluation of the external cost of air pollution, involved multiplying the number of cases (responses) by the monetary unit cost per incidence to generate finally, a range of overall benefits estimates. Comparison of emissions modeling results for the control and no-control scenarios indicates that the implementation of an FDG Unit would yield significant pollutant emission reductions.

The impacts of energy generation on human health, man-made and natural environment has increased a conscience around the world... so, we're still in time to do something about it.

ECONOMIC COST AND BENEFITS OF SO_2 REDUCTIONS AT YATAGAN POWER STATION

OBJECTIVE

Run and test a model that allows estimating environmental externalities from power generation.

INTRODUCTION

Electricity constitutes a critical input in sustaining the country's economic growth and development and the well-being of its inhabitants. However, there are by-products of electricity production that have an undesirable effect on the environment. Most of these are emissions introduced by the combustion of fossil fuels. The environmental impacts (or damages) caused by these emissions are labeled environmental "externalities." Included in the generic term "externality" are benefits or costs resulting as an unintended by product of an economic activity that accrue to someone other than the parties involved in the activity.

Externalities may take two forms. Firstly, there are negative externalities and occur when consumption or production of a good generates a cost borne by someone outside of the production or consumption of that good, and positive externalities occur when a benefit accrues to someone outside of the production or consumption of a good.

Speaking on the effects on health and the environment we could say that, like photochemical pollutants, sulfur oxides contributes to the incidence of respiratory diseases. Acid rains, a form of precipitation that contains high levels of sulfuric or nitric acids, can contaminate drinking water and vegetation, damage aquatic life, and erode buildings. When a weather condition known as a temperature inversion prevents dispersal of smog, inhabitants of the area, especially children and the elderly and chronically ill, are warned to stay indoors and avoid physical stress. Even everyday levels of air pollution may insidiously affect health and behavior. In less developed nations, the lack of running water and indoor sanitation can encourage respiratory infections.

Air pollution may possibly harm populations in ways so subtle or slow that they have not yet been detected. For that reason, research is now under way to assess the long-term effects of chronic exposure to low level of air pollution what most people experience. As well as to determine how air pollutants interact with one another in the body and with physical factors such as: nutrition, stress, alcohol, cigarette smoking, and common medicines. Another subject of investigation is the relation of air pollution to cancer, birth defects and genetic mutations.

In the present context, a physical impact or health endpoint is defined as a physiological response to an environmental stimulus, which is triggered by a pollutant emitted into the surrounding atmosphere. So, pollutants are transported away from the source via different dispersion routes, including air, water, soil and uptake by living organisms (plants and animals). For the case of airborne dispersion, pollutant uptake in humans may occur via three separate

pathways: inhalation, ingestion and skin absorption. For our purposes, we will assume that the pollutants enter the human body primarily by the inhalation route.

THE PROJECT

Basically, our project consisted of three steps: Research, running & testing and finally concluding remarks.

RESEARCH

The procedure to follow was, first to get and to know the subject of environmental externalities, by reading several papers that referred to that matter. Some of those papers were a couple of previous studies on coal power plants in Yatagan, Turkey (October 1992) and a presentation of an overview of environmental impacts of electricity generation by Guenter Conzelmann. Also, an economic valuation of environmental impacts and external costs, a paper of airborne pollution and general information obtained from the web, and most of all from the EPA web site.

Next, we got updated information from the power plant in Turkey. This research started by locating the power plant in a map and then taking two areas of investigation to cover both the local and regional ranges: the first one, consisted on a 50 kilometer square area to see the strongest impact of the fumes from the stack. Then, we took a 1000 kilometer square area to see the total impact area.

After drawing the maps, we started to get information about the population located into the $50km^2$ square. After that, we could calculate the local density by getting individual population data from each town in that area and then downloading this data into a spread sheet matrix, and making the calculations to obtain the area, density. Also at the same time we're getting data for the Mexico power plant that is located in Mazatlán.

RUNNING & TESTING

Then we began to run the query model for the data we had, but cause it was insufficient, the missing data we replaced with data from past studies from other place and we established that the decision we took didn't affect significantly the model response.

With the impact spreadsheet from the query model with the actual conditions of the power plant we started to make the quantification of the damages caused by the power plant with life costs from one of the papers from the background info. After wetting this information we actualized it with the inflation acquired in all this years since the first study that was made, where we got the monetary information. Then, in order to know the profits of increasing the stack high or adding a flue gas desulphurisation unit (FGD), we ran the model with those modifications to the plant. Also we saw that for the smallest generator in a previous study they decided to retrofitted with an atmospheric fluidized bed combustion boiler, that would reduce SO_2 emissions by 90% and at the same time, reduce annual operating cost and the use of

cheaper fuels. So this work doesn't apply for that unit. But for the biggest one it does and gives an idea for the other units.

Table 1 and 2. UNCONTROLLED & CONTROLLED CONDITIONS

Those worksheets show the results from QUERI model for the Yatagan power plant with uncontrolled and controlled conditions respectively. The uncontrolled sheet contains the original conditions of the power plant and the controlled one refers to the installation of the FGD Unit. Both tables show the three estimates and the monetary cost for each pollutant impact. At the bottom also, the numbers in bold are the result from the conversion of the original results in ECU1995 to US2000.

Table 3. ESTIMATING COST OF FGD RETROFITS

This table gives the total O&M cost in year 2000 using resource's requirements or parameters such as unit size, total capital requirements (TCR), fixed O&M cost and variable O&M cost. Also, we had to use the rate deflator again to convert the different amounts to US2000.

Table 4. COST & BENEFITS

This worksheet finally, shows the benefits of the FGD unit installation by comparing the uncontrolled damage cost versus the controlled damage cost. Showing a great difference and profit if the FGD unit is installed. We could calculate the total cost by the addition of the O&M cost per year allowing us to get the Cost-Benefits ratio.

CONCLUDING REMARKS

After ran and test the QUERI model for the Power Plant in Yatagan, we could obtain an approximate assessment of the health effects expected from airborne releases of SO_2 and sulfates. Then we ran the RUWM Model, which calculates the physical impacts to human health too, but using an Excel spreadsheet which allowed us to see all the input data and the results at the same time.

Both are approximate solutions to the impact assessment function[3] when one or more parameters are assumed to be constant throughout the impact domain. In the Simple version (which QUERI model is based), the population density, atmospheric dispersion parameters and the exposure response relationships are all treated as constants and independent of the actual source parameters and location. Whereas, in the Robust model, site dependence like stack height and exhaust flow values, are accounted for by a more rigorous, yet simplified, mathematical treatment.

For the another plant in Mazatlán, Mexico, we started to collect all the information that the model needs but we were able to get some data only; so, we couldn't run the model at all but we suppose this information can be useful in future projects.

[3] "Airborne pollution", Joseph V. Spandaro, May 2000. Page. 2-17.

July 25th 2000. YATAGAN data

Impact estimates [QUERI] module; ver 1.5

Legend:

R	=	Record	number;		
Site	=	Source	location	ID	[0-6];
Q	=	Emission	rate	[g/s];	
H	=	Stack	height	[m];	
T	=	Exit	temperature	[K];	
F	=	Exhaust	flow	[Nm3/s];	
Poll	=	Pollutant	ID	[1-7];	
Ploc	=	Local	population	[persons/km2];	
Preg	=	Regional	population	[persons/km2];	
fer	=	E-R	function	slope	[#/(yr.pers.ug/m3];
rsk	=	Risk	group	[fraction,	0-1];
k	=	Depletion	velocity	[m/s];	
Est.1	=	Impact -	method	1	[cases/yr];
Est.2	=	Impact -	method	2	[cases/yr];
Est.3	=	Impact -	method	3	[cases/yr].

Notes:

Est.1 is an adjusted value based on the SUWM;
Est.2 is a benefit transfer value based on the RUWM;
Est.3 combines local (ISCLT2) and regional (SUWM) models;

N/A - Not Available (primary); Not Applicable(secondary);

R	Site	Q	H	T	F	Poll	Ploc	Preg	fer	rsk	k	Est.1	Est.2	Est.3	Cost ECU1995	User	Comments (up to 100 characters)
1	1	1.38E+02	1.20E+02	3.93E+02	4.47E+01	2	6.44E+01	1.28E+01	2.04E-06	1.00E+00	7.30E-03	8.18E-01	7.40E-01	7.68E-01	$ 7,870	SO2	Respiratory hospital admissions
2	1	1.38E+02	1.20E+02	3.93E+02	4.47E+01	2	6.44E+01	1.28E+01	5.34E-06	1.00E+00	7.30E-03	2.14E+00	1.94E+00	2.01E+00	$ 155,000	SO2	Acute mortality mortality
3	1	1.38E+02	1.20E+02	3.93E+02	4.47E+01	5	6.44E+01	1.28E+01	4.20E-02	7.60E-01	1.73E-02	3.25E+03	N/A	N/A	$ 75	Sulfate	Restricted activity days
4	1	1.38E+02	1.20E+02	3.93E+02	4.47E+01	5	6.44E+01	1.28E+01	1.20E-03	5.70E-01	1.73E-02	6.97E+01	N/A	N/A	$ 84,330	Sulfate	Mortality YOLL for population of 30+years
												$6,437	$5,827	$6,047			
												$331,855	$300,390	$311,705			
												$243,825	$243,825	$243,825			assuming regional sulfate impacts from estimate 1
												$5,873,585	$5,873,585	$5,873,585			are valid in estimate 2 and 3 as well
							1 ECU1995 =	1.2366	US $1995		Total ECU1995	$6,455,701	$6,423,626	$6,435,162			
							1 US$1995 =	1.1234	US $2000								
											$$2000	$8,968,237	$8,923,679	$8,939,704			

Impact estimates [QUERI] module; ver 1.5

Legend:

R	=	Record	number;		
Site	=	Source	location	ID	[0-6];
Q	=	Emission	rate	[g/s];	
H	=	Stack	height	[m];	
T	=	Exit	temperatur	[K];	
F	=	Exhaust	flow	[Nm3/s];	
Poll	=	Pollutant	ID	[1-7];	
Ploc	=	Local	population	[persons/km2];	
Preg	=	Regional	population	[persons/km2];	
fer	=	E-R	function	slope	[#/(yr.pers.ug/m3];
rsk	=	Risk	group	[fraction,	0-1];
k	=	Depletion	velocity	[m/s];	
Est.1	=	Impact -	method	1	[cases/yr];
Est.2	=	Impact -	method	2	[cases/yr];
Est.3	=	Impact -	method	3	[cases/yr].

Notes:

Est.1 is an adjusted value based on the SUWM;
Est.2 is a benefit transfer value based on the RUWM;
Est.3 combines local (ISCLT2) and regional (SUWM) models;

N/A - Not Available (primary); Not Applicable(secondary);

R	Site	Q	H	T	F	Poll	Ploc	Preg	fer	rsk	k	Est.1	Est.2	Est.3	Cost ECU1995	User	Comments (up to 100 characters)
1	1	6.88E+00	1.20E+02	3.93E+02	4.47E+01	2	6.44E+01	1.28E+01	2.04E-06	1.00E+00	7.30E-03	4.09E-02	3.70E-02	3.84E-02	$ 7,870	SO2	Respiratory hospital admissions
2	1	6.88E+00	1.20E+02	3.93E+02	4.47E+01	2	6.44E+01	1.28E+01	5.34E-06	1.00E+00	7.30E-03	1.07E-01	9.69E-02	1.01E-01	$ 155,000	SO2	Acute mortality mortality YOLL
3	1	6.88E+00	1.20E+02	3.93E+02	4.47E+01	5	6.44E+01	1.28E+01	4.20E-02	7.60E-01	1.73E-02	1.63E+02	N/A	N/A	$ 75	Sulfate	Restricted activity days
4	1	6.88E+00	1.20E+02	3.93E+02	4.47E+01	5	6.44E+01	1.28E+01	1.20E-03	5.70E-01	1.73E-02	3.48E+00	N/A	N/A	$ 84,330	Sulfate	Mortality YOLL for population of 30+years
												$322	$291	$302			
												$16,585	$15,021	$15,593			
												$12,188	$12,188	$12,188			assuming regional sulfate impacts from estimate 1
												$293,721	$293,721	$293,721			are valid in estimate 2 and 3 as well
							1 ECU1995 =	1.2366	US $1995		Total ECU1995	$322,816	$321,221	$321,804			
							1 US$1995 =	1.1234	US $2000								
											$$2000	$448,454	$446,239	$447,049			

IMPYATAGAN.xls
controlled worksheet

Estimating cost of FGD retrofits

TCR-specific	290	US$1992/kWe
deflator	1.22	US$2000 / US$1992
TCR-specific	353.8	US$2000/kWe
Unit capacity	210000	kWe
TCR	$74,298,000	Total capital requirements per unit
Fixed O&M	0.73	US$1992/kWe/month
deflator	1.22	US$2000 / US$1992
Fixed O&M	0.8906	US$2000/kWe/month
Fixed O&M per year	$2,244,312	US$2000/year
Variable O&M	0.64	US1992/MWh
deflator	1.22	US$2000 / US$1992
Variable O&M	0.7808	US$2000/MWh
Operating hours	6500	hrs/year
Variable O&M per year	$1,065,792	US$2000/year
TOTAL O&M COST in Year 2000	**$3,310,104**	US$2000/year

IMPYATAGAN.xls
fdg worksheet

Cost & Benefits. Final Results

		2000-2010	2010-2020
GDP/capita growth rate (ggdp):		0.06	0.06
Population growth rate (gpop) :		0.015	0.014
elasticity 1:	1		
elasticity 2:	1		
gcost=	0.076	0.075	

Year	Uncontrolled (Est.1) Damage Cost	Controlled (Est. 1) Damage cost	Difference = Benefits	Costs
	$$2000	$$2000		
2000	$8,968,237	$448,454	$8,519,783	$77,608,104
2001	$9,648,927	$482,492	$9,166,434	$3,508,710
2002	$10,381,280	$519,113	$9,862,167	$3,719,233
2003	$11,169,219	$558,514	$10,610,705	$3,942,387
2004	$12,016,963	$600,905	$11,416,058	$4,178,930
2005	$12,929,051	$646,514	$12,282,537	$4,429,666
2006	$13,910,365	$695,584	$13,214,781	$4,695,446
2007	$14,966,162	$748,379	$14,217,783	$4,977,173
2008	$16,102,094	$805,181	$15,296,913	$5,275,803
2009	$17,324,243	$866,294	$16,457,948	$5,592,351
2010	$18,620,789	$931,128	$17,689,661	$5,927,892
2011	$20,014,369	$1,000,813	$19,013,556	$6,283,566
2012	$21,512,244	$1,075,714	$20,436,530	$6,660,580
2013	$23,122,221	$1,156,221	$21,966,000	$7,060,214
2014	$24,852,688	$1,242,752	$23,609,935	$7,483,827
2015	$26,712,663	$1,335,760	$25,376,903	$7,932,857
2016	$28,711,839	$1,435,728	$27,276,110	$8,408,828
2017	$30,860,633	$1,543,178	$29,317,455	$8,913,358
2018	$33,170,242	$1,658,669	$31,511,573	$9,448,159
2019	$35,652,703	$1,782,804	$33,869,899	$10,015,049
2020	$38,320,952	$1,916,229	$36,404,722	$10,615,952
	$428,967,883	**$21,450,429**	**$407,517,454**	**$206,678,085**
		C-B Ratio	**0.51**	
NPV (Net Present Value) 8%	$167,413,639	$8,371,476	$159,042,163	$122,526,891
		C-B Ratio @ 8% DR	**0.77**	

IMPYATAGAN.xls
cost-benefit worksheet

Appendix 10 b

Expression and Purification of a Microbial Inosine Monophosphate Dehydrogenase *

By

Jonathan Davila
Sacred Heart University
San Juan, Puerto Rico

Eliezer Huberman, PhD
BTC- Gene Expression and Function Group
Argonne National Laboratory

*Work performed at Argonne National Laboratory, a contract Laboratory of the United States Department of Energy.

Expression and Purification of a Microbial Inosine Monophosphate Dehydrogenase

Inosine 5'- Monophosphate Dehydrogenase (IMPDH), a crucial regulator of cell proliferation and differentiation, is the rate limiting enzyme in the synthesis of guanine nucleotides. IMPDH catalyzes the oxidation of Inosine 5'- Monophosphate (IMP) to Xanthosine 5'- Monophosphate (XMP) causing NAD^+ to convert to NADH. Understanding the nature of the enzyme makes IMPDH a major factor for the development of antiviral, anticancer and immunosuppressive agents. IMPDH of *a surrogate pathogen* was expressed in *Escherichia coli* using the Nde1 cloning site on the pET-15 (B) (novagene) vector. Expression of the IMPDH protein was obtained by inducing *E. coli* with 0.5 mM/ml IPTG. Several different conditions were experimented with to obtain a maximum yield of protein during purification. An hexahistadine tag was added to the N-terminus of the protein allowing the protein to be purified by means of histine binding affinity chromatography. For maximum yield of protein *E. coli* was induced for six hours at 37 C, producing a yield of 10mg/ml. Characterizing the nature of the enzyme could lead to the production of specific inhibitors of IMPDH.

Appendix # 10 c

NUMERICAL DATA RESEARCH FOR EXPOSURE FACTORS IN THE PROJECT CALLED: *WILD LIFE EXPOSURE PARAMETERS FOR ARID ENVIRONMENTS IN THE UNITED STATES.**

By

Brelys Rodríguez**
Universidad del Sagrado Corazón
Santurce, Puerto Rico

Doctor Ihor Hlohowskyj
Environmental Assessment Division
Argonne National Laboratory

*Work performed at Argonne National Laboratory, a contract Laboratory of the United States Department of Energy.
**Participant in the Summer 2000 Student Research Participation Program. This program is coordinated by the Division of Educational Programs.

During my days in Argonne National Laboratory I was working in the Environmental Assessment Division with Doctor Ihor Hlohowskyj and Allen Tsao in the projects called *Wild Life Exposure Parameters for Arid Environments in the United States*.

My work consists in looking for numerical data on exposure factors like: body weight, ingestion rate (food, water, soil), home range and diet composition, for endangered species of birds, reptiles and mammals in the south states of the United States. All these factors are a charge of the suitable growth, reproduction and the time of life of each organism. If some of these factors are altered, affected or harm the species, it completely changes their habitual behavior. With this type of study, we will know the type of patterns of behavior the organisms we are interested in have, it will facilitate other type of investigations. For example, we are able to find possible factors that affect the development or performance of their functions in the environment by determining polluting or toxic agents that cause danger to the species and the environment.

The first stage of my work was to read directly from journals that were given to me by Allan Tsao and to look for the information that pertained to our research. Once the information was found, I was able to continue documenting data (station of the year, place of the investigation, type of analysis, etc.) and the reference. In the second stage, I started the research in the database, e-journals, and specific catalogs, all this was via Internet. In the major cases an abstract of the investigation was accessible and therefore retained for observation. In other cases only were references or citations in papers.

I noticed that the journals mainly focused on mammals such as Coyotes (*Canis latrans*), Mule Deer (*Odocoileus hemionus*) and some reptiles, but in the case of the small mammals such as the Desert Kangaroo Rat (*Dipodomys deserti*) and a great part of the birds like

Lesser Nighthawk (*Chordeiles acutipennis*) it did not have complete investigations.

During this time for the organisms in which reports were found and had accessible information that was related to food ingestion/food habits or to home range was critical. The ingestion of soil, sediment, and water were very complicated to find and in some cases do not appear because the information was not in the appropriate catalog for the required subject. I thought that perhaps the investigations in such areas had not been made or simply the works were not published in the places that the search concentrated on.

I understand that all this information must be easy to access, because, they are details necessary to form a good base in the processed investigations on such organisms. I understand that data on water ingestion, soil and sediment are very important because we must consider that the water and the grounds are affected by the contamination. When small animals ingest contaminated waters or soils then big organisms will be contaminated too, I'm thinking in the nutritional chain and in the biomagnification of the toxic.

All the research that I accomplished helped me to learn about technical tracking, technical analysis and precaution measures that are used with the organisms to protect them as well as to also protect us. The experience was extraordinary, because aside from the biological information that I learned from, I found tips to make the journal papers extremely complete and that could help other investigators in their projects.

Consorcio Educativo para la Protección Ambiental/ Educational Consortium for Environmental Preservation (CEPA)

A Report on the Annual Meeting
in Santiago, Chile,
on April 14th - 16th, 1998

by

Equity Research Corporation
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THE CEPA 1998 ANNUAL MEETING IN SANTIAGO DE CHILE

The Educational Consortium for Environmental Protection/*Consorcio Educativo para la Protección Ambiental* (CEPA) held its 1998 annual meeting in Santiago de Chile April 14-16 under the auspices of the U.S. Department of Energy, Chile's National Commission on the Environment - *Comisión Nacional de Medio Ambiente* (CONAMA), and *La Mutual de Seguridad*, Chile's largest provider of safety, prevention and health services in the workplace. To achieve such cooperation across national boundaries among the academic, government, and private sectors is part of CEPA's mission. This report summarizes the instances of scientific, educational, and institutional cooperation on environmental issues that CEPA is making possible, as they were presented at the 1998 annual meeting.

The annual meeting confirmed that this year CEPA not only met, but surpassed expectations. This was evidenced by the presentations on applied environmental research and institutional capacity building underway at CEPA institutions; by the enthusiasm of the participants and the endorsement of high government officials; and by the substantive outcomes projected for FY 99. For a consortium of its size and scope, CEPA's relatively modest financial resources are yielding remarkable gains in strengthening Hispanic-serving institutions in research and environmental education areas. A continued investment in CEPA is a sound administrative and environmental decision.

I. Overview of CEPA's mission and goals

The main purpose of CEPA is to strengthen the capacity of Hispanic-serving institutions of higher education in the United States, in collaboration with institutions of higher education in Latin America, to deliver competitive environmental programs. This is done through human resource development and sustainable development programs.

CEPA is a collaborative international consortium that brings together institutions in the educational sector with governments, research laboratories, and private sector entities. As U.S. Department of Energy

(DOE) Secretary Federico Peña has stated, "Strong hemispheric cooperation ensures that we will have the essential infrastructure for economic

development in the Americas while preserving the environment. That is a CEPA goal that we in the Department are proud to share." (See Appendix 1) CEPA's goals are to develop bicultural environmental training programs at the graduate and professional levels; to train Hispanics in the fields of environmental science and technology; to increase access to educational programs for the study of the environment; to promote cross-sector research and development projects; to incorporate the unique scientific capabilities of DOE national research laboratories such as Sandia, Oak Ridge, and Argonne within the process of strengthening the capacity of Hispanic-serving institutions of higher education to address environmental priorities; and to develop a bilingual, Internet based CEPA information system on environmental issues.

II. Recognition of CEPA's vision and accomplishments by top U.S. government officials

CEPA's annual meeting was planned to coincide with the Second Summit of the Americas, which took place in Santiago de Chile April 17-19. U.S. Ambassador to Chile Gabriel Guerra-Mondragón stated in his CEPA keynote address, "The CEPA vision of strengthening the technical, professional and educational environmental infrastructure in Latin America and the United States is in alignment with the spirit of the Summit of the Americas. Both are calls for creative solidarity in the hemisphere by sharing resources, exchanging information, and developing our capacities to jointly address the challenges of economic growth while preserving the environment." (*See Appendix 2*)

In his message to CEPA participants, DOE Secretary Federico Peña pointed out that "By strengthening the technical and educational infrastructure, CEPA is making it easier for students and professionals in the Americas to access information and educational resources from neighboring universities and research institutions ... Much can be achieved if we enter into focused and constructive partnerships in an atmosphere of mutual respect. This is CEPA's unique vision ... You have made tangible contributions to enhanced hemispheric cooperation on education, energy, and the environment." (*See Appendix 1*)

III. Annual meeting participants and meeting activities

The main goal of the 1998 annual meeting was to present ongoing and future instances of scientific cooperation across national boundaries made possible by CEPA. (*See annual meeting agenda, Appendix 3*) CEPA's Action Plan for 1998-99 also was presented at the annual meeting. (*Appendix 4*) The projects and scientific accomplishments of CEPA scientists and CEPA institutions were showcased alongside distinguished scientists from the DOE National Laboratories who have supported CEPA endeavors by sharing their scientific expertise, their lab space, and their time with researchers and students from CEPA institutions.

There also were presentations of pressing environmental concerns by representatives of Chilean universities, among them CEPA's newest member, Universidad Austral, and by a delegation of Bolivian observers from various educational institutions who are very interested in joining the Consortium. A list of DOE and CEPA participants in the annual meeting is enclosed. (*Appendix 5*)

In addition to the presentations, networking was strongly encouraged with the DOE National Lab scientists and among CEPA institutional representatives.

Besides Ambassador Guerra-Mondragón and DOE Secretary Federico Peña, another keynote speaker was Dr. Enrique Leff of the United Nations Environmental Program (PNUMA), who is the coordinator of the *Red de Formación Ambiental*, which links about four hundred institutions throughout Latin America and the Caribbean that are involved in environmental education programs. There is great potential for academic exchange and joint project development between CEPA and PNUMA. (*Appendix 6*)

After a presentation on existing and possible links among the academic, government and private enterprise sectors by the director of the environmental division of *La Mutual Internacional*, private meetings were arranged with La Mutual executives and representatives of Oak Ridge and Sandia National Laboratories to explore possible collaborations on risk assessment and prevention efforts, and on increasing the use of environmentally sound mining technology in Chile. La Mutual, which services practically all of Chile's mining industry, has expressed great

interest in CEPA. It has sponsored a number of CEPA activities in Chile, wants to take part in CEPA international projects, and has expressed interest in contracting with the DOE National Laboratories.

On Friday, April 17, DOE scientists and CEPA representatives took part in a scholarly encounter with their Chilean counterparts at Centro EULA, Chile's premier environmental research center, located at *Universidad de Concepción*, also a CEPA member. Many of the environmental problems that are researched in Chile—such as climate change, the ozone layer, water resource contamination and the food chain-- are of great interest to scientists worldwide.

IV. Major CEPA activities in 1997-98

- Site visits in 1997-98 to CEPA institutions in Chile, Mexico, Puerto Rico, and Texas, as well as to Oak Ridge and Argonne National Laboratories in order to identify needs, capacities, and priorities, and develop strategic action plans for each region and each institution.

- A survey of the information technology and telecommunications capacity of CEPA institutions was conducted by the University of Texas at Brownsville (UTB) in order to ascertain communication and distance education capabilities.

- UPAEP (*Universidad Popular Autonoma del Estado de Puebla in Mexico*) — ORNL — University of Tennessee collaboration in the development of a Master's Degree Program in Science and Engineering with Specialties in Energy and Environment. The Master's Program was developed by the UPAEP in conjunction with ORNL, and it was submitted for review to the University of Tennessee, Texas A&M University, and Carnegie Mellon University. Peer review comments were positive. This Master's Program has been approved and recognized by academic and regulatory entities in Mexico; and research and technical assistance to the private sector, an integral part of the Master's Program, are underway. (*Appendix 7*) It is important to note that other CEPA universities on Puerto Rico and Chile also are considering adopting this model Master's Program.

- The launching of a CEPA web site at http:/www.usach.cl/ima with information in English and Spanish about CEPA activities, academic

and research programs, and environmental issues. This is a significant step towards a CEPA bilingual environmental information system and distance education network.

- An internship in 1997 by a graduate student from *Universidad de Santiago de Chile* (USACh) to ORNL to conduct chemical analyses in support of a study entitled: "Phytoremediation Research: Gas Phase Testing of a Sampling Chamber for Volatile Contaminants". This study was also sponsored by *La Mutual de Seguridad.*

- A 1997 visit to Sandia National Laboratories by Polytechnic University of Puerto Rico (PUPR) faculty to explore waste water treatment and solar detoxification of hazardous waste.

- Internships in 1998 by two faculty members from USACh to ORNL to refine the research conducted on phytoremediation; to adapt the Master's Program for application to Chile and give shape to a certificate program on environmental issues; and to develop an action plan for a USACh Program in Environmental Measurements.

- Internships in 1998 by two faculty members of the *Universidad de Concepción* to ORNL to develop an integrated energy and environment program; and to develop a water management program. *(See Appendix 8)*

- The development through CEPA-assisted efforts of a certificate program on environmental issues at USACh, which was inaugurated during the annual meeting.

V. Contributions to CEPA of the DOE National Laboratories, and Areas for Future Collaboration

Oak Ridge National Laboratory

ORNL has several ongoing CEPA activities that can benefit other consortium members. These include:

- Evaluating the efficiency of household plants in reducing indoor air pollutants;

- Analyzing the methods used to determine the reliability and accuracy of laboratory measurements;

- Developing a basin-level water resources plan;

- Refining a Master's Degree Program in Science and Engineering with specialties in energy and the environment;

- Developing strategies for technology transfer between the various CEPA regions and the ORNL; and

- Developing joint proposals on environmental security.

Potential areas for future collaborations include:

- Phytoremediation research related to reducing air and water pollution;

- A joint proposal to DOE-EE on innovative space conditioning systems;

- Analysis of environmental impacts related to hydropower development.

- Biomarkers of aquatic ecosystem health.

All water-related research projects are of great interest to Texas and Mexico universities, as well as to both the Interamerican, and Polytechnic Universities in Puerto Rico.

- Development of performance-based environmental analytical procedures with corresponding statistically-based certification;

- Initial certification of environmental analysis laboratories using custom-prepared performance evaluation samples employing matrices and analytes at known concentrations, all specified by CEPA members;

- Deployment of state-of-the-art analytical methods which have been certified, peer-reviewed, and tested extensively in the field, but not yet formally approved by the EPA; and

- Ongoing technical assistance and monitoring to member laboratories. (*See Appendix 9*)

Argonne National Laboratory

Dr. Jeffrey Gàffney, Atmospheric Sciences Section, Environmental Research Division, ANL, delivered the opening lecture at the inauguration of the USACh's certificate program on the environment, which opened with an enrollment of over 20 students.

Dr. Guenter Conzelmann, Decision and Information Sciences Division, Argonne National Laboratory, discussed Argonne's Energy and Environmental System Analysis work, which involves: the development of specific analytical tools and methodologies; and the application of these tools and methodologies to address a variety of issues, including electric system analysis, total energy system analysis, and environmental analysis.

ANL will be hosting visiting researchers and students from CEPA institutions in Texas and Puerto Rico.

Sandia National Laboratories

Dr. Dan E. Arvizu, Director, Materials and Process Sciences Center, Sandia National Laboratories, presented an overview of the distinguishing features of the DOE National Laboratories; specifically, their ability to address national problems; to serve as instruments of national policy; to solve complex, multidisciplinary problems; to execute large projects through collaborative teams; to maintain an outstanding staff of experts (30 - 40% of whom are Ph.D.s); and facilitating linkages with the military, industrial, and higher education sectors.

Dr. Arvizu discussed as well the strengths of the national laboratories in developing model-based products and process designs; developing intelligent manufacturing systems; and developing direct-build technologies. He discussed at length the role of national laboratories in fostering international partnerships that focus on the environment and the issues of developing sustainable energy sources in developing countries.

VI. Other Initiatives Generated at the Annual Meeting

The face-to-face networking the annual meeting made possible speeded up a number of collaborative projects that were in the preliminary stage and encouraged interuniversity information exchanges, as well as a more active involvement in CEPA of Sandia and Argonne National Labs. Specific initiatives include:

1. A one-year certificate program on environmental issues ranging from basic concepts to socioeconomic factors, global problems, environmental management, public policy and legislation developed at Centro EULA has proved very appealing to a broad range of professionals looking to gain an understanding of environmental issues to assist them in their own line of work. The Organization of American States is offering scholarships for an intensive 4-week session of this course in October. (*See Appendix 10*, "Diploma in Analysis and Management of the Environment."). CEPA institutions in Puerto Rico and Texas want to use this program as a point of reference.

2. Texas A&M Corpus Christi (TAMUCC) is proposing to explore the development of a virtual university for environmental education in the Americas via the Internet (*See Appendix 11*). This would be an enhancement of the bilingual environmental information system CEPA has begun already.

3. Establishing links with the United Nations Environmental Program (PNUMA) and its 400 institutional affiliates for Latin America and the Caribbean.

4. Continuing to develop CEPA's relationship with *La Mutual de Seguridad* in order to broaden their support of CEPA initiatives.

5. Immediately after the CEPA annual meeting, Dr. Juan Ferrada of ORNL visited the Centro *Nacional del Medio Ambiente* (CENMA) with Dr. Marina Hermosilla from CONAMA. CENMA is an institution supported by CONAMA and directed by Dr. Juan Escudero. The main concern expressed by Dr. Hermosifla is the lack of professionals trained to accomplish the environmental objectives and responsibilities of CONAMA. CONAMA will seek help from

Chilean universities for the preparation of these professionals. However, the curricula at these institutions have to be modified. CEPA institutions, in collaboration with DOE National Laboratories, can address this need. That is the kind of capacity building at government and regulatory agencies CEPA universities are willing and able to provide at all CEPA regions. (*Appendix 12*)

Margarita Benítez
CEPA Executive Director

Appendix # 1

"Remarks to the CEPA Participants":
Secretary Federico Peña
U.S. Department of Energy

PREPARED REMARKS BY U.S. ENERGY SECRETARY PEÑA

CEPA LUNCHEON

April 16, 1998

Buenos dias. Saludos a los cientificos del los laboratorios nacionales del Departamento de Energia que estan en Santiago, a Miriam Cruz, y a todos los participantes de esta reunion del Consorcio Educativo para la Protección Ambiental. Hoy quiero celebrar lo que, juntos, hemos logrado.

Before I begin, I'd like to acknowledge the Department of Energy scientists who are in Chile breaking new ground in hemispheric collaboration. Thank you for your hard work and dedication to making our international ties stronger.

As a science and technology agency, I believe that the Department of Energy has a unique role in supporting President Clinton's goal of improving the science and math performance of our nation's students. For this reason, I initiated the National Science Education Strategy last year --to provide our children with the tools they will need to take us into the next century.

We must do everything we can to help our children succeed in areas

such as science and math. And the door to educational resources must be opened to all students, including Hispanics. Through our science education initiative, we are making the scientific resources of the Energy Department's national labs and the remarkable talents of the scientists and technicians at those labs available to all students.

At the same time, CEPA institutions are providing Hispanic students and professionals with the opportunity to fulfill their God-given potential. By strengthening the technical and educational infrastructure, CEPA is making it easier for students and professionals in the Americas to access information and educational resources from neighboring universities and research institutions. Through collaborations with universities, businesses, and government, CEPA is helping to strengthen educational institutions. I salute CEPA for their work and dedication to our students.

President Frei of Chile has emphasized science education and training as "the essential and foremost tool" for development, and he is right. Much can be achieved if we enter into focused and constructive partnerships in an atmosphere of mutual respect. This is CEPA's unique vision.

Sustainable solutions to energy and environmental challenges require an adequate science and technology base, as well as trained environmental professionals. Strong hemispheric cooperation ensures that we will have the essential infrastructure for economic development in the Americas while preserving the environment. That is a CEPA goal that we in the Department are proud to share.

DOE's sponsorship of CEPA is one of many steps that the U.S. Department of Energy is taking to invest in hemispheric cooperation on energy, energy integration, and climate change. Argonne, Oak Ridge and Sandia National Laboratories are critical partners in this investment strategy, and I encourage their continued participation.

I am pleased to have this opportunity to recognize CEPA for the impressive list of accomplishments over the past year. You have made tangible contributions to enhanced hemispheric cooperation on education, energy, and the environment. CEPA is helping to improve the quality of our lives and our economic opportunities. For that I thank you. *Muchas gracias y les deseo mucho éxito.*

Appendix # 2

"Environmental Issues and the Summit of the Americas":
U.S. Ambassador to Chile Gabriel Guerra Mondragón

Draft Message Ambassador Gabriel Guerra Mondragon
April 15,1998, CEPA Annual Meeting
ENVIRONMENTAL ISSUES AND THE SUMMIT OF THE AMERICAS

Autoridades Universitarias; senores representantes del gobierno chileno y de la comunidad academica; visiting scientists, scholars and researchers from the United States, Mexico, Bolivia; compatriotas puertorriquenos; good friends all who are joined here today by common interests and shared aspirations.

It is a pleasure for me to take part in the Consorcio Educativo para la Proteccion Ambiental (CEPA) Annual Meeting. CEPA is an initiative that I have known and supported since its inception. Some years ago my good friend, Miriam Cruz, had a vision that I shared. A vision that with time, effort and the support of may visionaries some of whom I see here , gave rise to CEPA. The CEPA vision of strengthening the technical, professional, and educational environmental infrastructure in Latin America and the United States is in alignment with the Spirit of the Summit of Las Americas. **Both are calls for creative solidarity** in the hemisphere to share resources, exchange information, be well equipped (become stronger and prepared) to jointly address the challenges of economic growth while preserving the environment.

