Safeguarding the environment
Hammerhead sharks are seen congregating at El Bajío Espíritu Santo in the Gulf of California, where two researchers are tracing their movements. UC Davis Associate Professor of Wildlife, Fish and Conservation Science Peter Klimley and Professor of Fish & Marine Biology Felipe Galván Magaña, La Paz Centro Interdisciplinario de Ciencias Del Mar (CICM), aim at coordinating conservation areas for the endangered fish. (See details P. 15)

Sea snails like this Macron aethiops are among the pests that prey on oysters that UC Davis graduate student Laura Rodríguez is studying in Bahía San Quintín, Baja California, Mexico. The shallow bay supports a large oyster aquaculture industry, the second most important economic activity in the region after agriculture. (See details P. 39)

Air pollution dogs many major metropolises, but Mexico City leads the pack worldwide. UCLA’s John Froines and CINVESTAV’s Andrea de Vizcaya joined forces to test the dirty air seen here shrouding the city at nightfall. Their data show that vehicle emissions are only a part of the cause. Industry also contributes to the unhealthy air. (See details P. 13)

Agriculture specialists are deeply concerned about maintaining diversity among the many varieties of maize that have evolved in Mexico. UC Davis doctoral student Kimberlee Chambers is examining how much those varieties have changed since major seed collections took place in the 1940s and 1950s. (See details P. 4)
Academics seek to expand vision

Despite the importance of the environment to social well-being and survival, throughout human history communities and individuals have struggled to maintain a balance in the relationship between the environment and society; in extreme cases leading to the collapse of entire civilizations. In this century, however, human impact on the variety, intensity and scale of the environment has never been so far-reaching. In spite of an improved understanding of how the planet functions, we seem unable to solve its environmental problems. At best, we mitigate their negative consequences.

Part of the difficulty in addressing environmental issues lies in the tendency to regard them as technical problems divorced from the socioeconomic, political and cultural contexts from which they emerge. The development of the environmental justice movement – which pinpoints the struggles that exposure to hazardous substances or hazardous wastes cause, the conservation of species and habitats, or the management of natural resources – is tangible evidence that the environment can no longer be considered a common good while ignoring the social, economic and political divide. Often, the defense of specific economic interest takes precedence over important environmental issues, with severe social and environmental consequences. The environment is, in fact, an intrinsic component of social justice.

Recent decades, however, have been marked by an understanding that the regional and global dimensions of socioeconomic and environmental issues supersede the merely local. Indeed, the dynamic interaction of these three elements on the environmental debate is a trademark of the 21st century. No longer can the local aspects of environmental issues be considered in isolation from the regional and global, since those processes either help cause them or feed into and influence their consequences. Key to this debate is the complex interaction of social and biophysical processes on different geographical and temporal scales. The complexity of addressing these interwoven elements has posed huge problems for the international community. Despite the grave dangers to both human and natural well-being, reaching a consensus on such a broad scale has mostly proven elusive. The difficulty in addressing global environmental problems illustrates the challenges the international community faces in reaching consensus on these issues.

Improving patterns of growth requires new ways of thinking in multidimensional terms about society’s relationship with nature. Disciplinary contributions in areas related to the environment have generated significant knowledge and have been instrumental in creating a better understanding of specific environmental concerns. Our better understanding of atmospheric chemistry has developed a broader dimension of understanding about climate change. Knowledge about ecosystem functions has helped protect biodiversity and manage natural resources. Sadly, to date, there has been less progress in developing the multidimensional perspectives of these issues by focusing on the dynamic interactions among their biological, physical, chemical, social, economic, political and cultural dimensions, which all take place on different spatial and temporal scales.

New initiatives, seeking to create a generation of professionals and scholars with a multidimensional vision molded by interdisciplinary and transdisciplinary research, would help our societies to provide opportunities to better address the environmental problems they confront in the 21st century and create sustainable patterns of growth. Ideally, these initiatives would cat-
**ENVIRONMENTAL RESEARCH Vision**

Analyze new knowledge and creative thinking with balanced participation from the natural, physical and social sciences, and the humanities. Our search for better understanding and broader knowledge of environmental issues should recognize their complexity and foster multidimensional perspectives to address them.

Fortunately, there is growing recognition of the need for a new way of thinking about the environment. New multidimensional approaches are becoming part of international efforts to address environmental problems, among others, the Millennium Ecosystem Assessment, the International Panel on Climate Change (IPCC) and the Earth System Science Partnership (ESSP). National science foundations, private foundations and other agencies have also created programs supporting interdisciplinary research and training.

Integrated perspectives on the environment should also become part of the reassessment of educational programs, seeking to better prepare students to address contemporary societal challenges. Building a balanced relationship between nature and society is a dynamic learning process requiring periodic assessment of changing conditions. Training new generations of professionals, capable of better participating in those processes, necessitates a combination of disciplinary training with interdisciplinary analytical...
skills in future generations of scholars, practitioners and informed citizens.

UC MEXUS is assisting the University of California and Mexican universities in their efforts to better prepare their societies for such 21st century problems. This issue of our newsletter, which is dedicated to the environment, presents some of the joint projects between UC and Mexican researchers who are part of the UC/CONACYT program that provides support for collaborative projects. A significant number of these projects address environmental issues. The results from funded projects have contributed to a better understanding of environmental issues relevant to both Mexico and California. Those featured in this newsletter illustrate the quality and relevance of much of that research.

Other UC/CONACYT programs on Mexico that UC MEXUS administers also contribute to a better understanding of the environment. A number of Mexican graduate students are completing doctoral studies on UC campuses in fields related to the environment. Some of those former graduate students now collaborate with UC faculty on binational projects. One of the major outcomes of these binationally funded collaborations is training the students that participate in them. Among the major benefits are student exchanges between labs or in

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**Earth friendly farming**

Pedro Andrade, a former UC Davis graduate student, continues his work on cutting-edge agricultural technology with his Department of Biological & Agricultural Engineering mentor Shrini Upadhyaya. Their current joint project, Study of soil compaction & hydraulic conductivity to improve tillage & irrigation energy utilization in the Sacramento Valley & La Laguna México, funded by a 2004 UC MEXUS/CONACYT Collaborative Grant, focuses on equipment Andrade developed as a graduate student. The machinery measures soil density (a so-called Profile Compaction Sensor), and the soil's resistance to penetration (a Cone Index) to better evaluate the need for watering or for deep ploughing. The goal: to eliminate waste, reduce costs and environmental impact, and increase crop yield. Traditional agriculture taxes the environment by promoting soil erosion and over-using energy. Fear of crop failure also prompts many producers to squander seed, pesticide and herbicide sprays and fertilizers. As part of their collaboration, Andrade took two Mexican graduate students from La Laguna to explore the academic and research work at UC Davis. Andrade currently is a post-doctoral scholar at Washington State University in Prosser, where he is working with Francis Pierce, director of the Center for Precision Agricultural Systems, on field evaluation of sensor networks for agricultural applications.

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Information:
http://bae.engineering.ucdavis.edu/Research/soil.html
The Street of the Shrimp Ladies, often treated as a tourist attraction in Mazatlán, represents one of the few occupational options in an area where jobs are scarce.

Women dominate Mazatlán shrimp industry

Women shrimp traders in Mazatlán are a lively part of the local community and a regular stop for tourists, but they have been relatively invisible to local fishing authorities and the government. As a UCR Assistant Professor of Anthropology, María Luz Cruz-Torres sought to fill that gap in knowledge with her project, *Gender, fisheries and globalization: women shrimp traders in Northwestern Mexico*, supported by a UC MEXUS Faculty Research Grant. Cruz-Torres, who is an associate professor of women and gender studies, associate professor of transborder chicana(o)/Latina(o) studies and research associate of the North American Center for Transborder Studies at Arizona State University, conducted extensive interviews with the women and found that most started out as young girls, accompanying their mothers or another female family member until they were able to start a business of their own. About 25 years ago, when they were selling their shrimp door-to-door, a number of women decided to get organized. Despite government opposition, they invaded the street now known as the Street of the Shrimp Ladies, set up shop and eventually developed a shrimp sellers association, which is still active. Cruz Torres plans to expand her study to include women who work in the shrimp processing plants, with support from an NSF grant. Information: Maria.Cruz-Torres@asu.edu.

Environmental Research Vision

field work. UC MEXUS also annually supports dissertation research for UC doctoral students. These fellowships are open to any discipline, and a number of them have supported environmental research projects.

Most recently, UC MEXUS has been helping develop a joint initiative on the environment and society between Mexico’s National Autonomous University (UNAM) and the University of California (UC). The key component is development of multidimensional perspectives on the environment. Building on the extensive collaborations between UC campuses and UNAM over the years, this initiative envisions new models for integrating collaborative team-based research into student curricula, at both the undergraduate and graduate levels. The Environment and Society Initiative aims to offer interdisciplinary training and international experience to future professionals that will help them better address the increasing pressure of environmental conflicts and crises challenging the growth and wellbeing of our societies and nature in the 21st century.

