CHILE

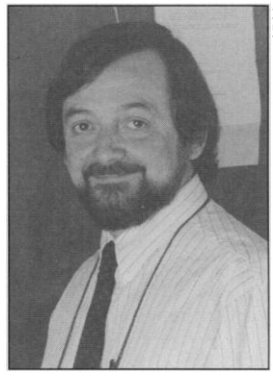
Biophysicists Re-Establish a Chilean Research Tradition

When biophysicist Ramón Latorre left Harvard Medical School for Chile in 1983, he traded sure success for a risky bid to revive science in his native country. Since leaving Chile a decade earlier, Latorre had built an international reputation as a leading researcher in the field of ion channels, the protein gateways that shunt ions across the membrane of a cell to produce an electrical signal. Now he was gambling that improved conditions in Chile and his own standing would help him re-establish the field there. "I do not know if my decision to return was a wise one," he says today, "but I feel happy."

Latorre has good reason to feel happy: He has overseen the rebirth of what is now one of the brightest areas of Chilean science. Ion channel research had blossomed in Chile during the 1950s and '60s, when foreign researchers came to Chile to study the nerves of then-abundant giant squid—and in the process seeded the growth of an indigenous research community. Like many academics in Chile, biophysicists including Latorre scattered abroad after the 1973 coup led by General Augusto Pinochet, whose regime cut university budgets and persecuted professors sympathetic to the left. But now, aided by Latorre and an unusual private institute that has eased the transition for returnees (see box), the flow has reversed.

The result is a community of about 20 Ph.D. investigators, along with an equal number of graduate students and other researchers, whose work on ion channels and their role in nerve and muscle disorders has been "really top quality," says Harvard University biophysicist Rod MacKinnon. And the resurrection of channel research is benefiting other areas of biology as well by introducing state-of-the-art techniques in cellular and molecular biology.

The next few years will be a critical period for this scientific renaissance and for other areas of academic life in Chile, say researchers there. Although the universities have recovered much of their intellectual independence, they are still hidebound by bureaucracy, faculty positions are scarce, and salaries are low. This is particularly discouraging for young researchers now studying abroad, who will be essential for the future of science in Chile. "They wait. That's difficult," says Benjamin Suarez-Isla, chair of the physiology department at the University of Chile's Faculty of Medicine. Like many of his colleagues, Suarez-Isla is looking to the government to step up investment in science and promote university reforms to sustain the revival already under way in biophysics.



CECS

Leading a revival. Biophysicist Ramón Latorre.

Biophysics first became a Chilean specialty because "that's where the squids were," says Christopher Miller, who studies ion channels at Brandeis University in Waltham, Massachusetts. Squid have especially large axons, making them the specimen of choice in the 1950s for studies of the electrical behavior of nerves—and Chile's huge squid, *Dosidicus gigas*, with its millimeter-wide, unbranched

Creating a Space for Science

No matter how committed an expatriate scientist may be to reviving his or her field of research in Chile, the low salaries and bureaucracy at the universities can be discouraging. For several dozen Chilean émigrés, the decision to return has been eased by the prospect of joining the Centro de Estudios Científicos de Santiago (CECS), an unusual private institute founded in 1984 by renowned Chilean theoretical physicist Claudio Teitelboim. Indeed, biophysicist Benjamin Suarez-Isla says help from CECS "was essential" when he left a post at the U.S. National Institutes of Health (NIH) in 1986 to return to Chile.

CECS

A community's center. The CECS headquarters on the outskirts of Santiago.

CECS now provides salary supplements and research funds to 30 scientists who have ties to the University of Chile, enabling them to bypass the university's cumbersome bureaucracy. Ramón Latorre, who heads CECS's biophysics branch, says the institute provides "a space where you [can] do science freely and with no concessions." In the process, says Jorge Allende, president of the Chilean Academy of Sciences, it has served as "the vehicle to facilitate the return to Chile of a small but excellent group of scientists," including many of the country's leading physicists and biophysicists (see main text).

