

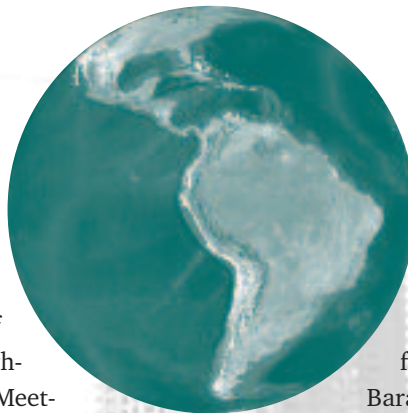


THE POWER OF GLOBAL SCIENCE COOPERATION

SCIENCE MINISTERS AND TOP POLICY LEADERS MEETING IN BUENOS AIRES EXPLORED HOW TO ADVANCE SCIENCE EDUCATION AND INNOVATION IN A CHALLENGING INTERNATIONAL ENVIRONMENT

Over the past 30 years, science and engineering have helped drive economic growth in a range of developing countries, and nations such as Argentina, China, Brazil and India have been so successful that they have moved into the ranks of emerging economies. But during a high-level discussion at the TWAS General Meeting in Buenos Aires, top science policymakers urged that developing nations at every stage of progress must increase investment and build closer ties in order to reinforce and extend these historic gains.

In a series of sessions on the opening day of the meeting, government science ministers and other science policy leaders cited a range of areas that should be science policy priorities for developing nations: increasing the corps of PhD researchers; building the ranks of women scientists and engineers;



expanding international educational and research exchanges; and creating more joint ventures – with other developing nations and with developed nations – to address global challenges.

The landscape is complex and difficult to navigate, said chemist Lino Barañao, Argentina’s minister of Science, Technology and Innovative Production. Developing nations must be like the Roman god Janus, Barañao said, with one face “looking outside to narrow the divide with the developing world, and the other facing inwards, to find advances and new technologies to aid those still excluded” from the nation’s progress.

“We feel it’s very important for developing countries in the world to get together and bring their scientists together to try to find solutions to some of the problems that are particularly prevalent in developing



countries”, said Derek Hanekom, the South African Minister of Science and Technology. “We can’t sit back passively and wait for the better-resourced countries and more prosperous countries of the world to find solutions... So this South-South collaboration is very important.”

Science is “the new grammar for shaping the future”, said Thirumalachari Ramasami, secretary of India’s Department of Science & Technology.

“We look at cooperation and sharing among the developing world of science [as something that] makes sense for shaping our own future.”

The science policy leaders, joined by TWAS President Bai Chunli, were prominent on the first day of the 24th TWAS General Meeting, held 1–4 October in Buenos Aires. Several spoke at the opening ceremony; the traditional ministerial session convened the first afternoon including nine top science policy officials from around the world. In addition, the policy leaders held a news conference that attracted a corps of Argentinian and other journalists.

Education and training were recurring themes, just as they were for Pakistani physicist Abdus Salam and other science leaders who had founded TWAS 30 years earlier. But the meeting in Buenos Aires made clear that science has created new progress and new global relationships.

A familiar message emerged from the discussions: A nation with strength in science and engineering is

more capable of independence, problem-solving and true international cooperation. Nations such as Argentina, China, Brazil, India and South Africa can serve as models and mentors for others that want to pursue economic growth and human progress through science and engineering.

Underscoring those themes, the science leaders used the opening sessions to announce a series of new commitments to TWAS:

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Barañao pledged that Argentina would support 30 new PhD fellowships annually, plus 15 postdocs, and five visiting scientists. In addition, Argentina opened 175 of its centres of research excellence to visits by researchers from the developing world under the TWAS-UNESCO Associateship Scheme.

Hanekom announced that the South African government will sponsor at least 100 new fellowships for students from developing countries to study for PhDs in South Africa.

Ramasami announced that the government of India would create 25 new PhD fellowships per year for African students, funded over the next five years at total cost of USD3.3 million.