Through such initiatives and the many other programs it has initiated, UC MEXUS is able to fulfill its commitment to foster understanding and collaboration between UC and Mexican institutions to the benefit of both Mexican and California societies.
A UC-Mexico study of minute worm-like creatures in the Gulf of California has blossomed to encompass an international investigation supported by the Mexican and U.S. national science agencies.

The 2002 UC MEXUS/CONACYT Collaborative Grant, "Collaborative bioinventory of intertidal nematode meiofauna to advance systematics and monitor ecological change in The Gulf of California," lay the necessary groundwork to qualify UCR for more than $1 million in National Science Foundation funds. In addition, Mexico’s National Council for Science & Technology (CONACYT) is supporting the expanded project with more than $82,000.

“The UC MEXUS project led to development of collaborations, protocols and preliminary results that were absolutely essential to the award of the extramural grant,” says UCR Department of Nematology Chair James G. Baldwin, who partnered with Axayácatl Rocha-Olivares, a researcher in the department of ecology and current chair of the Biological Oceanography Department at the Ensenada Center for Scientific and Higher Education Research (CICESE).

Nematodes are minute, often transparent creatures. The uninitiated will see a resemblance to the earthworm in the long, cylindrical body. But nematologists sigh with exasperation at such analogies, pointing out that such an error would be equivalent to lumping together humans and clams. Millions of different species of nematodes live in soil and sediment worldwide. The beneficial ones feed on bacteria or minute insects that attack plants and crops. Trouble-making cousins are responsible for billions of dollars in crop losses as well as creating severe health problems for animals and people in the form of pinworms, hookworms, trichina and dog heartworms. In addition, being such an integral part of the ecosystem, they may serve as a bellwether for the incursion of environmental hazards and the overall condition of the environment.

Yet, despite being one of the most numerous organisms and of such great potential significance, Baldwin says nematodes also are the least documented.

An enormous step to solving this problem was taken the year this binational project was initiated.

In 2002, former UCR Regents lecturer Sidney Brenner shared a Nobel Prize for discovering that the nematode *Caenorhabditis elegans* would work as a “test model” for studying early human development. His work led to dis-
coveries that illuminate the causes of many diseases in humans. At the same time, NSF launched an initiative to create a genealogical map of every branch of life on earth. The Tree of Life project sought to gather researchers from many disciplines into a focused network aimed at completing an inventory of all 1.7 million known species within 10-15 years. The branch of the tree belonging to nematodes was, and still is, one of the most uncharted areas. And for a few very good reasons.

Although the NSF was putting up millions of dollars to document and classify nematodes, and the Nobel Prize was making headlines in the mainstream media, at that time there were fewer than 100 full-time specialists in taxonomy worldwide who were documenting nematode diversity, Baldwin says.

Baldwin and Rocha-Olivares were uniquely qualified to step up to the plate.

For decades, Baldwin had worked with researchers from Mexico and elsewhere in the world. In his lab, he had mentored Mexican graduate students, who in turn became professional collaborators in their own right.

Rocha-Olivares had spent years looking at the ecological and evolutionary issues affecting marine organisms inhabiting the Gulf of California (aka Sea of Cortez) using molecular approaches to address fundamental questions regarding their divergence and speciation.

“The Sea of Cortez has an abundance of biodiversity that has historically been undisturbed,” Baldwin says. But that diversity was increasingly being threatened – not least by U.S. insistence on damming the majority of the Colorado River, changing the flow into the Gulf and adding to the concentration of agricultural runoff that was polluting the waters.

The two scientists theorized that nematodes were precise indicators of changes in the entire biosystem – a theory that would call upon their particular skills.

An integral part of Baldwin and Rocha-Olivares’s initial survey of marine nematodes was documentation of hundreds of previously unknown species.

“We were left with the problem of how you inventory the unknown,” says Baldwin, who called on Belgian colleague Paul De Ley for help.

A decade before, when the two tussled with the problem of inventorying nematodes in Costa Rica, De Ley had theorized that the answer lay in computerized imag-
Baldwin & Rocha-Olivares

Nematodes

ing, which could be accessed by researchers worldwide. Alas, the computers of the early 1990s were not up to the task.

In the intervening years, computer technology caught up and De Ley designed an on-line archiving system. This allows the researchers to make a movie of the creature before dissecting it to extract the DNA. The combined video and technical information is loaded on NEMATOL http://nematol.unh.edu/ a Web site where other researchers also can add information.

“Any researcher or student can examine the entity just as they would under a microscope and view all pertinent data,” says Baldwin.

The site now is being coordinated by molecular biologist Kelly Thomas, head of the Hubbard Center for Genomic Studies at the University of New Hampshire. Since the mid 1980s, Thomas, an expert in molecular phylogenetics (evolution that provides the basis for classification systems), has been a collaborator with Baldwin on a range of NSF projects. Thomas’s expertise in phylogenetics and the infrastructure of the Hubbard Center were essential to the project, Baldwin says.

Accomplishing such a vast body of work would not be possible without the collaboration of many other colleagues like De Ley, say Baldwin and Rocha-Olivares. They enlisted the help of Jorge de la Rosa-Vélez and Dora Waumann at Universidad Autónoma de Baja California (UABC) to contribute their ecological knowledge of the Sea of Cortez. They also collaborated with John Lambshead at the London Natural History Museum, an expert on marine nematode ecology with whom they currently are publishing a paper. An integral part of the Baldwin team for nearly 30 years, and a leader on this project, is former UCR graduate student, Manuel Mundo, whose work is central to collaboration in Mexico and to this marine project. Researchers also are quick to credit a dozen undergraduate and graduate students with helping collect and process more than 1200 specimens, and hundreds, if not thousands, of video and still images that include those of completely new taxa. Some of those students share authorship on articles about their finds.

In an area that so recently has come under the world’s microscope, researchers say there is still a long way to go in documenting their particular branch of the tree of life. The project has primed the development of a research program in marine nematode ecology and evolution at his institution, Rocha-Olivares says.

There are myriad interrelationships between nematodes and their environment to explore, document and explain. The work will have implications far beyond the Gulf of California.

“The dynamics of the sea are complicated,” Baldwin says.

“Nematodes are fed upon by other invertebrates that in turn are basically fish food, so if they start to disappear so do the bigger creatures. We are still figuring out the critical parts of that web.” – FF
A century of lead production at the largest smelting plant in Mexico has left the population of the city of Torreón and the surrounding area vulnerable to impairments ranging from learning and behavioral problems to possibly even more serious health issues. Myriad research studies conducted there and elsewhere document the problem.

In an earlier study, “Chronicling a century of lead pollution in Mexico: stable lead isotopic composition analyses of dates sedimentary cores,” researchers Arthur (Russ) Flegal of UC Santa Cruz and Martín Soto-Jiménez of the Mexican National University’s Institute of Marine Science were seeking to chronicle the past hundred years of lead pollution spewed over Mexico while at the same time quantifying the contemporary situation. To do so, they employed a multi-faceted approach. By extracting cores of sediment from four wide-ranging locations and examining the lead content layer by layer, they were able to decode and quantify the history of industrial lead deposits to sediments over time.

In their current project, “Assessing lead contamination in Torreón, México: A lead isotope ratio study,” supported by a UC MEXUS/CONACYT Collaborative Grant, they are taking environmental samples from stations around the Torreón smelting plant. In addition to water, soil and dust samples, they are checking the blood of local children.

They also have set up an air testing station about a kilometer from the plant. They then examined the lead particles using the sophisticated machinery in the labs at UC Santa Cruz, which tells them where the lead originated.¹

Lead particles carry a “fingerprint” that identifies their source, just as the ridges and valleys of a smudge on a gun that can identify the individual who pulled the trigger. In the case of the fundamental components of matter called elements (of which lead is one), those “fingerprints” are known as isotopes. So, by analyzing the ratio of isotopes of lead in a specific location, Flegal says he can tell whether it was produced locally, or was blown in on atmospheric currents from a neighboring country or from across the planet.

Flegal has long been fascinated by the global reach of lead emissions and has studied their presence in such far-flung locations as Antarctica, Alaska, Nigeria and Armenia.

The lead problem in Torreón intrigued and concerned both researchers.

In addition, the smelter is relatively close to the U.S. border, making it practically a local problem for the UC scientist. “Pollutants don’t recognize boundaries,” he says.

“When you have pollution in Mexico, it can be carried over into California in atmospheric emissions or on contaminated foods.”

Both researchers knew that

¹ UC Santa Cruz has highly sophisticated analytical equipment not found in many labs. Among those used on the Torreón project were a high-resolution inductively coupled plasma-source mass spectrometer (ICPMS) and a Thermal Mass Spectrometer. Such equipment costs hundreds of thousands of dollars and requires a PhD technician to operate it.
Lead

lead from gasoline additives was a declining problem in both the U.S. and Mexico, where those additives have been eliminated. As with many other countries, they began reducing or eliminating the use of leaded gasoline as the severe health hazards of lead pollution surfaced. Such measures slashed Mexican lead emissions from gasoline by 95 percent.