Teitelboim conceived of CECS in 1984, during the military dictatorship of General Augusto Pinochet, when conditions at the universities were much harsher than today. Seed money for the project came from the New York–based Tinker Foundation, a group that mainly funds social science projects in Latin America, which awarded him $450,000 over 3 years. He and Latorre then rounded up additional grants from sources including the NIH and the European Community. And when the global recession squeezed funding from foreign sources in the late 1980s, CECS sought corporate donors such as the Chilean Oil Company and Xerox—a tack unusual in Latin America. Since its founding, CECS has also received money from the Chilean government through a research funding program called FONDECYT.

The institute's budget remains modest—about $450,000 per year in research funds and salaries for scientists and students, plus $200,000 per year in operating costs. But money isn't CECS's only contribution; the institute's headquarters on the outskirts of Santiago, which hums with seminars and discussions, has become the intellectual heart of the biophysics and physics communities. And the center now has a voice in Chile's overall science policy: Teitelboim is leading a panel advising President Eduardo Frei about ways to bolster Chilean science as a whole.

–J.K.

axons, was an especially tempting subject. Foreign researchers set up shop at the coastal town of Montemar, where the University of Chile had a laboratory, and they were soon joined by Chileans, among them Mario Luxoro, who had been a graduate student at the Massachusetts Institute of Technology. Luxoro went on to establish biophysics as an indigenous field of research.

This first generation of Chilean channel researchers "made very excellent contributions," says University of Pennsylvania biophysicist Clay Armstrong. Luxoro and his student Eduardo Rojas, for example, were among the first to suggest that proteins, later identified as individual ion channels, played a role in transmitting electrical signals across the cell membrane. And during the 1960s a stream of visitors, including Armstrong and scientists from the U.S. National Institutes of Health, made Montemar into a sort of Woods Hole Marine Biological Laboratory in the Southern Hemisphere. The lab "was like a little window through which we were able to look at the world," says Latorre, who earned his doctorate under Rojas.

The contacts he and others made at Montemar served them well in the early 1970s, when those golden years ended. First the squid vanished from Chilean waters, for reasons that are still debated. Then came the 1973 military coup. By the mid-70s all but a few researchers in the field had left, many winding up in Europe or in Boston. Those who attempted to return in the 1970s found working conditions impossible. By then half the university faculty had been fired and "there was absolutely no support from above," recalls Francisco Bezanilla, now at the University of California, Los Angeles.

A turning point came in 1984, when conditions under Pinochet had become somewhat more tolerable. Latorre came back from Harvard to head the biophysics section of the Centro de Estudios Científicos de Santiago (CECS), a private institute being founded by physicist Claudio Teitelboim. There he worked to lure back other expatriates. CECS provided returnees with temporary salaries and funds to start up labs at the universities, circumventing the academic bureaucracy. As a result, more biophysicists trickled back each year. "We were very much aware that by coming back, we would make a big difference," says Cecilia Hidalgo, who returned to Chile from the Boston Biomedical Research Institute.

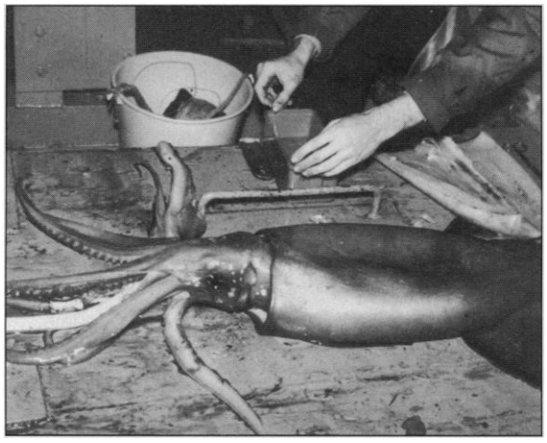
And Latorre's recruits, working mostly at the University of Chile, have continued to do internationally competitive research. For example, Hidalgo and others at the Faculty of Medicine have gained new insights into the biochemistry of calcium release in muscle, the cellular event that triggers contraction; they have also established muscle cell lines in which that process is defective, which will aid in studying muscular dystrophy. At the Faculty of Sciences, a team led by Pedro Labarca has identified a potassium channel that may explain an inherited learning defect in *Drosophila*. And Latorre's own lab, notes MacKinnon, has made "very nice advances" into the workings of calcium-activated potassium channels.

