

## Science in Peru: building research capacity in the biomedical sciences

*The Research Experience for Peruvian Undergraduates is a peer-organized program that trains and unites the next generation of Peruvian scientists*

BY ABEL ALCÁZAR-ROMÁN AND V. KENYI SAITO-DIAZ

**F**unding for research and support for graduate students and postdoctoral fellows in Peru is minimal. Young scientists often are forced to take on additional jobs to support themselves and end up pursuing masters and doctoral degrees abroad. To make matters worse, most of these scientists lose their connection to Peruvian scientific networks. The net result: Peru produces only a small number of scientists with graduate or post-graduate training, and many promising students follow other career paths or leave the country, resulting in a Peruvian scientific brain drain.

Many experts underscore the necessity of a concerted effort by international institutions, the national government, the private sector and academia in reversing this trend (1). A commitment from the top is critical for sustained national scientific development. However, efforts by current graduate students and postdoctoral fellows can provide unique help, as they are, in many respects, better suited for reaching and guiding the younger generation of scientists.

With this in mind, in 2007, two Peruvian graduate students at Vanderbilt University and Hospital do Cancer A.C. Camargo launched the Research Experience for Peruvian Undergraduates, a program that seeks to complement Peruvian undergraduate scientific education with a three-month research-intensive internship in laboratories in the United States. REPU aims to establish a strong connection among participants and encourage students to be active in the greater scientific community in Peru and abroad.

### The first year

REPU received 16 applications in its first year and was able to invite one student to Vanderbilt University in January 2008 thanks to the support of faculty members Susan Wentz and Daniela Drummond-Barbosa. For three months, V. Kenyi Saito-Díaz worked on stem cell regulation in the fly egg chamber in the Drummond-Barbosa lab.

“Kenyi’s visit to our lab was a very positive experience for everyone involved,” recalls Drummond-Barbosa. “We all enjoyed having him in the lab... he showed a lot of interest in the research going on in the lab, he read the literature with enthusiasm, he learned a lot of new experimental procedures, he kept his data organized, and he was always willing and eager to learn new things. It is always a pleasure to work with smart, enthusiastic and motivated students.”

The response to the program in its first year showed that Peruvian students were interested in this type of scientific training and that the U.S. scientific community was willing to help with the initiative. However, it also became apparent that networks for Peruvian undergraduate and graduate science students were minimal. As a result, undergraduate students were not familiar with available training opportunities or the work of Peruvian scientists abroad.

### The growth of the program

In 2009, REPU moved to Yale University and was able to invite one student to work on small noncoding RNAs with faculty members Christian Tschudi and Elisabetta Ullu. In 2010, the REPU program received more than 70 applications from all over Peru, and the program expanded to invite four students who worked in labs studying autophagy, ribosome biogenesis, protein quality control and calcium signaling. Again, REPU participants were very successful, and two of them were invited by their Yale advisors to stay for a year to continue their research with full financial support from their host labs.

As the number of REPU participants grew, the program started to implement new training approaches. In 2010, students presented papers relevant to their projects to each other at weekly journal clubs. They also presented their research to their peers and lab members at the end of the program. Students began to develop professional skepticism when reading

manuscripts and came to understand that presenting science in a clear and engaging way was a challenge for everyone. The students also attended informal meetings in which they discussed common research approaches and techniques, the scientific interests of established Peruvian scientists, and how best to help the development of science in Peru.

“REPU provides a unique opportunity that makes you redefine yourself as a scientist, your interests, what you are capable of doing, and the way you approach and think about science as well as your future goals and the role and type of contribution you would like to make to science in the long run,” says María Jesús Olarte, who participated in the program in 2010.

“REPU is a young and promising program, and I am very proud to be part of it at this stage,” adds 2010 participant Omar Julca. “I am confident that we are helping Peru in different ways, but there is still much to be done, and I am sure we will improve the program every year.”

The 2011 REPU program invited three new students and facilitated the return of another two. The students worked on topics ranging from the biophysics of DEAD-box helicases and autophagy to stem cell activation, germline development and neural crest formation. The students also were encouraged to apply for international training internships and to communicate their experiences with their peers at their home institutions and at conferences in Peru.

“REPU was a great opportunity to know about research, grad school and a grad student’s lifestyle,” says 2011 participant David Romero.

Jill Goldstein, a graduate student in Romero’s lab, adds, “It was a great experience to work with the Peruvian student program. David brought a curiosity and enthusiasm with

him that was contagious in the lab. He cultivated a number of scientific techniques during the program and organized his work into a sophisticated final presentation at the end of the program. This was a great experience for everyone in the lab.”

## REPU’s impact

The program’s priority is to give students a strong foundation in scientific research and communication in order to prepare them for success in their future scientific training. In addition, REPU seeks to create a strong network of scientists who will work together and help each other at different stages of training.