Industrial lead pollution, however, remained a major problem, Soto says, especially for communities close to large production facilities like the enormous Met-Mex plant in Torreón, where lead has been smelted for 100 years. Today, the plant processes a half million tons a day.

Mexico is a major world producer of silver, zinc, cadmium and lead ores, products shown to be a principal source of industrial metal contamination in the air, soil and water.

“Torreón is in textbooks for being a major source of industrial lead emissions,” Flegal says.
For 20 years, scientists and journalists have reported troubling environmental and health public problems in the city caused by the plant’s lead emissions. When a 1998 study of the children that lived in the area revealed such high lead levels that 80 of them needed immediate medical treatment, the government imposed a checklist of mitigation measures on the plant.

Lead contamination can damage a child’s learning abilities and cause behavioral problems at a level of 10 micrograms per deciliter of blood. Unborn and young children, especially, can suffer devastating effects, including low birth weight, decreased intelligence, behavioral abnormalities and other lifelong, irreversible damage, researchers have shown.

In 1998, the Mexican Health Agency found lead exceeding acceptable levels in the blood of 90 percent of children living near the plant. One child in ten showed blood-levels more than 4.5 times higher than the level considered dangerous – in some children more than 700 percent higher.

Despite the government having forced the smelting plant to make some changes in its operations to reduce atmospheric emissions of industrial lead, scientists were unsure whether those changes were sufficient to remove the conditions that are hazardous for the surrounding population.

The two researchers wanted to measure both the current and coat-tail effect of lead buildup over time in the dust and soil, from where it could continually be inhaled or washed into the water supply.

What they found surprised even them. The dust around the city contained approximately 300 times the levels naturally occurring in soil. And all of that lead appeared to have been produced in Mexico.

Lead readings in water extracted from Torreón wells ranged from 10-45 micrograms per liter. The World Health Organization raises a red flag to drinking water above 10. Dust and soil in the neighborhood of the smelter ranged up to 40 times higher than levels that scientists have defined as hazardous to humans. Detailed analysis of the lead particles showed they were indistinguishable from the ore processed in the plant. Airborne lead levels in Torreón are still being tested.

Local residents are aware of the dangers but feel helpless in the face of official inaction. One mother of a 3-year-old, whose lead contamination reading was 35, said she wouldn’t return for further tests because officials did nothing about the problem:

“... ya no la voy a llevar a más estudios, es la misma, no hacen nada.”

Although fetuses and children are the most susceptible to lead “poisoning,” even adults can be affected by breathing contaminated air, or eating or drinking contaminated products.

The researchers will continue to test the most vulnerable portion of the population – its children – in an effort to precisely trace the relationship in the lead from the smelting plant, in the Torreón environment and in children’s blood.

During the two years of sampling and testing, both researchers have been able to use the site analyses to educate their own students about the protocols for investigating major environmental problems, including the design of sample collection and analyses. Students also appreciate being able to grasp the global implications of local environmental issues – or the lack of them.

“We are parochial in our personal experiences,” Flegal says, “so this type of study allows us to address very real environmental problems that are affecting others, as well as to expand our own experiences.” – FF
Mexico City and Los Angeles belong to an exclusive club: Both top the list of their nations’ most polluted cities, and the United Nations has placed them among the top cities worldwide with serious air pollution problems.

But thanks, in part, to UC MEXUS and UCLA-Fogarty Program\(^1\) grants, researchers at four Mexican universities and research centers\(^2\) are working with scientists at UCLA and University of Southern California to quantify and qualify the nature of that pollution.

The Mexico City project, *Evaluation of In Vitro Biological Effects Induced by Particulate Matter from Mexico City and Los Angeles Collected with the VACES System*, supported by a 2003 UC MEXUS/CONACYT Collaborative Grant, became part of a larger cooperation that also included UC Riverside, UC Irvine, the University of Michigan and the University of Tsukuba, Japan. Those institutions are working together on international pollution issues through the Southern California Particle Center and Supersite (SCPCS).

The complex undertaking, which demanded sophisticated techniques to measure and evaluate the nature and sources of Mexico City’s dirty air, also brought together veteran UCLA environmental health scientist John R. Froines, director of both the UCLA-Fogarty Program\(^3\) and the Particle Center, and Mexico’s Andrea Marisa Gabriela De Vizcaya Ruiz, a researcher with Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV).

Now finalized, the Mexico City study has provided a basis of fundamental data for continued research that will examine more closely the health effects of particulate matter. Interest on the part of international researchers is intense because studies have shown that thousands of early deaths could be averted with cleaner air standards. Every year, as many as 64,000 people may die prematurely from cardiopulmonary disorders linked to particulate air pollution, according to an analysis conducted by the National Resources Defense Council, a U.S. environmental action organization.

Air pollution not only triggers chronic diseases like asthma, it weakens the immune system, making people more susceptible to infections, cancers and cardiovascular diseases.

“We know people in Mexico City are more susceptible to respiratory infections and inflammatory diseases that contribute to lung disorders,” she says.

In the most polluted cities, inhaling dirty air, on average, shortens lives by one to two years. Los Angeles tops the U.S. list, with an estimated 5,873 early deaths, researchers say. Yet Los Angeles trails Mexico City as one of the United Nations’ most pollut-

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\(^1\) The “UCLA-Mexico/Latin America Training and Research Program” (UCLA-Fogarty Program) has focused on training and research related to environmental and occupational health in Mexico since 1995. Its efforts have benefited hundreds of Mexican students, professionals and government officials through research findings, information and training.

\(^2\) Centro de Investigación y de Estudios Avanzados (CINVESTAV), Universidad Autónoma de México (UAM), Universidad Nacional Autónoma de México (UNAM), Instituto Nacional de Cancerología (INCAN).

\(^3\) (See Fogarty, above)
Air pollution

Rones & De Vizcaya

Air pollution

ed cities, occupying the 17th slot to Mexico City’s No. 1.

In addition to smoke and soot, air pollution consists of minute particles formed from sulfur dioxide emissions and volatile organic compounds. In the U.S., most of this dirty air comes from coal-fired power plants, industrial boilers, and gas- and diesel-powered vehicles. Part of the goal of the Mexico City project was to see whether the same elements came into play.

Researchers found that, while Mexico City certainly has lots of vehicle pollution, transportation isn’t the only contributor to the unhealthy air.

“In Los Angeles, the pollution mostly comes from fuel combustion,” De Vizcaya says, “But here we have industry and geological erosion as well.”

In addition, De Vizcaya and fellow researchers are finding that not only is knowing the level of contamination important but also the type of pollutant: its chemical nature is relevant to appropriately evaluating its toxicity.

The British-trained toxicologist began by researching metal-related compounds, which turned out to be a neat fit with her Mexican colleagues working on environmental issues.

Although Mexico City has been consistently monitoring air quality for a decade and a half, much work is still to be done in piecing together the patchwork of sources of pollution, dangerous components found in the air and the resulting susceptibility of the human population to a broad range of diseases.

The government has made great strides in bringing down air pollution in the last 15 years, De Vizcaya says, but scientists need to paint a clearer picture of cause and effect so that policymakers can prioritize which efforts are key to reducing the damage.

For this project, De Vizcaya and her colleagues sampled three regions of the city and found that the character of toxic particles varied.

The project has helped forge many new connections, both within the Mexican research system and outside the country.

“We were able to form a group that is still working together today – paralleling UCLA’s work with other universities and research centers on the L.A. Basin” she says.

One of those new ties was with the Particle Research Center where one of Froines’ collaborators, Phillip Fine of the University of Southern California, volunteered with two colleagues to make the trip to Mexico City. There he operated the sophisticated equipment needed for the air sample collection.

“USC and UCLA are pretty close because of the Particle Center,” Fine says. “We were the only ones with the expertise to operate the equipment (A Versatile Concentrate System for Particulate Matter or VACES).”

That work is now sparking interest farther afield, De Vizcaya says. When she presented preliminary results with two graduate students at some recent conferences, she says, many researchers from other Latin American countries expressed interest in duplicating their work.

– FF
Sharks, not folks, need protecting

Generations of movie watchers have thrilled to the fictional drama of “Jaws,” but scientists say that the real victims are the sharks, and the far greater threat is human.

United Nations experts estimate that as many as 100 million sharks are being slaughtered each year – many of them collateral damage in the hunt for more commercially desirable fish. Most, however, are captured for only their fins and discarded at sea.

Sharks are more vulnerable than other fish because they take at least six and as much as twenty-five years to mature and have relatively few offspring. The result: precipitous declines in their numbers worldwide and in the Gulf of California.