North and South America face complex environmental problems that do not recognize borders. Those problems require practical solutions for effective implementation. It is easier said than done! For instance the eradication of poverty is one of those complex challenges, since poverty becomes a choice between economic development and preservation of the environment. Certainly a scenario like that, requires the layout of a strategy that can balance economic development and environmental preservation for the benefit of the present and future generations.

The Summit of the Americas' agenda will bring to discussion action topics of the magnitude and complexity illustrated above. The Summit seeks for partnerships to facilitate the development and implementation of strategies in the following areas:

- Education demanding for actions involving student and teacher exchange programs, distance education programs and incorporation of new technologies.

- Preservation and Strengthening of Democracy and Human Rights requiring actions aimed at cooperation on projects for modernization of the State.

- Economic Integration and Free Trade needing for actions for the effective development of Science and Technology and regional energy cooperation.

- Eradication of Poverty and Discrimination asking for actions in support of micro enterprises and small to medium sized businesses as a way for job creations and actions pertaining to worker's health.

All these areas contain a pressing environmental component that requires addressing and managing for Summit success. This brings to the highlight the belief of President Frei of Chile regarding science education and training; "Science education and training is the essential and foremost tool for development." His view allows for asserting the importance of entering into appropriate partnerships that promote environmental education as the cornerstone that enables (1) environmental information management systems, (2) capacity building, (3) Hemispheric cooperation for systematic environmental management and (4) participation of private and government stakeholders. CEPA is an accurate articulation of President Frei's belief.

The United States has demonstrated in numerous examples its commitment to effective economic development initiatives while preserving the environment. Some of these initiatives are:

Reduction of Green House Emissions and Joint Implementation. The United States is committed to realistic and binding targets for our greenhouse gas emissions. It is also committed to pursuing flexible and cost-effective means to meet those targets. We seek to mobilize the resources of the private sector in developed countries through mechanisms that allow them to choose solutions that make good sense and that are effective against global warming-greenhouse gas emissions. The presented mechanisms is known as joint implementation and certainly will be attractive to the market place if businesses know that they will be given credit for the emissions reduction efforts they undertake. CEPA can certainly be a part of this undertaking by providing to the Consortium a project that will meet the greenhouse reduction goals.

Global Learning and Observations to Benefit the Environment (GLOBE) Program. Young people around the world have been encouraged to take part in scientific research relevant to the global environment and to make their observations available to scientists through the INTERNET. This kind of interaction teaches environmental-matters mostly to the young. The United States will like to have Chile as a participation country. CEPA can serve as one of the conduit for implementation.

This does not mean that the collaboration efforts stop at this point for all of us. The road that lies ahead for CEPA, the environmental future of the Americas and the action items of the Summit will require a concerted effort that connects and endorses governments, academia and private sectors to deliver the Plan that provided the implementation template to achieve sustainable development. However, to make these initiatives more effective and achievable, we need more presence and strategic participation from partnerships such as CEPA between the Americas. The Summit requires the sustainable support of collaborations and programs such as CEPA to properly execute the economic development/environmental management agenda. Chile is our partner in this endeavor and through Commision National del Medio Ambiente (CONAMA), a Consortium member, has provided support to CEPA and as usual to the U.S. Thank you Chile.

Outcomes of the Summit Agenda must initiate concrete steps the support the pressing environmental components of the key areas. Some of the concrete steps are:

- Development of environmental information management system that satisfies the needs of the Americas.
- Support capacity building in Chile and the rest of the Americas.
- Establishment of mechanisms to develop effective and widespread accepted environmental regulations.
- Integration of economic development, education, environmental management and human rights into a cohesive plan.

CEPA and the leaders of the region are focused on issues of education, poverty alleviation, financial stability and economic growth as we are domestically. It is not a coincidence that CEPA meets this year in Santiago de Chile, at the eve of the Summit of Americas. In many ways, you are doing what we are saying needs to be done: technology transfer, information sharing, academic exchanges, and creating new partnerships across national boundaries among academies, government, the private sector and the citizenry, to attain the goal of sustainable development. It is a truly common agenda, and it is the agenda we have developed collectively for the Santiago Summit.

For that, I salute you and I wish you well.

Appendix # 3

Agenda of the 1998 CEPA Annual Meeting

CEPA

CONSORCIO EDUCATIVO PARA LA PROTECCION AMBIENTAL (CEPA)
AGENDA FOR THE ANNUAL MEETING

April 14-16, 1998
Santiago de Chile

Tuesday, April 14th

Small meetings may be arranged in the afternoon among the various institutional representatives. Participants will be notified separately.

6:15 PM	Meet at the lobby of the Hotel Carrera to walk over to the Chilean Ministry of Foreign Affairs for the formal opening of the CEPA Annual Meeting.
6:30 PM	Opening Ceremony, Senate Ceremonial Hall, Chilean Ministry of Foreign Affairs
8:00 PM	Reception, Main Hall, Andrés Bello School of Diplomacy, Chilean Ministry of Foreign Affairs

Wednesday, April 15th

{Hotel Carrera guests will meet at the lobby at 8:50 AM in order to depart for the campus of Universidad de Santiago de Chile (USACh) at 9:00 AM. Breakfast will be provided at the hotel.}

consorcio educativo para la protección ambiental

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Morning sessions will run from 9:30 AM to 12:45 PM and afternoon sessions from 2:20 to 6:00 PM.

MORNING SESSION: **Dr. Margarita Benítez and Dr. Anamary Daniel, Conveners**

9:30 AM: Greetings and preliminary remarks, Dr. Margarita Benítez, CEPA Executive Director

9:40 AM: An overview of CEPA's scientific initiatives, Dr. Anamary Daniel, CEPA Technical Advisor

10:00 AM to 12:45 PM: **Presentations on the research, development and technology transfer initiatives developed in 1997-98 by researchers from CEPA institutions and their National Laboratory counterparts. (Group presentations will be followed by a ten-minute question and answer period.)**

10:00 – 10:20 Dr. Linda Cain, Director, Office of University and Science Education, ORNL

Oak Ridge National Laboratory: An International Resource

10 20 - 11:00 Dr. Juan Ferrada ORNL Staff Development Member; Dr. Rubén Rodríguez. Director, Center for Energy and the Environment -UPAEP, México; Dr Adolfo Acuña. Deputy Director Centro EULA- Universidad de Concepción, Chile

CEPA Activities at Oak Ridge National Laboratory

11:00-11:10 BREAK

11:10-12:00 Dr. James Loar, Director of the Environmental Analyses Section, ORNL; Dr Jaime Cornejo, Director, Gestión IMA, USACh; Mr. Franz Muñoz, graduate student, USACh.

Current and Future CEPA Collaborations with the Environmental Sciences Division at Oak Ridge National Laboratory

12:00-12:30 Dr. Bruce Allen Tomkins. Analytical Chemistry Division. ORNL; Dr. Nelson Carrasco, Materials Chemistry Department, USACh

A Proposed Environmental Collaboration Initiative Between CEPA Institutions and the Oak Ridge National Laboratory

12:30-12:45 Session Wrapup

END OF THE MORNING SESSION

12:45 – 2:15 BREAK FOR LUNCH

The U.S. Ambassador to Chile, the Honorable Gabriel Guerra Mondragón, will speak on "The Summit of the Americas and Environmental Issues"

AFTERNOON SESSION:

Future Initiatives Among CEPA-National Labs-DOE

Conveners: Dr. Margarita Benítez and Dr. Anamary Daniel

2:20-2:30 Preliminary Remarks, Dr. Anamary Daniel

2:30-6:00	**Representatives of the U.S. Department of Energy and the National Lab as well as two CEPA universities, will present current activities pertinen to future CEPA initiatives. CEPA university representatives will take part in a panel discussion of today's presentations, and how their participation in CEPA can evolve from the CEPA summit.**
2:30 – 2:45	Romulo Diaz, U. S. Department of Energy **CEPA from the perspective of the U.S. Department of Energy**
2:50 – 3:10	Dr. Jeffrey S. Gaffney, Atmospheric Sciences Section Environmental Research Division, Argonne National Laboratory **Environmental Research Division Capabilities at Argonne National Laboratory: Focus on Air Quality**
3:10 – 3:30	Dr. Guenter Conzelmann, Decision and Information Sciences Division, Argonne National Lab **Environmental Analysis of the Energy System: Lessons Learned from Argonne's 25 Years in the Business**
3:30 – 3:50	Dr. Dan Arvizu, Director, Center for Material and Process Sciences, Sandia National Laboratories **An overview of Sandia National Lab, and its experience with fuel cell technology.**
3:50-4:00	BREAK

4:00 – 4:20	Mr. Sebastián Valdés, Environmentsl Manager, La Mutual Internacional
	A look at CEPA from the private sector.
	Presentations by CEPA Universities
Convener:	Dr. Margarita Benítez, CEPA Executive Director
4:20 – 4:40	Dr. Graciela Ramírez, Director, CECIA (Centro de Educación, Conservación e Interpretación Ambiental.) Universidad Interamericana – Puerto Rico
	Overview of CECIA. Methodology for the Development of Environmental Water Quality Indicators
4:40 – 5:00	Dr. Jose Martin, Dean of Natural Sciences, University of Texas in Brownsville
5:00 –5:40	**CEPA university representatives will take part in a panel discussion of the day's presentations and how they relate to their own institutional initiatives. Dr. Benítez will moderate.**
5:45-6:00	Session Wrapup and Adjournment.
	After this session, a Special Event: Inauguration of a new certificate program on environmental education at IMA-USACh. This program was developed through a CEPA collaborative initiative among UPAEP, ORNL, and USACh.

Thursday April 16th

Convener:	Dr. Jaime Cornejo, CEPA-Chile Coordinator
	The morning session will focus on educational networking and research initiatives in Latin America and Chile.
9:30-9:40	Greetings and Introduction, Dr. Jaime Cornejo
9:40-10:20	Representatives from Chile's Comisión Nacional de Medio Ambiente (CONAMA)
	Environmental Issues in Chile
10:20-11:00	**Keynote Address: Dr. Enrique Leff, Coordinator, Environmental Education Network for Latin America and the Caribbean, United Nations Environmental Program**
11:00-11:10	BREAK
11:10-11:30	Dr. Andrei Tchernitchin, Head of the Experimental Endocrinology and Environmental Pathology Lab, Universidad de Chile
	Environmental Research and Teaching Activities at the University of Chile
11:30-11:50	Dr. Hugo Campos, Universidad Austral de Chile An overview of Universidad Austral
11:50-12:10	Dr. Oscar Parra, Director Centro EULA - Universidad de Concepción EULA en el entorno CEPA

12:10-12:30 Dr. Jaime Cornejo, Director, Gestión IMA

12:30-12:45 Session Wrapup

END OF THE MORNING SESSION

12:45-2:15 BREAK FOR LUNCH

AFTERNOON SESSION

Convener: Dr. Margarita Benítez

CEPA looks ahead. Branching out into related disciplines and new partnerships with the private sector and with other countries.

2:20-2:30 Introduction to the future. Dr. Margarita Benítez

2:00-3:15 Col. Alberto Abastoflor, Director, Military Engineering School of Bolivia

La situación medioambiental de Bolivia. El proyecto arqueológico de Pasto Grande.

3:15-3:50 Discussion period

3:50-4:00 BREAK

4:00-4:30 **CEPA Action Plan for 1998- Dr. Anamary Daniel**

4:30-5:00 New Business

5:00-5:15 Wrapup and Adjournment

Appendix # 4

CEPA's Action Plan

The CEPA Action Plan for 1998

The focus for the remainder of the afternoon was the CEPA Action Plan for 1998, which was presented by Dr. Anamary Daniel in three separate categories: ongoing activities; currently planned activities; and activities to be developed in the future. CEPA's ongoing activities for 1998 include:

- Capacity Building:
  - Phase implementation of UPAEP's Master's Degree Program
  - USACh adoption of UPAEP Master's Degree Program (Fall – Summer 1998)
  - Follow-up on Polytechnic University's visit to Sandia to develop an undergraduate environmental engineering program (Summer – Fall 1998)
- Joint Research:
  - Follow-up preparation of joint proposal entitled "Path Forward: Technology to Enhance IMA-USACh-ORNL Relationship under CEPA"
  - USACh-ORNL preparation of manuscript for publication on the results of phytoremediation analysis
- Technology Transfer:
  - Follow-up on USACh-ORNL initiative to develop performance-based analytical procedures tailored to specific environmental needs
  - Follow up on USACh-ORNL initiative to deploy state-of-the-art certified analytical methodology and instrumentation as necessary to address specific needs

CEPA's currently planned activities include:

- Capacity Building

  - Visit to ORNL of two UTB faculty members to develop undergraduate programming in environmental sciences (Summer – Fall 1998)

- Faculty Development

  - Visit to ORNL of Dr. Andrei Tchernitchin from Universidad de Chile to develop further research areas in experimental endocrinology and environmental pathology (Summer – Fall 1998)

- Joint Research

  - Development of Center for Education, Conservation and Environment Protection (CECIA) research initiatives among Inter American University campuses and other CEPA members (Fall 1998)

- Student Exchange

  - Summer visit to ANL of two undergraduate students from Universidad del Sagrado Corazón in Puerto Rico to conduct research activities under the guidance of Dr. Jeff Gaffney and selected staff (1998)

  - Visit to ANL of two UTB faculty members to develop a decision analysis center to address environmental border issues (Spring 1999)

CEPA activities to be developed in the near future include:

- Faculty Development and Joint Research

  - Visit to ORNL of two faculty members from Universidad Autónoma de Tlaxcala to develop research areas in hydrogeological modeling and wastewater steam characterization of the Tlaxcala region (Spring – Summer 1998)

- Capacity Building

  - Follow-up on EULA-ORNL-DOE initiative regarding short courses on pollution prevention principles directed to the Educational, Public and Industrial Sectors of the VIII Region of Chile (Summer – Fall 1999)

  - Assessment of programmatic and environmental priorities of the following universities: Texas A&M University, Corpus Christi (Summer 1998), and Universidad Austral de Chile (Summer 1998)

Appendix # 5

List of Participants

CEPA

Consorcio Educativo para la Protección Ambiental

CEPA Annual Meeting

at
Universidad de Santiago de Chile
April 14-16, 1998

Participants from the United States, Puerto Rico, Mexico, Bolivia, and Chile

Keynote Speakers

1. **The Honorable Gabriel Guerra Mondragón**
United States Ambassador to Chile

2. **Dr. Enrique Leff**
Coordinator, Environmental Education Network for Latin America and the Caribbean, United Nations Environmental Program (PNUMA)

Equity Research Corporation

3. **Ms. Miriam Cruz**
President, Equity Research Corp. – Washington, D.C.

4. **Dr. Margarita Benítez**
CEPA Executive Director

5. **Dr. Anamary Daniel**
CEPA Technical Consultant

Scientists from the DOE and

The National Laboratories

6. Dr. Juan Ferrada
Chemical Technical Division – Oak Ridge National Laboratory

7. Dr. Linda Cain
Director Office of University and Science Education –
Oak Ridge National Laboratory

8. Dr. James Loar
Environmental Sciences Division – Oak Ridge National Laboratory

9. Dr. Bruce Tomkins
Chemical and Analytical Sciences Division – Oak Ridge National Laboratory

10. Dr. Jeffrey S. Gaffney
Atmospheric, Physics and Chemistry Group, Environmental Research Division –
Argonne National Laboratory

11. Dr. Guenter Conzelmann
Assistant Energy Systems Engineer – Argonne National Laboratory

12. Dr. Dan E. Arvizu
Director of the Materials and Process Sciences Center – Sandia National Laboratory

13. Rómulo Díaz, Esq.
Special Counsel to the Secretary of Energy – DOE, Washington, D.C.

Representatives from CEPA Institutions

14. Dr. José Martín
Dean of Natural Sciences – University of Texas at Brownsville

15. Dr. Grady Blount
Chair, Department of Physical & Life Sciences –Texas A & M Corpus Christi

16. Dr. Pedro Rubén Rodríguez
Director, Center for Energy and the Environment, Universidad Popular Autónoma del Estado de Puebla, Mexico

17. Ing. Vicente Pacheco
Vice Chancellor - Universidad Popular Autónoma del Estado de Puebla

18. Ing. Moisés Merlo
Dept. of Engineering, Universidad Autónoma de Tlaxcala, Mexico

19. Dr. Gilberto Vélez
Dean of Engineering, Universidad Politécnica de Puerto Rico

20. Prof. Manuel Ravelo
Business Administration Department – Universidad del Sagrado Corazón, Puerto Rico

21. Dr. Graciela Ramírez
Director of the Center for Education, Conservation and Environment Protection (CECIA) – Universidad Interamericana de Puerto Rico

22. Dr. Jaime J. Cornejo
Academic Director, Gestión IMA, Departamento de Química de los Materiales, Facultad de Química y Biología, Universidad de Santiago de Chile

23. Dr. Oscar Parra
Director, Centro EULA- Chile. Universidad de Concepción

24. **Dr. Andrei Tchernitchin**
CIMAB, Facultad de Medicina. Universidad de Chile

25. Dr. Hugo Campos
Facultad de Ciencias. Universidad Austral de Chile

26. **Sr. Rodrigo Egaña**
Director Ejecutivo. Comisión Nacional del Medio Ambiente, Chile

27. Dr. Nelson Carrasco
Departamento de Química de los Materiales, Facultad de Química y Biología, Universidad de Santiago de Chile.

28. **Dr. Sergio Montes**
Departamento de Química de los Materiales, Facultad de Química y Biología, Universidad de Santiago de Chile

29. **Dr. Ricardo Schmidt**
Departamento de Química de los Materiales, Facultad de Química y Biología, Universidad de Santiago de Chile

30. Prof. Hernán Soto
Departamento de Química de los Materiales, Facultad de Química y Biología, Universidad de Santiago de Chile

31. Prof. Eduardo Valero
Departamento de Química de los Materiales, Facultad de Química y Biología, Universidad de Santiago de Chile

32. Dr. Lisandro Chueco
Jefe del Programa de Doctorado, Centro EULA- Chile. Universidad de Concepción

33. Dr. Adolfo Acuña
Sub Director, Centro EULA- Chile. Universidad de Concepción

34. Dr. Sergio Cabrera
Departamento de Biología. Facultad de Medicina, Universidad de Chile

35. Dra. Nina Lapin
Laboratorio de Patología Ambiental, Facultad de Medicina, Universidad de Chile

36. Dr. Lionel Gil
Departamento de Bioquímica, Facultad de Medicina, Universidad de Chile

37. Dr. Claus Behn
Departamento de Fisiología. Facultad de Medicina, Universidad de Chile

38. Dr. José Hernández
Facultad de Ingeniería, Universidad de Chile

39. Dr. Leandro Herrera
Facultad de Ingeniería, Universidad de Chile

Bolivian Delegation

40. Cnl. Alberto Abastoflor (Ret.)
Advisor to Bolivia's Military Engineering School

41. Lcd. Héctor Ormachea
Executive Director – Centro Boliviano Americano, La Paz

42. I ng. Héctor Córdoba
Vice Chancellor – Universidad Católica de Bolivia, La Paz

Appendix # 6

"Environmental Education and Sustainable Development":
Dr. Enrique Leff

ENVIRONMENTAL EDUCATION AND SUSTAINABLE DEVELOPMENT

Enrique Leff

The environmental question emerges as a crisis in civilization characterized by three fundamental points of rupture and renovation in relation to the rationality of modernity:

a) The limits of growth and the (Roegen, 1971; Meadows et.al., 1972);

b) The breaking up of knowledge and the emergence of systems theory, complexity, and interdisciplinarity (Apostel, 1975; Funtowicz & Ravetz, 1994; Garcia, 1986);

c) The questioning of the State and the market, and the emergence of citizen demands for equity, democracy, justice, participation, autonomy and self-determination.

These points of rupture have led to questioning of the paradigms of knowledge and the societal models of modernity. They point up the need to build another social rationality informed by new values and knowledge, by new means of production founded on ecological bases, cultural meanings and new forms of democratic organization (Leff, 1995). This new social paradigm implies a change in the economic, political and cultural order of our times, which is unthinkable without a transformation in the awareness and behaviour of people. That is why education must become a strategic process to form values, skills and capacities to direct the transition towards sustainability.

The environmental question as a problem of development and interdisciplinarity as a method for integrated knowledge emerged as complementary responses to the crisis in the rationality of modernity (UNESCO, 1980, 1985). Environmental education absorbed the new paradigm of complexity through a holistic approach to reality and an interdisciplinary recomposition of knowledge. In contrast to the intentions of the scientific project founded on formal and instrumental rationality to gain increasing control over the world, ecology, open system thermodynamics and chaos theory incorporate complexity, disorder, imbalance and uncertainty in the field of knowledge (Morin,1980). Science opens up from the accumulation and growth of positive formal knowledge, to incorporate the question of power and the strategic nature of knowledge (Foucault, 1989).

Experience in the last twenty years has revealed institutional obstacles and disciplinary interests that hinder progress in environmental education. Theoretical and pedagogical resistance has caused many programmes with interdisciplinary aims to fail, owing to the difficulty of integrating the current paradigms of knowledge. Environmental interdisciplinarity is neither the addition nor the articulation of disciplines; nor can it be

achieved outside the established paradigms of science as a pure game of complex thought. Environmental education requires the construction of new interdisciplinary objects of study, the transformation of prevailing paradigms, the training of teachers and the incorporation of emerging environmental knowledge in new curricular programmer (Leff, 1986).

It has not been easy to move from the concept and methods of complexity to the design and implementation of interdisciplinary training programmes. This process is more than simply joining disciplines to put together a multi-thematic programme. Interdisciplinary teaching in the field of the environment involves the construction of new paradigms of knowledge, and their incorporation as integrated content in the training process. It requires the training of teaching teams, the outlining of diverse environmental subject areas, new teaching strategies and new curricular structures.

Formal environmental education projects have lacked critical epistemological, methodological and pedagogical surveillance in conducting these programmes. Thus, the implementation of environmental programmes in universities has been relatively slow, which has resulted in a lack of professionals able to prepare and apply effective environmental policies. Although environmental knowledge has been developimg in some areas of the natural and social sciences, it has not been fully incorporated into the curricular content of new education programmer. Even though the supply of graduate courses in diverse subject areas has grown, the interdisciplinary nature and their environmental content of the courses is yet a purpose to be fulfilled. Furthermore, incipient efforts are only beginning to provide training that will enable local authorities, communities and the general population to exercise the rights granted to them in many countries by laws regarding the environmental assessment of development projects and the implementation of participatory self-management or co-management of natural resources production.

Together with complex thought and of interdisciplinary methods, a philosophy of nature and environmental ethics has also emerged. These ecosophies range from deep ecology (Naess, 1989) and biocentrism to social ecology that proposes new democratic values for the reorganization of society on the basis of peaceful coexistence, solidarity, integration, autonomy and creativity, in harmony with nature (Bookchin, 1991). Environmental awareness emerges as a need to reintegrate mankind into nature. Ecology, as a systemic science, appears as a paradigm capable of reintegrating the pieces of knowledge left by modern science to reorder the world. Thus, the political ecosophies and philosophies of environmentalism are founded on ecology as a model of social organization and knowledge.

Ecologist values have permeated the ideologies and practices of diverse ecologist and eco-community groups. Environmental ethics contributes new values and general principles that have been assimilated in the guidelines and content of some education programmer. These are reflected in the activities of various non-governmental organizations and have expanded towards the content of textbooks and study

programmer. The environmental dimension has thus been oversimplified and reduced to the incorporation of ecological topics and principles in the different subject areas at the primary level and to a general treatment of ecological values, rather than finding a way to translate the concept of environment and complex thought into the formation of new perceptions, new attitudes and new knowledge.

Environmental education has focused on nature conservation values; environmental principles have been incorporated through a view of interrelationships in ecological and social systems to underscore some of the most visible problems of environmental degradation, such as the pollution of natural resources and ecological services, the management and disposal of domestic and industrial wastes. The pedagogy of the environment has promoted the contact of students with their surroundings. In that regard, formal environmental education at the basic level transmits to the students a general awareness of the environment, which induces a change in their perceptive capacities and behaviours. However, environmental education is far from having fully penetrated the formal education system with its new insights. The environmental principles and values promoted by the pedagogy of the environment should be enriched with a pedagogy of complexity, to induce in students the capacity to analyse multiple causality and the interrelationships of their world at different stages in their psychogenetic development, generating critical and creative thinking through new cognitive capacities.

Environmental values are also being induced from outside the formal education processes. These range from general ecological principles (behaviour in harmony with nature) and new political ethics (openness to political plurality and tolerance towards others), to new cultural and collective rights that reflect the social interests revolving around the reappropriation of nature and the diversity of lifestyles, which break with the homogeneity and centralization of power in the prevailing economic, political and cultural order.

These values --which express a new political culture-- are penetrating the formal education system through participatory research and their incorporation into new curricular contents. The politicization of environmental values is also present in the nonformal education projects conducted by ecologist groups with communities and linked to the defense of their environment, the social appropriation of nature and the self-management of their productive resources. These projects give rise to grass-roots ecological education inspired in a pedagogy of liberation (Freire, 1970) enriched with principles of ecological sustainability and direct democracy.

In contrast to the objective/universal aims of science, environmental knowledge gives special value to unique, subjective and personal knowledge. Environmental education promotes the construction of personal knowledge which is the subjective entry into the world of complexity. This personal knowledge is built through a dialectical confrontation with reality and dialogue with others that gives consistency and coherence to knowledge, but expresses frequently opposing interests imbedded in alternative world views. In that regard, complex knowledge is achieved not only through interrelationships with the

external environment, but also through tension with otherness, which confronts the objectiveness of knowledge with different meanings for each subject and each culture, thereby generating a critical process that specifies and ingrains knowledge in individual and collective interests.

Environmental education should be viewed as part of a strategy to stimulate the collective reconstruction and personal reappropriation of knowledge. It implies that there is no fixed and given knowledge that is conveyed and instilled in the minds of students, but rather an education process that develops the capacity of students to construct concepts on the basis of their *primary meanings*. From this education perspective, the student is an actor in an ideological and social environment in which capacities can be developed for the student to shape his personal knowledge in relation to his own environment through critical and complex thought. Learning becomes the production of meanings and the subjective appropriation of knowledge. In that regard, the education process helps to build new social actors who will direct the transition towards a democratic and sustainable future. Thus, environmentalism is rooted in social movements that reflect culturalized and territorialized conflicts. Environmental education opens up a process of building and appropriating concepts that produce conflicting and divergent meanings of sustainability. Culture appears as the matrix of rationalities that resignify and specify the principles of environmental rationality, deeply instilling thcnl in the world of each person's and each community's life.

The challenges of sustainable development involve the need to build capacity to direct development founded not only on ecological bases, but on social equity, cultural diversity and political democracy. That implies establishing the right to environmental education and training as a principle of sustainable development, to enable every person and every society to produce and appropriate the information, techniques and knowledge required to participate in the management of their production processes, to decide their own conditions of existence and to define their quality of life. It is a question of doing away with dependence and inequity based on the unequal distribution of knowledge; it is a strategy to empower citizens and governments with knowledge and capacities to participate in the decision-making and management of sustainable development.

Appendix # 7

UPAEP Master's Degree Program

Appendix # 8

Faculty Internship to ORNL by two Faculty Members of the Universidad de Concepción

Past CEPA/ORNL Interactions

Past

- Long history of collaboration in research and education
- Scientists from four major Chilean universities toured ORNL facilities prior to signing of Memorandum of Understanding
- Ten representatives from CEPA institutions have visited ORNL since March 1997
- Participation of graduate student from the University of Santiago in collaborative research project at ORNL

ORNL Visit of Professors Adolfo Acuña and Pedro Pedreros from EULA, University of Concepción - Agenda

Activity	Date	Speaker
Discussion of Chilean Presentation	Monday, March 23, 1998	Linda Cain and Juan Ferrada
Air Dispersion Modeling	Tuesday, March 24, 1998	Bob Miller
Water Resources Modeling	Wednesday, March 25, 1998	John Tauxe
Energy and Economics	Wednesday, March 25,1998	Bob Perlack
Water Shed Planning	Tuesday, March 25, 1998	Tim Ensminger
Systems Analysis	Thursday, March 26, 1998	Juan I. Ferrada
Remediation	Friday, March 27, 1998	Les Dole
Effects of Hydroelectric Power on Aquatic Systems	Monday, March 30, 1998	Glenn Cada
Environmental Science Division	Monday, March 30, 1998	Tom Ashwood
Pollution Prevention, DOE Program	Tuesday, March 31, 1998	Ana Gonzalez, DOE
Pollution Prevention	Tuesday, March 31, 1998	Irvin W. Osborne-Lee
Environmental Externalities	Wednesday, April 1, 1998	Russell Lee
Water Quality, DOE Program	Thursday, April 2, 1998	Gary Hartrnan, Steve Haas, DOE
Energy and Environment, - an ORNL Perspective	Thursday, April 2, 1998	John Sheffield
Energy Planning System	Friday, April 3, 1998	Jim VanCoevering
Demand Side Management	Monday, April 6, 1998	Marilyn Brown
Energy and Industrial Perspective		Tony Schaffhaus

ORNL Visit of Professors Adolfo Acuña and Pedro Pedreros from EULL4, University of Concepción

Analysis of Visit

- Contact: Dr. John D. Tauxe, OR.NL
- Area: Ground Water Hydrogeologist
- Potential Project:
    a. Hydrogeology Modeling of Sensitive Areas in Pipeline Projects at the VIII Region.
    b. Evaluation of contamination in the underground water table at disposal sites.
- Contact: Dr. Juan Ferrada, ORNL
- Area: Modeling and Simulation
- Potential Project:
    a) Environmental Modeling of the Bio-Bio River System using FLOW Simulator
    b) Management and Disposal Options for Industrial Hazardous Wastes at the VIII Region
    c) Workshops about Systems Analysis applied to Environmental Problems

- Contact: Ms Ana R. Gonzalez, DOE and Dr. Irvin Osborne-Lee, ORNL
- Area: Pollution Prevention
- Potential Project:
    a) Short courses on Pollution Prevention Principles directed to the Academic, Public, and Industrial Sectors of the VIII Region

- Contact: Dr. Russell Lee, ORNL
- Area: Energy and Environment Policy Analysis Program
- Potential Project:
    a) Preliminary Assessment of Externalities of Hydro Electrical Power Generation in the Bio-Bio River System

Appendix # 9

"Current and Future Collaborations between CEPA and the Environmental Sciences Division (ESD) at Oak Ridge National Laboratory (ORNL)"
Dr. James Loar

Current and Future Collaborations between CEPA and the Environmental Sciences Division (ESD) at Oak Ridge National Laboratory (ORNL)

James M. Loar
CEPA Annual Meeting
Santiago, Chile
April 14—16, 1998

Initial Collaborations

- Scientists from four major Chilean universities in the CEPA consortium toured ESD facilities during visit to ORNL (August 1996)

  Correspondence via email initiated between Dr. Jaime Cornejo and Dr. Art Stewart

- Scientists at ORNL obtained funding to support collaboration on a study entitled "Phytoremediation Research: Gas-phase Testing of a Sampling Chamber for Volatile Contaminants" (September 1997)

Description of Study

- Evaluated the efficiency of Chilean plants in eliminating indoor air pollutants
- Used expertise and instrumentation in ESD and the Chemistry and Analytical Science Division to extend studies that had been initiated in Chile
- Involved 3-week visit to ORNL by Franz Muñoz, a student of Dr. Cornejo, who conducted the chemical analyses
- Involved Dr. David Joy, ORNL-UT Distinguished Scientist in the Metals and Ceramics Division, who helped to characterize the leaf surfaces by scanning electron microscopy and x-ray emission
- Collaboration on data analyses and manuscript preparation are continuing

Recent Collaborations

- Dr. Cornejo visited ORNL in February 1998 and worked with ESD scientists

  Prepared joint proposal entitled "Path Forward: Technology Transfer to Enhance IMA-USACH-ORNL Relationship under CEPA"

  Prepared draft manuscript summarizing the results of phytoremediation research

- Drs. Adolfo Acuña and Pedro Pedreros, Environmental Studies and Research Center at the University of Concepción, visited ORNL in March 1998

  ESD staff gave five presentations on topics ranging from environmental analyses of hydroelectric projects to innovative biological monitoring techniques

  Further discussions are planned at the University of Concepción on April 17, 1998

Potential Areas for Future Collaborations

- Phytoremediation

  Research related to reducing air and water pollution

  Joint proposal to DOE-EE on innovative space conditioning systems

- Analysis of environmental impacts related to hydropower development

  70—80% of Chile's electricity is produced by hydropower

  Six projects planned on Bio-Bio River

  ORNL has provided the environmental leadership to DOE Hydropower Program for past 20 years

- Biomarkers of aquatic ecosystem health

  Scientists from both Chile and ORNL collaborate with scientists at the University of Sieno, Italy on biomarker research

  Interaction initiated via email between Dr. Marshall Adams (ORNL) and Dr. Ricardo Barra (University of Concepción)

Planning for Future Collaborations

- Continue to identify areas of mutual interest and key scientists in Chile and at ORNL
- Prepare joint proposals to support

  Cooperative research

  Education and training

- Commit to build on success of initial collaborations

In kind contribution

UPAEP Master's Degree Program	$10K
EULA faculty visit	$10K
Academic training	$2K
Environmental Security Proposal	$10K
USACH Master's Degree Program Adaptation	$2K

Appendix # 10

"Diploma in Analysis and Management of the Environment"
Universidad de Concepción, Chile

DIPLOMA IN ANALYSIS AND MANAGEMENT OF THE ENVIRONMENT

Casilla 156-C, Fax: 056-41-242546; E-mail: ppacheco@udec.cl

DIPLOMA IN ANALYSIS AND MANAGEMENT OF THE ENVIRONMENT

PROGRAM

MODULE I : THE NATURAL SYSTEM (64h)

The objective of this module is to introduced the students to the structure and function o f the natural system.

Topics

1.- Introduction (4 h)

Environmental Science Concept
Environment
Sustainable development
Interdiscipline and integration
Meaning of the thematic sequence o f the Diploma program.

2.- Atmosphere (10h)

Basic concepts
Atmospheric circulation
Thermal inversion
Seminar

3.- Geosphere (10h)

General concepts on geographic projection system
Basic principies of geomorphology
Modeling agent (hydric erosion, eolic erosion, sedimentation)
Principies of fluvial and coastal morphology
Soil formation processes, classification of soils according to its use capacity, soil types, climate-soil relantionships, vegetation-soil relantionships.
Seminar

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4. Hydrosphere (14h)

Continental waters
Hydrologic cycle
Classification
Marine waters
The oceanic circulation and its variability
Coastal upwelling, vertical structure of the ocean
Seminar

5.- Biosphere (8h)

The levels of organization and the diversity of life
Metabolism and its environmental meaning
The flow of energy and biogeochemical cycles
Seminar

6.- Ecological Systems (8h)

Basic concepts, ecosystems, populations
Men and its environment
Habitat diversity
Community interactions
Seminar

7.- Natural Resources (2h)

Classification
Air, soil, water resources
Reserves and National Parks

8.- Workshop (8h) Cases of study

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***MODULE II:** THE SOCIAL AND ECONOMIC SYSTEM (56h)*

Topics

1.- Natural resources economy and environment (12 h)

Demand-offer, producer and consumer equilibria. Producer and consumer excess
Externalities of the produccion and the consumption, the right to property and optimum pollution
Economic valuation of the natural resources
Seminar

2.- Economic, social and demographic indicators (12 h)

Population growth, regional GDP, investment, employment, exportation
Social indicators (poverty, access to basic services) Demographic indicators (mortality rate, birthrate rate, migrations, distribution of the population)
Seminar

3.- Regional Development (14h)

Availability and current use of the natural resources in the region (forest, agriculture, mining energetic, hydric resources) Property and distribution factors of the production (natural resources, capital, work).
Process of productive reconversion, opening of the regional economy to the external
Seminar

4.- Workshop (8h). Cases of study

5.- Diploma seminar (10h)

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MODULE III : EFFECTS OF THE ANTHROPIC ACTIVITY IN THE ENVIRONMENT. (60h)

Topics

1.- Global environmental problems (28h)

Global climatic change (atmosphere, continents, oceans)
Destruction o f the ozone layer
Deforestation, desertification, erosion.
Biodiversity reduction
Social problems in the world (Seminar)
Demographic growth, undevelopment and poverty
Industrial and urban residues generation (Seminar)

2.- Contamination and environmental quality (18h)

Contamination (air, water and soil)
Environmental quality indicators
Norms and standards
Uses and environment quality
Seminar

3.- Workshop (6h) Cases of study

4. Diploma seminar (6h)

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MODULE IV: ENVIRONMENTAL MANAGEMENT (70h)

1.-Environmental management : instruments and tools (32h)

Sustainable development
Environmental legislation
Environmental impact assessment and environmental impact studies:methodologies and cases of study
Environmental audit
Economic mechanisms for the environmental regulation, taxes, rates, fines, pollution rights.