REPU has served as a springboard for students to pursue additional training opportunities. Sofia Espinoza, who participated in REPU in 2009, was invited to attend the Pan American Studies Institute on Function and Regulation of the Cytoskeleton in Rio de Janeiro, Brazil. REPU 2010 participant María Jesús Olarte presented her research at the American Society for Biochemistry and Molecular Biology’s recent annual meeting in Washington, D.C. And, in the summer of 2011, REPU 2010 student Omar Julca will be the first Peruvian student to participate at the Vienna Biocenter Summer School in Austria.

REPU also has established a connection between extremely talented students from Peru and graduate programs in the U.S. In 2009, Kenyi Saito-Diaz joined the interdisciplinary graduate program at Vanderbilt University, and Sofia Espinoza will start in the biological and biomedical sciences doctorate program at Yale University in August 2011. These achievements increase the recognition for these programs in Latin America and serve as an example of how these institutions can work to benefit scientific development in Peru while providing a new source of bright and motivated future graduate students.

REPU participants also have had an impact on the greater Latin American community by collaborating with University of California, San Francisco researcher Ronald Vale and his graduate student Sarah Goodwin and the American Society for Cell Biology to translate 27 *iBioMagazine* lectures from English to Spanish. These free online lectures are given by leading scientists from around the world, highlighting top-notch science and the human side of research. The lectures are powerful educational tools for biology classes all over Latin America.

REPU alumni starting in doctoral degree programs automatically are involved in the selection process and organizational decisions of REPU. In this way, the program secures a continuous flow of people and ideas and maintains a population of younger scientists who can relate to and mentor senior undergraduate students. A promising sign for the continuity and growth of the program is that several REPU students



REPU 2011 participants and mentors. Back row (left to right): Enrique De La Cruz, Martín García-Castro, and Valerie Horsley. Front Row: Omar Julca, Sofia Espinoza, Enith Sifuentes, Eliana Torres and David Romero. Photo courtesy of Pablo Tsukayama.

beginning graduate training are planning on starting REPU sites at their own universities.

“Being part of REPU has given me invaluable opportunities,” says Sofia Espinoza. “So now, as a grad student, I plan to pay that forward by mentoring and hosting new Peruvian students.”

## Limitations

REPU's success has been limited by three main hurdles: recruiting laboratories, securing visas and obtaining funding. As REPU learned from previous experiences, the first two limitations were overcome. Economic support remains the main restriction on the growth of the program. Participants invest personal funds to cover the expenses of visas, travel and room and board. Limited support from Peruvian universities and the Peruvian government is funneled to students with greater economic needs. This lack of funding reduces the pool of qualified students. As a consequence, many gifted students have been unable to participate in the program.

## Future Plans

REPU's success in the biomedical sciences suggests that the same approach can be applied to other fields, such as chemistry, physics and ecology. Expanding to these disciplines would help nucleate a wide network of Peruvian undergrads, graduate students, postdoctoral fellows, faculty members and professional scientists. This network would impact Peruvian science positively and give a natural foundation for interdisciplinary collaborations. Importantly, one of the main goals of the program is network building. Therefore a long-term goal is to expand beyond Peru and include other Latin American countries with similar needs, such as Ecuador and Bolivia.

Programs like REPU are well suited to complement scientific development in countries where graduate education in the sciences has not developed fully. This is the case in most countries in the region, the big exceptions being Argentina, Brazil, Chile, Uruguay and Mexico, where an established scientific community thrives in comparison. In fact, these countries invest five to 10 times more in research and development than their neighbors. As a result, exceptional opportunities like the one offered by the Pew Latin American Fellows Program mostly benefit these countries (97 percent of Pew Latin American Fellows come from these countries).

Generating a strong peer network of budding scientists is a critical component for advancing science in Latin America. A generation of well-trained, well-connected, socially engaged scientists will support the long-term goal

of establishing a strong scientific community in developing countries. This approach constitutes a perfect complement to the ongoing efforts to transform the scientific reality of Latin America.\*

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\* In Peru, important initiatives to organize scientists and to stimulate research and education are well underway. The National Center for Technology and Technological Innovation in Peru has secured a large investment grant from the Inter-American Development Bank and the Peruvian government to fund several research and development projects. Large international scientific meetings (ECLs) hosted in different parts of the country and high school science fairs that introduce children to the wonders of the discovery process disseminate information about science. And major universities have established re-entry grants to attract highly trained Peruvian scientists working abroad. In this context, and in a collaboration with UPCH, Carlos Bustamante at University of California, Berkeley, has established a mirror lab at UPCH to conduct single molecule studies on proteins of clinical interest in Peru. The REPU program fits perfectly with these initiatives and complements these efforts.

## REFERENCE

1. Sagasti, F. (2004) Knowledge and Innovation for Development: The Sisyphus Challenge of the 21st Century. Edward Elgar Publishing Ltd, Cheltenham, Gloucestershire.

## For more information:

- An ASBMB initiative to unite scientists in the U.S. and Latin America: <http://bit.ly/ASBMBLatinAmerica>.
- iBioMagazine lectures in English and with Spanish subtitles: [www.ibiomagazine.org](http://www.ibiomagazine.org).