"In the Gulf, the ocean that lies off the coast of Baja California, the numbers of shark and other fish were disappearing at alarming rates because of over fishing," says UC Davis researcher Peter Klimley.

In addition, studies by renowned shark researcher Felipe Galván Magaña from the Centro Interdisciplinario de Ciencias Marinas (CICIMAR), a marine research center from Instituto Politécnico Nacional, show that the fisheries in that area mainly target immature sharks. However, Mexico has no regulations to protect the fish. The problem is exacerbated, Galván says, by a lack of studies on the sharks, which means that the fishery authorities lack the biological support they need to institute protective measures.

Both researchers also agree that sharks' far-ranging migrations necessitate international protection. Such agreements cannot be struck without fundamental data that will show policymakers the numbers of sharks involved, their travel itineraries, and their mating and nursery sites.

To provide the necessary data on the Gulf, Galván Magaña paired up with Klimley, an associate professor of wildlife, fish & conservation biology. Galván is the foremost shark biologist in Mexico, Klimley says, examining reproduction, feeding habits, age and growth of the main shark species caught in Baja California Sur, Oaxaca and Chiapas. A professor of fish and marine biology, he supervises all shark and ray research based in La Paz. He first started studying sharks more than twenty years ago, as an undergraduate student volunteering on Klimley's earlier expeditions to study the behavior of hammerheads in the Gulf of California.

The task the two researchers set for themselves – Determination of Population Size and Migratory Corridor of Hammer-head Sharks and the Conservation of Species in the Gulf of California, supported by a 2003 UC MEXUS/CONACYT Collaborative Grant – proved to be Herculean.

Protecting endangered species at sea, they say, is much more complex than on land. Fish movements and habits are more difficult to observe and, once conservation experts establish that a species is threatened, no fence can guard against predators or prevent the fish from taking a trip, as sharks tend to do.

But experience had shown them that, while sharks traverse hundreds, even thousands of miles of ocean, they tend to congregate in a
few nutritional oases – as Klimley discovered during his first shark encounter in the Sea of Cortez 20 years earlier. That meeting, he says, left an indelible impression and carved a career path probing the mysteries of marine biology – especially the secret lives of sharks.¹

. . . through the dispersing bubbles from our entry, (I saw) a stunning sight – we were in the middle of a swarm of fish, as if we had joined the piscine version of rush hour at a subway station. More than a hundred hammerhead sharks, some close enough to touch, passed by us . . ."

That “marine subway stop,” El Bajo del Espiritu Santo, is an underwater mountain in the Gulf of California that daily lays out a banquet of marine life for all manner of marine predators and prey. Tide waters collide with the mountain and rush up and over it, carrying a concentration of tidbits on which all manner of fish feast, attracting the sharks that prey on them.

But the two investigators, geared up to estimate the population size of juvenile hammerhead sharks and their migratory patterns, ran temporarily aground. The problem lay in the fate of sharks in the 20 years since Klimley first swam among them.

For two years, Bodega Marine Laboratory research behaviorist Klimley took graduate students in search of sharks, to little or no avail.

“We have had difficulty tagging sharks in the Gulf of California due to their scarcity – the population is severely depleted,” Klimley says.

The tags have a five-year life and, each minute, record the position of their host as well as its swimming temperatures and the surrounding water temperature.

Although these tags alone are insufficient to complete the extensive marine assessment needed to produce realistic conservation recommendations, they will suffice to illustrate the possibilities to other funders, Klimley says.

Finally, in February, a flurry of excited e-mails erupted from Mexico to California and beyond.

“Thursday, two scalloped hammerheads were tagged on the border between Sinaloa and Nayarit,” wrote a jubilant Mauricio Hoyos-Padilla, one of Galván’s graduate students.

¹ The Secret Life of Sharks: A Leading Marine Biologist Reveals the Mysteries of Shark Behavior by A. Peter Klimley, Simon & Schuster (June 24, 2003)
the GPS ultrasonic tags feed upon one of the hammerheads, now he counts
But while Davis rejoiced, Hoyos-Padilla was setting off with local fishermen, who had captured hammerheads recently, in hopes of attaching the remaining eight tags.

“It is ironic that fishing, which is reducing the population size, may increase our likelihood of obtaining information critical to the species protection,” Klimley says.

In the meantime, Klimley and Davis graduate student James Ketchum have just completed a trip to Malpelos Island, 300 nautical miles west of Columbia, where they dived into schools of hammerheads. Using a pole spear, they attached GPS ultrasonic beacons to adult sharks and placed tag-detecting monitors on four moorings around the coastline of the island. These monitors will record each time a shark swims within their range of detection, record the length of time it remains near the island, how long the individual remains at the island and whether it returns in subsequent years. They also attached pop-up archival tags onto sharks. These tags not only store in their electronic memory where the shark travels on a daily basis but also determine their position as well as provide a summary of their dives and surrounding water temperatures. The tags will release (pop-up) to the surface after six to nine months, and send their contents to shore via a satellite. They will furnish a record of the shark’s long distance movements. The researchers suspect that sharks traverse vast expanses of ocean but spend long periods of time at seamounts and islands, where prey is more abundant.

“If we show this to be true, it may convince fisheries managers to create protective zones,” Klimley says.

The groundwork for such action already is underway. In 2004, the governments of Colombia, Costa Rica, Ecuador and Panama signed a declaration to work together to protect the 2-million kilometer expanse of the Tropical Eastern Pacific Corridor. If successful, it would serve as a model for protecting broad, international, ecologically connected areas.

Sharkology:

Sharks suffer the misperception of being mindless killers. The facts show that humans are the real mindless killer. If shark conservationists like Klimley and Galván had their way, Hollywood would be making movies titled “Flushed,” rather than “Jaws.”

The U.S. recorded an average of nine shark attacks per year in the 1990s whereas in 1996 alone, toilets injured 43,687 people.

**Shark vs. window blinds**

Since 1991, the U.S. has recorded eight fatal shark attacks, compared to 130 strangulation deaths by the pull cords of window blinds.

**Shark vs. dogs**

From 1991 to 1998 five people died from shark attacks; 56 people died from rottweiller and pitbull attacks.

**Sharks vs. humans**

Each year there is less than one fatal attack on humans in the U.S. compared to the 100,000,000 sharks that humans kill each year, according to the **UN Food and Agriculture Organization**. About 20 percent of those killings occur in the Sea of Cortez.

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*Condensed from IEMANYA OCEANICA Web site.*
The Monterey pine may bring tidings of joy to many a household during the holiday season, but its own fate is less cheery. Although researchers are cautiously optimistic that the species may survive in the wild, it faces an uphill battle in its native habitat as a result of human interference.

Monterey pine (Pinus radiata) has various personalities – that of a Christmas tree and landscaping enhancement, especially on the West Coast, and that of a hardworking timber producer in plantations in the southern hemisphere.

Refinements of the original California stock have enabled forestry experts in Australia, Chile, New Zealand and Spain to produce straight-trunked "workhorse" trees much sought-after by the lumber industry. More than 10 million acres of domesticated Monterey pine are grown in plantations worldwide.

As with any cash crop, geneticists interested in its long-term value are anxious to preserve the original stock – the native gene pools – because trees in native forests continue to adapt to changing climates whereas the plantation stock is static. Original stock also may harbor rare and important genetic variations.

Native to the West Coast of the Californias, it survives in only five locations – three in central coastal California and on two Mexican islands.

The sites in California, however, are seriously threatened by development and introduced species – such as a fungus that causes pitch canker disease. The two Mexican sites, Cedros and Guadalupe islands, engender interest because their pine populations are a unique and important part of the islands' ecology, and may harbor traits that would make the Monterey pine useful in more arid climates.

Monterey pine is one of the most visible and dramatic species on Guadalupe Island, which lies in the Pacific Ocean 160 miles off the Baja California coast. The trees are bigger and older than those at any other site and quite distinct from those on Cedros Island, which, while flourishing, are smaller.

Guadalupe Island used to be rich with the pines and many other native

1 http://frap.cdf.ca.gov/pitch_canker/
Monterey pine struggles to survive

plant and animal species, but contact with humans took a toll. The most damaging incursion took place in the 18th century, when goats were brought to the isolated outpost to provide food for the periodic human residents. Over the years, their increasing numbers have decimated the flora, including any fledgling pine that tried to establish itself. Several attempts had been made to control the goats, but success was incomplete and temporary.

In 1978, a US-Australian collaboration of forest geneticists collected pine seeds from the two islands to establish a seed bank. The shared passions of research and conservation motivated co-leaders Kenneth Eldridge of the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) and William Libby of UC Berkeley.

But by 2000, the situation on Guadalupe had deteriorated (about half the remaining pines had died) and, in the seed banks, the now decades-old seed had been used for research or lost much viability.