2.- Sustainable management o f the territory (20 h)

Territorial planning
Basic concepts
Historic development
Planning instruments
Urban settlement and environment
Integrated basins management
Management coastal zone
Seminar

3.- Control of environmental problems (12 h)

Control of che erosion
Basic notions on techniques for soil management and soils conservation
Management in the industry
Contamination prevention
Environmental compatible technologies
Treatment technologies
Methods for the rational use o f the energy Seminar

4.-Diploma seminar (2h)

5.- Workshop (6h) Cases of study

PROFESSORS LECTURING IN THE PROGRAM

Abarzua Riquelme, Mireya	*Biologist, MSc. in Microbiology*
Acuña Carmona, Adolfo	*Marine Biologist MSc in Oceanography*
Aguilera Vidal, Rosa	*Business Engineer, Msc. in Project evaluation*
Antinao Jeldes, Fernando	*Geographer*
Arrizaga Miranda, Alberto	*Biologist, Ph.D. in Biology*
Azócar García, Gerardo.D.	*Geographer, Ph in Environmental Sciences*
Barra Ríos, Ricardo	*Biochemist, Ph.D. in Environmental Sciences*
Blanco Palma, Hernán	*Engineer, Msc. in Environment and development*
Cisterna Vega, Marco	*Geographer,Ph.D.(c) in Environmental Sciences*
Inostroza Mellado, Esther	*Lawyer, M.Arts*
Martínez Piña, Patricia	*Geographer,Ph.D. (c) in Environmental Sciences*
Muñoz Rebolledo, María	*Architect, Ph.D. (c) in Architecture*
Pacheco Jara, Patricia	*Biologist, Ph.D. in Sciences*
Parra Barrientos, Oscar	*Biologist, Ph.D. in Natural Resources*
Pedrero Pérez, Pedro	*Engineer, Electrical Major*
Rivera Valdés, Susana	*Engineer, Ph.D(c) in Environmental Sciences*
Rojas Hernández, Jorge	*Sociologist, Ph.D. in Sociology*
Ruiz Adaros, Bolívar	*Lawyer*
Sobarzo Bustamante, Marcus	*Marine Biologist, Ph.D. (c) in Oceanography*
Urrutia Pérez, Roberto	*Biologist, Ph.D. in Environmental Sciences*
Valdovinos Zarges, Claudio	*Biologist, Ph.D. (c) in Zoology*
Weinert Seyfarth, Otto	*Pharmacist, Msc. in Chemistry.*

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SUMMARY OF THE DIPLOMA ACTIVITIES

Version	Year	Campus	Nº of students
1st	1992	Concepción	13
2nd	1994	Concepción	28
3rd	1995	Concepción	22
4th	1995	Los Angeles	16
Sth	1996	Concepción	28
6th	1997	Concepción	35
7th	1997	Lota	16
8th	1998	Concepción	19
Total			177

DIVERSITY OF PROFESSIONALS IN THE PROGRAM

Analytical chemist
Anthropologist
Architect
Biochemist
Biology teacher
Biologist
Engineer
Lawyer
Marine biologist
Nurse
Risk prevention technical professional
Sociologist
Social workers
Veterinarian

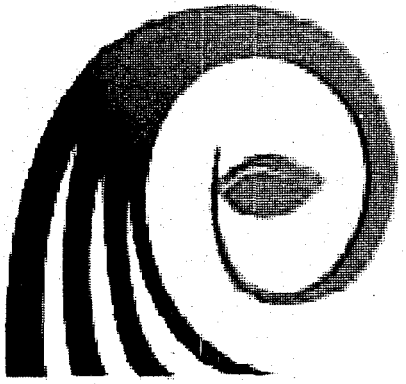
Casilla 156-C, Fax: 056-41-242546; E-mail: ppacheco@udec.cl

Appendix # 11

"Translingual Environment Science Education"

Dr. Grady Blount
Texas A&M University – Corpus Christi

Translingual Environmental Science Education



CEPA

By Dr. Grady Blount, Texas A&M University-Corpus Christi

"By strengthening the technical and educational infrastructure, CEPA is making it easier for students and professionals in the Americas to access information and educational resources"

-DOE Secretary Frederico Pena to the 1998 CEPA Annual Meeting in Santiago, Chile.

Introduction: Translingual education involves teaching across the boundaries of language. The following, decidedly informal, microproposal tries to make translingual environmental education a reality. But first, some background information is in order.

The academic relationship between the countries of the Americas is one of the most neglected on Earth. From Canada to Chile, educators and scientists have historically looked to Europe for examples of how to get things done. Ironically, when the subject turns to environmental education, this misplaced mentorship is in error. Europeans may be smart and have a long history, but they are very far away.

Part of the responsibility for this neglected relationship between North and South America can be laid at the foot of Eurocentric custom, history and habit. Most of the rest is due to the barriers of language and physical distance. This document addresses the latter issues and proposes a solution.

Rationale: The Principle of Environmental Unity states that everything is connected to everything else. Implicit in this statement is the fact that environments which share a common boundary affect

one another more strongly than those at a distance. Nowhere has this been demonstrated more clearly than along the U.S./Mexico border where foreign-owned maquilladoras have successfully exported highly polluting industries from the norte into the colonias of Tamaulipas, Nuevo Leon and Chihuahua.

Indeed, a common thread of environmental damage weaves its way through the Americas. Environmental educators understand this and have worked hard to share this knowledge with their students and governments. Yet, with the exception of CEPA, they seldom share this knowledge across national borders...particularly when the border is accompanied by a change in language.

Virtual Infrastructure: Technology now gives us the opportunity to cross the borders of language and landscape to share environmental information freely. Using Interest-based class delivery, we are on the verge of an information revolution capable of uniting environmental scientists and educators throughout the Americas.

Internet-based class delivery is an extension of a well-known educational technique known as distance-learning. Although fairly common within national borders, delivery of distance-learning across national borders had remained a novelty. Until now.

The Problem: In the U.S., attempts to initiate distance-learning to foreign sites are usually accompanied by mountains of red tape, particularly at the graduate level. Entry barriers such as the TOEFL (Test for English as a Second Language), high out-of-state tuition charges, the U.S.-only Graduate Record Examination, and a host of other site-specific requirements have served to effectively quash web-based learning between foreign institutions. Add to this the multilingual barriers of the Western Hemisphere and you have a recipe for inaction.

The Solution: Remarkably, only two things are needed to overcome the barriers of bureaucracy and monolingualism: 1) A dedicated and imaginative faculty; and 2) The technical know-how to make it happen. Both of these resources exist within the ranks of CEPA institutions.

I propose that Texas A&M-Corpus Christi (TAMU-CC) work directly with the Universidad de Santiago de Chile, and Centro EULA and initiate a bold new plan for environmental education as a pilot project during the 1998-99 academic year. Ideally the pilot project described below will be followed by a two-way exchange of translingual class offerings from our colleagues in Mexico, Puerto Rico, and Bolivia.

Translingual Environmental Science Education:

A Microproposal for Delivery of an Introductory Environmental Science Course

Introduction: This proposal is to create a Web-based delivery system for the CORE curriculum course ESCI 1470 Introduction to Environmental Science at Texas A&M University-Corpus Christi (TAMU-CC). This course has been offered seven times since the Spring 1995 semester and has proven to be one of the most popular and useful courses at TAMU-CC. The lecture portions of this course have also pioneered the use of computer-assisted multimedia (e.g. PowerPoint), web-delivery of course notes, and list-servers for the students. Through continuously upgrading, all 15 weeks of lecture material exist in PowerPoint format. The continued growth of distance learning delivered by non-

traditional media such as the World Wide Web (WWW) makes this course a logical choice as our first major entry into web-delivered lectures. By utilizing bilingual faculty and readily available language translation software, we can create the first translingual model for environmental science education.

Background: This proposal has been inspired by the runaway success of a mixed delivery model (see below) of campus and WWW based instruction at my former institution, the University of North Dakota. Earlier this year, I met with a group of 14 alumni of their program in the Houston area. All had received their MS degrees in Space Studies via the WWW delivery mode. One of the key points brought home during my interviews with these students was the distinction between the terms "distance learning" and "distance education". Although commonly treated as synonyms, the former is controlled by institutions and instructors while the later is controlled by the students (i.e. distance learning is the goal of distance education). The University can facilitate the learning aspect of these paradigms by supporting broad concepts of distributed education. Indeed, we now understand that physical presence may be as outmoded as recitation. The mixed delivery mode pioneered by the North Dakota experience is proposed for this project. Under this model, the on-campus lecture will be delivered in the classroom and on the WWW. Funding for this proposal is requested to implement the WWW aspect of the delivery.

The Mixed Delivery Model: During the Fall of 1997 I had several occasions to be absent from my regularly scheduled classes. Rather than falling back on a traditional substitute (e.g. showing a video or having a guest lecturer), I choose to videotape my presentation with the lecture audio superimposed on existing PowerPoint slides. Much to my surprise, I later received anecdotal reports that many of the students in my large ($\approx$ 265 seat) class had not realized I was absent when the videotaped lecture was being shown. This highlights the tremendous power of an effective mixed delivery model. Real-time audio coupled with well-designed graphics and illustrative video clips becomes the central focus of the learning experience. The oftentimes-distracting influence of an intimidating professor is removed.

The WWW delivery model utilizes three pieces of software: a Web-browser, Real Audio, and Internet Relay Chat to focus the learning experience on content rather than personalities. A typical student "attending" a WWW delivered class will see the visual content of the lecture via their web-browser (which shows streaming copies of the PowerPoint slides), hear the professor (via Real Audio), and be able to interact with other students (via typed message on a "Chat" window). Access to the WWW classroom is via a secure gateway in which students must obtain a username and password. This aspect is critical since an "open classroom" could be subject to devastating "Chat" intrusions, which would distract from the learning experience.

Intended Audience: Initially, the WWW delivery mode will be targeted to currently enrolled campus students who are unable to be physically present for the Tuesday/Thursday 8:00 AM starting time. The next logical step is to record the live audio during the mixed model lecture and make it available on the WWW for students with time conflicts and/or for verbatim review prior to examinations. By piloting the on-line version of the class locally, I expect to receive valuable feedback and critiques during the first monolingual semester of WWW delivery. Assuming success with this mode, we will work with appropriate TAMU-CC authorities to create administrative structures for off-campus web-based students.

Technical Issues and Requirements: The single most important technical issue is that instructors in a live classroom must deliver their lecture in the language of the students. The same is not true for the

printed material which appears on PowerPoint slides. All of my pre-produced slides will be translated into Spanish for Spring 1999 delivery. Direct e-mail communications between monolingual students and professors can be accomplished via software programs such as Systran, which allows for bi-directional translation between English and Spanish. I do not propose a technical fix for something as nuance-filled as language, rather, I suggest that software now has sufficient power to reduce the relative importance of what language a word or sentence is written in. The remainder of the software needed by a student is available as *freeware* over numerous Internet sites (e.g. Real Audio).

The minimum hardware configuration for an off-site student should be as follows:

486-33 or faster CPU (Pentium 100 preferred) running Win95/98/NT

16 MB of RAM (32 MB preferred).

SVGA graphics and sound card.

28.8 modem with PPP connection or direct Internet connection.

Assuming these conditions have been met, there are still several technical issues which will be site-specific on the receiving end. As an example, we have performed several "ping traces" between Corpus Christi and Santiago. This involves sending a signal from the TAMU-CC network to the network at the Universidad de Santiago de Chile and continuously monitoring the intermediate path of those signals. From these experiments it has become clear that the electronic path across the Americas is not straightforward. Most paths involved at least 2 uplinks to geostationary satellites...a fact which introduces a noticeable lag time. In addition, the volume of network traffic on both ends, classroom and student, can strongly affect the smooth flow of data. This aspect is known as bandwidth and is analogous to the number of lanes on a freeway. All else being equal, a freeway with more lanes can carry more traffic. Equally true however is the fact that a fixed bandwidth, like a freeway with a fixed number of lanes, will experience times of greater or lesser congestion. Optimization of class delivery as a function of these variables will be a prime goal of the first semester of operation (aka "getting the bugs out").

Excellent tutorials on the engineering aspects of Internet course delivery can be found at Michigan State University and at TAMU-CC's virtual classroom. For the time being I propose to use our first semester of operation to test several delivery modes: real-time audio and video, delayed audio and video, and preloaded audio and video. The leading commercial products for accomplishing these goals are Real Audio, Real Video, and QuickTime Movie.

Dissemination Plan: Leading by example has always been my personal style. Since the 1995 ESCI 1470 introduction of web-assisted class notes, student list-servers, and integrated multimedia, several biology courses and a new science CORE course have followed suite. In the spirit of the mixed delivery model, I propose to generate a video documenting our first two semesters of on-site/WWW delivery. This documentary will be edited into useable form with the intention of being viewed on a tutorial CEPA web page. Much of the barrier to routine WWW delivery with a mixed model is the requirement for downloading, installing, and configuring support software. The documentary of our experiences will include demonstrations of how to step through this process. In addition, a separate mini-tutorial videotape will be made available to students which will step them through the process of configuring their remote-site machines for reception of the WWW lecture.

Concluding Statement: With the age of the Internet upon us, more effective and convenient distance learning devices are being developed. Some of these, such as language translation software, allow us to accomplish goals never before dreamed of. It is appropriate, perhaps even inevitable, that the goal of environmental education in the Americas be accomplished by CEPA. It is an example for the entire world to follow.

Academic Year 98-99 Pilot Budget
Blount summer 98 preparation 1/4 release time $2,888
Graduate research assistant (300 hours @ $7/hour) $2,100
A/V encoding computer $2,600
Audio editing software $ 300
PROJECT TOTAL $7,888
Less IN-KIND CONTRIBUTION per Marinez $2,888
AMOUNT REQUESTED $5,000

For additional Information:

Contact Dr. Grady Blount, Texas A&M-Corpus Christi

Copies of this presentation are at www.geomadre.com/cepa

The Translingual Earth System Science Education Center

Texas A&M University
Corpus Christi

- **On-Line Environmental Education without regard to language.**
  - **Bilingual: Go through barriers**
  - **Translingual: Go around barriers**

Texas A&M University-Corpus Christi

Dramatis Persona

- TAMU-CC host site for CEPA Researchers and Educators from the U.S., Puerto Rico, Mexico, Chile and Bolivia.
- Students of those researchers.

Narratio

- What is Translingual Education?
- How does it work for a typical student?
- What we learned from our first attempt.
- What will happen next?
  - Earth System Science in the Americas

Texas A&M University-Corpus Christi

Translingual Education

- Learning across the boundaries of language by using an interactive audio/video mixture of two or more languages.
- For the TAMUU-CC project:
  - English lecture audio with Spanish language slides.

    -or-
  - Spanish language lecture audio with English language slides.
- In Practice: Daily class lectures are recorded in English, then published in Real Audio format on the web with Spanish language slides.

Serendipity: Santiago, 1998

- Initial idea came from accidental translingual presentations at last meeting....

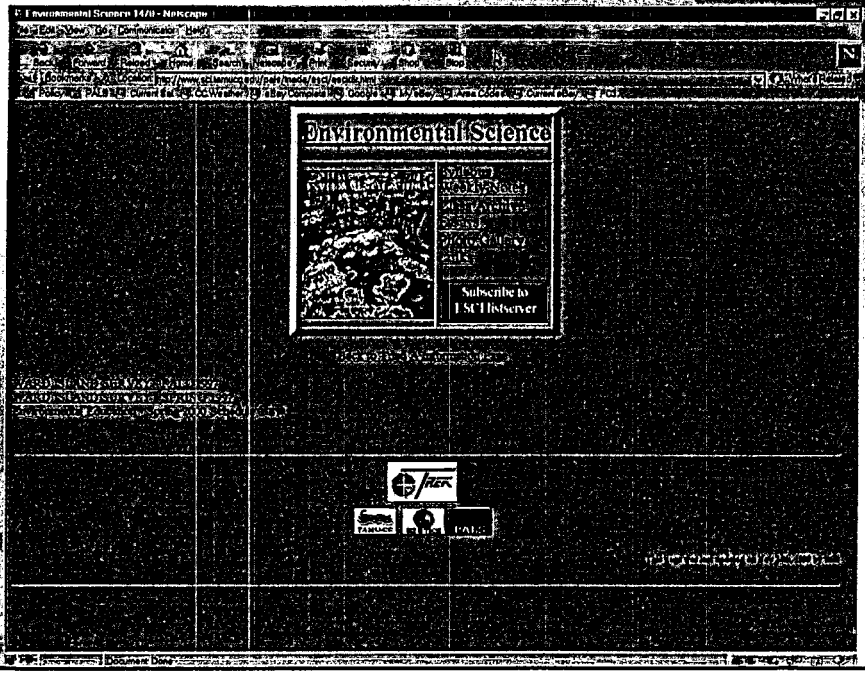
- » **English presentations with Spanish slide text.**
- » **Spanish presentations with English slide text.**

The on-line experience...

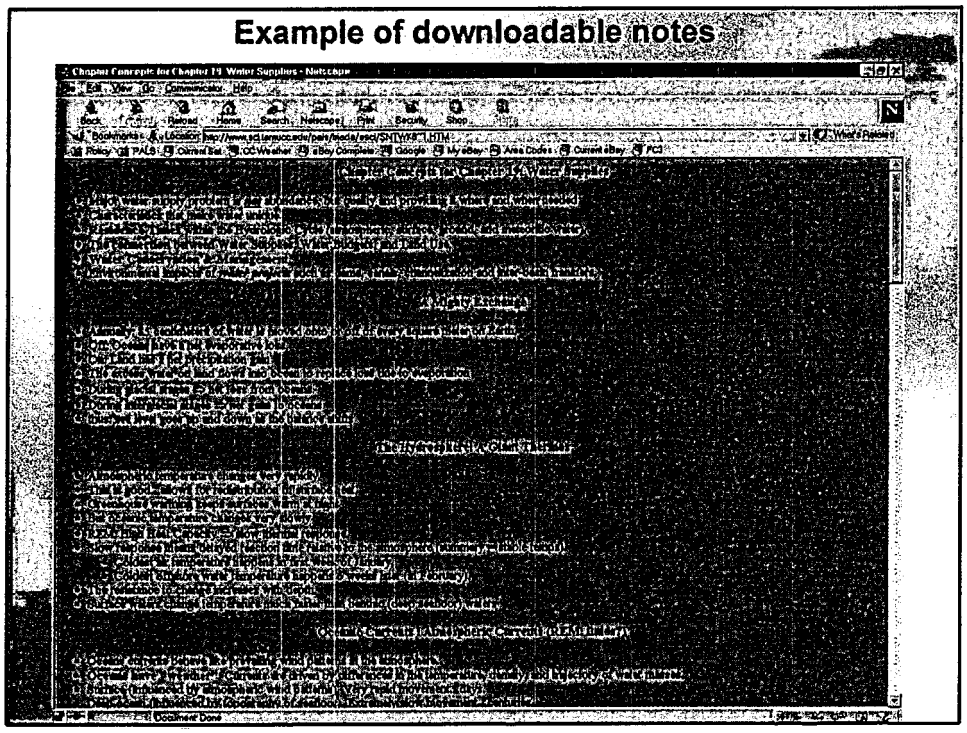
- Previously, monolingual class WebPages at:
  http://www.sci.tamucc.edu/pals/triada/esci/escidir.html

- Web-assisted class
  - On-line copies of instructors notes
  - On-line copies of diagrams / photos
  - On-line copies old exams / study guides

Original Class page (English version)



Example of downloadable notes



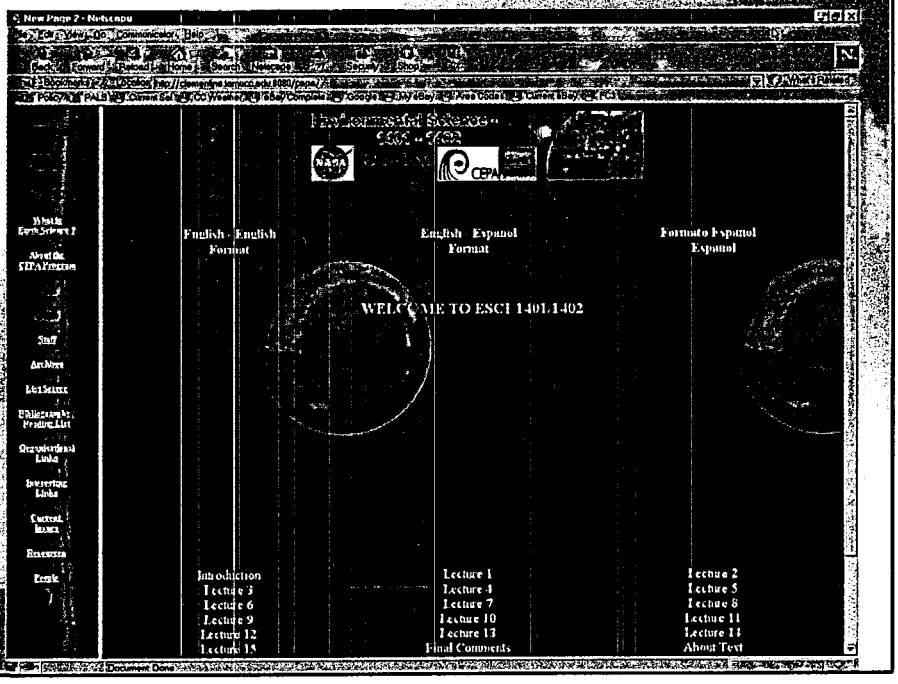
New Delivery Model

- Existing English language pages retained.
- New pages added allowing different language options.

  Lecture Audio - Slide Language

  - English - English (good for students missing class)
  - English - Spanish (If you understand English but not Spanish)
  - Spanish - English (If you can understand Spanish but not English)
  - Spanish - Spanish
- Implicitly: We want students to learn the scientific vocabulary of both languages.

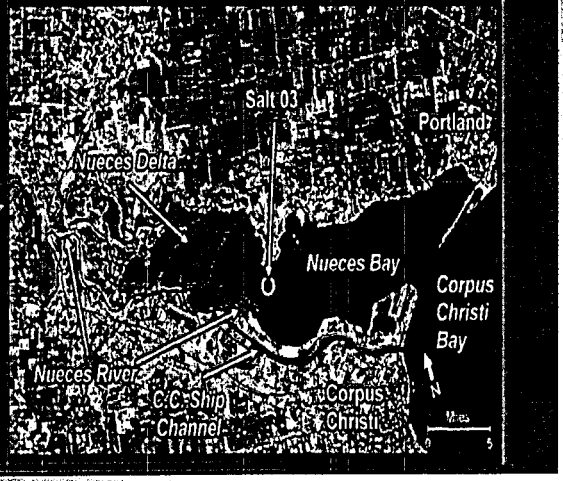
http://clementine.tamucc.edu:8080/cepa/



Example of lecture slide

Coastal Estuaries

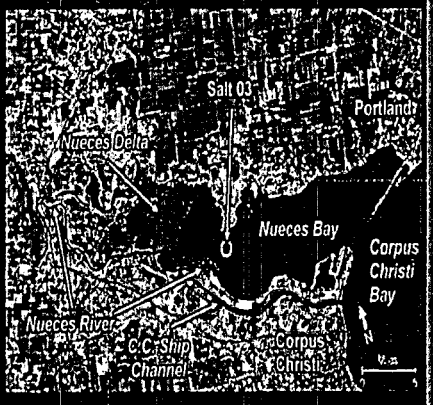
- Each associated with outflow from a river or stream:
  - Nueces Bay
  - Corpus Christi Bay
  - Oso Bay
  - Aransas Bay
- Baffin Bay (hypersaline estuary)



Example of lecture slide

Estuarios Costeros

- Estuarios son un tipo particular de humedal donde agua dulce se mezcla con agua salada.
- Cada uno está asociado con la desembocadura de un rio o un arroyo :
  - –Bahia de Nueces
  - –Bahia de Corpus Christi
  - –Bahia del Oso
  - –Bahia Aransas
- Bahía Baffin (estuario hipersalino)



What We Learned

- Lectures still designed around monolingual textbooks. Major Problem.
  - Solution = On-line text
- On-Campus Students stopped coming to the 8 AM lecture class.
- Bandwidth problems below 56 Kbps but...
  - RealAudio is fast but compressed too much; typically 500K per lecture.
  - PPT HTML files are slow but not compressed enough; typically 10 MB per lecture.
  - Still looking at software patches.
- The web supplements, but does not replace, an existing class. {Excellent for Independent Study}

What Next?

- Follow-on course for first-year students now being developed.
- Earth System Science: The study of the past development, current dynamic state, and future changes in the Earth System.
  - Where did we come from?
  - Where are we now?
  - What happens next?
- Based on gathering and analyzing large volumes of Earth data in near real-time.

Earth System Science as an integrating theme for CEPA

- Integrates all of the Earth Sciences with Math and Computer Science.
- A Model for a "hands-on" introductory science course.
- Studying the Earth System is, by definition, an international efforts.
- Data from first generation of *Mission to Earth* spacecraft coming down now.
  - Heavy emphasis on mathematical modeling.
  - Visualization of environmental variables.
  - Focused on large-scale phenomena modeled with fine meso-scale data as input.

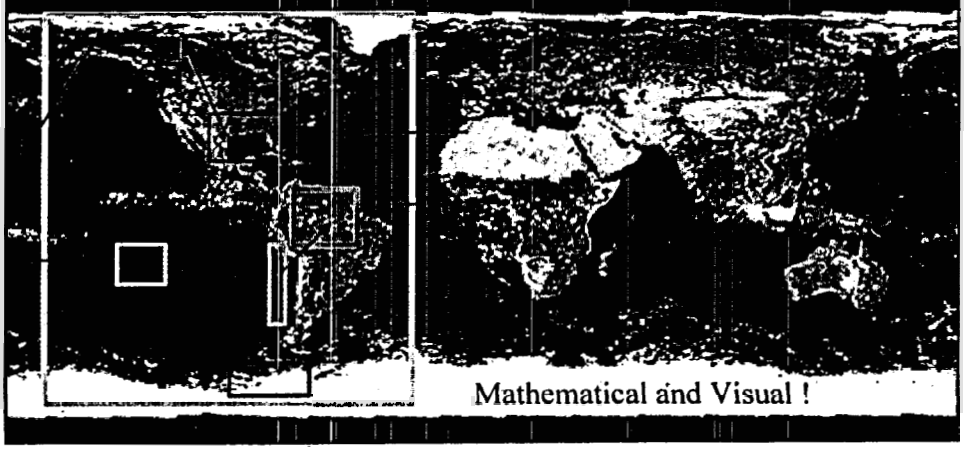
How ESS differs from Environmental Science

- Traditional Environmental Science focuses on local to regional-scale processes.
  - Trophic Relationships
  - Hydrologic Cycle
- Often taught as Ecology.
- ESS looks at connections between global cycles and processes:
  - Effects of volcanism on Climate Change, How do ocean currents affect Ozone Depletion...
- Large-scale, Multitemporal, Interdisciplinary.

Texas A&M University-Corpus Christi

Starting with The Quaternary Environment:

Ocean currents affect upwellings which affect rainfall patterns, which affect wind patterns, which affect climate, which affects polar caps, which affect global average temperatures, which affect ocean currents...



Mathematical and Visual !

Appendix # 12

Summary of Dr. Juan Ferrara's meetings with CONAMA in Chile

Summary of CEPA Activities
CEPA meeting at Santiago, Chile
Dr. Juan J. Ferrada

1. Status of Master Program in Energy and Environmental Management

The Master program developed by the UPAEP in conjunction with ORNL was submitted for, comments to the universities of Tennessee, Texas A&M and Carnegie Mellon. Comments were, very positive and only minor changes were suggested co the program The master program been approved and recognized by several of the pertinent institutions in Mexico. Research and technical assistance to the private sector that would be integral part of the master program has already started. The academic portion *of the* master program. will start once the requirement, for excellence (according CONACYT, Mexico) have been reached. Consequently, it is of most importance to help UPAEP get to the point where the conditions of excellence are met. One of the primary conditions to acquire such an status is to have internationally recognized experts teach for at least one year at the UPAEP facilities for this master program. During the meeting in Chile, a few names of experts were considered and as an action item for the coming quarter it was agreed in seeking the participation of these experts in the master program. Dr. Ruben Rodriguez and Dr. Juan. J. Ferrada will contact some of these professionals.

2. Status of work with Conception

Too professors from EULA, University of Concepción, visited ORNL to meet with several of the researchers that work in environmental problems. The agenda included professionals working in waste treatment, pollution prevention, remediation, bio-markers, systems analysis, environmental externalities, energy and environment, and monitoring. The two professors made a list of the most relevant ideas that may be translated into proposals in the near future. In the academic area it was determined that collaborating in teaching courses in pollution prevention and life-cycle analysis would be an appropriate action item to crystallized some of the help that Concepción needs and the ORNL researchers can promptly offer. Another action item would be to *bring one* of the professors back to the United States to work on his doctoral program. Dr. Juan J. Ferrada will find out the condition and type of work that this professor will be engaged. The last action item would. be to establish a hierarchy among the proposal ideas and start working on them. Concepción will determine their priorities and then will seek potential funding sources. ORNL researchers will collaborate with proposal writing.

3. Visit to CONAMA

Dr. Juan J. Ferrada visited the Centro Nacional del Medio Ambiente (CENMA) with Marina Hermosilla from CONAMA. This is a support institution funded by COMANA. Juan Escudero is the director of CENMA. The fundamental tasks of

CONAMA are: (1) establishing preventive goals through environmental impact analysis, (2) establishing environmental regulations for emissions and environmental quality, and (3) developing decontamination plans for Santiago and other large cities. CONAMA is the coordinating institution for the chilean national environment for water, air, and land. The main concern expressed by Marina Hermosilla was the lack of professionals trained to accomplished these tasks and responsibilities. CONAMA will seek help from Chilean universities for the preparation of these professionals. However, it is needed that the instructors are first trained in these environmental subjects that are not currently part of the Chilean universities curriculum. CEPA, through their national laboratories can be of big help to this need. One action was to determine the environmental course programs that the ORNL researchers have engaged themselves in the last years. Dr. Juan. J. Ferrada will compile this list of program and send it to CONAMA. The result of this interaction could be a set off courses that CONAMA is interested in and that the ORNL researchers could teach.

4. Post Title courses at IMA

Dr. Jaime Cornejo from USACh inaugurated their Post title course in environmental Management. Before the CEPA meeting in Chile, Dr. Cornejo asked a few researchers that could visit Chile to teach a few short courses in program. Only Dr. .Juan J. Ferrada accepted the conditions of the courses. Dr. Juan J. Ferrada decided to stay an extra week of which 4 days were Dr. Ferrada's vacation time. Preparation and instruction took from Saturday, April 18 to Thursday, April 23. The courses were given in Pollution Prevention and System Analysis applied to Environmental Problems. This was a good opportunity of contacting with chilean students. The courser s were attended by 30 people and the students all demonstrated high interest for the subjects taught during these days. Dr. Cornejo provided money for hotels, meals, and transportation for all these days.

Educational Consortium for Environmental Protection (CEPA)

First International CEPA Planning Meeting
August 4 -7, 1997

Host:

Universidad Popular Autónoma del Estado de Puebla

Puebla Mexico

CONSORCIO EDUCATIVO PARA LA PROTECCION AMBIENTAL

(CEPA)

EQUITY RESEARCH CORPORATION
COORDINATOR

UNITED STATES DEPARTMENT OF ENERGY
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UNIVERSIDAD POPULAR AUTONOMA DEL ESTADO DE PUEBLA
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AUGUST 4-7, 1997
PUEBLA, MEXICO

EQUITY RESEARCH CORP.

5 Thomas Circle NW, - Washington, D.C. 20005 - (202) 387 -3331 -.Fax (202) 797-1344

To All CEPA Summit Participants:

After several years of hard work and strong support from many of you, the dream of working together to develop and upgrade the environmental management capacities of Hispanic Serving Institutions throughout the Americas is becoming a reality.

We want to especially thank Dr. Alan Moghissi. It is because of his vision and hard work that we are here today. During the past years, he has worked with the Universidad Popular Autonoma Del Estado De Puebla (UPAEP) coordinating short courses on several environmental related topics, bringing UPAEP students and professors to participate in collaborative research at U.S. universities and augmenting UPAEP library acquisitions by donating several hundred books on environmental issues.

We would also like to thank the U.S. Department of Energy (DOE) in particular, the Offices of Environmental Management; Energy Efficiency and Renewable Energy; and Economic Impact & Diversity and its director, Ms. Corlis S. Moody. Previous support for student internships came from the Office of Worker and Community Transition and the Office of Nuclear Energy, Science and Technology.

Throughout our communication with the different divisions at DOE we counted with the support and assistance of Mr. Romulo Diaz, Jr., Mr. Anibal Taboas and Ms. Annie Whatley. Their knowledge of the Department and their commitment to the upgrading of educational opportunites for minorities were crucial to this project.

CEPA was initiated at UPAEP so it is fitting that we start with our official agenda here. We want to thank Chancellor Mario Iglesias and Vice Chancellor Vicente Pacheco for their commitment to this program. They have worked hard to make our stay in Puebla pleasant and productive.

Finally, we want to welcome the new leadership for the Consortium. CEPA will be in very capable hands. Dr. Margarita Benitez, Vice President at Equity Research Corporation will administer the Consortium. Dr. Anamary Daniel will be our Technical Consultant. Collaborating with them will be our partners at the Laboratories. They are Dr. Linda Cain from Oak Ridge National Laboratory, Dr. Norman Peterson from Argonne National Laboratory and Dr. William Dawes from Sandia National Laboratories.

Gracias por su participacion y colaboracion,

Miriam Cruz

EQUITY RESEARCH CORP.

5 Thomas Circle NW, - Washington, D.C. 20005 - (202) 387 -3331 -.Fax (202) 797-1344

AGENDA FOR CEPA SUMMIT MEETING
PUEBLA, MEXICO
August 4, 1997 to August 7, 1997

Monday, August 4th

TRAVEL DAY

Airport pickup by UPAEP van at Mexico City International Airport. (Terminals and times to be determined once all airplane reservations are made). Estimated travel time from Mexico City to Puebla: 2 hours.

Arrival at hotel Camino Real in Puebla, 7 Poniente #105, Puebla, Pue., CP 72000, Mexico; Telephone (22) 29 09 09-FAX (22) 32 92 51. This hotel is in the center of town, and walking distance from UPAEP Museum, although car transportation will be available to UPAEP Campus.

9:00 P.M. Welcoming Reception and Dinner at the Hotel.
UPAEP Chancellor Mario Iglesias and his wife Rosario de Iglesias, and Vice Chancellor for Academic Affairs Dr. and Mrs. Vicente Pacheco will host.

Greetings and presentation of the various university delegations and special guests.
Music and entertainment by the Tuna Universitaria.

Tuesday, August 5th

Breakfast in the hotel at your convenience.

9:30 A.M. Gather at the lobby to walk over to UPAEP's University Council Meeting Hall.

10:00 A.M. to 2:00 P.M. CEPA's MORNING SESSION

10:00 A.M.-10:10 A.M. The purpose of the Summit Meeting.
Miriam Cruz, ERC President

10:10 A.M.-10:40 A.M.	An Overview of the CEPA Experience at UPAEP Dr. Vicente Pacheco, Vice Chancellor
10:40 A.M.-11:20 A.M.	The Role of the National Laboratories in CEPA Dr. Anamary R. Daniel, CEPA Scientific Consultant Dr. Norman Peterson, Argonne National Laboratory Dr. William Dawes, Sandia National Laboratory Dr. Linda Cain, Oak Ridge National Laboratory
11:20 A.M.-11:35 A.M.	Graduate Program Development: An Instance of Effective Collaboration Dr. Juan Ferrada, Oak Ridge National Laboratory
11:40 A.M.-12:10 P.M.	Questions and Discussion
12:10 P.M.-12:30 P.M.	Break
12:30 P.M.-1:00 P.M.	Presentation of CEPA Budget and Discussion of Additional Funding Possibilities for 1997-98 and Beyond. Ms. Miriam Cruz
1:00 P.M.-2:00 P.M.	Introduction to CEPA's Proposed Work Plan for 1997-98 Dr. Margarita Benitez, International CEPA Coordinator Dr. Anamary R. Daniel, CEPA Scientific Consultant Dr. Wayne Lewis, University of Texas Brownsville Mr. Romulo L. Diaz, Jr., Representative from the U.S. Department of Energy
2:00 P.M.-4:30 P.M.	**LUNCH BREAK**

LUNCH WILL BE SERVED AT UPAEP'S COMEDOR EJECUTIVO

4:30 P.M.-7:15 P.M. CEPA's Afternoon Session

4:30 P.M.-6:00 P.M.	What new CEPA Institutions are bringing to the Table. Three fifteen minutes presentations by University of Texas at Brownsville Texas A & M Corpus Christi and Universidad de Tlaxcala Ten minute Presentations by CEPA guests Instituto Nacional de Ecologia (Mexico) and others.

