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Scientist Francesca Burgos-Bravo working in the author's lab at the Universidad de Chile.

## LATIN AMERICA

## Chile and Argentina Propel Science

By Christian A.M. Wilson

**T**hroughout Latin America, scientific research is hampered by a lack of investment. Chile and Argentina are no exception, with only about 0.4 percent of gross domestic product assigned to research and development (compared to 2.73 percent in the United States and 3.47 percent in Japan), and most of this R&D investment is public funding. The lack of resources limits access to grant opportunities and equipment, drives up costs, and results in low salaries for scientists. These daunting circumstances are reflected in low numbers of scientists: 320 per million inhabitants in Chile and 1,121 in Argentina, compared to 3,867 in the United States and 5,153 in Japan (Ciocca & Degladio, 2017).

However, both Argentina and Chile have another point in common: despite these challenging conditions, a vibrant scientific community has developed, often driven by personal initiative. These two countries share a platform for fruitful exchanges and collaboration in many

areas of cutting-edge scientific development. Together, scientists from Argentina and Chile are investing tremendous efforts to overcome funding gaps, achieving remarkable scientific discoveries and expertise thanks to dedicated teamwork and creative thinking.

In June 2019, Randy Schekman, a Nobel Prize-winning cell biologist at the University of California, Berkeley, visited Argentina and Chile. During his trip, Schekman praised local advances in science and research and called for stepping up collaboration and funding to make full use of expertise in both countries.

The visit was organized at the invitation of the Universidad de Chile and the Universidad Nacional de San Martín in Argentina and with support from the Center for Latin American Studies of UC Berkeley and Chile's Fondo Nacional de Desarrollo Científico y Tecnológico (FONDECYT, National Fund for Scientific and Technological Development). Schekman has a long

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history with of collaborating with Latin American scientists and welcoming visiting scholars from the region to his laboratory. His busy schedule included meetings with high-ranking government officials as well as a number of seminars and lab visits in both countries.

### Speeding Up Progress

In Chile, Schekman met with Undersecretary of Science Carolina Torrealba, one of two young scientists leading the newly created Ministry of Science, Technology, Knowledge, and Innovation headed by fellow biologist Andrés Couve. Schekman and Torrealba discussed ways to organize joint research teams in support of strengthening science and achieving greater results through collaborative efforts. Schekman's new foundation Aligning Science Across Parkinson's (ASAP) takes a similar approach that aims to speed up progress in this field by breaking down disciplinary silos.

Torrealba highlighted the new Ministry's efforts to cut the red tape that hampers access to funding. In Chile, there is currently a waiting period of up to three months before research funding is released. This considerable delay often forces researchers to take out personal loans to cover expenses in the interim. "I am particularly pleased with the development of a Ministry of Science in Chile," Schekman said following the meeting. "I wish we had such a government department in the United States!"

### Exploring the Key Role of Basic Science

We discussed our latest research results during field visits to the Universidad de Chile in Santiago, with tours of professor Lorena Norambuena's laboratory, where she focuses on plant molecular biology in the Biology Department at the Faculty of Sciences, and my own lab in the Biochemistry and Molecular Biology Department at the Faculty of Chemistry and Pharmaceutical Sciences, where I focus on single molecule manipulation of biomolecules and the mechanobiology of the protein translocation process. Schekman also took time for breakfast and lunch meetings with graduate and



Professor Randy Schekman receives an honorary degree from noted biochemist and biophysicist Jorge Allende at the Chilean Academy of Sciences.

undergraduate students who were eager to engage with their guest. They discussed matters ranging from funding for science to access to scientific journals.

Schekman gave a series of talks about his research and related topics at several local universities and at the Academia Chilena de Ciencias (Chilean Academy of Sciences), which made him an honorary member. In his presentation, "The Importance of Basic Science in Medical Advances," Schekman underscored the role of basic science in achieving progress, mentioning the CRISPR-Cas discovery as a case in point.

Sharing insights into his own work, Schekman talked about his research on protein transport and recalled details of his role as scientific advisor to the Chiron Corporation in the 1980s when he collaborated with Chilean scientist Pablo Valenzuela in the area of yeast secretion, in particular, the secretion of proinsulin

and yeast growth factors. As he concluded his visit in Chile, Schekman said, "I feel that Chile is making good progress in developing a strong presence in Latin American science, and I am pleased to help in any way that I am able."

### Overcoming Financial Hurdles

Schekman then traveled to Argentina, where he gave talks at the Universidad Nacional de San Martín (UNSAM), a public university located on the outskirts of Buenos Aires, and the Fundación Instituto Leloir (FIL), a private, non-profit research center focused on life sciences in the heart of Argentina's capital.

At UNSAM, Schekman delivered a presentation to an audience of researchers and undergraduate and graduate students in which he outlined the main achievements of his scientific career. Following this event, his host at UNSAM, Alberto Carlos Frasch, organized a roundtable discussion with a number of academics and other stakeholders involved in decisions about scholarly evaluation in Argentina. At this event, an Undersecretary of the Ministry of Education who is in discussion with Elsevier regarding the contract renewal for Argentina shared startling details on the escalating costs of the license agreement with the information company: while the cost of downloading an Elsevier paper within the University of California system is \$1.06, the same paper costs more than \$5 per download in Argentina. This striking difference in cost results in considerably higher investment for Argentine researchers, particularly considering the smaller scale of financial resources at their disposal.

Schekman urged colleagues across Latin America to align and put contract negotiations with Elsevier on hold until they adopt an affordable "publish and read" model.