Several hundred miles north in California, disease and development were eroding native Monterey pines: as much as 50 percent of the habitat was lost, and was continuing to be fragmented and degraded. Their dire condition and need for conservation attracted interest from the UC Genetic Resources Conservation Program. Deborah Rogers, a conservation geneticist there, was Libby’s last graduate student before he retired and she initiated a genetic conservation plan for the species. That same year, during a visit to Australia, she met with friends and colleagues Ken Eldridge and Colin Matheson. It didn’t take long to ignite the spark of an idea to revisit Guadalupe and Cedros islands. Their Mexican colleague, forest geneticist J. Jesús Vargas-Hernández, from Colegio de Postgraduados, shared their interest and joined the group.

By 2001, starting with a UC MEXUS/CONACYT Collaborative Grant, Threat Analysis and Genetic Conservation of a Restricted and Binational Species: Monterey pine (Pinus radiata D. Don), the group secured enough additional support from Mexico, Australia, Davis, the United Nations and private contributors to finance a trip to the islands.

By May, the group, with Mexican forest pathologist, Jesús J. Guerra-Santos and 10 volunteers, was bound for Guadalupe Island aboard a 100-ft. vessel. Their concerns were three-fold:

- To conduct a census of the remaining pine trees and determine whether conditions for natural regeneration still existed;
- To assess the trees’ genetic diversity and determine whether it was sufficiently diverse to sustain this population in the long term;
- To analyze the genetic makeup of a sizeable percentage of individual trees. This would tell researchers if they were inbreeding excessively. “Trees like Monterey pine typically grow in large stands and have pollen that travels long distances,” Rogers says. “The seeds that result from cross-pollination from unrelated trees are thought to be more likely to be healthy and vigorous. Trees that are inbred tend to suffer from ‘inbreeding depression,’ meaning that the plant may be less vigorous, more susceptible to infection and have a shorter life.”

The remaining Monterey pine forest huddles exclusively at the northern end of the island where there is somewhat more rain and fog. Although the trees remaining in 2001 were large and healthy, there was evidence that many of those alive in 1978 had died from old age. The group counted approximately 220 – half the number reported previously.

The researchers were encouraged to see seedlings sprouting near the old trees. At that time, a plan was finally in progress to remove the island’s foraging goats, giving the seedlings a chance to survive.

2 http://www.grcp.ucdavis.edu/projects/MtyPineConsdex.htm
3 http://www.bajawhale.com
Maintaining genetic diversity is like life insurance. Species must adapt to survive. If there is diversity within a species, individuals better suited to an environment will flourish and may confer that superior fitness on their offspring.

In the early days of conservation and restoration science, approaches were slightly cruder, Rogers says. “We used to measure biodiversity primarily by counting species,” she says. “Now we understand that there are many layers of diversity within a species. These layers include its genetic diversity, its different populations and the different types of relationships it has with other species.”

This awareness has major implications, Rogers says.
“It means that the diversity of a species usually can’t be represented by one of its populations (any more than for our own species). If we take out one population or significantly deplete genetic diversity, there may be a cascade of effects – from making the species more vulnerable to extinction in the long term, to weakening or reducing the diversity of other species.”

Geneticists also are finding that the unique characteristics of each “population” of trees like Monterey pine make it invaluable in its own right – supporting an assortment of wildlife that other branches of the “family” might not attract.

Each pine tree on Guadalupe Island is effectively an entire ecosystem. The death of each tree affects the well-being of many of the creatures it hosts, Rogers says. For example, the trees play a climatic role in condensing fog to water, which can then sustain other species.

One dramatic piece of good news was the absence of any sign of pitch canker fungus. The ubiquity of the fungus in the California populations caused researchers considerable anxiety in setting up the expedition.

“The last thing we wanted was to be a vector of this disease to the island,” Rogers says. She and other researchers and volunteers took only new or sterilized equipment such as ropes and clippers, and she insisted that everyone in the group pay particular attention to their shoes.

“The easiest way to ensure that we Californians weren’t carrying fungal spores on our soles was to get new hiking boots” Rogers says. “The size of our blisters after two days on the island was evidence that we all took that responsibility very seriously,” she laughed.

Though the island populations of Monterey pine may have a chance of surviving, Rogers and Vargas are not just banking on hope.

In 2002, aided by a UC MEXUS small grant, Planning for long-term preservation, distribution and documentation of seed collections of Monterey pine from Guadalupe and Cedros islands, they continued to research the best conditions for storing the pine seeds, and developed a plan to maximize the use of their valuable pine seed collection for research and conservation. They traveled to Mexicali, Mexico, to meet government officials to determine what portion of the seed collection should remain in Mexico for conservation, restoration and research purposes.

“Currently, a fraction of the seed lots is maintained in a seed bank facility managed by the National Forestry Commission (CONAFOR) in case they are required in the future to restore part of the population on the island,” Vargas says.

“Another fraction has been germinated to establish a common-garden test to determine the amount of genetic variation in adaptive traits.”

They also took a portion of the seeds to the U.S. National Center for Genetic Resources Preservation (NCGRP) in Fort Collins, Colorado, to reside under optimum storage conditions until needed. The terms of a binational agreement were worked out by Vargas, Rogers and NCGRP Administrator Henry Shands. Subsequently, a visiting researcher from Ensis in New Zealand, Cathy Hargreaves, used her newly developed techniques for cryopreservation of pine to put a few of the seeds into “deep sleep” at the Colorado facility, where they now have a very long shelf life.

None of this work would have been possible without the collaboration of her Mexican partner, Rogers says.

“Not only is this a better effort because of our collaboration, it’s essential,” she says. Efforts to improve conditions on the two

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5 http://www.ars.usda.gov/main NCGRP conserves crops & animal genetic resources important to US agriculture & landscapes
6 Ensis, an unincorporated Australian-New Zealand joint venture between CSIRO and Scion, provides innovative science-based services and solutions for the forestry industry and research for the entire forestry value chain.
islands depend on official Mexican involvement – something only Vargas can do.

“I would have been powerless to use my science to improve conservation in Mexico,” Rogers says. “Jesus (Vargas) can give feedback to the government and scientific community.”

In 2003 and 2005, information derived from this collaboration was presented in Ensenada, Mexico, at a couple of workshops focused on the restoration and conservation of Guadalupe Island.

“The results obtained so far have been very helpful in guiding the initial actions aimed at recovering the Monterey pine population on the island,” says Vargas.

The Mexican Ministry of the Environment and Natural Resources (SEMARNAT) granted biosphere reserve status to Guadalupe Island in 2005, increasing attention to its conservation needs and its problems with non-native inhabitants like goats and weeds.

“The pines are among several species unique to the islands whose genetic diversity needs to be safeguarded,” Vargas says.

Now the pair of collaborators is readying for a new expedition to the islands with a research team from UC Santa Cruz. Last year, Vargas and Rogers joined up with John Thompson, professor of ecology and evolutionary biology, working with postdoctoral fellow, Jason Hoeksema, on a new UC MEXUS-supported project, *Diversity and local adaptation in interactions between Monterey Pine (Pinus radiata) and key symbiotic mutualists ectomycorrhizal fungi.*

The Santa Cruz researchers study how species co-evolve. Hoeksema is a specialist in fungi and their relationship with their hosts — a beneficial association in the case of Monterey pine. The fungi attach to the tree roots and assist in plant nutrition in return for complementary resources the host plant provides.

In Monterey pine, Hoeksema is studying whether the types of fungi and the interactions with their pine hosts change from one pine population to another. Rogers sees this as a fascinating new direction for genetic research, examining species relationships at a more intimate level.

In the meantime, Vargas and Rogers will extend their reach to survey and collect seeds from a unique species of cypress (*Cupressus Guadalupensis*) on Guadalupe Island.

– FF

UC MEXUS News  •  Spring 2006

[Photo of researchers on Guadalupe Island]
Signs of growth in denuded land

The Dust Bowl of the 1930s forced tens of thousands of people to flee the devastated farmlands of the Great Plains. Persistent over-farming in an area of strong winds had swept away the fertile topsoil in blinding clouds of dust.

History threatens to repeat itself in Mexico today, where the deforestation and overgrazing of rangelands are threatening to chase close to a million subsistence farmers from central Mexico’s semi-arid plains.

But where agriculture and cattle grazing have rendered the land denuded of vegetation, and exposed the soil to wind and water erosion, a binational team of researchers found signs of hope.

“We were very surprised to see the relatively high fertility of the soil,” says Elisabeth Huber-Sannwald, Instituto Potosino de Investigación Científica y Tecnológica (IPICyT), who is working with UC Davis Assistant Professor of Viticulture David Smart on their UC MEXUS/CONACYT Collaborative Grant project, “Restoration of desertified landscapes in the Altiplano of Mexico.”

The goal in studying the area, which was rapidly turning into desert, was to examine the quality of the remaining soil and plant life to determine whether the area could make a comeback. It was designed to collect information that can be used to develop a long-term rehabilitation plan for the area.

The two researchers found that the soil in their test areas was well able to support both spontaneous plant life and the seeds that they planted.