6:00 P.M.-7:00 P.M.	Discussion of Regional and Institutional Priorities in CEPA's 1997-98 Work Plan. The CEPA regions of Mexico, Chile, Puerto Rico and Texas, will make a 10-minute presentation, followed by general discussion.
7:00 P.M.-7:15 P.M.	Summary and Adjournment.

DINNER AT 9:00 P.M. AT THE UNIVERSITY MUSEUM.
MUSIC BY UPAEP'S CHOIR

<u>Wednesday, August 6th</u>

8:00 A.M.-9:00 A.M.	Breakfast Round Table at the Hotel for CEPA members interested in exploring collaborative options for teacher education programs. (Optional)
9:30 A.M.	Gather at the lobby to walk over UPAEP's University Council Meeting Hall.

10:00 A.M. to 1:30 P.M. CEPA's Morning Session

10:00 A.M.-11:00 A.M.	Review, Discussion, and Approval of the 1997-98 Work Plan, and of the Regional and Institutional Priorities.
11:00 A.M.-12:15 P.M.	CEPA's April Meeting in Santiago de Chile, previous to the Summit of the Americas, to be held in Santiago in April 1998. Ms. Miriam Cruz
12:15 P.M.-12:30 P.M.	Break
12:30 P.M.-1:30 P.M.	Proposal on the Arts and the Environment Project for an Alliance for the Restoration of Historical Monuments. UPAEP's School of Architecture presentation. Proposals from the floor.
1:30 P.M.-2:00 P.M.	New Business Plans and projects beyond 1997-98

LUNCH BREAK FROM 2:00 P.M. TO 4:30 P.M.

4:30 P.M.	Guided visit to Puebla's historical monuments
9:00 P.M.	**DINNER AT LAS BODEGAS DEL MOLINO RESTAURANT**

Thursday, August 7th

TRAVEL DAY **UPAEP will provide transportation to Mexico City Airport.**

CEPA SUMMIT MEETING AUGUST 4 - AUGUST 8, 1997

LIST OF PARTICIPANTS AND TITLES

PUERTO RICO

SACRED HEART UNIVERSITY

Dr. Jose Jaime Rivera
President

POLYTECHNIC UNIVERSITY

Mr. Ernesto Vazquez
President

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Dean, Faculty of Engineering, Architecture & Surveying

INTER AMERICAN UNIVERSITY

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Associate Vice President for Academic Affairs

TEXAS

UNIVERSITY OF TEXAS AT BROWNSVILLE

Dr. Juliet Garcia
President

Dr. Jose G. Martin
Dean, Science Department

Dr. Wayne Lewis
Director, Academic Computing Department

Mr. Rene Sainz
Manager, Educational Technologies

TEXAS A & M UNIVERSITY AT CORPUS CHRISTI

Dr. Diana I. Marinez
Dean of College of Science & Technology

CHILE

UNIVERSIDAD DE CONCEPCION

Dr. Oscar Parra
Director, Centro EULA

UNIVERSIDAD DE SANTIAGO

Dr. Jaime J. Cornejo
Director, IMA

MEXICO

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Director, School fo Ecology & Environmental Protection

UNIVERSIDAD AUTONOMA DE TLAXCALA

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M. en C. Antonio Durante Murillo
Director of the Department of Engineering and Technology

Quim. Moises Merlo Cortina
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Ing. Jose A. Aguiñaga Gomez
Chief of Staff

U.S. DEPT. OF ENERGY LABORATORIES

ARGONNE NATIONAL LABORATORY

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Laboratory Administrator

OAKRIDGE NATIONAL LABORATORY

Dr. Linda Cain
Director of the Office of University & Science Education

Dr. Juan Ferrada
Development Staff Member
Chemical Technical Division

SANDIA NATIONAL LABORATORIES

Dr. William Dawes
Director of Educational Programs

OTHER PARTICIPANTS

MEXICO

INSTITUTO NACIONAL DE ECOLOGIA

UNITED STATES

DEPARTMENT OF ENERGY

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General Counsel

EQUITY RESEARCH CORPORATION

Miriam Cruz
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Dr. Anamary R. Daniel
CEPA Senior Scientific Consultant

Dr. Margarita Benitez
International CEPA Coordinator

CEPA

11/21/96

Memorandum of Understanding and Intent
on the
Educational Consortium for Environmental Protection
(Consorcio Educativo para la Proteccion Ambiental or CEPA)

BACKGROUND

Recent events, including the Summit of the Americas convened by President Clinton and the passage of the North America Free Trade Agreement (NAFTA), have increased awareness of the need to emphasize environmental protection in the Americas. The attainment and maintenance of environmental quality require public understanding of environmental protection principles by the public and the commitment of various governments to base their decisions on these principles. Successful environmental management must be based on an appreciation for recycling, reuse, pollution prevention, waste minimization, remediation of past contamination and regulatory compliance. This requires cooperation among all of the Americas, particularly countries neighboring the U.S., regardless of their level of industrial development. Environmental education, enabling environmental policies, strong public participation, and technology transfer are the cornerstones of successful implementation of environmental protection.

Environmental education provides the conduit for disseminating science and technology. Environmental protection presents highly technical issues, and little can be accomplished if there is a lack of information about the nature and extent of the problems, and highly trained environmental professionals to promote a sound regulatory climate. Knowledge is essential for national strength, and fundamental to environmental protection. Continuous advances in science and technology can provide for an effective environmental management, a deeper understanding of the relationship between people and nature, an expansion of available natural resources, and an increase in the use and economic benefits of resources.

Environmental policy that encourages innovation must be structured around the main factors that influence the application of technical resources to societal and economic needs which are: (1) a demand for action of adequate size, direction, and constancy; (2) sufficient numbers of technically skilled people, suitable research and development, and adequate capital resources; (3) an appropriate informational infrastructure upon which to base decisions; (4) a hospitable climate for commercialization of new technologies; and (5) an appropriate legal, organizational, and technological orientation in government.

Strong participation from the public in environmental preservation promotes a sustainable environmental protection process. Environmental protection is an ongoing process that requires active and iterative participation of academic, business, and governmental institutions. In developing sound environmental policies, everyone is both an information supplier and an information user. Therefore, active involvement of all participants through education, the enactment of enabling policies, and the enhancement of the information infrastructure is

indispensable for the development of an acceptable and sustainable environmental protection strategy.

Technology development is essential for appropriate pollution prevention and control. It is more economical to transfer an existing technology used in one industry or country to a different industry or country, than to develop a new technology. Technology transfer requires certain prerequisites, notably the development of curricula for environmental competencies, including life cycle issues that are considered during product development and manufacture. The process of technology transfer ensures that research and development achievements and existing technologies are quickly and effectively transferred to the users.

THE CEPA VISION

The recognized need for effective environmental protection, environmental training, and education in the Americas led to the creation of the Consorcio Educativo para la Protección Ambiental (hereafter referred as CEPA or the Consortium). The CEPA vision is to strengthen the technical, professional, and educational environmental infrastructure in Latin America and the United States. The CEPA program consists of a true partnership among participating groups and includes curriculum development, student exchanges, faculty development, creation of educational materials, joint research, and other cooperative activities. The collaboration developing from this alliance will help to provide each participating institution, the private sector, and governments the expertise and capacity to develop strong environmental strategies and programs.

CEPA recognizes that cultural diversity must be considered when addressing environmental preservation. Cultural heritage and conservation are connected to societal and economic needs and environmental preservation. This concept offers promise for all the participating groups. The interests of environmental preservation are best served with a knowledgeable public that is able to understand the technological and environmental systems at various levels of society.

In the United States and Latin America, development of a sound environmental infrastructure is linked to the need for environmental education. Furthermore, in the United States, most Hispanics, because of socioeconomic-economic conditions, are not participants in the environmental process. The Consortium is unique because U.S. Hispanic Serving Institutions are considered to be critical for its growth. The Consortium interacts with the United States and Latin American professionals, and is an incentive for more U.S. Hispanics to enter environmentally related careers. Through participation in this process, U.S. Hispanic Serving Institutions will strengthen not only their ability to serve environmental engineering students, but also the surrounding Hispanic communities in general.

In research and policy, Consortium members can tackle many of the pressing questions about environmental protection and assist in addressing methods that ultimately support environmental preservation.

MOU PURPOSE AND GOALS

This Memorandum of Understanding and Intent (MOU) establishes a collaborative program in environmental science, education and research. The MOU is based on the common understanding that in education there is a need to base concepts such as pollution prevention, waste minimization and reuse, as well as product and material recycling and reuse considerations, on broad engineering science principles, and to introduce them into environmental education. New education programs may have to be developed to educate the present and next generation of engineers, scientists, and environmental professionals so that they can incorporate environmental factors into regulatory and industrial decisions. The sustainability of the Consortium is based on the commitments of the Consortium members, the private sector, and governments. Each member will ensure the success of CEPA by implementing the program within its educational, political, social, and financial framework. The principal components of this effort are listed below:

1. Educational Programs. Consortium participants and/or other entities as agreed by Consortium members work as collaborators in the development and evaluation of undergraduate and graduate curricula and research programs at participating institutions. These curricula and research activities may deal with areas pertaining to the development of environmental sciences, industrial ecology, environmental engineering, environmental management, or regulatory issues.

2. Faculty Development. Joint faculty/staff appointments, internships and exchanges at respective institutions will be encouraged (e.g., adjunct faculty, summer faculty, visiting staff scientists). These faculty/staff appointments, internships, and/or exchanges may or may not be salaried.

3. Joint Research. Certain Consortium members are more experienced than others. Research programs and projects are developed and/or enhanced through collaboration with participating laboratories and universities. The results of the research are then published in the open literature in recognition of the contributions of the participant institutions.

4. Student Exchange. The educational institutions participating in the Consortium are committed to identifying high-achieving graduate and undergraduate students who will participate in summer and education programs.

5. Technology Transfer. Consortium participants collaborate in the transfer of informational and technological resources. The participants: (1) provide resource personnel to teach courses and present lectures in mathematics, science and engineering at participating educational institutions as allowed under corporate policies, (2) assist in development and/or enhancement of courses, short courses, lectures, and workshops, and (3) foster the

effective transfer of pollution avoidance and control technologies.

6. Professional Training. Consortium participants collaborate on the development of training and certification programs for environmental professionals. One of CEPA's priorities in this area is the development of programs and courses that impart knowledge and skill to environmental trainers throughout the Consortium. They are seen as crucial for environmental infrastructure development en the Americas. The Consortium will suggest a System of acreditacion for the training of environmental profesionals.

7. Promotion of Sustainable Development. Since sustainable development is the appropriate balance of economical and societal growth for preserving the environment, CEPA enables professionals to acquire the acumen necessary to develop holistic strategies that address issues pertaining to the environment in a sustainable development context.

INITIAL PARTICIPANTS

°	CHILE	Universidad de Concepción Universidad de Chile Universidad de Santiago de Chile Comisión Nacional del Medio Ambiente de Chile
°	MÉXICO	Universidad Popular Autónoma del Estadode Puebla (UPAEP) Universidad Autónoma de Tlaxcala
°	UNITED STATES	Texas A&M University at Corpus Christy (Texas) The University of Texas at Brownsville (Texas) Argonne National Laboratory Oak Ridge National Laboratory Sandia National Laboratories United States Department of Energy Equity Research Corporation Institute for Regulatory Science
	Puerto Rico	Universidad Interamericana de Puerto Rico Universidad Politécnica de Puerto Rico Universidad del Sagrado Corazón de Puerto Rico

INITIAL TERM AND FUNDING

It is in the best interest of the parties that the initial term of this MOU shall be for three years, and

be automatically renewable on an annual basis thereafter in the absence of a sixty-day written notice by any Party to all other Parties.

It is expected that the Parties to this MOU will enter into component agreements for formal support to each other and/or non-signatories that may include university, nonprofit and/or profit-making organizations. These agreements may include Interagency Agreements, Funds-in-Agreements, Cooperative Agreements, Grants, Cooperative Research and Development Agreements, Joint Programs, and other forms of collaboration as appropriate, and consistent with authority and availability of funds.

AMENDMENTS AND TERMINATION

This MOU may be modified or amended by written agreement of all Parties. Any Party may terminate its participation in the MOU upon providing a sixty-day written notice to the other Parties.

EFFECTIVE DATE

This MOU shall be effective upon the latest date of signature of the Parties.

FOR THE PARTIES:

Corliss S. Moody, Director
Office of Economic Impact and Diversity
U.S. Department of Energy

Equity Research Corporation

Universidad de Concepción

Universidad de Chile

Universidad de Santiago de Chile

Comisión Nacional del Medio Ambiente de Chile

Universidad Popular Autónoma del Estado de Puebla

Universidad Autónoma de Tlaxcala

Texas A&M University at Corpus Christy

The University of Texas at Brownsville

Argonne National Laboratory

Oak Ridge National Laboratory

Sandia National Laboratories

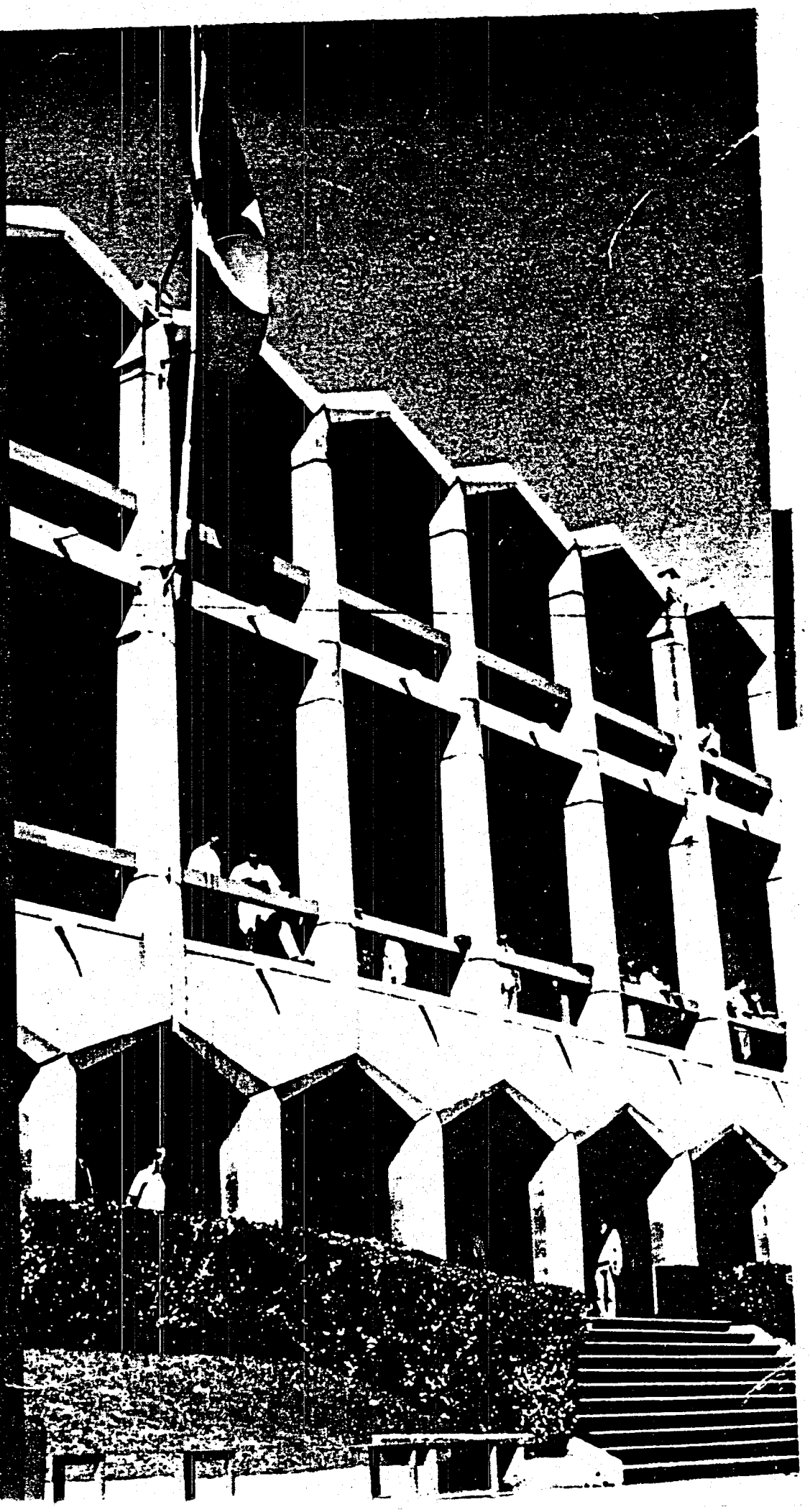
Institute for Regulatory Science

Universidad Interamericana de Puerto Rico

Universidad Politécnica de Puerto Rico

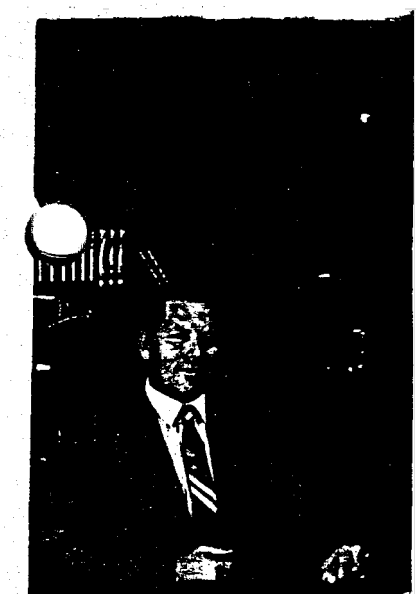
Universidad del Sagrado Corazón de Puerto Rico

Universidad Popular Autonoma del Estado De Puebla



UPAEP

universidad popular autónoma del estado de puebla



LETTER FROM THE CHANCELLOR

Each passing day a society reveals its character, its condition and its stage of development. A university within that society must reflect the same qualities; hence to understand a society we should examine its academic institutions.

The Universidad Popular Autonoma del Estado De Puebla (Popular Autonomous University in the State of Puebla—UPAEP) was established through the united efforts of the people of Puebla, Mexico. Their desire to offer their young men and women the opportunity of a better education, in an atmosphere of academic excellence and a deep sense of commitment to human rights and values, is being achieved within a university environment of fostering responsibility and respect for others.

The UPAEP is a non-profit organization that since its creation in 1973 has functioned with low operating costs as a result of its high productivity. This committed effort enables UPAEP to provide educational opportunities to many young people who want to pursue higher academic studies. Hundreds of well-known and respected professionals in the Puebla area donate their time to the university as teachers and professors. The gifts of private donors have provided the necessary financial resources.

This spirit of community and solidarity is passed on to the senior students through their participation in an Interdisciplinary Social Services Program: a program which is especially formulated to serve the neediest areas of Puebla.

By assisting in the development of capable and responsible professionals UPAEP contributes to the society that has and continues to provide its unconditional support and commitment to the university. This is our way of helping to build a better and more prosperous Mexico.

Mario Iglesias García-Teruel

UNIVERSIDAD POPULAR AUTONOMA DEL ESTADO DE PUEBLA
21 SUR 1103 C.P. 72160 Tel. (22) 49-08-80;
46-95-80; Fax (22) 32-62-91
Puebla, Pue. Mexico

THE HISTORY OF UPAEP

The UPAEP was established in May of 1973 on the site of an old hacienda. The University was initially comprised of only two schools—Architecture and Business Administration—with 450 students and 50 professors. Initially, many of the founders taking this pioneering step thought the experiment had little chance of success.

The new University lacked official recognition, buildings, proper classrooms, and adequate financial resources. Classes were conducted outdoors in the garden. Despite these obstacles, the University did have an abundance of professors who willingly gave their time and effort, and an abundance of students eager to learn.

UPAEP continued to grow and soon after, the Schools of Public Accounting, Political Science, Law, Economics, Civil Engineering, and Medicine were in operation. A preparatory school was also established.

The first building was purchased and the Schools of Psychology and Chemical Engineering were established in 1975. Encouraged by its many successes and support of the local population, the government of Puebla granted official recognition to UPAEP that same year. Already, the University was serving 2,000 students and hosted 300 professors.

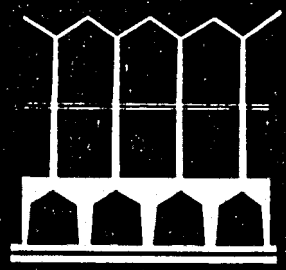
As a result of this momentum, the School of Philosophy was opened in 1976. In 1978, the Schools of Industrial Engineering and Dentistry were established and the historic Haro and Tamariz Hospital was converted into the School of Medicine. This beautiful ancient building was further refurbished and equipped and today functions as UPAEP Hospital.

In 1979, the School of Nursing opened its doors, and UPAEP acquired land to construct its Central Administration building. The School of Agricultural Engineering was created in 1982 and the School of Communications in 1983. UPAEP continued to grow: the School of Education was established in 1985, the School of Computer Science in 1986, and the Schools of Administration of Institutions, Graphic Design, and Ecology in 1990.

Today, thousands of graduates proudly hold UPAEP degrees and are using the knowledge they gained to contribute to many aspects of Mexican society. The University currently has over 4,600 enrolled students and over 850 professors, and continues to serve the community and the nation.

UPAEP at a Glance

- Twenty-two schools for undergraduate study and seven graduate schools
- 5,100 graduated students
- 4,691 enrolled students
- Over 850 academic instructors
- 1,650 incoming students



UPAEP: OUR MISSION

A historical and cultural mission to provide: a solid foundation in a changing society. . .

UPAEP has a historical and cultural mission as well as an academic mission. We at UPAEP believe that all universities interact with the society of which they are part, the culture they foster, and the men and women they educate and influence.

Historical Mission

Although all universities share the goal of academic excellence, every university has a unique personality, determined by the society of which it is part and the goals and ideals of its founders.

UPAEP was established during a period of great social and political debate within Mexico. It was hoped that this new institution would provide an academic environment to inspire the continuation of this great debate, through the encouragement and free exchange of new ideas. UPAEP's goal was also to serve as a solid foundation in a changing society, thereby helping to preserve the moral and religious values of the family and the Mexican nation.

. . . and a better understanding of the cultural heritage which forms our national identity.

Cultural Mission

UPAEP also has a mission to preserve and enhance the culture of Mexico and encourage understanding of cultural influence and ethical questions. As a result, UPAEP approaches cultural issues and ethical debate with more aggressive interest than many other academic institutions.

The University promotes the study of Judeo-Christian influence on modern culture, especially in the context of the problems of the contemporary world. UPAEP also takes seriously its role to foster examination of the rapid development of modern science and the ethical questions it raises.

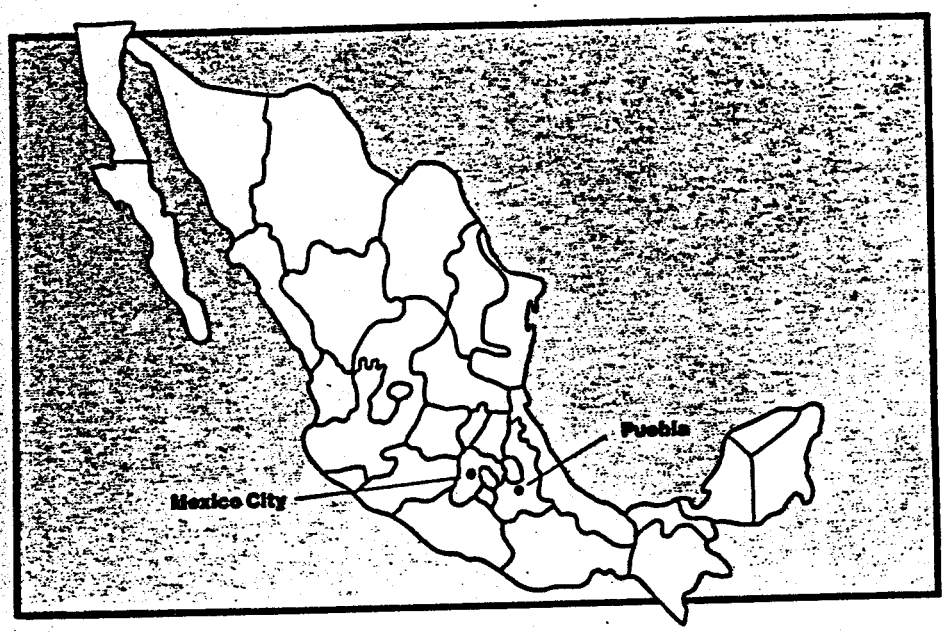
Another very important part of our cultural mission is to reach a better understanding of the cultural heritage which forms our national identity. Such an understanding is necessary for better comprehension of our society as well as future progress.

THE CITY OF PUEBLA

PUEBLA: A 460-year-old city chosen by UNESCO for its wealth of colonial art and architecture as a "Heritage of Humanity."

Puebla, the city in which UPAEP is located, is the capital of the state by the same name. Situated approximately 80 miles from Mexico City, Puebla is one of Mexico's most important and historically rich cities.

Puebla was founded in 1531 when, as an experiment, land was offered to the Spanish soldiers who participated in the conquest. During the 17th century, as a result of its rapid growth, Puebla became the second most important city in New Spain, as Mexico was then known.



For today's admirers of art and architecture, Puebla possesses some of the greatest architectural treasures of Mexico. The city offers an abundance of temples and colonial architecture, and its cathedral is considered one of the most elaborate on the continent. As a result of this extraordinary collection of art and architecture, the World Committee of UNESCO named Puebla a "Heritage of Humanity" in its eleventh meeting on December 10, 198".

Industrial activity in Puebla dates back to 1835, when the first textile factory in Latin America was founded. Puebla continues to be commercially significant, hosting a number of industrial parks and businesses such as Volkswagen.

Agricultural products, such as corn, sugarcane, rice, and fruits, are the backbone of the region's economy. Livestock is also significant.

Puebla retains strong cultural traditions and there is still considerable production of craftsmanship, especially ceramics and basketweaving. Puebla is even noted for its exquisite contributions to Mexican cuisine, including the famous mole, chalupas, and los chiles en nogada.

ACADEMIC PROGRAMS AND DEGREES

UPAEP currently offers the bachelor's degree in 22 fields of study in the Humanities and Sciences; master's degrees in 10 fields including Architecture, Philosophy, Public Finance, Business Administration and Clinical Psychology; Analysis and Structural Design, Contemporary Political Thought, Decorative Horticulture, International Commerce, and Theory and History of Political Thought.

Its graduates play a significant role in wide fields of current Mexican development. Another 4,500 are currently enrolled and are preparing to take their places in the nation's workforce. More than 842 full and part-time professors lead the academic programs offered in the following divisions and institutes:

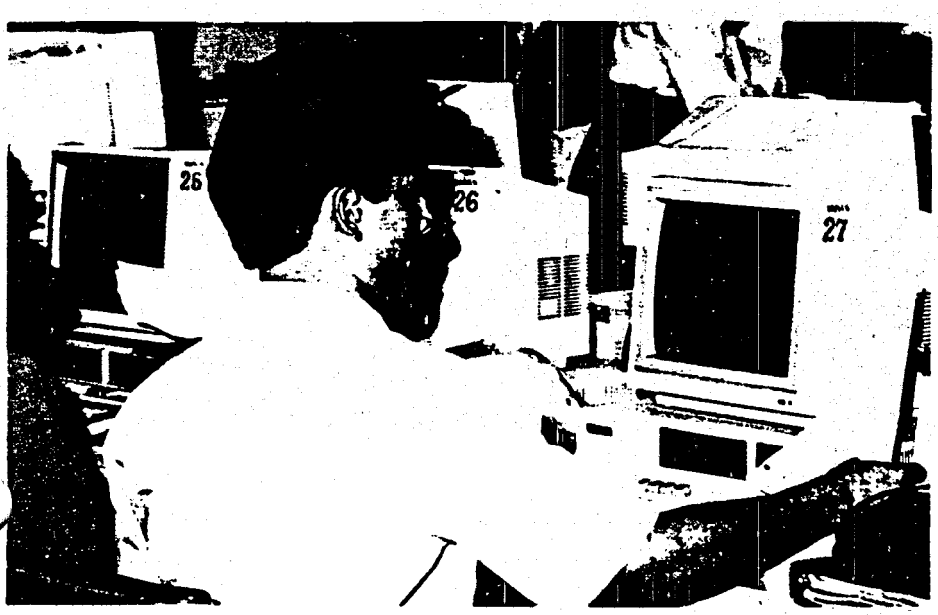
Division of Humanities & Social Sciences
School of Philosophy
School of Political Science
School of Law
School of Psychology
School of Communications
School of Education

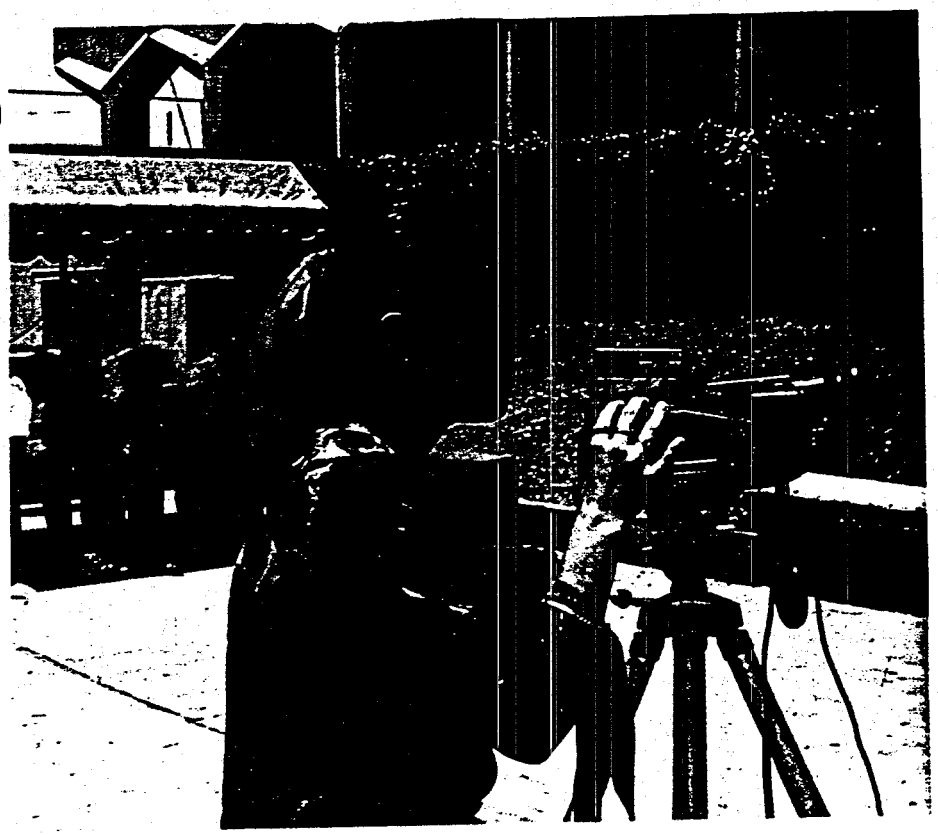
Institutes of Human Research

Health Sciences
School of Medicine
School of Dentistry
School of Nursing

Division of Economic Sciences
School of Business Administration
School of Public Accounting
School of Economics
School of Administration of Institutions

Division of Technological Sciences
School of Architecture
School of Civil Engineering
School of Chemical Engineering
School of Industrial Engineering
School of Agricultural Engineering (Vegetable Anatomy and Zoonomy)
School of Computer Sciences
School of Graphic Design
School of Ecology





A comfortable and safe environment where students can reach their highest academic and personal potential.

Counseling

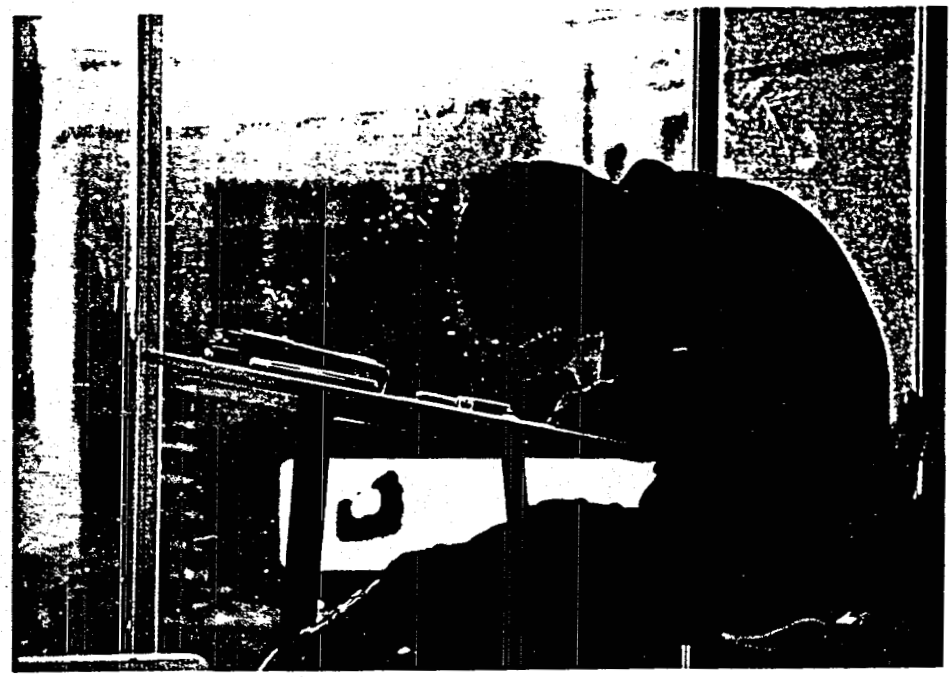
UPAEP offers individual counseling to its students to assist them in their academic work, study habits, adaptation to university life, and personal development.

Extracurricular Activities

We believe that UPAEP's goals are also served by students' experiences outside the classroom, and the University fosters a wide range of extracurricular activities. A series of University-sponsored "Cultural Wednesdays", for example, presents artists in performance on the campus, and students are encouraged to participate in competitions organized by the Department of Cultural Promotion.

A sampling of student groups active at UPAEP includes the University Theater Group; Folkloric Dance; Classical Ballet and Jazz; Chorus; Speech and Debate Club; Photography Club; Animation Club.

THE NEXT 10 YEARS AT UPAEP



UPAEP is launching a series of projects for material improvement and enhanced academic research. Contributions for these projects will fill UPAEP's financial gap and will provide the University with the means to maintain its objectives:

1. **TO EXCEL IN ACADEMIC QUALITY:** Upgrading UPAEP's teaching capabilities (faculty training, building completion and equipment procurement);
2. **TO REACH OUT AND PROMOTE SOCIAL JUSTICE AND FREE ENTERPRISE:** Supporting social programs performed by students (equipment procurement and financing of social service programs); and
3. **TO FORWARD ACADEMIC RESEARCH:** Providing intellectual support to face the challenges of social justice, free enterprise and genuine development in Mexico and Latin America (financing of academic projects and social service programs).

OFFICIAL ACCREDITATION

UPAEP degrees have official accreditation through Executive Decree 2370 of August 1, 1975.

All academic programs at UPAEP are validated by the Secretary of Education of the state of Puebla. UPAEP has its academic curricula registered with the Professional General Directory No. 365 of Book 71–11.

National Register of Scientific and Technological Institutions of the National Counsel of Science and Technology (CONACYT) No. 90/154.

The School of Medicine is registered in the World Health Organization Directory of Medical Schools.

UPAEP is a member of the following professional organizations:

- Union of Latin American Universities (UDUAL)
- Federation of Private Mexican Institutions of Higher Education (FIMPES), founding member.
- Mexican Association of Christian Institutions of Higher Education (AMIECIC)
- International Federation of Catholic Universities (FIUC)
- Mexican Association of Graduate Schools of Administration (AMEGA)
- International Association of University Presidents (IAUP)

POLYTECHNIC UNIVERSITY OF PUERTO RICO
SAN JUAN, PUERTO RICO

A. Institutional Capability Statement

Polytechnic University of Puerto Rico (PUPR) eminently an engineering school, awards BS degrees in Civil, Industrial, electrical and mechanical engineering. These four programs are accredited by the Accreditation Board for Engineering and Technology (ABET). Besides these, PUPR also awards BS in Land Surveying, and Architecture. Additionally, offers a bachelor in Business Administration. At the graduate level is offering a Master in Engineering Management(MEM). The total enrollment is about 4,500 of which close to 80% belong to the engineering programs.

