SCIENCE MINISTER LINO BARAÑAO DREAMS OF TRANSFORMING ARGENTINA INTO AN INTERNATIONAL CENTRE FOR RESEARCH. WHEN TWAS CONVENES IN BUENOS AIRES FOR THE ACADEMY'S 24TH GENERAL MEETING, MEMBERS WILL FIND THAT THE DREAM IS BECOMING REALITY.

ARGENTINA: A NATION FOR INNOVATION

Sometime later this year, Argentina will celebrate a milestone in its modern scientific development: After an epidemic of brain drain over the last 15 years, the 1,000th Argentinian scientist is expected to return home to resume work. It is a measure of the commitment to science made by Argentinian president Cristina Fernández de Kirchner and the nation's first minister of science, technology and productive innovation, Lino Barañao.

Barañao was appointed nearly six years ago, when the government upgraded the secretariat for science, technology and productive innovation into a ministry. He brought scientific vision and administrative skill to the job, and has maintained perspective by continuing to run his own cell biology laboratory.

Argentina has long had a sophisticated and accomplished science culture; it has had three Nobel laureates, more than any other Latin American nation. But for decades, many of its best researchers have left to work in Europe and the United States. This challenge is known well in many other nations of Latin America and the developing world, but for Argentina, the problem was compounded by a severe financial crisis in 2001–2003.

Under Kirchner, Latin America's second largest country is working to renew its research strength through targeted interventions in science and technology. It has increased investment in science, technology and innovation to 0.51% of its gross domestic product, up from 0.39% during the crisis. This has placed Argentina in third place among Latin American nations, after Brazil (1.11%) and Chile (0.68%). The country is now among the top performers in terms of number of scientists, with 5.68 for every 1,000 economically active people. It maintains partnerships with top research centres in Europe and the United States. Its universities are pulsing with new energy and resources, and its science-related companies are growing and succeeding in international markets.

However, Barañao aims high. He has a clear picture of where Argentina stands today, and of where it should be a decade from now. In advance of TWAS's 24th General Meeting, from 1 to 4 October in Buenos Aires, Cristina Serra from the Academy's Public Information Office interviewed him to get insight into Argentina's current work and future plans.

Your appointment as the first Argentinian minister of science, technology and productive innovation started in December 2007. What were the priorities in your agenda?

We identified two major goals. Formulate new science and technology policies, with the aid of a special secretary devoted to the elaboration of national plans; and draft guidelines aimed at obtaining governmental, private and international funds to carry out scientific projects. Such a big innovation differentiates the actual policy from the past. The strict coupling between medium- and long-term projects, with ad hoc funding to carry out these investigations, gave our recent strategic plan – *Argentina Innovadora 2020* – an unprecedented solidity, with important reflections also on our economy.

What is *Argentina Innovadora* and why is it so important for the economy?

Argentina Innovadora is the Argentinian plan for scientific and technological development that covers years 2012–2015. It acknowledges that the national development and the competitiveness of our economy are tightly linked. Science plays a key role in this, acting as in a domino

LINO BARAÑAO

A renowned scientist with strong expertise in cell biology, reproductive physiology and animal biotechnology, Lino Barañao is minister of science, technology and productive innovation in the government of Argentinian president Cristina Fernández de Kirchner.

Barañao graduated with honours in chemistry at the University of Buenos Aires in 1976, then earned his PhD in biological chemistry in 1980. The same year, he received the National Medical Academy's award for his investigations aimed at elucidating the role of hormones in diabetes. Moved by a passion for scientific research, he spent some time in the United States and Germany, and upon his return to Argentina, he was in the team that created the first genetically engineered calf, altered to produce 'fortified milk' containing human growth hormone (2002).

In 2003, he was the president of the National Agency for Science and Technology, and in 2007 was appointed Argentina's first minister of science, technology and productive innovation.