“With some human intervention (such as solving the water run-off problems), and an educational program, ‘natural’ rehabilitation of some of these disturbed ecosystems seems possible,” Smart says.

Jayne Belnap from the U.S. Geological Survey supported the project by examining species on the top soil and training Mexican graduate students on how to classify those findings. Victor Olalde from the National Polytechnic Institute Center for Research and Advanced Studies (CINVESTAV), Irapuato, studied the plant root distribution in the soil.

The researchers found that nature itself had been working on a Band-Aid to prevent soil erosion. Despite the sparse natural grass cover, a thin film of amazingly diverse lichen, bacteria and algae (called a “biological crust”) covered the meager
Smart & Huber

Growth

soil that sits atop the volcanic matter.

“This biological crust . . . stabilizes the soil and reduces soil erosion,” Huber-Sannwald says. Overall, however, researchers say they know relatively little about the function of these “biological crusts” in the ecosystem and their role in the recovery of the land.

“Our work is among the first to show that the biological crust may play an important role in the recovery of desertified ecosystems,” Smart says.

The team set up their test sites by fencing off twenty 100-square meter segments of land in the hills of Sierra San Miguelito in Southwest San Luis Potosí, where the land is dying. The Ejido land (held in common by the community) has lost close to two-thirds of its grassland and 40 percent of its scrub. Researchers were concerned because some of the land seems to have passed the point of being able to recover spontaneously. They thus felt it was critical that a program be instituted as soon as possible where lands capable of natural recovery were stabilized.

Local residents use the land for subsistence farming. If the earth looses its productivity, their communities will disintegrate, scattering the 900,000 inhabitants across the region and, researchers say, probably across the border in search of a livelihood. In an era of binational negotiation about the millions of undocumented Mexican workers in the U.S., such a threat injects an element of binational urgency to the work.
Signs of Growth

The common ownership of the land and its importance in sustaining local inhabitants prompted researchers to invite the local residents to hear about their work and offer their input.

Once the project began, researchers made sure to select some of the worst areas, in part so as not to deprive the community of usable grazing land.

Initially, their detailed soil and plant analysis excited such interest that local residents, overcome by curiosity, damaged the experiments. Now a farmer from the area helps set up the experiments and takes samples while keeping an eye on the plots. The long-term nature of the experiments means that local support and participation is vital.

The researchers hope to pinpoint all plant, animal and mineral elements under threat and explain their role in contributing to a healthy ecosystem. Eventually, they want to be able to illustrate to local residents, as well as business and government entities, the role those organisms play in providing a resource (rangeland) on which local livelihoods depend.

The team also hopes to learn how grazing affects the plant and microbial communities, and how much grazing will need to be moderated to stabilize soils against erosion, while continuing to provide a livelihood for the Ejidos.

The study is designed to form the basis for a long-term rehabilitation project in this and such other arid zones of Mexico as Chihuahua and Sonora – even into the U.S., where “dustbowl” conditions still are being created. The test site, they say, will develop knowledge, expertise and methods for use in similar work worldwide.

About one-fifth of the world’s population lives in areas being impoverished by overuse in similar ways, researchers say. More than a third of the earth’s landmass falls into this category. Lack of understanding about how human activity degrades the land poses the threat of even more situations where Dust Bowl conditions can develop.

International awareness about the urgency of such work was evidenced during the January “Ecology in an Era of Globalization” meeting of the Ecological Society of America, held in Merida, Yucatan, Mexico, where three of the students involved in the project presented work.

“It was a very successful meeting,” Huber-Sannwald says. “We attracted substantial attention from national and international scientists working on the role of biological crusts in the stability of desert soils, and desertification of rangelands.”

Huber-Sannwald has received additional funding from the Mexican Department of the Environment and Natural Resources (SEMARNAT) to extend her work into other parts of Mexico. In addition, she says that Smart and Belnap are helping connect her with organizations that also might support the project.

Assistant Professor of Viticulture David Smart from UC Davis is working with Elisabeth Huber-Sannwald of IPICYT on the restoration of desertified landscapes in central Mexico.

http://www.ipicyt.edu.mx/diarn.htm
Salamanders tell a tale of evolution

For the best part of four decades, UC Berkeley’s David Wake has occupied a front-row seat in the drama of evolution. His study of salamanders, the pigmy contemporaries of the dinosaur, has lead to discovery after discovery about these timid creatures, and how they have quietly survived and evolved for the last 150 million years – long after their goliath companions disappeared.

A collaborative project with colleague and former graduate student Gabriela Parra-Olea from the National Autonomous University of Mexico chalked up yet more startling discoveries about Mexican salamanders and their innovative methods of adaptation. During their 2002 project, supported by a UC MEXUS/CONACYT Collaborative Grant, Biodiversity and phylogeography of plethodontid salamanders in western Mexico, they tracked down a little-seen and never studied salamander.

Wake’s relationship with the colorful little amphibians began during his early years as a biologist, when he says he found himself charmed by the benign creatures and, on further acquaintance, found that they posed fascinating biological questions.

The mystery of their survival when most of their contemporaries disappeared, their unique and apparently irrational dispersal patterns are among the puzzles that have driven his research for many years.

“They are incredibly successful evolutionary strategists,” he says.

Not all of the ten families of salamander are equally venturesome. Nine of them remained in the northern temperate zones of the Americas. The tenth family contains four clans, but only one emigrated south into the tropics, and that migration came relatively late in their history.

No one knows what prompted this seemingly rash move: Organisms tend to flee the tropics, which overflow with abundant life. Only the salamander swam against the tide to make its home in Central America (Southern Mexico and Guatemala) where it flourished in widely varied climates and landscapes.

During Wake’s pursuit of the Central American salamander, he has gathered an international family of sorts – colleagues who were
less a luxury than a necessity, he says, especially when the focus of study is in another country.

“I struggled for years to find collaborators in Mexico. I told my friends to at least send me a grad student because I want to ensure that this is an ongoing investigation.” Now he has collaborators in Costa Rica, Panama, Mexico and Spain.

Parra-Olea was the first Mexican graduate student he had so assiduously sought, and the working relationship with Wake has been one that she treasures.

“It gave me the chance to work on a group that is important in terms of Mexican biodiversity,” she says, “And it’s a great group for studying evolution at different levels.”

After earning her doctorate, Parra-Olea took a Harvard post-doctoral fellowship where she worked with another former graduate student of Wake’s, James Hanken. Together they started looking at the molecular evolution of a miniaturized group of neotropical salamanders. Since the collaboration began, the Wake-Parra-Hanken team has discovered at least six new species of minute salamanders.

“We have enough data to collaborate for several decades,” says Parra-Olea. “We keep finding new species of salamander every time we go into the field.”

One of the most significant single findings of their joint study was the rediscovery of a rare salamander that has been observed only twice since its existence was recorded; a species so poorly known that no tissue was avail-
Winant & Gutiérrez-de Velasco

Lagoons support wildlife wellbeing

This story of wetlands and lagoons at risk begins with the endangered Pacific Grey Whale, which mates and raises its young in the Sea of Cortez.

A decade ago, the Mexican government invited two young researchers to evaluate the risks to the whale and other vulnerable wildlife posed by building a salt-processing plant in an area uniquely rich in marine life.

Since 1946, Mexico has led the movement to protect the endangered mammal, and feared that the processing plant would alter the salinity of the water and pose a threat to nursing whales and their pups.

Although the researchers, Guillermo Gutiérrez de Velasco, a researcher at the Ensenada Center for Research in Science and Higher Education (CICESE), and Clinton Winant, a professor of oceanography at UC San Diego Scripps Institute for Oceanography (SIO), found the risks to be negligible, the project brought two unexpected bonuses. In addition to forging a partnership that continues to be productive, they learned that time and patience are of the essence when studying lagoons and wetlands, and how best to manage them, Winant says.

“We saw that you had to look at these systems over a year, rather than just a few days, to see how they worked.”

The two researchers returned to study that same area, Bahía Concepción, in 2003, for their UC MEXUS/CONACYT Collaborative Grant project, Circulation in the Coastal Lagoons of Californias. Joint teams of CICESE and SIO scientists conducted field trips for repeated sampling of the waters in

Wake & Parra-Olea

Salamanders

able for modern study. *Pseudo-eurycea bellii sierraoccidentalis* was found among the snow and rocks of the Chihuahua mountains more than 500 kilometers from the nearest relatives in Jalisco. This tropical salamander has found a way to adapt to a micro-climate vastly different from the humidity that most of its relatives favor.

The pair of researchers published a paper in *Biological Journal of the Linnean* and more publications are in the works.

The involvement of both a Spanish and a Mexican graduate student was an invaluable contribution, researchers say. Ernesto Recuero of Spain came to them through his adviser, Mario García-París, who had worked with Wake as a post-doctoral fellow. Parra-Olea has since become one of his advisers. Íñigo Martínez-Solano completed his dissertation and now is a post-doctoral fellow with Wake. A third student from Ensenada, Amy Peralta, has joined the team to work on the molecular systematics of the salamander, which was a primary focus of the UC MEXUS grant.