Two new engineering programs were submitted to the Council of Higher Education for their authorization. These are: BS in Environmental Engineering and a BS in Chemical Engineering. At the graduate level PUPR is working on three new programs: a) MS in Civil Engineering, b) MS in Manufacturing Engineering, and c) MS in Electrical Engineering. (See attachment A for the description of the undergraduate programs),

The physical facilities include over 25 modern laboratories furnished with state of the art equipment, adequate to conduct experimentation at the undergraduate level. The only program that lacks the appropriate laboratory equipment is the Chemical Engineering.

The library is one of the best of its kind in Puerto Rico. The number of volumes available, the publications, the CD ROMS, the computerized catalog and all the other modern features, indeed, make it an excellent one.

B. A list of PUPR's three main CEPA priorities for 1997-98

1. *Financial support for three full time professors each of Environmental Engineering and Chemical Engineering.*

2. *Financial support to furnish the Environmental Engineering Laboratory II with state of the art research equipment.*

3. *Financial support to initiate the acquisition of state of the art laboratory equipment for the Chemical Engineering laboratories.*

C. An updated list of PUPR's equipment and infrastructure needs

PUPR is working closely with the government of Puerto Rico and the industrial sector with the aim of establishing partnerships to conduct research and development that may promote the creation of new jobs.

In order to achieve this goal, it is essential that a Research Center be organized. Preliminary conversations with high echelon government officials have taken place with the purpose of identifying a government building in the neighborhood of PUPR's campus that may be acquired by us. In the building to be acquired, the installation of three laboratories are being considered. The first one will be the Surface Mount Technology (SMT) laboratory that will be moved from its present location. Its expansion, by adding more high technology equipment, will help serve much better the electronics industry sector in Puerto Rico by doing research and development for its members.

The second laboratory considered will be one to serve the plastic industry. An injection molding center with the capability to design and build molds will be built. Technical as well as engineering curricula in the mechanical engineering department will be developed to provide well trained people as well as molds to the plastic industry in Puerto Rico and elsewhere.

The third laboratory will be one to provide service to the biotechnology industry, specially to the pharmaceutical and food sectors. This laboratory will require two pilot plants, one for each sector. These pilot plants, besides serving the purposes of the chemical engineering program, will also serve the research and development activities required by the said industry.

This research and development center, with its three laboratories, will be manned by the faculty, especially those teaching in the graduate programs as well as the environmental and chemical engineering programs faculty members. The tentative equipment needed is the following:

1. SMT Laboratory

At the present time the laboratory have equipment in place for about $2.2 million. This equipment has been used to train technical equipment companies. Also the manufacturing line has been used to run tests of prototype components or models for several companies. PUPR industrial engineering students have taken courses about this technology. Additional equipment for about $1,000,000 may be required to offer better services. It will occupy an area of about 6000 ft^2.

2. Creation of a Product Realization Center for Plastics at Academia

A Product Realization Center can be defined as an integrated operational entity that has the latest technologies in terms of design, development, prototyping, fabrication of molds, molding of product, testing, assembly of product and characterization of processes, as well as characterization of materials.

The Product Realization Center (PRC), will have four main modules or components that are fully integrated and located within the Research Center. These are defined as follows:

Module 1 - Product Design Center

This will consist of at least ten (10) computer design work stations with the power, memory, and peripherals to run the design software to design the product, design the molds and tooling, and create the databases for manufacturing the molds, inspection and process controls, as well as assembly functions. The software will be both Parametric Technology and Unigraphics, to match industry preferences.

Module 2 - Rapid Prototyping Center

This will consist of two stereo lithography machines (SLA) that have the capability of depositing resin based plastic polymer in incremental layers (.001" or less in each pass) to build a model to exact dimensions of the design created by the plastics designer from the data bases generated during the design process. This allows the complete product to be created from the 3-D computer model. The designer can perform fit and function of internal and external components as well as provide samples for marketing. There are other promising technologies, such as sintering, which are still emerging. The rapid prototyping center will also have the capability of machining components of the product from the same 3-D models and databases.

Module 3 - Mold Build Center

This will consist of all the computer work stations, at least five, networked to the Product Design Center to develop the CAM (Computer Aided Manufacturing) and CMM (Coordinate Measuring Machine) and other computer controlled machines and equipment used to fabricate the components for the mold. This mold build center will have two EDM machines, one wire and one plunge; (Either Charmilles or Mitsubishi which have the highest accuracy and executions in the industry and the latest technologies). It will also have at least one large CNC machining center (15 HP with 30 tool charger with at least 40"x80"x20" of x,y,z travel. It will also contain two small CNC machining centers (10HP wth 20 tool charger with at least 20"x40"x15" x,y,z travel.

In addition there will be at least two CNC grinders, two conventional grinders, one CNC lathe, one conventional lathe, two conventional milling machines, drills, micro welding equipment, band saw, horizontal saw, heat treat ovens, one high speed electrode CNC machining center with a 40,000 RPM spindle such as a Klink or Leblond Makino, and the other supporting tooling and equipment.

The CNC equipment will all be hooked up and linked through an RS232 interface to the programming workstations and the CAD/CAM and information data bases. This will allow toolpaths and other machining and status and control data to be exchanged electronically. The Mold Build Center will also have a CMM again interfaced to the system to be used for measuring and digitizing parts and mold components for inspection and

performing dimensional checks. The Mold Build Center will be at least 30'x100' and will house the programming workstations and the manufacturing machines.

Module 4 - Product Molding Center

This will consist of two molding machines, a 70-90 ton, and a 150 ton machine both hydraulic. They will both be fitted with robotic unloading systems and be fed individually by hopper. A mini central feed system will also be hooked up to them to teach and expose the students to central feed techniques and equipment operation. There will also be two grinders to teach polymer reuse principles, regrind plastics of various types and various constituent mixes. Within this module will be set up work stations for assembly utilizing robotic assembly, ultrasonic welding and other mechanical as well as adhesive and chemical joining methods. There will also be vision inspection and measuring equipment, to teach process controls and quality control functions.

This module will be used to prove out molds and teach mold operation and mold processing principles and sciences, including polymer chemistry. In the industry, this resource is extremely difficult to find as it is as much of an experiential based science as a pure science based engineering discipline. Within this module will also be the laboratory to perform mechanical and chemical ALT (advanced/accelerated life testing) of products. This module will teach and develop process controls for molding and assembly operations for industry. This module will work with the UPR materials characterization laboratory as a plastic industry link to their resources for polymer materials characterization and development of material substitutes and behavioral properties and characteristics.

The following table shows the budget and the type of equipment to be acquired to the project labor to be applied and the facilities fit up as well:

CAD/CAM/CAE Programming Center	*$ 200,000*
Stereo Lithography System (3D)	*$ 150,000*
Rapid Prototype Silicone Molding Center	*$ 250,000*
Small five (5) Axis Machining Centers (8-10)	*$ 400,000*
Fully Programmable EDM's	*$ 400,000*
3D Digitizing/Scanning Center	*$ 160,000*
Laser Interferometry & Measurement Center	*$ 80,000*
Electrode Casting Center	*$ 75,000*
Heat Treatment Center	*$ 40,000*
Miscellaneous Machining Computer Interface Cards and LAN System	*$ 100,000*
SUBTOTAL EQUIPMENT	***$1,855,000***

Facilities Fit Up	*$ 300,000*
R&D Engineering and Technical Labor	*$400,000*
GRAND TOTAL	*$2,555,000*

3. The pilot plants for the pharmaceutical and food processing plants

These pilot plants, which also will be used as laboratories for the Chemical Engineering Program, are in a very preliminary stage of the planning process. New developments to identify and quantify the equipment required in each case are needed. However, the Environmental Engineering Laboratory II requires the following equipment which amounts to about $35,000.

1 Water Level Indicator, 50M Max Depth.
1 Landfill Gas Analyzer to Monitor Methane, Carbon Dioxide, Oxygen and Pressure C/W Logger, Battery Charger and Sampling Tube 110V 60HZ 1PH
1 Sampling Probe for use with 450-075/09. Length 650 mm. Complete with Handgrip
1 10 Liter Air Sampling Pump Supplied with Battery Charger and 1 Meter Plastic Tubing.
1 25mm Open Face Filter Holder
1 37mm Open Face Filter Holder
1 25mm GFA Glass Fibre Filters 100/PK
1 37mm GFA Glass Fibre Filters 500/PK
1 Flow Calibrator 2-25 Liters/min
1 Flow Calibrator 6-50 Liters/min
1 Hand Bellows Pump
1 Hydrogen Sulphide (H_2S) Gas, Monitor 0-100 PPM
1 Carbon Monoxide (CO) Gas Monitor 0-1000 PPM
1 Nitrogen Oxide Gas (NO), Monitor Ranger 0-100 PPM, Alarms 3 and 9 PPM
1 Nitrogen Dioxide (NO_2), Gas Monitor 0-1000 PPM
1 Hydrogen (H_2) Gas Monitor 0-2000 PPM
1 Sulphur Dioxide (SO_2), Gas Monitor, 0-100 PPM, Alarms at 2 and 6 PPM
1 Oxygen (O_2) Gas Monitor 0-25%
1 Gas Monitoring Station Comp. Frame, Enclosure, Logger & Sensors for Care on Monoxide, Sulphur Dioxide & Nitrogen Dioxide Batts, Charger & Software.

The following equipment will be part of the Chemical Engineering undergraduate laboratories.

1.	*Binary Manual Injection HPLC System*	*$ 26,000*
2.	*Gas Chromatography System*	*15,000*
3.	*Impact 4 x Spectrometer FT-IR & PC Station*	*2,200*
4.	*Atomic Absorption Spectrophotometer*	*31,000*

5.	*UV-VIS Spectrophotometer with PC Station*	*$ 13,000*
6.	*Analytical Mettle Balance Model AG 245 DR*	*3,000*
7.	*Mettle Top loading Balance* Model PG 533	2,800
8.	Hydrogen/Nitrogen/Air Generator Packages	12,000
9.	HPLC Analytical Columns	500
10.	GC 55 1/8 x 20 meters columns	500
11.	GC 17A Capillary columns	700
12.	Class-VP HPLC & GC Data Collector Software and PC Data Station	20,000
		$146,000

INTER AMERICAN UNIVERSITY OF PUERTO RICO

OVERVIEW AND CAPABILITY STATEMENT

JUNE, 1997

INTER AMERICAN UNIVERSITY OF PUERTO RICO

INSTITUTIONAL OVERVIEW

Inter American University of Puerto Rico (IAUPR) is a private comprehensive, multi campus, non profit institution of higher education serving the Commonwealth of Puerto Rico and the Caribbean. It was founded in 1912 by Reverend J. Will Harris. Inter American University is committed to provide an education of excellence adapted to the diversity of needs of the present and future demands of Puerto Rican society. IAUPR plays a key role in preparing the human resources for the development of the Puerto Rican economy.

In 1944, Inter American University (IAUPR) became the first institution in Puerto Rico to be accredited by the Middle States Association for Colleges and Universities. At present, Inter American University is authorized by the Council on Higher Education of the Commonwealth of Puerto Rico and is approved by the Federal Veterans Administration and the Commonwealth's Department of Education. In addition, Inter American University has been accredited by the American Bar Association and the Council of Optometric Education.

In 85 years the University has grown from a small liberal-arts institution located in the western region of the Island, to a multi-campus university system with diversified academic programs. IAUPR provides an array of programs in the professional and technical fields at the undergraduate and graduate levels in the arts and sciences programs (Graduate and Undergraduate Academic Programs). Its educational, research, and service roles require responsiveness to support today's public and private sectors.

An Inter American University education enables students to keep pace with innovations in society and to excel in a rapidly changing world. Resources are devoted to enhance the information technology system. The academic programs are constantly adjusted to better prepare students for the challenges of a global economy. New science and engineering facilities were just recently constructed. Libraries, laboratories and classrooms are being modernized with state-of-the art technology. Each campus has found a special way of improving the quality of life of its community. Thus, Inter American University has become much more than an educational center. Through its nine campuses and two professional schools, IAUPR is a major contributor to the Island's health, education, environment and economic stability.

Students become highly qualified professional men and women who actively participate in the social and economic development of Puerto Rico, either in public service or the private sector. Inter American University of Puerto Rico is a university where students, faculty and staff have an active role in community growth.

A commitment to excellence in education has made Inter American University the largest private, non-profit university in Puerto Rico and the Western Hemisphere. Young men and women from Puerto Rico, the Caribbean and around the world, choose Inter American for a well-rounded education that stresses high-level intellectual and marketable skills in a wide range of professional and technical fields.

Enrollment increases yearly in both the graduate and undergraduate programs. Total enrollment of IAUPR during the first Semester of the academic year 1996-97 was 42,034. This figure includes all levels: undergraduate, graduate and students of the professional schools, the School of Law and the School of Optometry. Of the total enrollment, 30,914 students are full time and the remaining are part time students.

IAUPR offers different academic programs throughout eleven campuses. Their respective emphasis are stated below:

Aguadilla - Strengthening of all academic areas with special attention in the disciplines related to Tourism and Management, in agreement with technical advances but in a social, cultural and historic context of Puerto Rico

Arecibo - Scientific technological emphasis on Sciences Business Administration, health related professions, supervised practice work and research for students.

Bayamón - Advanced Technological Sciences and Engineering are emphasized; Aeronautics, Business Administration, Computer Sciences as well as Natural Sciences are offered.

Barranquitas - Education and Criminal Justice are emphasized at this campus, also Business Administration and Secretarial Sciences, Mathematics, Sciences, Nursing and Technology are particularly important at Barranquitas Campus.

Fajardo - Liberal Arts Education, Human Resources prepared for service areas with emphasis on Tourism; communications skills and cultural heritage are strengthened to improve quality of life.

Guayama - Technical, professional degrees and associate degrees; emphasis placed on Health, Technology, Education and Business Administration.

Ponce - Emphasis of mission is on Education, Health Management and Entrepreneurship; Industry, Technology, and Humanistic approach. Also special needs of adults and disadvantaged and talented students are given special attention.

Metropolitan Campus - Undergraduate studies in Science and Technology, Economics and Business Science; Behavioral Sciences; Education, Nursing and Humanities. Graduate Programs and Research to be strengthened.

San Germán - Environmental Sciences and interdisciplinary projects are emphasized. The use of technology in daily life and bilingual education are highlighted at this campus.

School of Law - Curricular reform finished in 1986; accredited by the American Bar Association. Graduated over 650 students who pursue a Juris Doctor degree.

School of Optometry - Graduates Doctors of Optometry. Only accredited bilingual program in the United States, Caribbean and Latin America. Students are prepared for State and National Boards examinations for licences to practice Optometry.

As of 1997, the IAUPR has a faculty of 2,569. A major investment has been made during the past three (3) years in developing Total Quality Management capabilities throughout the entire University System including faculty and administration. Each Campus is adequately staffed and equipped with an Educational Resource Center. These Resource Centers function together as an automated library system. An on-line catalog provides access to all Universities bibliographical resources that are made available for computer based research. The System's collection contains more than one million volumes in printed microfilm and audiovisual formats. All the participating Campuses have installed fiber optic technology, facilitating teleconferences and communications systems.

The governance of the Inter American University System rests with the Board of Trustees which consists of twenty-three members who represent a wide spectrum of professional, educational and business fields. Trustees serve the University on a voluntary basis without financial remuneration. Under the leadership of the Central Office and with the approval of the Board of Trustees, a decision was made to decentralize functions and give each academic unit added autonomy. This process of decentralization has resulted in a revision of each Campuses Mission and Goals and a review of the administrative and fiscal policies of the Institution.

Inter American University of Puerto Rico (IAUPR) is unique in a variety of ways and strengths:

Uniqueness:

- Inter American University of Puerto Rico is the largest private institution of higher education in the Nation.
- IAUPR has the largest Hispanic student enrollment in the Nation.
- IAUPR has over thirty strategic alliances among institutions throughout the world including the United States, Europe, South and Central American.
- IAUPR hosts numerous international academic conferences in Science, Business Research, and others.
- IAUPR has the largest investment in higher education in Puerto Rico in construction and telecommunication projects.
- IAUPR has held a position prestige in the Hispanic community for the past 85 years.
- IAUPR has a respectable position throughout all the federal agencies based on its administrative capacity. IAUPR's President is a member of the White House Commission on Educational Excellence for Hispanic Americans.

- IAUPR is financially sound with the largest Endowment Fund among any institution in Puerto Rico.
- IAUPR has the only School of Optometry and School of Aviation in the Commonwealth of Puerto Rico.
- The Board of Trustees has wide representation from members of different sectors of the community and business.

Strengths:

- Academic facilities and infrastructure meet state of the art standards for academic excellence.
- A technological infrastructure of over 700 computers and fiber optic technology.
- Total Quality Management (Administration and Faculty).
- Implementing Outcome Assessment.
- Has the largest faculty body of any private institution in Puerto Rico
- Has a strong alumni community involvement that serves Puerto Rico and the nation.
- Middle States Association accreditation as well as other local and professional accreditations.
- The eleven (11) campus system serves the entire island of Puerto Rico with modern facilities and resources.
- External Funding is received from federal agencies for demonstration projects, research, acquisition of technology, student services and many others.
- IAUPR was awarded the Excellence in Service Award by the Puerto Rico Products Association.
- The Chamber of Commerce granted IAUPR an Excellence in Education Award for its outstanding dedication and commitment in the Service Sector.

FACULTY PROFILE

For the 1996-97 academic year IAUPR has a total faculty of 2,569. Twenty-eight percent (28%) of full time faculty have a doctorate and 66% masters degree while twelve (12.2%) of Part Time Faculty have a doctorate degree and 77% a masters degree. Two hundred and twenty four (224) full and part time faculty hold professional degrees. Tenured faculty increased in the first semester of 1995-96 to 47.2%.

Seventy professors were granted economic assistance for studies and sabbaticals. Twelve professors were awarded institutional funds to develop Computerized Educational Material.

Also, ten projects were awarded for Education-Innovations to do research on new teaching techniques. Total Quality Improvement Techniques Workshops were offered to the faculty. At the end of the 1995-96 year, the total faculty using quality or creative techniques in classroom increased from 49% to 85%.

INSTITUTIONAL CAPABILITY

Inter American University has placed itself in a unique position, reaching for the best resources in order to provide its students with a quality education, one that is responsive to the times.

IAUPR recognizes the primary role played by faculty in the accomplishment of its educational goals. Special attention is given to professional development opportunities for the faculty. Professors are also encouraged to continuously strive for excellence in the classroom as well as in their research and other creative endeavors. Total quality practices are currently being incorporated by faculty into the teaching-learning process. The following community service projects are examples of critical issues that are being addressed that will improve the quality of life in Puerto Rico:

Center for Environmental Education Research and Conservation (CECIA). The Center develops academic programs and performs environmental research. So far, about 25 projects have been developed at the Center sponsored by private and institutional support. It also offers seminars, workshops and other activities to high school and college students.

The Inter American Psychology Clinic. Operates a community mental health service center. It was established in 1992 to provide an alternative course of treatment for patients. Free services are provided by graduate psychology students supervised by licensed professional psychologists. A special unit treats children with learning disabilities and their families. Local foundations and private donors help keep the Clinic open to the public.

Institute for Drug, Alcohol and AIDS Prevention (IPDAS). The Institute implements measures to prevent AIDS, and alcohol and drug abuse among youth inside and outside our campuses. The Institute produces videos and other educational tools available to parents and teachers for a small fee.

Secretariat for the Elaboration of an Economic Development Strategy for Puerto Rico (Estrategia Puerto Rico). In 1993, Inter American University convened other institutions of higher learning and representatives of the business sectors to design a comprehensive blue print for the economic development of the Island. Various committees are working on an integrated vision of Puerto Rico beyond the year 2000, to be presented to the government as a goal to be met in areas such as health, education and transportation.

The Legal and Environmental Clinic. Affiliated to our Law School, this is the only source of free legal counsel in Puerto Rico for citizens and communities who seek environmental justice. The clinic also serves as a training center for law students.

Visual Assessment Clinic. Students from our School of Optometry, supervised by faculty members, provide free visual assessment and diagnostic services to the community. In 1995 alone, approximately 2,000 patients were served in 30 different locations throughout the Island.

The Inmate Education Program. This service, offered in local prisons, enables inmates to facilitate their transition into the workplace within the free society.

University-Industry Center. The Center promotes strengthening ties with business and government by offering research and training opportunities and by developing innovative collaborations.

Small Business Development Center. Provides island wide counseling and training to small entrepreneurs.

RESEARCH CAPABILITIES

In it´s continuous pursuit for excellence not only in the classroom but the research area, Inter American University has engaged in activities that will further enhance it´s educational mission. Research and technology development is a priority that can be perceived through its accomplishments.

During the past year, a **Biotechnology Laboratory** was established at Metropolitan Campus. Research data in tissue culture will be used for commercialization production procedures. Students are then trained in the skills of biotechnology to prepare them for advanced studies and the eventual employment in local pharmaceutical industry. The development of a technology transfer package to produce pathogen-free plants that will lead to new medicinal compounds for patenting is expected.

Other projects are taking place in the Barranquitas Campus in the areas of **human parasitology, biochemistry and molecular biology.** Research will be focused towards **agriculture, environment and human health.**

The quality of science education has improved considerably with the use of non-traditional modes of instruction at Metropolitan Campus such as the construction and utilization of locally produced equipment for science education computer interactive packages and inter active videodiscs in the construction of locally produced equipment, and computer-interfaced interactive laboratory equipment. Through this project faculty and students have successfully developed the specific skills needed in the construction and utilization of instructional scientific equipment. Moreover, technology is being transferred into the classroom through the laboratory system. The equipment is then used for general chemistry courses at the campus. Our Center was recognized by the Committee on Teaching Chemistry of the International Union of Pure and Applied Chemistry and UNESCO. It is one of six exemplary centers in the whole world.

Training workshops are being conducted in the use and application of **Internet work technologies** for science faculty and selected students. This will enable us to provide faculty with the tools necessary for the exchange and dissemination of contemporary science education curricular materials, instructional strategies and assessment tools available locally, nationally and internationally. The existing network infrastructure at **IAUPR** will be built on to install and maintain Internet servers for WWW, FTP and others to provide access to the Internet to all science faculty.

A collaborative computer-based laboratory activities project using the World Wide Web is being developed at Metro Campus. Emphasis is placed on real problem solving in laboratory experiments to discover chemical principles using local area computer networks and the Internet.

A set of comprehensive instructional modules for the introductory chemistry courses will be developed, implemented and evaluated. The modules will include a students´ manual and a teachers´guide and suggestions for their implementations.

New instrumentation has been purchased and integrated into the classroom and laboratory curricula. Students will learn concepts through hands-on experience in the undergraduate chemistry curriculum which includes Physical Chemistry; Analytical Chemistry; Biochemistry; Organic Chemistry and courses in Instrumental Analysis. Talented school students will be involved in special projects. One hundred fifty students (including chemistry majors) will benefit from this project.

A Minority High School Student Research Apprentice Program is encouraging high school participants to pursue research training and graduate studies. The project provides research experience for students with the help of faculty mentors.

Advanced biomedical research and training in Puerto Rico is taking place at our campuses through a research project aimed at research areas of biomedical importance. The project provides Puerto Rican students, the opportunity to acquire research skills.

IAUPR is excelling in health-related sciences, specially in its efforts to aid disadvantaged students to gain admission to health profession schools. Literacy and mathematical skills and weaknesses in basic science courses, counseling and orientation and study skills are emphasized in a health career opportunity program at the San Germán Campus.

New technology and advanced techniques have been introduced in the microbiology program area through two research projects at the Arecibo campus: Gas Chromatography Technology to Improve Microbiology Analysis and Molecular Analysis by Liquìd Chromatography for Mycobacterium Identification. Modern instrumentation will allow the faculty to strengthen and update the teaching learning process in the laboratory. At the same time it involves the students in undergraduate research. Curricular improvement of a number of courses of the Biology Program is expected.

Higher Education programs have also received wide recognition. English and Spanish Track Programs attend specific targeted populations. They have been instrumental in providing educational opportunities and alternatives for thousands of secondary and postsecondary socially and economically underprivileged Hispanic youth. They offer enrichment services such as instruction, tutoring, personal and academic counseling to support those individuals who have had limited opportunities. Institutional and community resources have been maximized through the operation of TRIO Programs instruments, materials and modules developed in the Spanish language and used with similar populations outside of Puerto Rico.

The introduction of technology-based instruction into the curriculum has improved the academic programs and faculty development. The current teaching/learning process in the classroom has been revised through the incorporation of modern technology. Emphasis has been placed in student assessment at the classroom level to adopt alternative teaching learning strategies more relevant to actual student progress and understanding.

Academic support and operation services have been redesigned in order to achieve significant and measurable improvement through a Strategic Enrollment Management Program. A computerized Information System has been developed to link via LAN all functional areas.

Tutoring and literacy services redesigned to integrate the emergent technologies to sustain information acquisition skills, aim at improving academic performance and support services for Hispanic low-income students.

An enrichment program for Basic Biology and Pre-Calculus courses is also underway. It will impact 800 undergraduate students annually at the Arecibo Campus. The project consists of introducing Interactive Teaching Learning into the basic and pre-calculus courses through the implementation of electronic classrooms and multimedia laboratory connected to Internet, monitored through systematic computerized outcomes assessment methodology. The creation of a large scale interactive Web Site of information will allow the dissemination of materials benefitting students and faculty.

The Biology and Mathematics curricula at the Aguadilla Campus are enhanced through the use of computers and multimedia. Computerized simulated research will help to retain students as well as encourage the professional development of the faculty. Other science programs, education, health, tourism and management existing programs will be strengthened, raising the levels of academic excellence. Ties with industry, commerce, banking and other public and private entities will be developed and strengthened through the mutual sharing of resources and scientific knowledge.

An illustration of how well-advanced IAUPR is in technology and information sciences is the development of an automated station for the synchronization performance characterization of telecommunications network. It will allow analysis of telecommunications network through the collection of data tests at the Bayamón campus. Undergraduate students that will participate in the research project will be exposed to the disciplinary nature of network synchronization. The Puerto Rico Telephone Company is collaborating in the collection of data.

IAUPR keeps close ties with the business and industry community in order to respond to societies´ needs to better equip students with the technical knowledge they will need to face the changing world. This path can be perceived throughout the entire University system. The University recently signed a cooperative agreement with the U.S. Small Business Administration to manage and administer a comprehensive small business assistance network to deliver services to small business in Puerto Rico. IAUPR has had ample exposure to the small business community through many programs. At present, the following programs are active:

- Small Business Development Center from which numerous small businesses and faculty members receive direct counseling and training sessions.

- Small Business Management and Entrepreneur Institute. Besides normal courses and experience for students, it provides educational training and consulting services in areas of finance; entrepreneurship; public policy; family business; corporate ventures and innovation technology.

- Center for Applied Economics: provides research in the field of Economics. The center that has distinguished scholars in its research team, serves the research needs of small businesses.

- **World Trade Information Center:** is committed to developing international commercial skills enabling students and the local business community to increase their exporting capabilities.

Other outstanding activities under development are: Small Business Seminars; Graduate Program of International Business; Puerto Rico Strategy and the President's advisory committee on Development.

IAUPR has recently received approval for the implementation of its graduate program in International Trade.

An additional systemwide program that deserves to be acknowledged is AVANCE, an adult education program which provides learning experiences through flexible modes of study, encouraging adults to expand and update their knowledge, skills and attitudes to meet the needs of society.

TECHNOLOGY AT THE SERVICE OF TEACHING AND LEARNING

Higher education institutions that seek to achieve academic excellence must incorporate new technologies and redefine the scope of the teaching/learning process. Through its Information and Telecommunications Plan, IAUPR strives toward: (1) Transformation of the Educational Resource Centers into Information Approach Centers; (2) Incorporation of new technologies to the teaching/learning process and; (3) The development of Video/Voice/Data Centers.

To achieve these goals new equipment has been acquired: 200 personal computers for the libraries; local networks were completed at each campus to connect computers that will access a Unicorn Literacy System and other services including Internet. Faculty has been trained in computer use and community access. Instructional Development Centers offer support at each campus at specially equipped laboratories for local and international Internet. The World Wide Web is widely used throughout the eleven (11) campuses.

A high speed fiber optic network has been completed allowing not only its use in the teaching/learning process but for access to distance learning education to the entire academic community. Video conference equipment was purchased.

Achievements in this area for 1995-96 include:

- Connection of all computers through the network (via monitor, personnel computer or workstation).
- Administrative network to support Banner System.
- Academic network in support of library system (200 Sirsi System; 2,500 Internet users)
- Installation of T1 to improve access to Internet via UPR system.
- Distribution of processes to improve services (Time to access information has improved)
- Management information system has been developed.
- Thirteen modules developed for Economic Assistance.
- Twelve Information modules developed for Students.
- Nine modules developed for Finance Office.

- Eleven modules developed for Human Resources.
- On-going faculty training in new teaching/learning techniques.
- Development of computerized educational materials.
- World Wide Web Home pages at six campuses.

However, the most outstanding achievements have been:

- Constant increasing need of the teaching learning process
- Modification and increase in services
- More users
- Increases in the capability of information
- Improvements in the network infrastructure

UNIVERSITY OF THE SACRED HEART

A. General Profile:

The University of the Sacred Heart is a coeducational, non-profit, private university located in San Juan, Puerto Rico. It is governed by a 24-member Board of Trustees, who appoints a President as the institution's chief executive officer. The University has a full-time faculty of 154 professors and 209 part-time professors. Currently, the University of the Sacred Heart offers 36 majors leading to undergraduate degrees in six Departments: Business Administration, Social Sciences, Natural Sciences, Communication, Education and the Humanities; it offers associate degrees in five technical programs; a professional certificate in Medical Technology and six Master degrees in Business Administration, Education and Public Relations. The University is accredited by the Middle States Association, the Puerto Rico Council of Higher Education, the Committee on Allied Education and Accreditation (Medical Technology Program), the Council on Social Work and the National League of Nursing. Total enrollment for the fall of Academic Year 1996-97 was 5,154; having 4,766 undergraduates, 354 graduates and 34 Medical Technology certificate students. In June, 1996 the University awarded 26 Associate degrees, 581 Bachelor degrees, 38 Medical Technology certificate students and 24 Master degrees.

The University is located in the Santurce district of the city of San Juan, in the heart of the San Juan Metropolitan Area. An aerial view of the institution would show a 33-acre green pocket with early turn-of-the-century

buildings and modern facilities nestled in a densely populated neighborhood. These characteristics have helped to determine the university's fundamental urban nature and the composition of its student body, which is mainly Hispanic.

The origins of University of the Sacred Heart can be traced to the end of the 19th Century (1880). The University was originally founded as an elementary and secondary institution by the Sisters of the Order of the Sacred Heart. In 1935, the Order established the College of the Sacred Heart, a higher education institution to provide education in the liberal arts to young Puerto Rican women. In 1972 it became a coeducational and pluralistic University, governed by a lay Board of Trustees. In 1988, following a 17 year period of explosive growth in which enrollment increased from about 800 to close to 8,500, the University implemented its first Strategic Development Plan which reformulated its mission and academic goals and programs. Institutional academic leaders initiated a reform aimed at achieving a more personalized education and reinforcing the liberal arts and sciences. Over the following years, the University concentrated in strengthening its admission policy and decreasing its enrollment by around 40% while maintaining its faculty body to allow for a more enriched educational experience. This visionary project has placed the University of the Sacred Heart at the forefront of educational excellence in the Island.

The Mission of the University of the Sacred Heart, as revised in consultation with students, faculty and staff and approved by the Board of Trustees in 1988, reads as follows:

> To educate intellectually free and morally responsible men and women willing to participate in building a more authentically Christian society.
>
> The University recognizes that faculty and students are co-participants in the educational process, that they are committed to continued intellectual and moral advancement and to the voluntary development of a social consciousness that promotes professional responsibility.
>
> The University promotes a participatory, active and personalized education that is relevant to modern social and cultural realities. It emphasizes in equal measure humanistic, scientific, technological and professional formation, complemented with the development of logical thought, critical and creative thinking skills, team work and the ability to recognize and practice moral values. It realizes that education is a life-long endeavor and gives special attention to the continued education needs of its members and the community in general.

The urban character of the University allows for constant interaction with its surroundings. The institution intends to use its position and prestige and its strategic location in the heart of the Island's center of business, government, cultural and professional activities to serve as an agent of change for Puerto Rican society as we meet the complex but promising challenges of the new millenia.

B. Other Facts:

Financial:

Tuition costs (1997-98): $125 for an undergraduate credit; $150 a graduate credit

Operation Budget: 1995-96 - $17,893,563; 1996-97 - $19,094,028

Institutional funds for Scholarship: 1996-97 - $778,302

Faculty/student ration for Fall semester academic year 1996-97: 1:27

Computers/student ratio for academic year 1996-97: 1:18

Average class size: 24 students

C. Major Strengths:

* Recognized tradition of innovative projects and a commitment to excellence during its 62 years as a higher education institution.
* Strong academic programs in Communications, Business Administration, Tourism, Natural Sciences, Allied Health, Education, Computer Sciences, Social Sciences and the Humanities.
* Strategic location and attractive campus.
* Recognized faculty; committed to teaching, but active in their professional fields.
* Growing community presence and a commitment to community development.
* Center for the Arts. (Modern Arts Museum; Art Galleries; Radio Museum; Sculpture Garden; Belaval Theater)

D. Innovative Efforts:

* Automated Library using an innovative graphic environment.

- Tele-Sagrado - an advanced internal and external telecommunication network produced by students.
- The Community Development Center: co-curricular project to place students in community based organizations (CBO's)
- Institute for the Study of Violence on Media; Center for Research and Development of Center for Development of the Industry; Tourism, Insurance and the Center for the Development of the Third Sector.
- Center for Entrepreneurial Development of Women.
- The Center for Academic Research: provides support for faculty research and development.
- The Personal Development Center: (a nationally recognized leader in personal counseling, and drug and alcohol abuse prevention)

E. Areas for New Developments:

- <u>Technological Infraestructure:</u>

  Incorporate the most advanced infraestructure in our Telecommunication studios; photography labs; visual/graphic arts labs; science labs and computer centers;

- <u>Community Services and Outreach Projects:</u> to become a development and support center for CBO's

*Curriculum Development

New projects in Information Sciences, Telecommunication; Entrepreneurial Sciences; Interdisciplinary Studies;

*Innovative Teaching Strategies

Production of multimedia educational resources; "learning by serving" model;

* Peer-Supported Student Services Model

* Institutional funds for Scholarships: 1996-97- $778,302

Universidad Austral de Chile

Conocimiento y naturaleza

La Universidad Austral de Chile, es una Universidad Privada, considerada dentro de las Universidades tradicionales de Chile. Fue fundada el 16 de febrero de 1954, obteniendo su personalidad jurídica el 7 de septiembre del mismo año, siendo esta fecha la que conmemora oficialmente el inicio de la Universidad. La comunidad universitaria está formada por alrededor de 9.200 alumnos de pregrado y 600 de postgrado. Además cuenta con 776 profesores de jornada completa y 823 funcionarios de administración y apoyo distribuídos en las diferentes Facultades ubicadas en los Campus Isla Teja y Miraflores (Valdivia) y Campus Puerto Montt en la ciudad del mismo nombre. La Universidad mantiene sedes en Ancud (Isla de Chiloé), Trapananda en la ciudad de Coyhaique en la XI Región y Oficina de Representación en Santiago.

Posee 10 Facultades con 68 Institutos (Departamentos), 28 Carreras Profesionales, Conservatorio de Música, Ballet Folklórico, Orquesta de Cámara y Conjuntos Corales, Jardín Botánico, varios Museos (Históricos, Antropológicos, Arte Moderno), por lo que es capaz de entregar formación de alto nivel en la casi totalidad de las áreas fundamentales del conocimiento y de la creación.