He is also president of the Federal Council for Science and Technology, a major advisory board to the ministry; president of the Science and Technology Cabinet; and member of the Management Council of the Argentinian Nanotechnology Foundation. He also remains a faculty member at the University of Buenos Aires.

effect: by fuelling our national scientific capacities, we give impulse to entrepreneurship and productive innovation. This, in turn, will boost the national workflow and ultimately improve the population's quality of life. The plan is a far-sighted document, as it was drafted by 300 experts from science, technology, production and social sectors, who identified strategic intervention areas worth developing such as targeted funding, technological innovation, availability of information (like in Argentina's Electronic Library of Science and Technology), outreach and science dissemination.

Argentinian science minister Lino Barañao with Argentinian president Cristina Fernández de Kirchner.

The economic crisis that struck Argentina in 2001–2003 caused massive stagnation. What did the government do to reboot the economy?

To compensate for the lack of imports, the government began to support some small local companies. A number of these then flourished, and now they are well consolidated. One such successful example refers to the milk industry. Instead of buying foreign supplies, the government helped a few dairy companies with incentives and tax concessions. As a consequence, the companies incorporated more professionals; they grew in size and competitiveness, and now they hold a firm position on the market. So, in some ways we exploited the crisis to promote local firms that in the past could not compete with foreign imports, and triggered local productive changes.

What happened to science during the crisis?

During last decade's crunch, the whole scientific community agonized. As a scientist (I still run a laboratory and follow my team personally), I recall that we suffered from the situation in terms of manpower, development of new ideas, wages. Generally speaking, salaries in Argentina were very low and many qualified colleagues fled the county looking for jobs at American or European universities, where facilities and funds were available.

How did these 'migrants of science' feel about leaving their country?

In most cases they knew that leaving was the right choice. However, they were strongly motivated to come back: they have an international brain, but their heart is Argentinian. Their roots were here. Families were here. They wanted to raise their children here. This is why, once given the chance, they were happy to return, to contribute to the prosperity of our society and to economic development.

As the newly appointed minister, what did you do to give science fresh energy and halt the brain drain?

From 2003, with the inception of the national agency for promotion of science, the government

tried to attract Argentinian scientists who were working aboard by launching a programme called R@ices (*raíces*, or roots). The idea was to repatriate skilled investigators and build a new scientific network with international links. They set up this programme under Nestor Kirchner's presidency, and we made it official with an *ad hoc* law under de Kirchner's mandate. From 2003 to July 2011, some 834 scientists came back, mainly from America (54%) and from Europe (44%). At the end of 2013, we expect to celebrate the 1,000th return. From the time of my appointment on, we also focused on creating better work conditions: by increasing the salaries, making new grants available and launching ambitious programmes to enhance scientific structures and facilities all over the country. Today, the budget allocated for science is tenfold the budget we had in 2003. And scientists have better equipment and wider spaces.

Were these scientists happy to come back?

We tried to ease their return by providing them with full-time contracts, special funds to establish laboratories and security for life. They were well-received, were interviewed on TV, explained what they were doing. Today I can say that we did the right thing: the productivity of these people is very high, their publications are excellent. Overall, Argentina's scientific production during the last seven to eight years has increased tenfold with respect to the past decade, showing that highly competitive scientists perform well, yet maintaining their collaborations with foreign countries. Which is an added value.

Other steps to boost science?

Making sure that we could develop both basic science and the private sector, we identified three platforms worth developing: nanotechnology, biotechnology and informatics. Argentina, for example, is particularly strong in biotechnology and in its intersection with health: we have identified some recombinant proteins – proteins engineered with laboratory techniques – that are now on the market.

In addition, we launched a call to boost proposals from public/private consortia, and we funded three consortia that produce recombinant proteins for medical use. With the initial grants we allotted, almost USD7 million, these consortia have covered the initial high-risk phase; then private actors followed, providing funds for further development and to up-scale the production and reach the market. This scheme is working well: partnerships between universities and companies widen the spectrum of opportunities, enhance human resources and provide a critical flow of knowledge, instrumental to getting transforming results.

Barañao at work in his laboratory.