There is a certain urgency to their work. Unplanned development, destruction of forests and global warming have contributed to dramatic reduction in the overall numbers of salamanders and other amphibians, says Wake, founding director of Amphibians Around the World.

The task force, dedicated to documenting a suspected decline of so many of the creatures, initially came under attack as being extremist, he says. Subsequent developments sadly proved their stance and today that decline is widely accepted. FF

* Biological Journal of the Linnean Society, Volume 81, Number 3, March 2004, pp. 325-346(22)
Lagoon waters

the 22-mile-long bay. The sampling enabled them to gather data demonstrating the influence of wind and tides on the composition of the water. The data are essential to understanding the kinds of environments that help or harm the wildlife inhabiting such bodies of water.

The project provided the basis for a subsequent $650,000 grant from the National Science Foundation (NSF) to extend the study, Winant says. In addition, CICESE provided the logistical and administrative support for the experiment, and full salaries for all members of its research team.

A rich mix of wildlife inhabits the lagoons and estuaries that dot the California coasts both in the U.S. and Mexico. They serve as way-stations for migrating birds, mating and calving grounds for the Pacific gray whale, and nurseries for a variety of flora and fauna, Winant says.

Development, industry and tourism introduce sewage and contaminated waters, while landfill encroachment onto the wetlands often blocks the tidal flow necessary to keep the water healthy.

“The lagoons are sitting next to the ocean and we are pumping debris into the lagoon because it’s easier than putting it into the ocean,” Winant says. All these elements take a toll on the
wildlife, some of which is under severe threat of extinction.

As a result, lagoons need to be handled in the resource management sense of the word, Winant says.

The information he and fellow researchers are uncovering is helping describe how nutrients are brought into the water, how they are distributed and how the mix is affected by the rate at which unadulterated ocean water mixes with sheltered lagoon waters.

The ocean water that constantly renews coastal wetlands and lagoon water keeps them healthy. Winds and tides control the exchange of water.

Rapid development and ever-changing technologies mean that looking at what was done in the past will not suffice.

“History may be a great teacher,” Winant says, “but in the field of resource management, anticipating the future carries much more weight.”

The project also served to cement relations between CICESE and Scripps so as to forge a long-term collaboration and provide unique educational opportunities to both UC and Mexican graduate students. It’s a partnership that is beneficial to both sides.

The Scripps team has a superior grasp of the technologies involved and access to the necessary instrumentation, researchers say, and the Mexican team members have a profound understanding of the environment.

Not least, Gutiérrez says, have been the priceless friendships born of shared knowledge, experience, and the hardships and rewards of fieldwork.

Importantly, the long term partnership has engendered the kind of learning that comes from working with a top level research team.

“The topics (we investigate) are current worldwide,” he says. The knowledge and information acquired on the natural systems we study will be invaluable for the management planning of these regions.”

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**INTERNATIONAL PROGRAMS**

**Fellowships catch on elsewhere**

By Dr. Wendy DeBoer
Director
International Programs

UC MEXUS has fallen victim to its own success. One of its most effective programs, the UC-CONACYT doctoral student fellowship, faces increasing competition from other U.S. universities and colleges, many of which have modeled their programs after our own.

When the University of California signed the initial agreement with Mexico’s National Council for Science and Technology (CONACYT) on July 25, 1997, it was one of the first of its kind in the country. The accord came at a time when feelings of mistrust on both sides of the border were straining relations between Mexico and the United States. The chilly political climate made California less attractive to potential graduate students. Since then, the fellowship program has smoothed the way for outstanding Mexican applicants to pursue their doctoral studies at the University of California by providing up to five years’ financial support at any UC campus, including non-resident tuition, fees, a modest stipend, and help with health insurance.

The high cost of non-resident tuition for foreign students has his-
InternationaI Programs

Fellowships

historically posed a barrier both to students wishing to pursue their studies at UC and to financially-strapped graduate programs wanting to admit qualified Mexican doctoral applicants. The UC-CONACYT doctoral fellowship, which provides non-resident tuition for up to five years, directly alleviates this problem.

While the value and strengths of this program cannot be overestimated, in recent years its visibility, both at UC and in Mexico, has declined. From a high of 39 UC-CONACYT fellows admitted in 2003-2004, the number of new fellows declined to 22 in 2004-2005 and then to 16 in 2005-2006. In part, this decline reflects a national trend in decreased foreign graduate student admission to U.S. universities and colleges, stemming from such factors as increased competition from European institutions of higher education and changes in J-1 Visa procedures resulting in delays in processing and stricter rules.

This drop comes at a time when Mexican students in particular perceive a heightened anti-Latino sentiment in California and other border states. As one of the first American institutions of higher education to develop a cost-sharing doctoral fellowship program with CONACYT, UC celebrated its historical recognition of the benefits of Mexico-California exchange. What it currently faces, however, is a danger of complacency.

To those of us working directly with potential Mexican doctoral fellows, it is apparent that UC is at a critical juncture in needing to reassert its long-standing commitment to binational academic exchange. Indeed, on a recent visit to Mexico, it became clear that the competition for the best and the brightest Mexican students has increased both in the number of institutions recruiting students and the quality of competitor institutions. Ivy League schools such as Harvard and Yale, for example, have recently entered into CONACYT doctoral fellowship agreements. In addition, the competition for outstanding Mexican students increasingly comes from Mexican colleges and universities, more of which are developing doctoral programs to meet the demands of a better educated youth.

UC MEXUS is addressing the visibility of its program on two fronts. First, through workshops at each of the UC campuses, where we hope to increase awareness of the fellowship among faculty and chairs of doctoral programs. This year we presented workshops at seven of the ten UC campuses. Faculty and departmental response to the fellowships was very enthusiastic, and we plan to continue these workshops on a bi-annual basis. Additionally, we continue to attend graduate studies fairs in Mexico, and recently completed a visit to San Luis Potosí where we spoke to hundreds of students interested in graduate study at the UC.

Prior to the UC-CONACYT agreement, UC MEXUS had a long, if sporadic, history of funding Mexican graduate students when extra sources of funding were available. Some of those early students are now veterans of academic life in Mexico. As the first cohorts of UC-CONACYT fellows return to Mexico with doctoral degrees, they are bringing with them knowledge and experience culled in the labs and classrooms of UC campuses. Mexican UC graduates populate academic and government institutions throughout Mexico, and have developed programs, made movies, become architects, doctors and engineers.

From the California perspective, one of the most rewarding results of this program is that an increasing number of UC-trained academics are maintaining ties with their host departments and creating research partnerships that are creating invaluable knowledge and resources both to Mexico and to California.
UC MEXUS constantly receives books to review. The most recent acquisitions are listed below. The complete list can be access on line at http://www.ucmexus.ucr.edu

**2006**

**Dorsey, Margaret E.,** *Pachangas: Borderlands Music, U.S. Politics, and Transnational Marketing.* University of Texas Press. Explores the growing convergence of politics, transnational marketing and borderlands music in the South Texas pachanga.

**Esquibel, Catriona,** *With Her Machete in Her Hand.* University of Texas Press. A collection of plays, novels, and short stories by Chicana/o authors that depict lesbian characters or lesbian desires.

**Garcia, Maria Cristina,** *Seeking Refuge: Central American Migration to Mexico, the United States and Canada.* University of California Press. Describes migration between 1972 and 1996 and shows how domestic and foreign-policy interests shaped the asylum policies of Mexico, the United States and Canada.

**Hernandez-Chávez, Alicia,** *Mexico: A Brief History.* University of California Press Berkeley. Analyzes the ways economic, social and political dynamics have interacted to shape the nation's past.


**Winn, Peter,** *Americas: The Changing Face of Latin America and the Caribbean.* University of California Press. Examines the historical, demographic, political, social, cultural, religious, and economic trends of Latin America.

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**Aguirre Beltrán, Gonzalo,** *Pobladores del Papaloapán: biografía de una hoya.* University of Arizona Press. A comprehensive overview of recent political and economic developments in Mexico. Geographers and sociologists map the regional and cultural diversity of the Hispanic/Latino population of the U.S.


**Amith, Jonathan D.,** *The Mobius Strip: A Spatial History of Colonial Society in Guerrero, Mexico.* Stanford University Press. Theoretical and methodological manual that provides a spatial history of colonial society in Guerrero, Mexico.

**Anaya, Rudolfo,** *Jemez Spring.* University of New Mexico Press. Chicano novelist Anaya sends his detective protagonist Sonny Baca to investigate the murder of the governor of New Mexico in an Albuquerque bath house.

**Anderson, E.N.,** *Political Ecology in a Yucatec Maya Community.* University of Arizona Press. Story of Chunhuhub at the beginning of the twenty-first century, focusing on the resource management of plants and animals.