La Universidad Austral de Chile, como una institución de educación superior, coloca un gran énfasis en el nexo entre programas de investigación de relevancia regional, nacional e internacional y la calidad de la docencia; la contribución directa o indirecta al desarrollo social, cultural, y económico de la sociedad; y la sustentación de las necesidades intelectuales de sus académicos, permitiéndoles que se mantengan en la vanguardia de sus disciplinas

Desde el año 2000 la Universidad Austral de Chile es miembro activo de CEPA, participando por primera vez en el SUMMIT 2000 en Brownville, Texas. En septiembre del mismo año CEPA cofinanció la participación a un representante de la Universidad en el "2000 Environmental Leadership Course" del Smithonian Institution que se llevó a cabo en Front Royal, Virginia. A fines de noviembre se organizó en el Campus Isla Teja el Coloquio "Universidad y Medio Ambiente" como una primera actividad organizada por nuestra Universidad en el marco del Consorcio CEPA. En él participaron representantes de San Juan de Puerto Rico, de El Paso, Texas y de universidades nacionales miembros

de CEPA. Dado que el objetivo de este coloquio era reactivar el proyecto de creación de un Centro de Ciencias Ambientales en la Universidad, se convocaron la mayor parte de los investigadores involucrados activamente en temas ambientales. Como consecuencia del buen éxito obtenido, a comienzos del año 2001, la Rectoría de la Universidad promulgó un Decreto nombrando un secretario ejecutivo y una comisión asesora para materializar la formación del mencionado Centro. Se presenta en esta Conferencia el estado de avance de este proyecto.

EQUITY RESEARCH CORP.

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August 20, 1997

Meeting Participants

Margarita Benítez
CEPA International Coordinator

NOTES ON THE AUGUST 6 BREAKFAST MEETING AMONG CEPA INSTITUTIONS INTERESTED IN TEACHER TRAINING PROGRAMS IN ENVIRONMENTAL EDUCATION

Participants

Dr. Linda Caine, Oak Ridge National Lab
Dr. Norman Peterson, Argonne National Lab
Dr. Gilberto Vélez, Universidad Politécnica de Puerto Rico
Dr. Diana Marínez, Texas A&M Corpus Christi
Dr. José Martín, UT/Brownsville
Dr. William Dawes, Sandia National Lab
Mr. René Sáinz, UT/Brownsville
Dr. José Jaime Rivera, Universidad del Sagrado Corazón
Dr. Ileana Irvine, Universidad Interamericana de Puerto Rico
Dr. Margarita Benítez, Equity Research

Topics discussed

Dr. Benitez began by pointing out that CEPA does not now include in its work plans assistance to member institutions in the development of teacher training programs. Nevertheless, most CEPA institutions offer such programs, and have shown great interest in sharing information about existing programs, and in adding an environmental component to them. This meeting was convened in order to facilitate information sharing and networking among CEPA members.

After everyone spoke about the status of teacher training programs at their respective institutions, it was clear that there were common concerns and needs. A second round highlighted interesting initiatives already taking place, such as:

1. A Sandia-sponsored curriculum designed for training science teachers at levels K-8 at the University of New Mexico. Among its salient features are the integration of scientific knowledge in physics, chemistry, biology, and math, the emphasis on hands-on experience, and a $25 limit on the cost of science labs, in order to assure they may be replicated in standard classroom situations. Dr. Dawes is willing and eager to share these materials with CEPA institutions.

2. The "Adopt a Wetland" program at TAMU Corpus Christi. It involves children from elementary school on, and uses the

Internet to open up their awareness of all that can be done directly and through telecommunications. Dr. Marínez will send additional information to all meeting participants. This program was of particular interest to Interamerican University of Puerto Rico, since they are involved in wetlands research.

3. National environmental education initiatives for children such as "GREEN," "WILD," and "GLOBE," which are linked to the National Science Teachers Association, have the support of Vice President Gore, and may be accessed through Internet. Another attractive project is the National Geographic Kids Network. Dr. Linda Caine will send additional information.

4. All National Laboratories hold summer institutes for elementary and secondary school teachers that last 3-4 or 6-8 weeks. National Lab representatives will send out additional information and application materials.

5. Universidad del Sagrado Corazón in Puerto Rico is holding its teacher training sessions at an at risk school district in Cataño, in order to approximate the realities that teachers must face in their daily lives. Information on the pros and cons of this experience is available.

6. Standardized test results for minority populations in the U.S. are very disturbing. UT/Brownsville and Sandia have compiled information on this topic.

The following suggestions came up:

1. Emphasis on development of national and international "environmental pen pals" through Internet.

2. Use the prestige of the National Labs in order to present the Sandia/UNM curriculum initiative as a viable option. In Puerto Rico, solicit the support of the College Board in order to convene university presidents to follow up on the recommendations of a blue-ribbon commission that dealt with the factors that affect the transition from high school to college.

3. Discuss at every institution the need for a service component for all science majors.

4. Use the environmental theme to stress the importance of a learning environment, and in order to improve other science skills.

It was agreed that a summary of this meeting would be circulated, and that institutions would carry on from there.

CEPA Action Plan

1997 - 1998

From the CEPA Action Plan 1997/98
Specific Initiatives

1. Research on Bioremediation and Hazardous Materials Monitoring

- **Paper based on joint bioremediation studies** conducted to date (ORNL/USACh) on the elimination of hazardous substances from indoor air using Chilean plants. *Authors*: Jan Ma, Art Stewart, Jaime Cornejo and Franz Muñoz. *Suggested journal*: Ecotoxicology
- **Joint proposal on bioremediation** on the biochemistry and systematic assessment of decontamination ability in Chilean plants, including practical applications (J.Cornejo. A. Stewart)
- **Joint research (IMA-USACh/ORNL), on the applications of microcantilever sensors** to the monitoring of hazardous contaminants in measurement chambers, buildings and labs (J. Cornejo, T. Thundat)

2. New Environmental Educational Programs

Programs to be implemented in 1998 by Gestion IMA at Universidad de Santiago de Chile:

- A Postgraduate program on the Best Science and Engineering for Environmental Protection, and
- An International Graduate Environmental Program on the basis of an adaptation of the recently evaluated, CEPA-based program developed jointly in 1997 by UPAEP, ORNL and UTK.

3. New R&D Proposals by ORNL/CEPA-Chile that need Funding

- **New Regional Environmental Information System (pilot)**
- **IMA as a state-of-the-art center** regarding research, technology transfer and education for environmental protection in Chile.

4. Identification of Technology Transfer Opportunities

5. Identification of Joint Research Opportunities

- Studies on metal uptake from contaminated waters using specific ligands bound to a polymeric matrix.
- Studies on the ability of metal uptake from water media by tree bark left as residue in the Chilean wood processing industry (oak, acacia, eucaliptus, pine and others)

6. The Technical Program for the 1998 CEPA Summit

Program will highlight the work and accomplishments of CEPA professionals and institutions.

7. Development of the CEPA web page.

Proposal to develop the IMA and CEPA Internet platforms as relational databases with search capabilities, to increase specialty topics coverage to include bilingual editions of all new information uploaded, to have state-of-the-art PCs and peripherals suitable for high end applications and further development, and to implement a multimedia classroom equipped with PCs properly fitted for information access and retrieval from Internet databases for workshop and professional training purposes.

CONSORCIO EDUCATIVO PARA LA PROTECCIÓN AMBIENTAL/ EDUCATIONAL CONSORTIUM FOR ENVIRONMENTAL PRESERVATION (CEPA)

MISCELLANEOUS

BY

EQUITY RESEARCH CORPORATION
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MEMORANDA OF UNDERSTANDING

WITH

U. S. DEPARTMENT OF ENERGY

AND

THE ENVIRONMENTAL PROTECTION AGENCY

CEPA

11/21/96

Memorandum of Understanding and Intent
on the
Educational Consortium for Environmental Protection
(Consorcio Educativo para la Proteccion Ambiental or CEPA)

BACKGROUND

Recent events, including the Summit of the Americas convened by President Clinton and the passage of the North America Free Trade Agreement (NAFTA), have increased awareness of the need to emphasize environmental protection in the Americas. The attainment and maintenance of environmental quality require public understanding of environmental protection principles by the public and the commitment of various governments to base their decisions on these principles. Successful environmental management must be based on an appreciation for recycling, reuse, pollution prevention, waste minimization, remediation of past contamination and regulatory compliance. This requires cooperation among all of the Americas, particularly countries neighboring the U.S., regardless of their level of industrial development. Environmental education, enabling environmental policies, strong public participation, and technology transfer are the cornerstones of successful implementation of environmental protection.

Environmental education provides the conduit for disseminating science and technology. Environmental protection presents highly technical issues, and little can be accomplished if there is a lack of information about the nature and extent of the problems, and highly trained environmental professionals to promote a sound regulatory climate. Knowledge is essential for national strength, and fundamental to environmental protection. Continuous advances in science and technology can provide for an effective environmental management, a deeper understanding of the relationship between people and nature, an expansion of available natural resources, and an increase in the use and economic benefits of resources.

Environmental policy that encourages innovation must be structured around the main factors that influence the application of technical resources to societal and economic needs which are: (1) a demand for action of adequate size, direction, and constancy; (2) sufficient numbers of technically skilled people, suitable research and development, and adequate capital resources; (3) an appropriate informational infrastructure upon which to base decisions; (4) a hospitable climate for commercialization of new technologies; and (5) an appropriate legal, organizational, and technological orientation in government.

Strong participation from the public in environmental preservation promotes a sustainable environmental protection process. Environmental protection is an ongoing process that requires active and iterative participation of academic, business, and governmental institutions. In developing sound environmental policies, everyone is both an information supplier and an information user. Therefore, active involvement of all participants through education, the enactment of enabling policies, and the enhancement of the information infrastructure is

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indispensable for the development of an acceptable and sustainable environmental protection strategy.

Technology development is essential for appropriate pollution prevention and control. It is more economical to transfer an existing technology used in one industry or country to a different industry or country, than to develop a new technology. Technology transfer requires certain prerequisites, notably the development of curricula for environmental competencies, including life cycle issues that are considered during product development and manufacture. The process of technology transfer ensures that research and development achievements and existing technologies are quickly and effectively transferred to the users.

THE CEPA VISION

The recognized need for effective environmental protection, environmental training, and education in the Americas led to the creation of the Consorcio Educativo para la Protección Ambiental (hereafter referred as CEPA or the Consortium). The CEPA vision is to strengthen the technical, professional, and educational environmental infrastructure in Latin America and the United States. The CEPA program consists of a true partnership among participating groups and includes curriculum development, student exchanges, faculty development, creation of educational materials, joint research, and other cooperative activities. The collaboration developing from this alliance will help to provide each participating institution, the private sector, and governments the expertise and capacity to develop strong environmental strategies and programs.

CEPA recognizes that cultural diversity must be considered when addressing environmental preservation. Cultural heritage and conservation are connected to societal and economic needs and environmental preservation. This concept offers promise for all the participating groups. The interests of environmental preservation are best served with a knowledgeable public that is able to understand the technological and environmental systems at various levels of society.

In the United States and Latin America, development of a sound environmental infrastructure is linked to the need for environmental education. Furthermore, in the United States, most Hispanics, because of socioeconomic-economic conditions, are not participants in the environmental process. The Consortium is unique because U.S. Hispanic Serving Institutions are considered to be critical for its growth. The Consortium interacts with the United States and Latin American professionals, and is an incentive for more U.S. Hispanics to enter environmentally related careers. Through participation in this process, U.S. Hispanic Serving Institutions will strengthen not only their ability to serve environmental engineering students, but also the surrounding Hispanic communities in general.

In research and policy, Consortium members can tackle many of the pressing questions about environmental protection and assist in addressing methods that ultimately support environmental preservation.

MOU PURPOSE AND GOALS

This Memorandum of Understanding and Intent (MOU) establishes a collaborative program in environmental science, education and research. The MOU is based on the common understanding that in education there is a need to base concepts such as pollution prevention, waste minimization and reuse, as well as product and material recycling and reuse considerations, on broad engineering science principles, and to introduce them into environmental education. New education programs may have to be developed to educate the present and next generation of engineers, scientists, and environmental professionals so that they can incorporate environmental factors into regulatory and industrial decisions. The sustainability of the Consortium is based on the commitments of the Consortium members, the private sector, and governments. Each member will ensure the success of CEPA by implementing the program within its educational, political, social, and financial framework. The principal components of this effort are listed below:

1. Educational Programs. Consortium participants and/or other entities as agreed by Consortium members work as collaborators in the development and evaluation of undergraduate and graduate curricula and research programs at participating institutions. These curricula and research activities may deal with areas pertaining to the development of environmental sciences, industrial ecology, environmental engineering, environmental management, or regulatory issues.

2. Faculty Development. Joint faculty/staff appointments, internships and exchanges at respective institutions will be encouraged (e.g., adjunct faculty, summer faculty, visiting staff scientists). These faculty/staff appointments, internships, and/or exchanges may or may not be salaried.

3. Joint Research. Certain Consortium members are more experienced than others. Research programs and projects are developed and/or enhanced through collaboration with participating laboratories and universities. The results of the research are then published in the open literature in recognition of the contributions of the participant institutions.

4. Student Exchange. The educational institutions participating in the Consortium are committed to identifying high-achieving graduate and undergraduate students who will participate in summer and education programs.

5. Technology Transfer. Consortium participants collaborate in the transfer of informational and technological resources. The participants: (1) provide resource personnel to teach courses and present lectures in mathematics, science and engineering at participating educational institutions as allowed under corporate policies, (2) assist in development and/or enhancement of courses, short courses, lectures, and workshops, and (3) foster the

effective transfer of pollution avoidance and control technologies.

6. Professional Training. Consortium participants collaborate on the development of training and certification programs for environmental professionals. One of CEPA's priorities in this area is the development of programs and courses that impart knowledge and skill to environmental trainers throughout the Consortium. They are seen as crucial for environmental infrastructure development en the Americas. The Consortium will suggest a System of acreditacion for the training of environmental profesionals.

7. Promotion of Sustainable Development. Since sustainable development is the appropriate balance of economical and societal growth for preserving the environment, CEPA enables professionals to acquire the acumen necessary to develop holistic strategies that address issues pertaining to the environment in a sustainable development context.

INITIAL PARTICIPANTS

°	CHILE	Universidad de Concepción Universidad de Chile Universidad de Santiago de Chile Comisión Nacional del Medio Ambiente de Chile
°	MÉXICO	Universidad Popular Autónoma del Estadode Puebla (UPAEP) Universidad Autónoma de Tlaxcala
°	UNITED STATES	Texas A&M University at Corpus Christy (Texas) The University of Texas at Brownsville (Texas) Argonne National Laboratory Oak Ridge National Laboratory Sandia National Laboratories United States Department of Energy Equity Research Corporation Institute for Regulatory Science
	Puerto Rico	Universidad Interamericana de Puerto Rico Universidad Politécnica de Puerto Rico Universidad del Sagrado Corazón de Puerto Rico

INITIAL TERM AND FUNDING

It is in the best interest of the parties that the initial term of this MOU shall be for three years, and

be automatically renewable on an annual basis thereafter in the absence of a sixty-day written notice by any Party to all other Parties.

It is expected that the Parties to this MOU will enter into component agreements for formal support to each other and/or non-signatories that may include university, nonprofit and/or profit-making organizations. These agreements may include Interagency Agreements, Funds-in-Agreements, Cooperative Agreements, Grants, Cooperative Research and Development Agreements, Joint Programs, and other forms of collaboration as appropriate, and consistent with authority and availability of funds.

AMENDMENTS AND TERMINATION

This MOU may be modified or amended by written agreement of all Parties. Any Party may terminate its participation in the MOU upon providing a sixty-day written notice to the other Parties.

EFFECTIVE DATE

This MOU shall be effective upon the latest date of signature of the Parties.

FOR THE PARTIES:

Corlis S. Moody, Director
Office of Economic Impact and Diversity
U.S. Department of Energy

Equity Research Corporation

Universidad de Concepción

Universidad de Chile

Universidad de Santiago de Chile

Comisión Nacional del Medio Ambiente de Chile

Universidad Popular Autónoma del Estadode Puebla

Universidad Autónoma de Tlaxcala

Texas A&M University at Corpus Christy

The University of Texas at Brownsville

Argonne National Laboratory

Oak Ridge National Laboratory

Sandia National Laboratories

Institute for Regulatory Science

Universidad Interamericana de Puerto Rico

Universidad Politécnica de Puerto Rico

Universidad del Sagrado Corazón de Puerto Rico

CEPA

Memorandum of Understanding and Intent
On the
Educational Consortium for Environmental Protection
(Consorcio Educativo para la Protección Ambiental, or CEPA)
Appendix 1

Participation by the Unites States Environmental Protection Agency

The recognized need for effective environmental protection, environmental training, and education in the Americas led to the creation of the Consorcio Educativo para la Protección Ambiental (hereafter referred to as CEPA or the Consortium). The CEPA vision is to strengthen the technical, professional, and educational environmental infrastructure in Latin America and the United States. CEPA recognizes that cultural diversity must be considered when addressing environmental preservation. Cultural heritage and conservation are connected to societal and economic needs and environmental preservation.

The United States Environmental Agency (EPA) relies on qualified professionals trained in fields as diverse as environmental policy, forestry, geology, economics, statistics, computer modeling, and information management to accomplish its primary mission of protecting public health and the environment on which all life depends. The students and faculty of CEPA's member universities represent an invaluable resource for EPA as it continues to explore more effective and innovative approaches to environmental and public health protection. Moreover, EPA's participation in CEPA will help accomplish several priority objectives, including support of the Agency's awareness-raising and outreach activities focused on the nation's Hispanic community, enhancement of EPA's ongoing efforts to recruit and retain qualified graduates, and the strengthening of ties to local communities served by CEPA's member institutions.

The original Memorandum of Understanding and Intent (MOU) established a collaborative program in environmental science, education and research, with the following partners:

CHILE

Universidad de Concepción
Universidad de Chile
Universidad de Santiago de Chile
Comisión Nacional del Medio Ambiente de Chile

MEXICO

Universidad Popular Autónoma del Estado de Puebla (UPAEP)
Universidad Autónoma de Tlaxcala

UNITED STATES

Texas A & M University at Corpus Christi
The University of Texas at Brownsville
Argonne National Laboratory
Oak Ridge National Laboratory
Sandia National Laboratory
United States Department of Energy
Equity Research Corporation
Institute for Regulatory Science
Boricua College

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PUERTO RICO

Universidad Interamericana de Puerto Rico
Universidad Politécnica de Puerto Rico
Universidad del Sagrado Corazón de Puerto Rico

The U.S. Environmental Protection Agency joins the CEPA memorandum of understanding and intent with the consensus of all other parties.

April 7, 2000

Romulo L. Díaz, Jr.
Assistant Administrator for Administration
And Resources Management
U.S. Environmental Protection Agency

Date

Consorcio Educativo para la Protección Ambiental
(CEPA)

Equity Research Corporation developed an alliance with institutions of higher education in the United States, Puerto Rico, Mexico, and Chile, in conjunction with the U.S. Department of Energy's national laboratories and the U.S. Environmental Protection Agency, committed to design collaborative environmental education and research projects. The educational institutions in this consortium are represented by two Hispanic-serving universities in the United States, three universities in Puerto Rico, two universities in Mexico, three universities in Chile, the U.S. Department of Energy and the U.S. Environmental Protection Agency. Under the acronym, CEPA (Consorcio Educativo para la Protección Ambiental) the program consists of a true partnership among participating groups and provides for:

- Curriculum development for a Masters in Environmental Science
- Student exchanges
- Internships at laboratories
- Faculty development
- Creation of bilingual educational materials
- Joint research at national laboratories
- Graduate seminars
- Other cooperative activities

Partners

United States Universities
University of Texas at Brownsville
University of Texas A&M Corpus Christi

Puerto Rican Universities
University of the Sacred Heart
Inter American University of Puerto Rico
Polytechnic University of Puerto Rico

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Mexican Universities
Universidad Popular Autonoma del Estado de Puebla (UPAEP)
Universidad Autonoma de Tlaxcala

Chilean Universities
Universidad de Santiago de Chile
Universidad de Concepcion
Universidad de Chile

Federal Agencies
U.S. Department of Energy
U.S. Environmental Protection Agency

CEPA Member Institutional Profiles

INTER AMERICAN UNIVERSITY OF PUERTO RICO
BARRANQUI TAS CAMPUS

The Inter American University of Puerto Rico, Barranquitas Campus (IAUPR-BC), is a private, nonprofit, Hispanic Higher Education Teaching Institution located in the central region of Puerto Rico. Since it founding in 1957, IAUPR-BC has provided educational opportunities to those who would otherwise have had little access to a college education. Its student body is diverse, composed of both traditional and non-traditional students.

IAUPR-BC serves seven communities with a population of 121,000. Socioeconomic indicators show that this region is among the poorest areas of the nation. IAUPR-BC has an enrollment of 1800 students.

Currently, the campus offers a total of twenty-two (22) Bachelor degrees including a BS in Biology and Computer Sciences and a BA in Elementary and Secondary Biology, six (6) associate degrees and four (4) Professional Certificates. The majority of the students are registered in the Computer Science Program and Education.

The faculty of the Campus has increased in number in the last few ears. For the fall term of 1999 there were 97 active faculty members, of those 37 (38%) worked full-time and 60 (62%) worked part-time.

Thirty-three of the full-time faculty members hold master's degrees, three hold a doctoral and one is a Juris Doctor. Eight members of the full-time faculty are doctoral m aid one additional faculty member is on sabbatical leave for this purpose. The student faculty radio (Fall '99) for all academic programs on campus is 25.84, based on a 1,449 full time equivalent enrollment (FTE) and 58 full-time equivalent faculty members, at a r of 25.1 under-graduate student/faculty member.

POLYTECHNIC UNIVERSITY OF PUERTO RICO

Polytechnic University of Puerto Rico, (PUPR) is a private not for profit, coeducational, nonsectarian institution founded in 1966. It is the largest private Hispanic Serving Engineering School in the United States and its territories.

PUPR is located in the Metropolitan Area of San Juan at 377 Ponce de Leon Avenue which is near the financial and economic center of Puerto Rico. The campus consists of nine acres and six buildings housing classrooms, laboratories, academic offices, library, administrative offices, student center, medical services, athletic and other facilities, and a parking building.

Until 1974, PUPR offered specialized courses in Land Surveying and Mapping. In 1974, it became a degree granting institution with a Bachelor of Science in Land Surveying and Mapping and a Bachelor of Science in Civil Engineering (BSCE). It was followed by a Bachelor of Science in Industrial Engineering (1980), Bachelor of Science in Electrical Engineering (1984), Bachelor of Science in Mechanical Engineering (1987) and Bachelor of Science in Business Administration with a major in Industrial Management (1990). In 1992, the institution started offering graduate programs with a Master's Degree in Engineering Management. In 1995, a Bachelor in Architecture program was initiated. A Bachelor of Science in Chemical Engineering and a Bachelor of Science in Environmental Engineering were initiated in 1997. Also in 1998, the Master in Business Administration, Master of Science in Civil Engineering, Master of Science and Master of Engineering in Manufacturing Engineering, a Master in Environmental Management, Master of Engineering in Civil Engineering, and a Master of Science and a Master in Manufacturing Competitiveness were started.

The University is accredited by the Council of Higher Education of Puerto Rico, the Middle States Association of Colleges and Schools and the Accreditation Board of Engineering and Technology (ABET).

As an institution of higher education, Polytechnic University of Puerto Rico provides opportunities for individuals from diverse backgrounds to cultivate their potential for leadership, productivity and competitiveness with the purpose of providing greater social responsibility toward their communities, through exposure to intellectual, humanistic and technological advancement.

PUPR serves a large sector of students with economic and academic limitations. Since it's inception, the university has graduated 3,500 engineers and surveyors. Its graduate program has graduated 131 students in Engineering Management.

The faculty at PUPR has grown significantly since 1989 from 142 to 217 at present. Currently 86 % of the faculty members hold a master or doctoral degree, while 42 % of the faculty members hold full-time (tenure or tenure track) positions.

SACRED HEART UNIVERSITY

The Sacred Heart University, a Catholic educational institute is the oldest Institution of Higher Education on the Island of Puerto Rico. Established in 1880 by the religious order of the Sisters of the Sacred Heart as an elementary school, in 1935, the government issued a Charter establishing the *Colegio Universitario del Sagrado Corazón.* In 1970, the Sisters of the Sacred Heart transferred the governance of the Institution to a lay Board of Trustees and in 1972, a co-educational policy was approved. The official name was changed to Sacred Heart University in 1976. The University is located on thirty-two acres of urban property. In 1985 its Portico and Chapel were declared Historical Monuments.

Sacred Hearts University has been accredited by the Middle States Association of Colleges and Schools since, 1950 and also by the Puerto Rican Council of Higher Education, National League of Nursing, Council on Social Work Education, National Accrediting Agencies for Clinical Laboratory Sciences, and the International Association for Continuing Education and Training.

The Institution offers 2 Associate Degree Programs, 42 Bachelor's Degrees, 3 Professional Certificates, and 10 Master's Degrees. It organizes its academics offerings on a daytime, evening and Saturday schedule. It offers Continuing Education Programs, short term courses, workshops and training opportunities tailored to the needs of individuals, agencies, and businesses. It has exchange programs with 168 universities in the United States and individual agreements with other Institutions abroad, among them Spain, Mexico, France, Canada, Belgium and Sweden.

The faculty is composed of 136 full time professors and a group of part-time faculty members coming from industry, other professional fields and the public sector, all of whom facilitate more pertinent education.

The total student enrollment for fall semester of 2000-2001 was 5,234 (4,724 being undergraduates). The average number of students per classroom is 22. The student body composition is 64 % female and 36 % male, with adults comprising 16 % of the total student body. Seventy five percent (75 %) of the students come from the San Juan Metropolitan area, 23 % from the rest of the Island, and 1 % are foreign students. It has the most active Alumni Association on the Island.

The University Library, with its digital graphic environment, is the first of its kind on the Island. It has modern physical fitness facilities, basketball, tennis, and volleyball courts, and an Olympic size swimming pool. It also has modern residential facilities for 417 students and visiting professors.

The faculty of the Institution is committed and engaged with scholarly activities. Among the research centers are:

The Center for Entrepreneurial Development of Women
Academic Research Center
Center for Personal Development
Center for the Enhancement of Teaching and Learning
Center for the Development of the Insurance Industry
Institute for Tourism Research
Technological innovation for Changing Environments Center (CENIT)
Ford Foundation Urban Partnership Program
Institute for the Study of Violence in the Social Media
Institute for the Development of the Third Sector
Artificial Intelligence Laboratory
National Writing Center
Center for the freedom of Press
Community Linkage Support Center
Women's Business Institute
Cellular Molecular Biology Laboratory
(among others).

Texas A&M University-Corpus Christi

Texas A&M University-Corpus Christi (TAMU-CC) is a comprehensive urban university, member of The Texas A&M University System, located on the South Texas Gulf Coast. The university focuses on the higher education needs of South Texas and the state, and on coastal and urban issues, with special emphasis on Allied Health, Applied Technology, Arts and Humanities, Business Administration, Environmental Studies and Teacher Education.

Texas A&M University-Corpus Christi is undergoing major change involving expansion of its student body and program offerings. The University currently offers a variety of undergraduate and graduate degree programs including selected doctoral and professional degrees. Additional degree programs are being developed in response to the expanding student body and regional needs. The University also provides continuing education and outreach programs that serve the needs of area businesses, professionals, and the general population.

Undergraduate programs (78% of the total student body) prepare students for productive careers in their chosen fields of study and provide them with the intellectual, cultural and ethical foundation necessary to contribute effectively and positively to a changing global community. Graduate programs (22% of the total student body) prepare students for leadership roles in the future development of the region and the state through formal instruction and through research and other forms of scholarly activity. The University emphasizes endeavors that focus on solving problems related to the South Texas urban and coastal region through services to the community.

Texas A&M University-Corpus Christi is committed to the pursuit of excellence in instruction, research and other forms of scholarly activity, and public service. Consistent with this commitment, the University seeks to identify, recruit and retain students who have high potential for academic success, especially those from groups who historically have been under-represented in higher education. To these ends, the minorities at Texas A&M University-Corpus Christi represent approximately 40% of the total student body. This proportion is itself 2-3% in par with the mix of the regional college-going population. Moreover, the most recent enrollment census has shown that slightly over 61% of student body is composed of women.

Institutional History

The island campus of Texas A&M University-Corpus Christi has been a setting for higher education since 1947. That year, Ward Island became the home of the University of Corpus Christi (UCC), an institution affiliated with the Baptist General Convention of Texas. The UCC campus was developed on land previously used by the U.S. Navy as a radar training facility.

In 1970, Hurricane Celia severely damaged the college campus. The following year, UCC and the Baptist General Convention took steps to end their affiliation. Concerned about higher education in Corpus Christi, a coalition of civic leaders sought local support as well as state legislation to convert the campus of UCC to a state-supported institution with an expanded curriculum.

In 1971, the 62nd session of the Texas Legislature authorized the creation of a state-supported institution of higher education in Corpus Christi. The Board of Directors of the Texas A&M University System was authorized to establish an upper-level university and to prescribe courses for the new institution at the junior, senior, and graduate levels leading to both bachelor's and master's degrees.

Funding was approved by the legislature to initiate planning for the university. The citizens of Corpus Christi approved a bond issue to purchase the campus of the University of Corpus Christi on Ward Island. Subsequently, the campus was given to the State of Texas as a site for the new state-supported university. Civic leaders in Corpus Christi also launched a successful public fund raising campaign to provide local financial support for the fledgling university. On September 4, 1973, several months after UCC completed its final classes, Texas A&M University at Corpus Christi opened its doors with an initial enrollment of 969 students.

In 1977, the legislature changed the name of the institution to Corpus Christi State University. The name of the university system, which also included Laredo State University and Texas A&M University, was changed the same year to the University System of South Texas (USST).

In 1989, the Texas Legislature abolished the University System of South Texas and merged Corpus Christi State University and the other two USST universities into The Texas A&M University System. In the same year, the legislature approved the expansion of Corpus Christi State University to a four-year comprehensive university, with enrollment of freshmen and sophomores to begin in fall 1994. In 1992, the role of the institution was expanded further when the Texas Higher Education Coordinating Board authorized the University to offer its first doctoral degree program. Another milestone occurred in 1993 when The Texas A&M University System Board of Regents renamed the institution Texas A&M University-Corpus Christi. The arrival of freshman and sophomore students in 1994 marked the transformation of the institution to a four-year university.

The University continues to expand in terms of student enrollment and program offerings. In 2000, student enrollment grew to more than 6800. Program offerings in the four academic colleges now include 59 undergraduate and graduate degree programs. Additional degree programs are planned and will be offered following state approval.

Institutional involvement in the CEPA Program

Texas A&M University-Corpus Christi, via the College of Science and Technology, has been involved with the CEPA program since 1997. Their primary emphasis has been on distance education connections, in particular, multi-lingual web-based learning in the interdisciplinary area of Earth System Science. TAMU-CC began a CEPA-funded on-line pilot project in 1999 dubbed Translingual Earth System Science education (TESS). Major funding for this program was later picked up by NASA as part of their Earth Science Enterprise. The Spanish and English versions of this class are currently available on-line at www.oso.tamucc.edu. For more information contact Dr. Grady Price Blount (blount@tamucc.edu) or Dr. Patrick Louchouarn (loup@cbi.tamucc.edu).

University of Texas at Brownsville and Texas Southmost College (UTB/TSC)

Mission

The University of Texas at Brownsville and Texas Southmost College has been a member of the University of Texas System since 1991. The University serves over 10,000 students at its campus in Brownsville, Texas. UTB/TSC offers a wide range of programs from Associate to Baccalaureate degrees to graduate classes and continuing education. UTB/TSC also supports the delivery of doctoral programs through cooperative agreements with doctoral degree granting institutions.

The mission of UTB/TSC is to provide accessible, affordable, postsecondary education of high quality, to conduct research, which expands knowledge, and to present programs of continuing education, public service, and cultural value to meet the needs of the community. The Partnership combines the strengths of the community college and those of an upper level university by increasing student access and eliminating inter-institutional barriers while fulfilling the distinctive responsibilities of each type of institution.

UTB/TSC has a total of 450 faculty members. Of those, 225 are full-time and 195 part-time. Approximately 125 are tenured and 83 tenure-track. Seventy-five percent of the faculty has degrees.

The university advances economic and social development, enhances the quality of life, fosters respect for the environment, provides for personal enrichment, and expands knowledge through programs of research, service, continuing education and training, it convenes the cultures of the community, fosters an appreciation of the unique heritage of the Lower Rio Grand Valley and encourages the development and application of bilingual abilities in its students. It provides academic leadership to the intellectual, cultural, social and economic life of the bi-national urban region it serves.

UTB-TSC is a Hispanic Serving Institution (HSI) in which 92% of the 10,000 students are Hispanic. Only a handful of students take math and science courses beyond those required for the general core. Math and science majors are rarer still. The Office for Institutional Research at UTB-TSC reported in 1999 that 1.2% of students were math majors, 0.3% physics majors, and 0.4% chemistry majors. The encouraging spot in the sciences was in engineering where 4.3% of students were majors, but this included those enrolled in two-year industrial arts programs. The dearth of science majors is particularly troubling in an area where maquiladora manufacturing is booming and even high tech companies and components of companies are fast emerging.

UNIVERSIDAD AUTONOMA DE TLAXCALA

Estado de Tlaxcala (Habitantes 957 843)
Idioma Español
Tlaxcala capital (Habitantes 70 000)
Ciclo escolar : Semestres y cursos de verano
http.// www.uatx.mx

PRESENTACIÓN

La U.A.T. es un organismo de servicio público, descentralizado, con personalidad jurídica, patrimonio propio y plana autonomía en su régimen jurídico económico y administrativo, que conjuntamente con la constante actualización de planes y programas de estudio de las diferentes licenciaturas y posgrados, la calidad del nivel académico del personal docente, la infraestructura y los espacios adecuados, el fervor propio de una institución joven, hacen de esta, el paradigma de la educación superior en el estado de Tlaxcala.

PANORAMA GENERAL

La U.A.T. se constituye el 20 de noviembre de 1976 cuando el Congreso del Estado de Tlaxcala, a través del decreto número 95, dicta la Ley Orgánica que da origen legal a la institución.

El Instituto de Estudios Superiores del Estado fue el antecedente académico institucional; éste, integraba las escuelas de Enfermería y Obstetricia, Derecho, Normal Superior, Superior de Comercio y Odontología. Por ello, con esas carreras dio inicio en funciones académicas la universidad. Posteriormente se fueron creando distintas opciones educativas: Trabajo Social (1977); Ingeniería Química y Químico Industrial (1978); Educación Especial, Biología Agropecuaria y los posgrados de Derecho y de Administración (1979-1983); Medicina Veterinaria y Zootecnia, Economía, Ingeniería Mecánica, Ciencias Políticas y Administración Pública, Historia, Literatura Hispanoamericana, Filosofía, Administración, Matemáticas Aplicadas y los posgrados de Educación, de Biología de la Reproducción, de Análisis Regional, de Educación Especial y de Odontología (1983-1990); Negocios Internacionales, Medicina General Integral y el posgrado de Ciencias de la Calidad (1994-1995).

FUNCIONES

Fiel a la misión de impartir enseñanza superior independiente, y ajena a partidismos políticos y religiosos, contribuye a mejorar el nivel físico, moral, cultural, humanístico, científico y técnico de la población, formando profesionales útiles y comprometidos con su estado y nación.

La U.A.T. tiene como funciones primordiales:

I. Impartir la educación superior para la formación de profesionales, técnicos y científicos de la más alta calidad.
II. Promover, impulsar y realizar investigaciones científicas y culturales en todos sus aspectos.
III. Difundir la cultura, la ciencia y la técnica en beneficio de los sectores sociales.
IV. Propugnar y coadyuntar al desarrollo cultural, económico y social de Tlaxcala y de la nación; para ello deberá mantener permanente comunicación y contacto con el pueblo, a fin de no desvincularse de su ámbito social.
V. Impulsar el mejoramiento de la técnica en la docencia, ya que las actividades de la Universidad deberán ser encaminadas a obtener un grado máximo de eficiencia.
VI. Investigar, rescatar y preservar el acervo cultural.

Además, la Universidad examinará dentro de un marco de libertad y respeto todas las corrientes del pensamiento filosófico, científico y los hechos históricos y las doctrinas sociales con la rigurosa objetividad que corresponde a sus fines académicos pero sin pronunciarse a favor de alguna, para cuyo efecto estará alejada de toda manifestación religiosa y política extra universitaria.

ESTRUCTURA ADMINISTRATIVA

La organización académico administrativa de la U.A.T., desde su nacimiento, fue concebida bajo la idea o esquema divisional y bajo el modelo educativo Departamental. Una de las características de este modelo consiste en que los recursos humanos o materiales institucionales no son exclusivos de un departamento, coordinación o dirección escolares, sino que cabe la posibilidad de que tales recursos sean aprovechables por todas las instancias, dándoles así una movilidad y utilidad flexibles, siempre bajo el sustento de programa o proyecto académico o administrativos bien definidos y justificados. Bajo las consideraciones anteriores, todas las esferas del conocimiento que se desarrollan en la Universidad quedan integradas en 4 divisiones académicas:

- División de Ciencias Básicas, Ingeniería y Tecnología.
- División de Ciencias Biológicas.
- División de Ciencias Sociales y Administrativas.
- División de Ciencias y Humanidades.