### Unleashing Our Full Potential

Schekman concluded his visit to Argentina at the Fundación Instituto Leloir, where he was received by Professor Armando Parodi, a former director of the FIL and the scientist who discovered the protein quality control mechanism in cells. The FIL is a perfect illustration of how a personal effort by scientists (in this case, Bernardo Houssay and Luis Leloir), combined with some start-up capital from private investors, can deliver world-class results. This renowned institution has been preparing great scientists for global careers since 1947.

At the Fundación Instituto Leloir, Schekman addressed graduate students, post-doc fellows, and senior researchers. In his talk, he outlined his most recent research focusing on the secretion of small RNAs by mammalian cells.

Argentine and Chilean scientists are investing tremendous efforts to deliver first-rate science in Latin America despite scarce financial resources. Both countries have a long tradition in science; for instance, Argentina has produced three Nobel Prize winners in this field. As Schekman suggests, our countries should step up efforts to improve scientific collaboration and confront political issues such as lagging government support for science and inequitable access to scientific journal subscriptions. An adequate level of financial resources would enable Latin American research to achieve its full potential — and considering the available expertise, this potential is huge.

Dr. Christian A.M. Wilson is Associate Professor of Biochemistry and Molecular Biology at the Universidad de Chile, where he received his Ph.D. in 2011. He completed postdoctoral training at UC Berkeley with Dr. Carlos Bustamante and Dr. Susan Marqusee.

## An Interview With Randy Schekman

Harley Shaiken, Chair of the Center for Latin American Studies at UC Berkeley, spoke with Professor Schekman on October 9, 2019.

**Harley Shaiken:** Would you share your reflections on the recent trip to Chile and Argentina, as well as the previous trip you made to Chile several years ago? What did you find most important about traveling to Latin America in general and to Chile and Argentina in particular?

**Randy Schekman:** In both cases, I found great enthusiasm. Students and faculty were eager to talk about their work and to learn about my work. I spent much of my time, particularly on the second occasion, talking about issues of scientific publication policy. [The second trip] was an opportunity to visit with undersecretaries of various government ministries in Chile and Argentina. In Chile, I spoke with a woman who had previously been a cell biologist and is now

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an undersecretary in a new science ministry. We spoke at length about problems accessing commercial publications in Latin America, in particular, problems with the large scientific publisher Elsevier. And this, of course, is known here in the UC system because of our ultimately failed negotiation with Elsevier to secure access to publications. The problem in Latin America is even more acute.

I learned that a large fraction of the budget that Chile has for access to scientific publications is taken up by Elsevier. And I learned even more specifically in Argentina how difficult negotiations have been and, frankly, how unfair Elsevier has been in extracting money from a government that increasingly has to reduce its science budget. In fact, in Argentina, in order to access the publications, they had to pay more per download of each paper than we do here in California. I found two data points that are striking. The UC system pays something like \$11 million to have access to more than 2,000 different journals. That represents one-quarter of the University of California Digital Library budget, and yet, other

scientific journals cost much less. The journal of the National Academy of Sciences, the Proceedings of the National Academy of Sciences of the United States of America (PNAS), costs \$25,000 per year for the university. But that is only one journal. With the help of the head librarian here at Berkeley, we computed the enormous difference in cost. Elsevier charges the UC system \$1.06 per download, and the PNAS charges only \$.04 to download.

Bear that striking contrast in mind when I tell you that the Argentine Assistant Minister of Education told me that in his country, until two years ago, Elsevier was charging them \$5 per download. This is just highway robbery! And in subsequent negotiations, the Minister said that the currency had been devalued, the budget for science had been slashed. So Elsevier agreed to cut the budget down to \$2 per download, but warned the Minister that they would not receive this favored treatment going forward. This is a real eye opener and adds ammunition to my fight against Elsevier.

**HS:** These statistics are shocking and disturbing. On a very different note, what did you find most satisfying about the trip, either scientifically or personally?

**RS:** I enjoyed visiting my host in Chile, Christian Wilson. And I had a wonderful time at the Chilean Academy of Sciences, where I was formally received and gave a lecture to a diverse audience [which included Christian's mother and sister]. That was terrific. And Christian took me on a tour of the Central Cemetery in Santiago, which I had not seen on my first trip and which was very interesting. I also visited the cemetery in Buenos Aires and saw the monument to Eva Perón, who is buried there, as well as the tomb of the very famous scientist Luis Federico Leloir.

The most satisfying part of my trip was the incredibly warm reception I received in both places. This was the second time I have been to Chile, and the reception from Christian's family was quite remarkable. We went to his parents' house and ended up dancing at the end of dinner. They are very warm and genuine people. That was a treat. Similarly, in Buenos Aires I saw a number of people, old friends, and I had a guided

tour through historic parts of Buenos Aires on the last day. It was all a very memorable experience.

**HS:** You have done so much to build new linkages among UC Berkeley and both Chile and Argentina. Does anything come to mind about the ways in which the Center for Latin American Studies, and UC Berkeley more generally, could improve these linkages?

**RS:** One thing that would really help — and of course this requires some heavy lifting — would be scholarships for travel stipends for scholars from Latin America to work or study at Berkeley, even for brief periods. My laboratory manager spent two weeks visiting Christian Wilson's lab and will go again in a few weeks to spend some more time in Santiago to help them with their experiments. So, this kind of exchange, even for a short period of time, would benefit both sides quite measurably.

Randy Schekman is Professor of Cell and Developmental Biology in the Department of Molecular and Cell Biology at UC Berkeley. He was awarded the Nobel Prize in Physiology or Medicine in 2013.

Schekman lectures at the Universidad de Chile in 2019.



Photo by Felipe Engelberger.