Some of this work has been done in collaboration with labs in the United States—in part because of the logistical and funding difficulties that still plague work in Chile. Know-how and equipment obtained through these foreign ties have also helped Chilean researchers expand their own labs. In 1991, for example, Latorre and Labarca set up a molecular biology lab so they could clone channel proteins themselves instead of getting them from abroad. Returning postdocs are also building up the molecular biology infrastructure by bringing expertise in such areas as protein structure determination.

Because of the difficulties of working in Chile, many of the best Chilean biophysicists still remain abroad. But some of their colleagues in Chile believe the climate for basic science may soon become more favorable. Suarez-Isla says that the Faculty of Medicine's new government hopes to add 40 new positions for researchers, some in basic science, in the next few years. Chile's government is also considering taking steps to strengthen basic research, such as offering large grants to leading investigators.

Putting more money into science is not unreasonable, even in a country where basic economic needs are still pressing, Luxoro argues. "You see," he says, "underdevelopment is a question of mind rather than anything else."

–Jocelyn Kaiser



E. ROJAS/NIDDK/NIH

What a nerve. The squid *Dosidicus gigas*, whose outsized axons drew foreign biophysicists to Chile in the 1960s.

Jocelyn Kaiser, a former Science *intern, is an intern at* Science News.

MEXICO

A Stubborn Amoeba Takes Center Stage

MEXICO CITY—Amebiasis, the diarrheal disease caused by *Entamoeba histolytica*, is one of those serious diseases that tend to get short shrift from funding agencies in rich countries like the United States. But not in Mexico. For more than 20 years, Mexico has produced some of the world's leading researchers studying *E. histolytica*, a protozoan that afflicts millions of people with diarrhea and, in extreme cases, causes liver abscesses. All told, the organism accounts for an estimated 100,000 deaths a year. "The largest center for doing work on amebiasis in the world is Mexico," says Louis Diamond, who studied amebiasis for 35 years at the U.S. National Institutes of Health (NIH).

Diamond, who retired last year, had the only lab on the NIH campus studying the disease. In contrast, Mexico City's Center for Research and Advanced Studies (CINVESTAV) alone has three prominent amebiasis research groups. "In the long term, [Mexican researchers have] made some of the really pivotal observations," says Sharon Reed, an amebiasis researcher at the University of California, San Diego. "They were pioneers in the field, and they're still in there." Their work touches on almost every aspect of the disease: how prevalent it is, how *E. histolytica* destroys cells, how to detect it, and what proteins it contains. Mexican investigators have also been key players in a debate about whether or not there is a benign strain of *Entamoeba* as well as the disease-causing one—a debate whose outcome will shape future public-health strategies (see box).

Mexico's commitment to amebiasis research stems from its high rate of the disease: A recent survey of nearly 70,000 Mexican blood samples revealed that 8.4% showed evidence of prior infection with a disease-causing strain of the amoeba. Mexican researchers hope their work will lead to new treatment and vaccine strategies. There is certainly a need for new approaches: Although the drug metronidazole is effective against acute amebiasis, the disease still causes over 1200 deaths annually in Mexico alone. And because it can be difficult for a clinician to be sure that a patient's diarrhea is caused by amebiasis and not another disease (such as bacterial dysentery or inflammatory bowel disease), researchers are also working on new diagnostic tests, some based on cutting-edge technologies such as the polymerase chain reaction.