Cada una de las cuales incorpora un número variado de licenciaturas que exploran, desarrollan e investigan sus campos específicos de conocimiento.

PROGRAMAS ACADÉMICOS Y VINCULACIÓN

ÁREA DE DOCENCIA

El nivel de licenciatura se imparte en 10 departamentos: 8 de ellos ubicados en el municipio de Tlaxcala y 2 en los municipios de Ixtacuixtla, Apizaco y Huamantla. En la U.A.T. se pueden estudiar 23 carreras profesionales, 5 especialidades, 13 maestrías y 3 doctorados. En el Sistema de Universidad Abierta puede cursarse una licenciatura y un nivel técnico.

<u>División de Ciencias Básicas, Ingeniería y Tecnología</u>

El 4 de agosto de 1978 fueron creadas, en las inmediaciones de Apizaco, Tlax., las primeras Licenciaturas de estas División Académica: Químico Industrial e Ingeniería Química. De esta manera la U.A.T. respondía a las necesidades socioeconómicas estatales al establecer, cerca de los centros productivos del corredor Industrial de Apizaco-Xalostoc, una división y un departamento universitarios donde habría de formarse personal capacitado que daría respuesta a tales requerimientos. Poco tiempo después, el 11 de septiembre de ese mismo año inicia actividades el Departamento de Ciencias Básicas, Ingeniería y Tecnología.

Después, en 1983, frente a las nuevas demandas socioeconómicas regionales y nacionales y en respuesta a los avances tecnológicos de un mundo cada vez más cercano e independiente, se crea la Licenciatura en Matemáticas Aplicadas. Finalmente, de acuerdo a los lineamientos establecidos en el plan de Superación Académica 1985-1988 de la U.A.T. se crearon dos licenciaturas más, Ingeniería en Computación r Ingeniería Mecánica. Una vez más, la U.A.T. crecía atenta a las exigencias del desarrollo científico y tecnológico regional y mundial.

En el Departamento de Ciencias Básicas, Ingeniería y Tecnología se imparten las carreras de: a) Químico Industrial, b) Matemáticas Aplicadas, c) Ingeniería Química, d) Ingeniería Mecánica y e) Ingeniería en Computación.
Su ubicación es en Calzada Apizaquito s/n Apizaco, Tlax., Teléfono (012) 41 725 44

La División de Ciencias Básicas, Ingeniería y Tecnología ha estado muy atenta a los avances científicos y tecnológicos mundiales así como a las necesidades regionales; en función de ellas es que se orienta y vincula su desarrollo académico. A través del tiempo son varios los hechos que así lo indican, por

ejemplo: el 27 de octubre de 1987 la U.A.T. y la Cámara Nacional de la Industria de la Transformación (CANACINTRA) firman un Convenio de Cooperación para "...iniciar el Programa de Investigación de Métodos para el Tratamiento de Residuos Industriales". El 6 de julio de 1988 se firma un Convenio entre la U.A.T. y la Academia de Química Inorgánica con la finalidad de celebrar en la entidad el "II Congreso Iberoamericano y el IX Congreso Nacional de Química Inorgánica". El 30 de mayo de 1994, el Departamento de Ingeniería y Tecnología abre el Diplomado en Calidad Total.

El 14 de septiembre de 1994 abre la Especialidad en Simulación y Control de Procesos. Actualmente se suman a estos procesos los posgrados, la especialidad en Ciencias de la Calidad, la Maestría en Ciencias en Ingeniería en Computación y la Maestría en Ingeniería Química.

El Departamento de Ciencias Básicas, Ingeniería y Tecnología se vincula con los sectores productivos estatales a través de tres áreas importantes:

a) Laboratorios de Investigación y Servicio Externo, que atiende el análisis de aguas y aguas residuales, el análisis y control en la industria de alimento y sus derivados, además del servicio metal mecánica por máquinas y herramientas; b) Laboratorio de Pesados de Ingeniería Química, que proporciona análisis de contaminantes en aguas e identificación de compuestos por cromatografía de gases, recuperación de solventes y separación de mezclas multicomponentes, y determinación de propiedades de los compuestos poliméricos; y c) Diseño de Sistemas de Programación y Sistemas Electrónicos.

Actualmente se inició el programa académico de Ingeniería en Sistemas Electrónicos, la población estudiantil del Departamento es de 1100 estudiantes de los 9000 de toda la Universidad, la planta docente la constituyen 104 docentes de los cuales 45 son de tiempo completo, 11 de medio tiempo y 48 de hora clase. Los profesores de tiempo completo pertenecen a 4 cuerpos académicos que son: 1. Ciencias Ambientales (Química Industrial e Ingeniería Química), 2. Modelación Matemática (Matemáticas Aplicadas), 3. Sistemas Distribuidos y Redes, 4. Control y Automatización de Procesos.

PROBLEMÁTICA AMBIENTAL

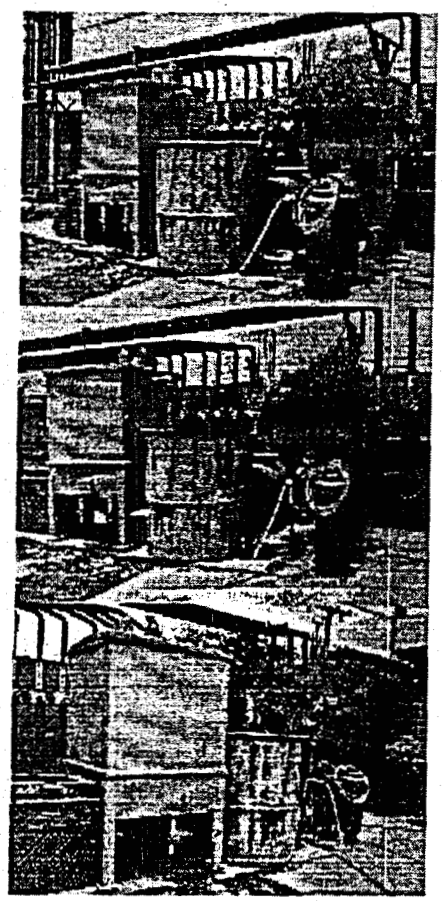
En el estado de Tlaxcala siendo el más pequeño de la República Mexicana cuenta con una extensión territorial de 4 061 km2, con una población de 957 843 habitantes, de éstos el 81% asentado en el medio urbano y 19% en el medio rural, también cuenta con 33empresas de diversos giros generando 54 784 empleos en los diferentes corredores industriales.

En el estado se descargan anualmente alrededor de 41 millones de metros cúbicos de aguas residuales municipales de los cuales únicamente se tratan el 35% en los sistemas existentes, mismos que presentan serias deficiencias.

Siendo el saneamiento del río Zahuapan principal cuerpo receptor en el estado, una de las prioridades del actual Gobierno del Estado, la Comisión Nacional del Agua y el mismo gobierno estiman que se requieren 891.2 millones de pesos para rehabilitar, ampliar y adecuar la infraestructura existente en cuanto a tratamiento de aguas residuales,proponiendo el titular de Coordinación General de Ecología que el poder legislativo considere el endeudamiento para esta inversión.

Ante esta problemática, el Departamento de Ciencias Básicas, principalmente la carrera de Químca Industrial se dio a la tarea de buscar alternativas de sistemas de tratamiento de aguas residuales industriales y municipales, obteniéndose dos innovaciones:

1. Filtros Biológicos o percoladores de alta eficiencia para aguas residuales con alta carga orgánica.
2. Sistema de Precipitación química para aguas residuales con contaminantes inorgánicos.

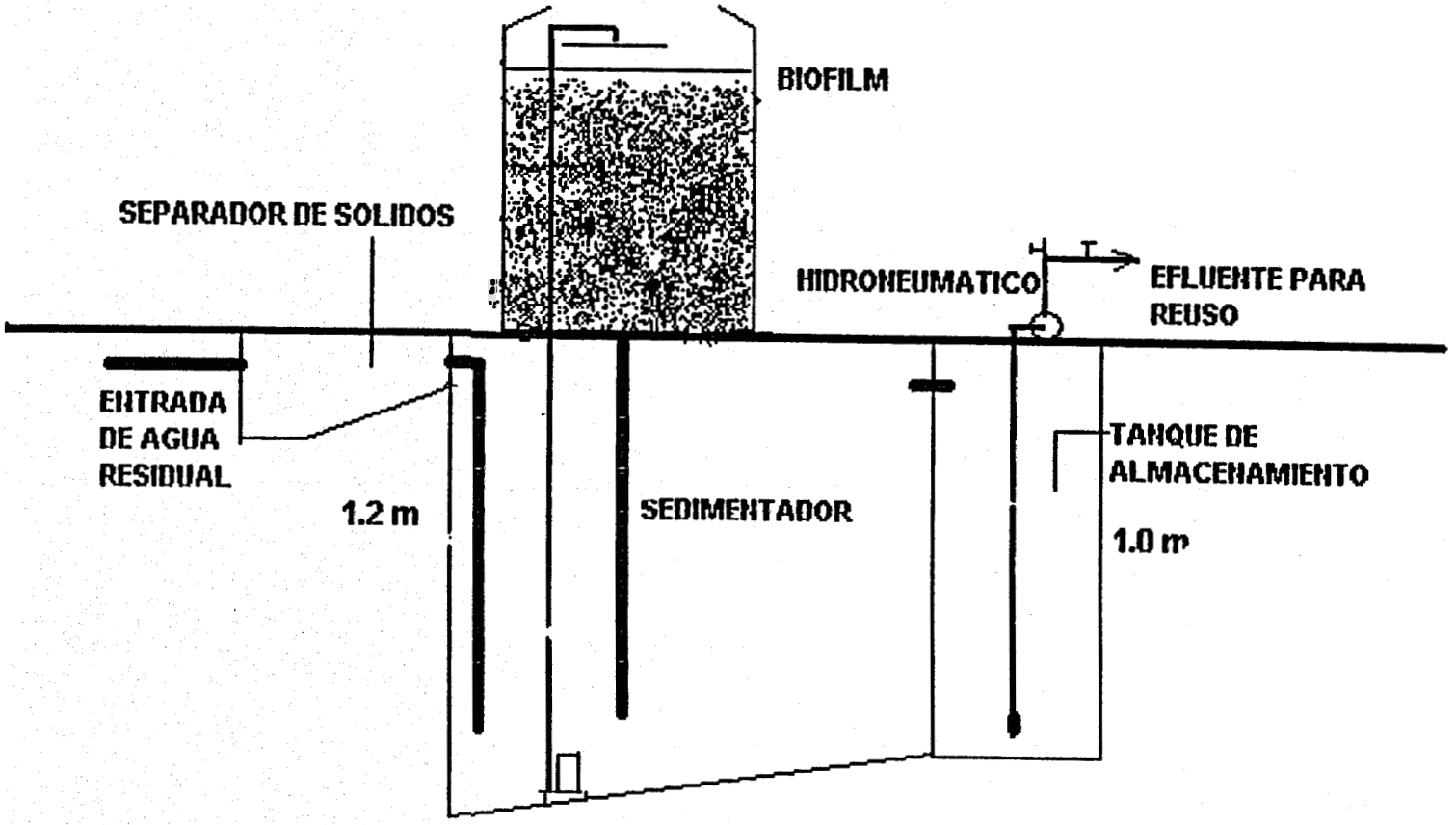


Estas serán propuestas a las instancias correspondientes para implementarse en su programa de saneamiento del río Zahuapan.

La formación de recursos humanos es una prioridad importante para el buen funcionamiento de un programa

por lo que dada la necesidad del manejo adecuado de los recursos hídricos se está viendo la posibilidad de implementarse una especialidad en "Recolección, Tratamiento y Disposición final de aguas residuales" en conjunto la U.A.T. y la U.P.A.E.P

Para esto próximamente se instalará un espectrofotómetro de inducción de Plasma acoplado en el Centro de Investigación y Desarrollo Tecnológico (U.A.T.) que en junio próximo se inaugurará con lo que se apoyaría la formación práctica en este campo tanto para la determinación de la calidad de aguas superficiales, subterráneas y residuales tratadas y crudas.



NOTA: SIN ESCALA

UNIVERSIDAD POPULAR AUTÓNOMA DEL ESTADO DE PUEBLA (UPAEP)

Puebla City (pop. 2,200,000)
Language of instruction: Spanish
Academic year, semester or summer exchanges
AP ratio of 5:7
http://www.upaep.mx

Profile: UPAEP is a private institution whose main goal is to provide high quality, human and professional, higher education to students throughout Mexico and Latin America. Since the university's foundation in 1973 on the site of an old hacienda, it has grown to include 27 undergraduate schools and 36 different graduate programs.

UPAEP's mission is to provide a solid foundation in a changing society and a better understanding of the cultural heritage that forms the Mexican national identity.

UPAEP's urban main campus facilitates collaboration with the community and students to dedicate a significant amount of time in outreach activities carried out with local social service organizations, both rural and urban. Campus facilities include fully equipped computer, library, and educational technology centers (film, radio, video, photography, etc.) and cafeteria, gymnasium and other sports facilities. The university is known around the country for its basketball and soccer teams, and various student groups are also active in theatre, dance, chorus, speech and debate, photography and animation. There are also many cultural activities. Today, its thriving industries include automobile manufacturing (Volkswagen plant), motor craft and automotive parts industry. Total university-level enrollment: 10,497.

UPAEP is accredited by FIMPES and ANUIES, two of the most important Universities Associations in Mexico.

Locale: The main campus is minutes away from the historical center of Puebla City. The city was the second most important one from the 17th century until the early 1900s in Mexico; the number of buildings dating from as early as the 16th century is outstanding. The concentration of pre-Hispanic archaeological sites around the city and the region is one of the richest on the continent. Puebla City is 80 miles southeast of Mexico City and a three hour drive from *Veracruz* and the Gulf Coast of Mexico. Since 1985, it is considered part of the cultural heritage of humanity because of its historic monuments and the varied culture.

Puebla City is known for its clear, sunny weather, with an average temperature of 50°F in winter and 85°F in summer.

Divisions: Arts (architecture, graphic design, design and publicity production); Economic and Business Administration (public accounting, administration of institutions, business administration, marketing, economics, foreign trade, information systems); **Health Sciences** (dentistry, medicine, nursing); **Humanities** (communications and journalism, law, pedagogy, philosophy, political science, psychology); **Science and Engineering** (chemical, civil, ecological, mechatronic, and industrial engineering, computer systems, agronomy [animal and vegetable sciences]); also, courses in mathematics, physics and social studies.

Academic notes: Courses of interest to foreign students include: Mexican legislation, Mexican and Latin American politics, Mexican business environment, Latin American history and culture. While full-time graduate-level study is not possible, some graduate courses are available in the areas of architecture (urbanism, master or science architectural and urban inheritance conservation), business administration and public health. Students in engineering, management and psychology may have opportunities for internships with local businesses.

All undergraduate programs, as well as all co-and extra curricular activities, are open to CEPA participants. Class attendance is required in order to receive credit. Several partial tests and a final examination compose the final grade. Seven is the minimum passing grade. Community-service placements and internships can be arranged. Graduate programs are closed to CEPA participants.

Courses sometimes offered in English for foreign students include Mexican history, geography, sociology, political structure, anthropology, art, commercial and financial environment. These courses can be taken in conjunction with regular course offerings, but require a minimum enrollment of 20 students.

The summer session includes Mexican business, Mexican culture and Spanish courses.

Language notes: Proficiency in Spanish is required and an exam will be given upon arrival. Students with low proficiency will be required to take remedial Spanish language courses.

Room and board: Students are housed and take their meals with host families.

Exchange dates: Early August to May, early August to December or mid-January to May. A six-week summer program (mid-June to July) is also offered.

Universidad Austral de Chile

Conocimiento y naturaleza

La Universidad Austral de Chile, es una Universidad Privada, considerada dentro de las Universidades tradicionales de Chile. Fue fundada el 16 de febrero de 1954, obteniendo su personalidad jurídica el 7 de septiembre del mismo año, siendo esta fecha la que conmemora oficialmente el inicio de la Universidad. La comunidad universitaria está formada por alrededor de 9.200 alumnos de pregrado y 600 de postgrado. Además cuenta con 776 profesores de jornada completa y 823 funcionarios de administración y apoyo distribuídos en las diferentes Facultades ubicadas en los Campus Isla Teja y Miraflores (Valdivia) y Campus Puerto Montt en la ciudad del mismo nombre. La Universidad mantiene sedes en Ancud (Isla de Chiloé), Trapananda en la ciudad de Coyhaique en la XI Región y Oficina de Representación en Santiago.

Posee 10 Facultades con 68 Institutos (Departamentos), 28 Carreras Profesionales, Conservatorio de Música, Ballet Folklórico, Orquesta de Cámara y Conjuntos Corales, Jardín Botánico, varios Museos (Históricos, Antropológicos, Arte Moderno), por lo que es capaz de entregar formación de alto nivel en la casi totalidad de las áreas fundamentales del conocimiento y de la creación.

La Universidad Austral de Chile, como una institución de educación superior, coloca un gran énfasis en el nexo entre programas de investigación de relevancia regional, nacional e internacional y la calidad de la docencia; la contribución directa o indirecta al desarrollo social, cultural, y económico de la sociedad; y la sustentación de las necesidades intelectuales de sus académicos, permitiéndoles que se mantengan en la vanguardia de sus disciplinas

Desde el año 2000 la Universidad Austral de Chile es miembro activo de CEPA, participando por primera vez en el *SUMMIT 2000* en Brownville, Texas. En septiembre del mismo año CEPA cofinanció la participación a un representante de la Universidad en el "*2000 Environmental Leadership Course*" del *Smithsonian Institution* que se llevó a cabo en Front Royal, Virginia. A fines de noviembre se organizó en el Campus Isla Teja el Coloquio "Universidad y Medio Ambiente" como una primera actividad organizada por nuestra Universidad en el marco del Consorcio CEPA. En él participaron representantes de San Juan de Puerto Rico, de El Paso, Texas y de universidades nacionales miembros de CEPA. Dado que el objetivo de este coloquio era reactivar el proyecto de creación de

un Centro de Ciencias Ambientales en la Universidad, se convocaron la mayor parte de los investigadores involucrados activamente en temas ambientales. Como consecuencia del buen éxito obtenido, a comienzos del año 2001, la Rectoría de la Universidad promulgó un Decreto nombrando un secretario ejecutivo y una comisión asesora para materializar la formación del mencionado Centro. Se presenta en esta Conferencia el estado de avance de este proyecto.

THE EULA-CHILE CENTER
ENVIRONMENTAL SCIENCES CENTER (EULA-CHILE) AT THE UNIVERSITY OF CONCEPCIÓN, CHILE

The University of Concepción was founded in 1919 by the community of Concepción city and nowadays stands out by the beauty of its Campus and by the traditional and present academic prestige. Concepción University was established in the core of the community of Concepción to contribute to the development of Chilean higher education keeping in mind three main objectives:

i) create and transfer knowledge to the highest level of excellence;
ii) develop research and
iii) spread culture.

The University Corporation has a Directorate composed of ten persons who have not a contractual link with the University. The latter has a budgetary and patrimonial responsibility and is presided over by the president. The staff members of more than 1,400 (70% of them are full time) allows the University to give academic formation to more than 14,000 students from the whole country (but also some from abroad) through 15 Faculties and more than 50 professional careers. The University Graduate School offer more than 30 postgraduate programs among which there are 8 at a doctorate level.

The University performs its activities in three Campus:

i) The Concepción Campus contains the offices of the president, central administration and eleven faculties;
ii) In the branch office of Chilean City campus, the faculties of Agronomy, Agricultural Engineering, Veterinary Medicine and Forestall Sciences are found, and
iii) The Departments of Auditoring, Basic Sciences, Education, Topography and Forestry are located in the academic unit of the Los Angeles City campus.

The three academic branch offices allow the University to perform its fundamental activities of teaching, researching and extension within a complete regional insertion.

The EULA-CHILE Center was created on March 1990 through an international collaborative program between the Chilean and Italian government, as a permanent academic unit of Concepción University. This Center was established to dedicate its efforts to the study and advance of environmental sciences, and to become a modern structure for research, education and technical interdisciplinary assistance in environmental matters. Among its main objectives are to:

i) support and coordinate studies applied to land planning in relation to environmental sciences and renewable resources;
ii) promote, plan, develop and carry out educational programs at the under graduate courses and academic degrees (Master and Doctorate) levels, and specialization programs (Diploma) in environmental sciences and the management of natural renewable resources.

The Center consists of three major buildings located on the University of Concepción Campus. This campus contains laboratories for Environmental Biology, Environmental Chemistry, Environmental Oceanography, Earth Sciences, Informatics and Geomatics, Environmental Engineering, Meteorology, Hydrology and Land Planning, including "Coastal Zone Management". The Center staff members consist of both highly qualified academicians from the University Departments and Faculties, as well as researchers of its own.

The staff members together with the state of the art equipment and information available at the Center, has resulted in a high academic status recognized at national and international levels.

UNIVERSIDAD DE SANTIAGO DE CHILE

www.usach.cl

The *Universidad de Santiago de Chile* evolved from the *Escuela de Artes y Oficios*, a technically oriented institution which was established in Santiago, Chile in 1849. The university was accredited as a national, public university in 1947, with a strong orientation towards engineering careers. Today the university has areas of concentration in practically all main branches of knowledge, and serves more than 20,000 students in its main campus in Santiago, Chiles' capital. The university, known also as *USACh*, offers a wide range of courses from Technical to Baccalaureate degrees to graduate classes and continuing education. The strong development of academic research activities in recent years has allowed the creation of several masters and doctoral programs in engineering and the natural and social sciences.

The mission of the university is to guarantee access and good quality postsecondary education for all members of the Chilean society and to expand knowledge through the pursuit of research, continuing education and creation and dissemination of cultural values. The university ranks among the top four universities in the country, with most of its student population coming from public secondary schools in low middle class or poor neighborhoods.

The Universidad de Santiago de Chile offers 53 undergraduate majors to a population of about 18,000 undergraduates. It has over 2,000 faculty, of which 649 are full-time and 266 have PhD's. There are 27 masters programs and 8 Doctoral programs. There are doctoral programs in Physics, American Studies, Chemistry, Mathematics Microbiology, and Engineering Sciences with mentions in Automation, Materials Science and Computer Engineering.

These and other programs receive strong support from the university's' participation in several international agreements and cooperative programs, which involve development agencies and important universities and research institutions worldwide.

In recent years, continuing education has evolved into a major activity to respond to the training needs of a society undergoing strong economic and technological changes. Several postgraduate programs are in place in diverse areas, such as administration, economics, environmental engineering and management, environmental science, quality management, public health, risk prevention and safety. The programs serve several hundreds of practicing professionals in the Metropolitan and surrounding areas.

More recently, the university has started using its applied research and development strengths to solve important problems affecting society. University groups participate in competitive bids for government contracts and grants from international organizations and foundations. Major areas involved include environment, computers and education, administration, public health, and technical training. Most of these activities involve state-of-the-art technologies, expansion of original research, and the application of modern principles, such as sustainable development, ISO standards for quality and environmental management, education across the curriculum, and others.

Materials prepared for the CEPA Initiative

What is CEPA?

There is a recognized need for effective environmental protection, environmental training and education in the Americas. In addressing that need Equity Research Corporation developed an alliance with institutions of higher education in the United States, Puerto Rico, Mexico, and Chile, in conjunction with the U.S. Department of Energy's national laboratories and the Environmental Protection Agency. The educational institutions in this consortium are committed to design collaborative programs for the development of environmental professionals and research projects. Under the acronym, CEPA (Consorcio Educativo para la Protección Ambiental, the program consists of a true partnership among participating groups and provides for:

- Curricula development for undergraduate and graduate programs in Environmental related fields.
- Student exchanges
- Internships at laboratories
- Faculty development
- Creation of bilingual resources
- Joint research at national laboratories
- Graduate seminars
- Other cooperative activities.

The Consortium interacts with the United States and Latin American professionals, and is an incentive for more U.S. Hispanics to enter environmentally related careers. Through participation in this process, U.S. Hispanic Serving Institutions of Higher Education will strengthen not

Participating Engineers from Chile South America

only their ability to serve students in environmental related studies, but also the surrounding Hispanic communities in general. In research and policy, Consortium members can tackle many of the pressing questions about environmental protection and assist in addressing methods that ultimately support environmental preservation.

The collaboration developing from this alliance will help provide each participating institution, the private sector, and governments the expertise and capacity to develop strong environmental strategies and programs. CEPA recognizes that cultural diversity must be considered when addressing environmental preservation. Cultural heritage and conservation are connected to societal and economic needs and environmental preservation. This concept offers promise for all the participating groups. The interests of environmental preservation are best served with a knowledgeable public that is able to understand the technological and environmental systems at various levels of society.

FOR MORE INFORMATION ABOUT THIS PROGRAM PLEASE CONTACT US AT:

Equity Research Corporation

5 Thomas Circle NW
Washington, Dc 20005

Phone: 202-387-3331
Fax: 202-797-1344
Email: equityrc@aol.com

Participating Partners

United States Universities
University of Texas at Brownsville
University of Texas A&M Corpus Christi

Puerto Rico Universities
University of the Sacred Heart
Inter American University of Puerto Rico
Polytechnic University of Puerto Rico

Mexico Universities
Universidad Popular Autónoma del Estado de Puebla (UPAEP)
Universidad Autónoma de Tlaxcala

Chile Universities
Universidad de Santiago de Chile
Universidad de Concepción
Universidad Austral

United States Federal Agencies
U.S. Department of Energy
U.S. Environmental Protection Agency

5 Thomas Circle NW
Washington, Dc 20005

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Equity Research Corporation

CEPA

Consorcio Educativo para la Protección Ambiental . (Educational Consortium for the Environmental Preservation)

Equity Research Corporation

La Gestión IMA
Saluda a la Reunión Anual de
CEPA
Consorcio Educativo para la Protección Ambiental

tión IMA

CEPA

Consorcio Educativo para la Protección Ambiental

An Environmental Initiative for the Americas

Homepage
- ¿Qué es la Gestión IMA?

Inscripciones Nuevo Postítulo

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- Qué hay de Nuevo?
- Search IMA
- CEPA: Protección Ambiental para Chile, EE.UU, México y P.Rico
- Postítulo Análisis Ambiental
- Conferencias/Programas y Cursos IMA
- PublicaciónMedio Ambiente y Salud Pública
- Ley de Bases
- Reglamen
- R

Summit CEPA '98
13-17 April, 1998
Preliminary Program

APRIL 13-17, 1998: Preliminary Program

The CEPA Action Plan 1997/98
- Cooperation ORNL/IMA-USACh
- New International Graduate Environmental Program (UPAEP and possibly USACh)

CEPA in Chile: Historical Developments and Accomplishments

Chile
- CONAMA
- Universidad Autral de Chile
- Universidad de Santiago de Chile
- Universidad de Concepción

CEPA: Una Iniciativa de Medio Ambiente para las Américas

La educación ambiental, las políticas ambientales habilitantes, una efectiva participación ciudadana, y la transferencia tecnológica constituyen los pilares de una exitosa implementación de estrategias de protección ambiental.
En reconocimiento a todo lo anterior se ha creado el **Consorcio Educativo para la Protección Ambiental, CEPA**, acuerdo al que han concurrido, en forma oficiosa desde 1996 y en forma oficial desde principios de 1997, instituciones privadas, de gobierno y universidades de los **Estados Unidos, Puerto Rico, México y Chile.**

Universidad de Santiago de Chile
Abril 14 al 17 de 1998

Visite nuestra homepage Sustentabilidad y Medioambiente www.usach.cl/ima

CEPA

ConsorcioEducativo para la Protección Ambiental

An Environmental Initiative for the Americas

IMA saluda al Summit CEPA 2000 05 - 08 April

- Cooperation ORNL/IMA-USACh
- New International Graduate Environmental Program (UPAEP and possibly USACh)
- CEPA in Chile: Historical Developments and Accomplishments

CEPA: Una Iniciativa de Medio Ambiente para las Américas

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Chile

- CONAMA
- Universidad Autral de Chile
- Universidad de Santiago de Chile
- Universidad de Concepción
- Universidad de Chile

Estados Unidos

- U S Department of Energy, DOE
- Equity Research Corporation
- Institute for Regulatory Science
- ArgonneNational Laboratory
- Oak Ridge National Laboratory
- Sandia National Laboratories
- The University of Texas at Brownsville
- Texas A&M University at Corpus

	Christi
México  • Universidad Popular Autónoma del Estado de Puebla • Universidad Autónoma de Tlaxcala	**Puerto Rico**  • Universidad Interamericana de Puerto Rico • Universidad Politécnica de Puerto Rico • Universidad del Sagrado Corazón de Puerto Rico

- Misión
- La Estrategia de CEPA
- Areas de programación estratégica

- Plan CEPA 1997

- Programas Educacionales
- Desarrollo Académico
- Investigación Conjunta
- Intercambio de Estudiantes
- Transferencia Tecnológica
- Promoción del Desarrollo Sustentable

La Visión de CEPA

El Protocolo de Acuerdo o Memorandum of Understanding (MOU)

El Protocolo de Acuerdo e Intención (MOU), firmado por las partes en 1997, establece para CEPA un programa de colaboración en ciencias del medio ambiente, educación e investigación. El MOU está basado en el común acuerdo que en lo que respecta a educación existe una necesidad de basar conceptos como prevención de la contaminación, minimización de desechos y reutilización, así como las consideraciones para reciclaje y reutilización de productos y materiales, en principios de ciencia e ingeniería de amplio alcance, para luego introducirlos en educación ambiental.

Es muy posible que se tengan que desarrollar nuevos programas educativos para educar a la actual y a la siguiente generación de ingenieros, científicos y profesionales del medio ambiente de modo que ellos puedan incorporar los factores ambientales en decisiones industriales y regulatorias. La sustentabilidad del Consorcio está basada en los compromisos de los miembros del Consorcio, del sector privado, y de los gobiernos. Cada miembro asegurará el éxito de CEPA implementando el programa dentro de su esquema financiero, social, político y educacional.

La Misión de CEPA

La misión de CEPA se orienta al fortalecimiento de la infraestructura científico-técnica, profesional y educacional en Protección Ambiental de los Estados Unidos, Puerto Rico, México y Chile.

El Consorcio CEPA es una sociedad muy especial, de carácter único e innovador, en que participan gobiernos, laboratorios nacionales y universidades, todos orientados a mejorar la educación profesional en medio ambiente en las comunidades de habla hispana en las Américas a través del desarrollo de nuevos programas de estudio, intercambio de estudiantes, capacitación de académicos, creación de materiales educacionales, investigación conjunta, y otros programas de cooperación. La colaboración y el desarrollo derivado de esta alianza ayuda a proporcionar a cada institución participante, al sector privado y a los gobiernos la experiencia y la capacidad para desarrollar poderosos programas y estrategias para protección ambiental.

Como resultado de la Iniciativa de Apertura a los Hispanos (Hispanic Outreach Initiative) impulsada por el Ministerio de Energía de los EEUU (US Departament of Energy, DOE), así como del acuerdo conocido como NAFTA (North American Free Trade Agreement) y del reciente Encuentro de las Américas organizado por el Presidente Bill Clinton, hoy se reconoce en los Estados Unidos y en el resto de las Américas la necesidad de:

- Disponer en la región de estrategias efectivas de protección ambiental.
- Incorporar los principios de la protección ambiental y que los gobiernos de la región se comprometan a basar sus decisiones en esos principios.
- Implementar una gestión ambiental basada en prácticas efectivas de reciclaje, reutilización, prevención de la contaminación, minimización de desechos, remedio de contaminación existente y cumplimiento con la normativa.
- Cooperación en materias ambientales entre los países americanos, cualquiera sea su nivel de desarrollo industrial.

La Estrategia de CEPA

Los miembros del Consorcio CEPA reconocen la necesidad de basar conceptos claves de protección ambiental, tales como prevención de la contaminación, minimización de desechos, así como consideraciones para reciclaje y reutilización de materiales, en sólidos fundamentos de ciencia e ingeniería antes de introducirlos en esquemas de educación ambiental.

Será fundamental entonces desarrollar nuevos programas educacionales para preparar las generaciones actual y futura de ingenieros, científicos y profesionales de medio ambiente de modo que ellos puedan incorporar las variables y factores ambientales en decisiones industriales o regulatorias.

La sustentabilidad del Consorcio se basa en el compromiso de los miembros del Consorcio, el sector privado, y los gobiernos. Cada miembro asegurará el éxito de CEPA implementando la estrategia CEPA dentro de su esquema educacional, político, social y financiero.

Areas de programación estratégica

1. Programas Educacionales. Los participantes del Consorcio y/u otras entidades aceptadas por los miembros del Consorcio trabajan como colaboradores en el desarrollo y evaluación de programas de pregrado y posgrado, y de programas de investigación en las instituciones participantes. Estas actividades pueden estar relacionadas con áreas específicas de desarrollo de ciencias del medio ambiente, ecología industrial, ingeniería ambiental, gestión ambiental, o asuntos regulatorios.

2. Desarrollo Académico. Se enfatizarán los contrataciones conjuntas de académicos y profesionales de planta, las estadías, y los intercambios en las respectivas instituciones (por ejemplo, profesores adjuntos, académicos en estadías de verano, científicos de planta visitantes). Estas contrataciones, internados o intercambios pueden ser o no remunerados.

3. Investigación Conjunta. Ciertos miembros del Consorcio tienen más experiencia que otros. Los proyectos y programas de investigación se desarrollan y se mejoran a través de la colaboración con los

laboratorios y universidades participantes. Los resultados de la investigación se publican en la literatura para reconocer las contribuciones de las instituciones participantes.

4. Intercambio de Estudiantes. Las instituciones educacionales que participan en el Consorcio están comprometidas en la identificación de estudiantes destacados de pregrado y posgrado que participarán en los programas educacionales y de verano.

5. Transferencia Tecnológica. Los participantes del Consorcio colaboran en la transferencia de recursos tecnológicos e informáticos. Los participantes: (1) proporcionan personal calificado para dictar cursos y presentar conferencias en matemáticas, ciencia e ingeniería en las instituciones educacionales que participan, en armonía con las políticas institucionales al respecto, (2) proporcionan asesoría en el desarrollo y mejoramiento de cursos, cursos cortos, conferencias y talleres, y (3) enfatizan la transferencia efectiva de tecnologíaspara control y prevención de la contaminación. (6). Capacitación Profesional. Los participantes del Consorcio colaboran en el desarrollo de programas de capacitación y certificación para profesionales del medio ambiente. Una de las prioridades de CEPA en esta área es el desarrollo de programas y cursos que capaciten con conocimientos superiores y habilidades específicas a capacitadores en medio ambiente del Consorcio. Se considera que ellos son cruciales para el desarrollo de infraestructura ambiental en las Américas. El Consorcio sugerirá un Sistema de acreditación para la capacitación de profesionales del medio ambiente.

6. Promoción del Desarrollo Sustentable. Puesto que el desarrollo sustentable se concibe como el balance apropiado entre el crecimiento económico y como sociedad y la preservación del medio ambiente, CEPA proporciona herramientas para que los profesionales adquieran la experticia necesaria para desarrollar estrategias holísticas para el enfoque de los temas centrales relacionados al medio ambiente en un contexto de desarrollo sustentable.

LA VISIÓN DE CEPA

La necesidad ya reconocida de tener una efectiva protección ambiental, junto con efectivas capacitación y educación en medio ambiente en las Américas, condujo a la creación del Consorcio Educativo para la Protección Ambiental (CEPA). La visión de CEPA consiste en reforzar la infraestructura técnica, profesional y educacional en medio ambiente en América Latina y en los Estados Unidos. El programa CEPA involucra una sociedad de hecho entre los grupos participantes e incluye desarrollo de curriculum, intercambio de estudiantes, perfeccionamiento de académicos, la creación de materiales educacionales, investigación conjunta, y otras actividades de colaboración. El esquema de colaboración que se desarrolle a partir de esta alianza ayudará para proporcionar a cada institución participante, al sector privado, y a los gobiernos la capacidad y experiencia para desarrollar poderosas estrategias y programas ambientales.

CEPA reconoce que la diversidad cultural debe ser considerada cuando se enfoque la preservación ambiental. La conservación y la herencia culturales están conectadas tanto a las necesidades económicas y de la sociedad como a la preservación ambiental. Este concepto es promisorio para todos los grupos participantes. Se cautelan mejor los intereses de la preservación ambiental cuando el público tiene un adecuado conocimiento como para ser capaz de entender los sistemas ambientales y tecnológicos a los diferentes niveles de la sociedad.