Argentina was the first Latin American country to set up fruitful relationships with the European Union, through a cooperation agreement (1990). Since then, other articles were signed: what results stemmed from these science and tech agreements?

The first, in 1990, set the stage for bilateral cooperation and exportations. Then we signed other agreements on fisheries (1993), on the peaceful use of nuclear power

(1997) and on science and technology (1999). Our continuous participation in EU programmes is very important; this is why we set up a dedicated office that advises scientists on how to participate in the programmes. But we provide this service also to other Latin American countries that do not have such a facility. This is not an altruistic policy. We have an ambitious dream: to make Argentina first, and South America later, an international laboratory where scientists meet, exchange ideas and spot original solutions to common problems. This is why we keep close relationships with different European institutions, such as the Max Planck Institute in Germany; the CNRS in France; the International Centre for Genetic Engineering, in Trieste, a world-renowned centre for biotechnology. Cooperation with the EU is, in general, a top priority for us.

Regarding South America, this idea of an international laboratory calls for establishing fresh political connections based on common interests and more global views. How are the relationships between Argentina and the neighbouring countries?
I am deeply convinced that scientists share a common view of nature, common interests, that speak the same language and are able to tie countries that otherwise would remain isolated. Policy and economy work to maintain national identity for the benefit of national interests. Science and technology are international activities, not constrained by boundaries. In a sense, scientists are the *diplomacy arms* of governments. It is quite common to see scientists from Israel and Palestine or from Russia and China work together, bridging gaps that policy is unable to overcome.

This is why we are promoting international networks in Latin America: we participate in Mercosur, providing counseling in meetings on science and technology and we keep a high level of cooperation with Brazil.

Alongside Mercosur, there is another initiative called Biotechsur. Could you explain what it is?
Biotechsur is a biotechnology platform funded by the European Union. It aims at fostering innovation in food production through the promotion of biotechnology in the four Latin American members of Mercosur (Argentina, Brazil, Uruguay and Venezuela). Biotechsur is a far-sighted platform where policymakers formulate public policies based on these technologies, and it has already achieved some success. One example is a robot for the phenotypic evaluation of soybean plants that is speeding up the process of selecting proper varieties to increase the productivity of soils. In the pipeline, we also have some projects to identify vegetable genes that provide resistance to drought and abiotic stress. Some of these genes were already identified and patented in US companies and in Argentina's. Another study that will be published soon is on the genome of common

Barañao with his research team.

Left: Argentinian president Cristina Fernández de Kirchner and minister for science, technology and productive innovation Lino Barañao. Right: Scientists at work.

beans, carried out by a consortium of Latin American laboratories, which expects to find genes important in terms of productivity and nutritional values.

Let's try to imagine where Argentina will stand five to ten years from now…
I like to picture Argentina as *the* place for innovation, where scientists and entrepreneurs come with a problem, and from where they leave with a solution.

We want to develop and use our creativity and ingenuity, to provide innovation and show that we can compete as a country, not in terms of salaries, but in terms of creativeness. Latin America as a whole should recover a more dynamic role in innovation.

This autumn, Buenos Aires is hosting TWAS's 24th General Meeting, convening more than 300 scientists from all over the world. What are your expectations for this event? What could the major outputs be?
We will like to show what's going on in Argentina, what major technologies are, and I think it will be important for our country and for the other scientists to be here and have direct contact with our reality, to see our scientific products. It is also crucial for our politicians, as they need to show that Argentina is a very attractive country for scientists where science gets supported by an assisting policy. Our goal is to use this TWAS event to consolidate what we have been doing in the last ten years.

Do you think that science academies like TWAS have a role in modern societies and economies?
I think that Latin America, and Argentina in particular, owes much to TWAS, in terms of the formation of human resources. Many young scientists have received inspiration as well as important support from your Academy. In the long term we want to collaborate more closely with TWAS, sharing its mission to create new facilities in Buenos Aires and elsewhere, for training of scientists from all Latin America. We hope we can establish a new order based on scientific internationality. ■