**Arroyo, Rane,** *How to Name a Hurricane.* The University of Arizona Press. A collection of fiction depicting Latino drag queens and leather men, religious sinners and happy atheists, working class heroes and cyberspace vaqueros – a parade of characters that invites readers to consider whether one is a more authentic gay Latino than another.

**Aragón, Francisco,** *Puerta Del Sol.* Bilingual Press. A collection of poems about morning and memory in both English and Spanish.

**Archer, Christon,** *The Birth of Modern Mexico.* University of Arizona Press. Exploration of the roots of Mexican Independence 1780-1824 in essays by significant scholars of the era.


**Buchenu, Jurgen,** *Mexico Otherwise, Modern Mexico Through Foreigners' Eyes.* University of New Mexico Press. Travellers and immigrants to Mexico, from famous names like Evelyn Waugh to previously unpublished writing. Four sections, each covering 50 years from 1800 to 2000.

**Busto, Rudy,** *King Tiger.* University of New Mexico Press. Tells of the religious vision of Reies López Tijerina.

**Crandall, Russell,** *Mexico's Democracy at Work: Political & Economic.* Lynne Rienner Publishers, Inc. Concise and comprehensive overview of recent political and economic developments in Mexico. Highlights the paradoxes presented by the country's recent democratic breakthrough.

**Chipman, Ronald E.,** *Moctezuma's Children: Aztec Royalty Under Spanish Rule, 1520-1700.* University of Texas Press. A history that follows the fortunes...
of the principle heirs of Moctezuma II across nearly two centuries, using extensive Mexican and Spanish archival research.

Cota-Cardenas, Margarita, Sanctuaries of the Heart. University of Arizona Press. A narrative about a young Chicana writer's journey of introspection that leads her to explore what "sanctuary" really means to present-day Chicanas.

De la Luz Montes, Amelia María, María Amparo Ruiz de Burton: Critical & Pedagogical Perspectives. University of Nebraska Press. An aristocratic Californian who championed the rights of Mexican Americans in novels, plays, and letters.


Gerlach, Nancy, Foods of the Maya, A Taste of the Yucatán. University of New Mexico Press. More than a cookbook, an examination of the history and the evolution of Maya cuisine from pre-colonial to modern times.

Gonzalez, Michael, This Small City Will Be a Mexican Paradise. University of New Mexico Press. Interpretation about life in Los Angeles between 1821 and 1841, the years that Mexico governed California.


Hart, Paul, Bitter Harvest: The Social Transformation of Morelos, Mexico, and the Origin of the Zapatista Revolution, 1840-1910. University of New Mexico Press. The creation of the rural working class: developments in Morelos reflected a broader pattern shared with other parts of Mexico that erupted in revolution.


Hawkins, John P., Roads to Change in Maya Guatemala: A Field School Approach to Understanding the K'iche'. University of Oklahoma Press. Authors' field-school method of involving undergraduate students in primary research and ethnographic writing. Student essays that examine the effects of modernization on K'iche' Maya religion, courtship, marriage, gender relations, education and community development.


Kaplowitz, Craig A., LULAC: Mexican Americans and National Policy. Texas A&M University Press. A study that offers a bridge between the history of social movements and the history of policy development.


Kepecs, Susan, The Postclassic to Spanish-Era Transition in Mesoamerica: Archeological Perspectives. University of New Mexico Press. Essays by anthropological archeologists that bridge the gap that divides the study of Postclassic Mesoamerica and colonial Mexico.


Mazal, Ricardo, *La tumba de la Reina Roja, from reality to abstraction.* University of New Mexico Press. An artist’s response to visiting the Tomb of the Red Queen a 600 AD Maya burial site at Palenque.

McSherry, J. Patrice, *Predatory States: Operation Condor and Covert War in Latin America.* Rowman and Littlefield Publishers, Inc. Claims U.S. forces secretly condoned and aided in the implementation of a covert operation in Latin America during the cold war where seizures and murders of political opponents across state borders were taking place.


Niemeyer, Lucian, *Desert Wetlands.* University of New Mexico Press. Traces the migratory paths of desert stopover points from Mexico to Utah for migratory birds and water source for other desert wildlife.


Nutini, Hugo G., *Social Stratification and Mobility in Central Veracruz.* University of Texas Press-Austin. An ethnography of the changes in Mexican social classes and upward mobility since the 1910 Revolution.

Parra, Max, *Writing Pancho Villa’s Revolution: Rebels in the Literary Imagination of Mexico.* University of Texas Press. Novels, chronicles, and testimonial writings from 1925 to 1940 that narrated Pancho Villa’s grassroots insurgency and celebrated – or condemned – his leadership. Examines alternative views of the revolution and of the villistas.

Pedelty, Mark, *Musical Ritual in Mexico City - from the Aztec to NAFTA.* University of Texas Press. Contemporary history and ethnography of musical rituals in the world’s largest city.


Portales, Marco, *Latino Sun, Rising: Our Spanish-Speaking U.S. World.* Texas A&M University Press. A collection of essays that give an autobiographical view of the private world and public significance of Latinos in the U.S.

Quiroz, Anthony, *Claiming Mexican Americans Citizenship in Victoria, Texas.* Texas A&M University Press. Experience of Mexican American citizens of Victoria; challenges common assumptions about the power of class to inform ideology and demonstrates that embracing ethnic identity does not always mean rejecting Americanism.

Oropeza, Lorena, *Raza Si! Guerra No! Chicano protest and Patriotism During the Viet Nam War.* University of California Press. Exploration of the evolution, political trajectory and eventual implosion of the Chicano mobilization against war in Viet Nam.

Reed, Maureen, *A Woman’s Place, women writing New Mexico.* Univ. of New Mexico Press. Life stories of six 20th century women writers such as Cleofas Jaramillo, who formed a Hispanic women’s cultural preservation group; Fabiola Cabeza de Baca, who work with League of United Latin American Citizens, and Pablita Velarde, a painter and activist.

Reinhartz, Dennis, *Mapping & Empire: Soldier-Engineers on the Southwestern Frontier University of Texas Press.* Essays by 8 historians of the processes by which Spanish, Mexican & U.S. soldier-engineers mapped the southwestern frontier.


Sandstrom, Alan R., *Native Peoples of the Gulf Coast of Mexico: Native Peoples of the Americas.* University of Arizona Press. Chronicles the prehistory, ethno history and contemporary issues surrounding the many and varied peoples of the Gulf Coast.


Silva, Jose, *After-Dinner Conversation: The Diary of a Decadent.* University of Texas Press. A semi-autobiography is written as the diary of a decadent sensation-collector in exile in Paris.

Sperling Cockroft, Eva, *Signs from the Heart.* University of New Mexico Press. A quarter century of contemporary Chicano murals with four interpretative essays by Chicano scholars.


Stephen, Lynn, *Zapotec Women: Gender, Class & Ethnicity in Globalized Oaxaca.* Duke University Press. An anthropology of Zapotec women in a socio-historical context; contemplates the aesthetic component of the sarapes created by the artisan of Teotitlán del Valle.

Stuart, David E., *Zone of Tolerance: The Guaymas Chronicles.* University of New Mexico Press. Memoir of an anthropologist’s adventures in the night club district in Guaymas, Mexico.

Torres, Eliseo "Cheo," *Curandero, A life in Mexican folk healing*. University of New Mexico Press. Folk healing through the author's experience and that of three famous healers: Don Pedrito Jaramillo, Niño Fedencio and Teresita Urrea.


Velasco Ortiz, Laura, *Mixtec Transnational Identity*. University of Arizona Press. Examines formation of ethnic identity under conditions of international migration through survey, ethnography and biography.


Wright, Angus, *The Death of Ramon Gonzalez*. University of Texas Press-Austin. Modern agricultural dilemma.

Zabrebska, Carla, *Guadalupe*. University of New Mexico Press. Examines traditions and legends surrounding the devotion to Our lady of Guadalupe.
The oyster aquaculture industry in the Bahía San Quintín, Baja California, is the second most important economic activity in the region after agriculture. As part of her study of oyster predators, UC Davis evolution and ecology graduate student Laura Rodríguez, spent last summer studying a small marine snail called a whelk, which preys on the commercial oyster stocks. Her project, *Ecological impacts of an invasive marine invertebrate in an economically important system*, was supported by a UC MEXUS Dissertation Grant (with Chicano Studies Research Center, SCR43 funds).

Rodríguez theorizes that the impact of the voracious whelks is an underestimated source of mortality among oysters and hopes to determine what makes certain types of oysters more vulnerable to their attacks. She will continue her investigation of the predator/prey relationship along with the dynamics of other invertebrates that share the oysters’ habitat. – FF

Please refer to that magazine for a copy of the article.

DePuis, recipient of a 2004 UC MEXUS faculty grant for El Engancho: rural development, migration and placemaking in the Valley of San Quintin, is a professor of sociology at UC Santa Cruz.