En los Estados Unidos y en América Latina, el desarrollo de una infraestructura adecuada en medio ambiente está ligado a las necesidades de educación ambiental. Además, en los Estados Unidos muchos hispanos, en razón a sus condiciones socioeconómicas, no son actores en el proceso sobre el medio ambiente. El Consorcio es único porque las instituciones que dan servicio a los hispanos en los Estados Unidos son consideradas críticas para su crecimiento. El Consorcio interactúa con profesionales latinoamericanos y estadounidenses, y es un incentivo para que más hispanos en los Estados Unidos ingresen a carreras relacionadas con el medio ambiente. Por medio de la participación en este proceso, las instituciones que dan servicio a los hispanos en los Estados Unidos reforzarán no sólo su capacidad para servir a estudiantes de ingeniería ambiental sino también a las comunidades hispanas en general que las rodean.

En investigación y políticas, los miembros del Consorcio pueden confrontar muchas de las interrogantes acerca de la protección ambiental y colaborar en el desarrollo de métodos que tengan como fin último la preservación del medio ambiente.

La educación ambiental proporciona el medio para diseminar ciencia y tecnología. La protección ambiental presenta aspectos altamente técnicos, y poco se puede conseguir cuando existe tanto una carencia de información acerca de la naturaleza y alcance de los problemas como una carencia de profesionales del medio ambiente altamente capacitados para promover un clima regulatorio adecuado. El conocimiento es esencial para la fortaleza como país, y fundamental para la protección ambiental. Los avances contínuos en ciencia y tecnología pueden sustentar una gestión ambiental efectiva, una comprensión más profunda de la relación entre seres humanos y naturaleza, una expansión de los recursos naturales disponibles, y un aumento en la utilización de los beneficios económicos de los recursos.

Una política ambiental que estimule la innovación debe estar estructurada alrededor de los factores principales que influyen en la aplicación de recursos técnicos a necesidades económicas y de la sociedad. Dichos factores son: (1) una demanda por acción de tamaño, dirección y perseverancia adecuadas; (2) cantidades suficientes de gente técnicamente competente, adecuada investigación y desarrollo, y recursos adecuados de financiamiento; (3) una infraestructura de información adecuada sobre la cual basar las decisiones; (4) un clima favorable para la comercialización de nuevas tecnologías; y (5) una apropiada orientación legal, organizacional y tecnológica en el gobierno.

Una activa participación de la ciudadanía en la preservación del medio ambiente promueve un proceso de protección ambiental sustentable. La protección ambiental es un proceso continuo que requiere la participación activa e iterativa de las instituciones académicas, empresariales y de gobierno. Cuando se desarrollan políticas ambientales adecuadas, cada participante es a la vez un proveedor y un usuario de información. Por lo tanto, la intervención activa de todos los participantes a través de la educación, la implementación de políticas habilitantes, y el mejoramiento de la infraestructura de información son indispensables para el desarrollo de una estrategia aceptable y sustentable de protección ambiental.

El desarrollo de tecnologías es esencial para un control y prevención adecuados de la contaminación. Es más económico transferir una tecnología existente, en uso en una industria o país, a una industria o país diferente que desarrollar en éstos una nueva tecnología. La transferencia de tecnología debe cumplir ciertos prerrequisitos, en particular para el desarrollo de planes de estudio para especializaciones de medio ambiente, lo que incluye consideraciones de ciclo de vida total que se toman en cuenta durante el desarrollo y manufactura de productos.

Overview of CEPA Activities at ORNL
1998 – 2000

CEPA Vision

Strengthen the technical, professional, and educational environmental infrastructure in Latin America and the United States

Past CEPA/ORNL Interactions

Past

- Long history of collaboration in research and education
- Scientists from four major Chilean universities toured ORNL facilities prior to signing of Memorandum of Understanding
- Ten representatives from CEPA institutions have visited ORNL since March 1997
- Participation of graduate student from the University of Santiago in collaborative research project at ORNL

On-going CEPA/ORNL Efforts

- Evaluation of the efficiency of Chilean plants in reducing indoor air pollutants
- Analyses of methods to determine the reliability and accuracy of measurements carried out by selected environmental laboratories
- Development of basin-level water resources plan
- Development of a Master's Degree program in Science and Engineering with specialties in energy and environment
- Development of a strategy for technology transfer between Chile and ORNL
- Development of a joint proposal on environmental security

Contributions of ORNL to CEPA

- Staff time
- Facilities
- Equipment/instrumentation
- Funding
  - *Direct support through funding from overhead*
  - *In-kind support*

Future CEPA/ORNL Interactions

- Continuation of on-going efforts
- Establishment of additional areas of research collaboration with CEPA institutions
- Faculty and student exchange

Opportunities and Challenges

- Enhanced research capabilities
- International approach to global concerns
- Students ~~and faculty~~ partnering as a community of learners
- Sustained funding

ORNL Visit of Professors Adolfo Acuña and Pedro Pedreros from EULA, University of Concepción - Agenda

Activity	*Date*	*Speaker*
Discussion of Chilean Presentation	Monday, March 23, 1998, 2:00-4:00	Linda Cain and Juan Ferrada
Air Dispersion Modeling	Tuesday, March 24, 1998, 9:00-11:00	Bob Miller
Water Resources Modeling	Wednesday, March 25, 1998, 9:00-11:00	John Tauxe
Energy and Economics	Wednesday, March 25,1998, 2:00-3:00	Bob Perlack
Water Shed Planning	Tuesday, March 25, 1998, 3:00-4:00	Tim Ensminger
Systems Analysis	Thursday, March 26, 1998, 2:00-4:00	Juan J. Ferrada
Remediation	Friday, March 27, 1998, 2:00-4:00	Les Dole
Effects of Hydroelectric Power on Aquatic Systems	Monday, March 30, 1998, 9:00-11:00	Glenn Cada
Environmental Science Division	Monday, March 30, 1998, 2:00-4:00	Tom Ashwood
Pollution Prevention, DOE Program	Tuesday, March 31, 1998, 10:00-11:30	Ana Gonzalez, DOE
Pollution Prevention	Tuesday, March 31, 1998 2:00-4:00	Irvin W. Osborne-Lee
Environmental Externalities	Wednesday, April 1, 1998, 2:00-3:00	Russell Lee
Water Quality, DOE Program	Thursday, April 2, 1998, 9:00-11:00	Gary Hartman, Steve Haas, DOE
Energy and Environment, - an ORNL Perspective	Thursday, April 2, 1998, 2:00-4:00	John Sheffield
Energy Planning System	Friday, April 3, 1998, 2:00-4:00	Jim VanCoevering
Demand Side Management	Monday, April 6, 1998, 2:00-4:00	Marilyn Brown
Energy and Industrial Perspective	Tuesday, April 7, 1998, 2:00-4:00	Tony Schaffhauser

ORNL Visit of Professors Adolfo Acuña and Pedro Pedreros from EULA, University of Concepción

Analysis of Visit

- Contact: Dr. John D. Tauxe, ORNL
- Area: Ground Water Hydrogeologist
- Potential Project:
  - *Hydrogeology Modeling of Sensitive Areas in Pipeline Projects at the VIII Region.*
  - *Evaluation of contamination in the underground water table at disposal sites*
- Contact: Dr. Juan Ferrada, ORNL
- Area: Modeling and Simulation
- Potential Project:
  - *Environmental Modeling of the Bio-Bio River System using FLOW Simulator*
  - *Management and Disposal Options for Industrial Hazardous Wastes at the VIII Region*
  - *Workshops about Systems Analysis applied to Environmental Problems*

ORNL Visit of Professors Adolfo Acuña and Pedro Pedreros from EULA, University of Concepción

Analysis of Visit *(continued)*

- Contact: M.s. Ana R. Gonzalez, DOE and Dr. Irvin Osborne-Lee, ORNL
- Area: Pollution Prevention
- Potential Project:
  - *Short courses on Pollution Prevention Principles directed to the Academic, Public, and Industrial Sectors of the VIII Region*
- Contact: Dr. Russell Lee, ORNL
- Area: Energy and Environment Policy Analysis Program
- Potential Project:
  - *Preliminary Assessment of Externalities of Hydro Electrical Power Generation in the Bio-Bio River System*

Environmental Security Proposal with Dr. Ruben Rodriguez of UPAEP

Title: Environmental Health and Sustainable Development

- Principal Investigators:
- Juan J. Ferrada, ORNL
- Ruben Rodriguez, UPAEP

Mexico's current issues include the following:

- high industrial growth rates in outlying regions result in environmental degradation;
- environmental degradation forces population concentrations in the Mexican cities and northern provinces;
- an insufficient potable water supply accelerates the spread of cholera, rabies, and encephalitis;
- a risk exist from an active volcano Popocatepetl next to Puebla, the fourth largest city in Mexico; and
- many other new and legacy environmental problems are overwhelming the infrastructure of such a newly reinvigorated democracy.

Environmental Security Proposal with Dr. Ruben Rodriguez of UPAEP (continued)

Tasks

- Development of an organization and the integration of working teams
- Define two initial study regions using ecological regimes
- Develop conceptual models of the environmental interactions
- Analyze the current trends and forecast probable scenarios
- Produce final documents for the study regions

Future Plans

Master's Degree in Energy and Environment

- Implementation at UPAEP
- Visiting professors from ORNL, UT, and other universities to form a center of excellence at UPAEP
- Adapt Master's Degree in Energy and Environment at the University of Santiago
- Academic training for faculty from UPAEP

Implement projects with EULA

- Educational program in pollution prevention
- Finish proposals in modeling and simulation tool for the Bio-Bio River

In kind contribution

UPAEP Master's Degree Program	$10K
EULA faculty visit	$10K
Academic training	$2K
Environmental Security Proposal	$10K
USACH Master's Degree Program Adaptation	$2K

Current and Future Collaborations Between CEPA and the Environmental Sciences Division (ESD) at Oak Ridge National Laboratory (ORNL)

James M. Loar

CEPA Annual Meeting

Santiago, Chile

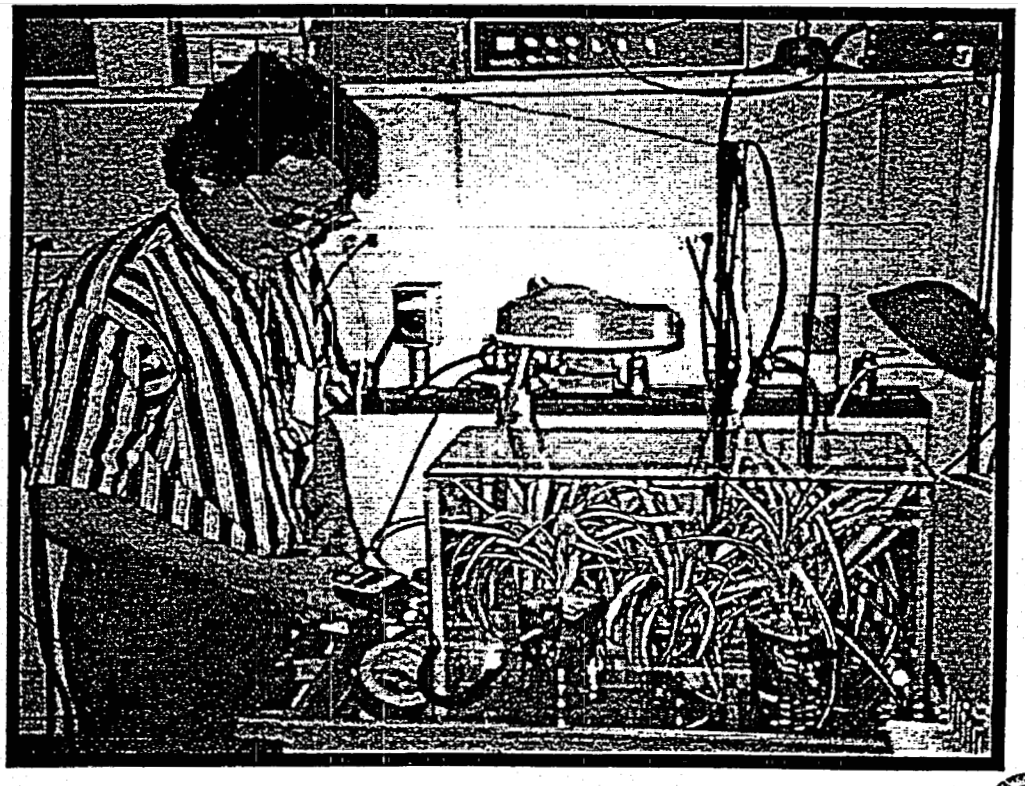
April 14–16, 1998

Initial Collaborations

- Scientists from four major Chilean universities in the CEPA consortium toured ESD facilities during visit to ORNL (August 1996)
  - *Correspondence via email initiated between Dr. Jaime Cornejo and Dr. Art Stewart*
- Scientists at ORNL obtained funding to support collaboration on a study entitled "Phytoremediation Research: Gas-phase Testing of a Sampling Chamber for Volatile Contaminants" (September 1997)

Description of Study

- Evaluated the efficiency of Chilean plants in eliminating indoor air pollutants
- Used expertise and instrumentation in ESD and the Chemistry and Analytical Science Division to extend studies that had been initiated in Chile
- Involved 3-week visit to ORNL by Franz Muñoz, a student of Dr. Cornejo, who conducted the chemical analyses (see photo)
- Involved Dr. David Joy, ORNL-UT Distinguished Scientist in the Metals and Ceramics Division, who helped to characterize the leaf surfaces by scanning electron microscopy and x-ray emission
- Collaboration on data analyses and manuscript preparation are continuing



Recent Collaborations

- Dr. Cornejo visited ORNL in February 1998 and worked with ESD scientists
  - *Prepared joint proposal entitled "Path Forward: Technology Transfer to Enhance IMA-USACH-ORNL Relationship under CEPA"*
  - *Prepared draft manuscript summarizing the results of phytoremediation research*
- Drs. Adolfo Acuña and Pedro Pedreros, Environmental Studies and Research Center at the University of Concepción, visited ORNL in March 1998
  - *ESD staff gave five presentations on topics ranging from environmental analyses of hydroelectric projects to innovative biological monitoring techniques*
  - *Further discussions are planned at the University of Concepción on April 17, 1998*

Potential Areas for Future Collaborations

- Phytoremediation
  - *Research related to reducing air and water pollution*
  - *Joint proposal to DOE-EE on innovative space conditioning systems*
- Analysis of environmental impacts related to hydropower development
  - *70–80% of Chile's electricity is produced by hydropower*
  - *6 projects planned on Bio-Bio River*
  - *ORNL has provided the environmental leadership to DOE Hydropower Program for past 20 years*
- Biomarkers of aquatic ecosystem health
  - *Scientists from both Chile and ORNL collaborate with scientists at the University of Sieno, Italy on biomarker research*
  - *Interaction initiated via email between Dr. Marshall Adams (ORNL) and Dr. Ricardo Barra (University of Concepción)*

A New Proposed Collaborative Environmental Initiative Between CEPA and the Oak Ridge National Laboratory

Bruce A. Tomkins, Ph. D.
Organic Chemistry Section
Chemical and Analytical Sciences Division
Oak Ridge National Laboratory
Oak Ridge, TN 37830

What Does the New Initiative Offer CEPA?

- Development of performance-based environmental analytical procedures with corresponding statistically-based certification
- Initial certification of environmental analysis laboratories using custom-prepared performance evaluation samples employing matrices and analytes at known concentrations, all specified by CEPA members
- Deployment of state-of-the-art analytical methods which have been certified, peer-reviewed, and tested extensively in the field, but not yet formally approved by the U. S. EPA
- Ongoing technical assistance and monitoring to member laboratories

The Chemical and Analytical Sciences Division in Brief

- Performs both basic and applied research
- Emphasizes analytical chemistry, mass spectroscopy, radiochemistry, geochemistry, and materials chemistry
- 135 permanent staff; 95 degreed scientists and engineers, 75 of whom hold Ph. D.s; 4 sections
- Funding distribution: 70% from U. S. Department of Energy; 30% from "Work for Others"
- Common practice to collaborate and interact with other divisions

Relevant Capabilities and Experiences of the Organic Chemistry Section, CASD

- Extensive experience in the determination of airborne species in "second-hand" and mainstream tobacco and.. headspace of radioactive storage tanks
- Design, construction, testing of new mass spectrometers for specific applications
- Development, statistical validation, and evaluation of new analytical procedures for unusual analytes of military origin in ground water, soil, and building materials

The Analytical Environmental Support Group in Brief

- Develops and implements quality assurance/quality control programs for the environmental area. Current customers include the U. S. Army Rocky Mountain Arsenal and the U. S. Postal Service
- Develops guidelines for auditing laboratories and field activities
- Performs independent audits of environmental laboratories
- Preparation of performance evaluation samples

The Analytical Environmental Support Group in Brief (continued)

- Reviews new analytical methods
- Reviews analytical data generated and determines their usability
- Provides training and guidance in quality assurance procedures

What are the Properties and Advantages of "Performance-Based" Analytical Methods?

- Method is defined using "Data Quality Objectives", in which the user specifies certain questions which the method must address
- Users specify "false positive" and "false negative" rates
- Methods can be specified for uncommon analytes or matrices
- Standard unbiased statistical treatments are used to evaluate key characteristics such as detection limits, usable concentration range, robustness, and recovery of surrogate standards

Thermal Desorption/GC/MS Analysis of Waste Tank Headspace Samples

- Originally developed for the determination of headspace volatiles in large waste storage tanks at the U. S. Department of Energy's Hanford site, Richland, WA
- Specialty determination of 25 volatile target analytes known or suspected to be in the headspace
- Sampling performed with sampling traps containing three carbon sorbents; analytes later desorbed for GC/MS analysis

Thermal Desorption/GC/MS Analysis of Waste Tank Headspace Samples (continued)

- Performance characterized in a statistically-valid and unbiased manner based on several parameters to satisfy customer and regulatory needs
  - *Desorption efficiency*
  - *Reproducibility*
  - *Analyte stability*
  - *Linearity of calibration*
  - *Method Detection Limits*
  - *Pre-analytical holding times*
  - *Quality control limits for surrogate standard recoveries*

First Collaborative Venture with a CEPA Partner

- Perform an initial scoping study of the volatile components in the urban air of Santiago using twelve triple-sorbent sampling traps used in the U. S. DOE Hanford study
- CASD has provided the CEPA partner with traps and a portable sampling pump
- Traps will be returned to CASD for mass spectrometric analysis of volatile components
- Results will be used to prepare future studies and refine the initial air sampling plan

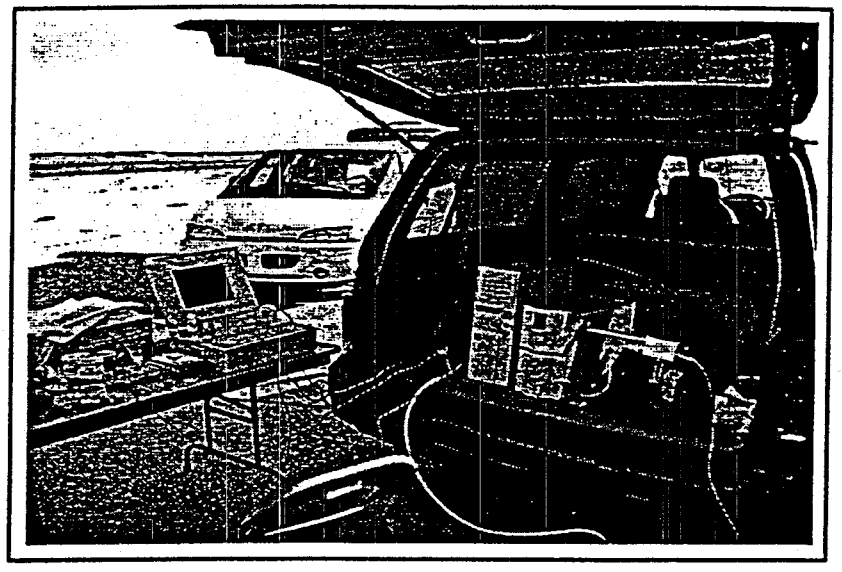
Solid Phase Extraction Using Empore™ Disks

- Disks contain sorbents (several types available) in flexible inert Teflon® matrix
- Excellent for extracting organics rapidly from large volumes (>1 L) of water
- Analytes removed using only small volumes of hazardous solvent
- Methods developed for pesticides, explosives, nerve agent products in ground water
- Performance-based procedures vali-dated and accepted by U. S. Army Rocky Mountain Arsenal. Some also accepted by Colorado and U. S. EPA.

Direct-Sampling Ion Trap Mass Spectrometry (DSITMS)

- Developed, tested, certified, and deployed by ORNL staff members
- Capable of very rapid batch analysis and near-real time monitoring of specified test compounds
- Part-per-billion sensitivities for analytes in air, water, soil
- Van-portable; two-man portability; field ruggedized; operates from batteries or portable generator
- Extensively tested at U. S. DOE Savannah River Site, Oak Ridge Toxic Waste Incinerator, others
- Submitted for approval to U. S. EPA, but not yet accepted

The DSITMS Operating in the Field



Summary: Aims of the Proposed Initiative

- Develop performance-based analytical procedures tailored to specific environmental needs identified by CEPA members
- Deploy state-of-the-art certified analytical methodology and instrumentation as necessary to address specific needs
- Provide ongoing unbiased certification of local analytical laboratories to ensure reliability and accuracy
- Provide ongoing technical assistance and training
- Establish a ***funded*** initiative with CEPA partners

Credit

- The Oak Ridge National Laboratory is managed by Lockheed Martin Energy Research Corp. under U. S. Department of Energy Contract
- DE-AC05-96OR22464

Short Courses Developed for the CEPA Initiative

1997 - 2000

INTRODUCTION TO ENVIRONMENTAL PROTECTION

This course introduces the students to the basic requirements of environmental protection. It is intended for the upper undergraduate or lower graduate level student. Although it relies heavily upon the U.S. system, it is designed for a Mexican audience. The topics identified below are not necessarily taught in the order of their appearance on the list. The course is designed for 32 hours of presentation. Note that an hour is defined as 50 minutes of lecture including discussion and a 10 minute break. Because of the complexity of the problem, certain topics may require more than one lecture hour, conversely several topics may be combined in one lecture hour.

1. The concept of environmental assessment.

2. The concept of the environmental impact statement. The U.S. National Environmental Policy Act (NEPA) will be used to demonstrate the process.

3. Description of air pollutants indicating Ambient Air Quality Standards (AAQS) and Hazardous Air Pollutants (HAPs).

4. Discussion of AAQS, how the levels are chosen.

5. Air Quality Index.

6. Discussion of HAPs using three examples to demonstrate what they are.

7. Discussion of the concept of best available technology and similar concepts.

8. The risk assessment process.

9. The risk management process.

10. Discussion of water quality standards.

11. Water source control demonstrated by the U.S. National Pollution Discharge Elimination System (NPDES).

12. Drinking water standards and how they are developed.

13. Municipal solid waste management system.

14. Disposal technologies for municipal waste.

15. Definition of industrial waste.

16. Treatment of industrial waste.

17. Incineration of industrial waste.

18. Disposal of industrial waste.

19. Control of toxic substances as demonstrated by the U.S. system of Premanufacture Notification (PMN) and cancellation process.

20. Control of pesticides as demonstrated by the U.S. system.

21. Standards of pesticide residue in food.

22. The concept of risk benefit analysis.

23. Control of stationary sources of air pollution as demonstrated by the U.S. system.

24. Requirements for fossil fuel power plants.

25. Generation of electricity by nuclear power.

26. Nuclear waste management.

27. Comparative assessment of various energy sources.

28. Energy conservation and waste recycling.

29. Global environmental issues such as global warming and protection of ozone layer.

30. Management of wild like and biodiversity.

31. Clean up of contaminated soil.

32. Protection of underground water.

33. Assessment of scientific information for environmental decisions.

34. Overview of Mexican environmental laws.

35. Control of mobile sources of air pollution.

36. Indoor air pollution and its mitigation.

37. Pollution of oceans and its prevention.

38. Storage tanks.

Prepared by A. Alan Moghissi. Ph.D.

Laboratory/ Institutional Collaborations

Briefing on Centro EULA visit - Concepción Chile

A group of scientists from the National Laboratories and the U.S. Department of Energy (DOE) will be honored guests at Chile's foremost center for environmental research on Friday, April 17, 1998. This one-day meeting will take place under the auspices of the Educational Consortium for Environmental Protection/*Consorcio Educativo para la Proteccion Ambiental* (CEPA), a DOE-funded collaboration that fosters research and education in environmental sciences across regional and national boundaries.

CEPA brings together representatives from the DOE and its national laboratories, as well as 6 Hispanic-serving institutions of higher education in the United States, two universities in Mexico, and five universities in Chile to develop joint research projects and educational programs; to design faculty and professional training programs; to promote student exchanges; to facilitate the transfer of technology and related resources; and to promote sustainable development. As an integral part of the DOE's Hispanic Outreach Initiative, CEPA works to promote educational, employment and business opportunities for Hispanics in the United States.

The meeting on April 17 will take place at the *Centro* EULA CHILE, which is the International Inter-University Center for Research and Training in Environmental Sciences at the *Universidad de Concepción* in Chile. The *Universidad de Concepción* is one of the active partners in CEPA; it is also part of CICS/EULA, the Inter-University Center for Scientific Cooperation between Europe and Latin America. CICS/EULA is a consortium between five universities in Italy (*Universitá di Genova, Politecnico di Milano, Universitá di Pisa, Universitá della Tuscia, Universitá di Palermo*) and the *Universidad de Concepción.*

CICS/ELA was developed in 1989 as a cooperative pilot program between Chile and Italy to manage the water resources of Chile's BioBio (*bee-oh bee-oh*) River Basin and its adjacent coasts. The pilot program brought together 120 Chilean and 60 Italian scientists, and consisted of several research projects on the lands and the terrestrial, continental, and marine waters of the region, as well as the relationship between the environment and the economy. In 1990 the *Centro* EULA CHILE became a permanent academic unit of the *Universidad de Concepción*, dedicated to

supporting and coordinating the study of land planning in relation to environmental and renewable resources; and to promoting the planning and implementation of undergraduate and graduate programs in environmental sciences and the management of renewable resources.

Centro EULA CHILE consists of three major buildings located at the *University of Concepción*. The buildings contain laboratories for Land Use Planning, including Coastal Zone Management; Earth Sciences (Sedimentology, Geology and Geomorphology); Informatics, Digital Cartography and Satellite Imagery Interpretation; Environmental Chemistry; Environmetal Oceanography; Art and Documnetation; Editorial Services; as well as areas for lectures and other training activities.

The staff of the *Centro* EULA consists of highly qualified members of the university's faculty, as well as independent researchers trained under the pilot program. *Centro* EULA has been involved in highly complex consulting and technical assistance projects in Chile that range across public and private industries, including the petrochemical, chemical, forestry, pulp, mining, construction, and fishing industries. Additionally, the *Universidad de Concepción* has signed agreements with the regional government designating *Centro* EULA on all matters concerning the environment.

Based on the success of the pilot program in the BioBio River Basin, the *Centro* EULA has begun to develop a Latin American network of professional training and program sites that include Argentina (*Universidad Nacional del Sur*, Bahía Blanca), Brasil (Universidad de Santa Calarina, Florianópolis), Peru (Universidad de Piura), Uruguay (Universidad de la República), and Venezuela (Universidad Simón Bolivar).

Workshops and Meetings held at the University of Santiago (USACh)

I was invited to attend to the University of Santiago, as representative of the Oak Ridge National Laboratory and the DOE program Consortium for the Education of Environmental Protection (CEPA). I was received by the USACh representative to CEPA, Dr. Fernando Corvalan. Three workshops were prepared as main events.

First Workshop (Monday 15)

Attendees

Dr. Jaime Pizarro, Director of the USACh International Relations Office
Dr. Fernando Corvalan, USACh representative to CEPA
Prof. Jorge Cerda, Dept of Geographic Engineering
Prof. Victor Pantoja, Dept of Geographic Engineering
Prof. Rolando Vega, Dept of Chemical Engineering
Prof Luisa Sepulveda, Dept of Chemical Engineering
Prof Patricia Mery, Dept of Civil Engineering

Activities

Welcome words by Dr. Jaime Pizarro, Director of the USACh International Relations Office.

Overview of Oak Ridge National Laboratory research experience and analysis of the CEPA program in relation with ORNL and USACh institutions. Dr. Juan J. Ferrada

Overview of the USACh Chemical Engineering Department. They have a post-degree and a graduate program. Post-degree are a set of courses offered to the B.S. and Civilian degrees alumni, aimed to solve environmental problems and is not conducive to a graduate degree. They require experts in different environmental areas to offer the post degree program. They expressed interest in having professionals from ORNL to help them with some of the short courses. In the technical assistance area, they provide help to national institutions to set emissions regulations. They also expressed interest in establishing contacts with experts in regulatory matters. Dr. Rolando Vega

Overview of the Civil Engineering Department. Different from USA, this department does not have the career of environmental engineering, but they have two environmental courses in undergraduate level (Physical-chemical treatment and biological treatments). However, they do have research in environmental areas such as bioremediation, acoustic contamination, construction saving energy, handling of hazardous materials, and solidification of hazardous materials. The only possibilities that I see with this department is the joint participation with some of the national laboratory researchers for training purposes. Ms Sc Patricia Mery.

Overview of the Geographic Engineering Department. They do have a 5-yr career in Environmental Engineering that has been approved to start next year. They do have research in areas of natural resources, soil degradation, territorial planning, and environmental impact statements. They provide technical assistance to CONAMA (the USA EPA counterpart), in particular in areas of water management. Prof. Victor Pantoja.

They also have professors dedicated to dynamics of natural systems, transport phenomena and interfaces with residual treatments. They are very interested in dynamic simulation systems in treatment plants, and decision making in environmental problems. Dr. Fernando Corvalan.

They have accumulated quite a bit of experience in GIS technology and have applied this technology to global systems analysis. They would like to improve their knowledge of life cycle analysis applied to environmental problems. Prof. Jorge Cerda.

These group of academics are interested in areas of decision making algorithms, GIS technology and applications of life cycle analysis to environmental challenges. ORNL has plenty of experience in these areas and exchange with these professionals is very viable. In particular, applications of life cycle analysis, I also visualize a collaboration with EPA, since they have a very strong group in life cycle analysis. Romi Diaz could be interested in interacting with this department.

Second Workshop (Monday 15)

Attendees

Dr. Fernando Corvalan, USACh representative to CEPA
Dr. Roberto Santander, Department of Mechanical Engineering
Dr. Pedro Saa Herrera, Department of Mechanical Engineering
Dr. Valeri Ivanovich, Department of Mechanical Engineering
Dr. Jaime Simpson, Department of Metallurgical Engineering

Activities

Welcome words by Dr. Fernando Corvalan.

Overview of Oak Ridge National Laboratory research experience and analysis of the CEPA program in relation with ORNL and USACh institutions. Dr. Juan J. Ferrada

Overview of the Mechanical Engineering Department. At the Mechanical Engineering Department, researchers have done quite a bit of work in analysis of steam fireburner emissions. They have done atmospheric diffusion models, use of fluidized bed for coal burners, and they are actually interacting with Russian researchers in contamination reduction for fixed sources. They are also working in porous media to reduce CO2, SO2, and NOx emissions. Commercial companies are already interested in this research. The technology transfer is done with Russian participation. One of the best applications of this technology is the treatment of medical residues. Dr. Roberto Santander

They have also worked in glass making waste reduction. They have applied pollution prevention methodologies to improve the operations of the glass making manufacturers. Dr. Pedro Saa

Another line of research is on materials development. In particular, insulating materials using silica composites.

They are interested in exploring possibilities of transferring their technologies as well as interacting with ORNL scientists working on this area. Medical residue treatment is an interesting topic for the state of Tennessee, since getting permits for waste incineration is becoming virtually impossible and any alternative to incineration is very attractive.

Overview of the Metallurgy Department. Their research has evolved around simulation of mineral processing and material lining for size reduction equipment. They have also worked in hydro metallurgy and solvent extraction simulation. In other areas of research interest, they have work in reduction of arsenic and cadmium. This group is also very strong in real time electrode behavior simulation and pyrometallurgy process simulation. This department also has post-degree courses in control and corrosion prevention. Dr. Jaime Simpson.

An interest may exist in technology transfer for the copper mining industry through work done at the ORNL.

Third Workshop (Tuesday 16)

Attendees

Prof. Arnoldo Arias, Director of the Industrial Engineering Department
Prof. Axel Gottschalk, Executive Director for the Center of Production and Technological Innovation and professor of the Industrial Engineering Department
Dr. Juan Sepulveda, Department of Industrial Engineering
Ms Sc Patricia Mery, Department of Civil Engineering
Ms Maria-Elena Torres, Director of the Environmental Technologies Division of the Technological InstitutedTechnologico de Chile (INTEC)
Ms. Sc. Juan-Ramon Candia, Environmental Technologies Division of INTEC
Mr. Jaime Olguin, CFO Mining and Metallurgy Research Center (CIMM)
Mr. Leopoldo Contreras, CEO of CIMM
Mr. Hector Leiva, Metallurgy Project Manager
Ivan Derpis, professor of the Industrial Engineering Department

Activities

Welcome words by the Director of the Industrial Engineering Department, Prof. Arnoldo Arias.
Welcome words by the Executive Director for the Center of Production and Technological Innovation, Prof. Axel Gottschalk.

Overview of Oak Ridge National Laboratory research experience and analysis of the CEPA program in relation with ORNL and USACh institutions. Dr. Juan J. Ferrada

Overview of the Industrial Engineering Department. The Department of Industrial Engineering has engaged in agreements with national centers for research such as the CIMM and INTEC. These agreements all point toward clean technologies for the mining industry. Prof. Ivan Derpis.

The agreements that the Department of Industrial Engineering has with the CIMM are based on commercializing technological and service products. Activities included training, research, and technical assistance. CIMM has business connections with Ecuador, Peru, and Brazil will be added soon. Business environmental areas are becoming more important within the CIMM project portfolio. Environmental businesses include monitoring, environmental impact statement, clean technologies, and environmental engineering. CIMM's strategical objectives in teaming up

with the University of Santiago are building a research powerhouse that positions them as leaders in the mining industry in South America. Mr. Hector Leiva.

The Department of Industrial Engineering in partnership with the CIMM to work together with INTEC in the Center for Clean Production. The objectives of this center are geared to promote economic advantage by applying clean technology principles to industry. They already have signed agreements with 300 Chilean companies. They have among their mechanisms to work with industry the fast diagnostic auditing system. This system will allow industry to obtain quick economic gains by applying pollution prevention to their daily practices. Ms. Maria-Elena Torres.

This group is highly interested in establishing contacts with researchers from the national laboratories. In particular they would like to explore the possibility of establishing partnerships that can participate in bids for proposals funded by international agencies. They are also interested in getting help with the Center for Clean Production. Transfer of technology is also high in their priorities since they have defined this topic as the venue to position themselves as the leaders in research and development for South America. I think we could establish interesting agreements with this group, particularly, in the area of copper mining industry.

Meetings during Wednesday 17

Meeting with Dr. Ignacio Caro, Director of the Environmental Management Program at the University of Santiago (USACh). Dr. Caro is the director of the most successful training program that USACh has to interact with institutions and the private sectors. They have already established over 25 post-degree seasons. They work from the College of Engineering. The objective of this program is to train professionals in all matters pertaining with environmental problems. Dr. Caro has already worked with professors from UT, Knoxville and other USA companies. He is interested in finding researchers from ORNL that can teach at their post-degree seminars. He is also interested in visiting ORNL. I believe if we invite him to visit this laboratory many ORNL researchers can participate in those seminars. This visit will cost no direct money to ORNL or CEPA However, I need to provide him with meetings with appropriate researchers of our lab.

Meeting with professor Elsa Contreras and Luisa Sepulveda from the Department of Chemical Engineering. These two professors are working with the Chilean Nuclear Energy National Commission in encapsulating radioactive low level waste. They are currently cementing diatomaceous earths contaminated with Tritium. Next they will have to encapsulate U-235 residues. They are very interested in establishing contacts with the Oak Ridge National Laboratories for technology transfer in appropriate encapsulating technologies.

Meeting with Mr. Jaime Olguin, CIMM CFO. Mr Olguin is going to provide me with information about processing of Selenium in the copper mining industry. They have developed quite a bit of knowledge in this area. They are also interested in the mercury extraction process. Most importantly, they are interested in technology transfer that could benefit the copper mining industry.

Final Comments

Miriam, as you see, there are quite a few possibilities of establishing contacts with other groups of the University of Santiago. Dr. Corvalan prepared a good agenda for me and I believe that at least one of the possible lines of work will be successful within a year. I would suggest that CEPA tries to fund one trip of Dr. Corvalan to the ORNL so he can observe first hand and interact with the researchers to move on to the next stage of the agreement.