‘LOST DECADES’ OF EDUCATION

For many of the ministers and other top policy officials who spoke on the first day of the meeting, one concern topped all others: funding, and especially national investment in research and development. Funding, they suggested, is the fuel that drives education,

Left to right: Argentinian science minister Lino Barañao and TWAS President Bai Chunli; Elías Micha Zaga, CONACYT, Mexico, and then-science minister of South Africa Derek Hanekom; Gabriel Casaburi, Inter-American Development Bank. (Photos: Roque Silles)

Below: Bai Chunli; T. Ramasami, Department of Science & Technology, India; and Yasutaka Moriguchi, Ministry of Education, Culture, Sports, Science and Technology, Japan. (Photo: Roque Silles)



research and cooperation. And it is a clear measure of national commitment.

Ramasami, for example, said that India's investment in R&D has been increasing by 15% to 20% a year. China's R&D investment is nearing 2% of gross domestic product (GDP), surpassing other developing countries.

But investment in Latin America is lagging far behind developed nations in Asia, North America and Europe, said Gabriel Casaburi, lead specialist in the Competitiveness and Innovation Division at the Inter-American Development Bank.

R&D as a percentage of GDP "is very low in Latin America in general", Casaburi said. While developed countries spend 2% to 4% of GDP on R&D, in Latin America, he said, only Brazil spends 1% on R&D. Other nations in the region spend less than 0.5%.

"Even if we reach that desired level of 1% of GDP,

we still have a long way to go", Casaburi added. Most R&D is done by Latin America's public sector, but in developed countries, most is done by the private sector. Meanwhile, the number of researchers per 100,000 people in Latin America also lags behind developed countries.

Mexico's economy ranks 14th in the world, but even so, it is among the countries with a "very low" rate of R&D investment, said Elías Micha Zaga, adjunct director for regional development of Mexico's national research council, *Consejo Nacional de Ciencia y Tecnología* (CONACYT). But, he said, new Mexican President Enrique Peña Nieto has a strong commitment to bring the investment up to 1% of GDP by 2018.

A lack of R&D investment results in a cycle of lagging scientific progress, brain drain and economic stagnation, speakers said. And while a nation's education system is a linchpin in its scientific development, it often suffers from weak policy and financial support.

TWAS Fellow Calestous Juma, an influential author and Harvard scholar, cited the developing world's "long neglect of higher education" in a paper he prepared for the General Meeting that was delivered by TWAS Executive Director Romain Murenzi. Without high-end skills in the science and technical workforce, Juma asked, how can a nation address challenges such as agriculture, health and environment?

"To make up for lost decades of education and training, you need greater investment in scientific, technical and engineering capabilities", he wrote. "The recent history of India and Brazil has demonstrated how such investments can drive rapid advancement in electronics and agriculture. Other regions of the world, however, have not registered such improvements. Why? It's at least partly because of their low levels of investment in higher technical training."

INVESTING IN GLOBAL BRAIN CIRCULATION

At the core of TWAS's philosophy is that students – and science-lagging nations – can build strength through opportunities to study at good universities outside of their home countries.

"TWAS has been working in many special projects that support younger scientists for study in countries such as Brazil, India and China", TWAS President Bai said at the Buenos Aires press conference. Bai, who also

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Left to right: Jorge Grandi, Elías Micha Zaga; Romain Murenzi seen through the viewing screen of a video recorder; Glaucius Oliva, president, Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Brazil; Roberto Salvarezza; Jorge Grandi, Yasutaka Moriguchi. (Photos: Roque Silles)



serves as president of the Chinese Academy of Sciences, offered an example: the new CAS-TWAS President's Fellowship, which brought 140 students from the developing world to China in 2013 to pursue their PhDs.

Top officials from Japan, Argentina and Brazil said their nations, too, had policies in place to promote global brain circulation.

"We have a strong international cooperation with many countries, and in particular we work to foster mobility of research and research fellows", said Roberto Salvarezza, president of Argentina's national research council, *Consejo Nacional de Investigaciones Científicas y Técnicas* (CONICET).

For example, Argentina has strong relations with Germany and with Latin American countries, and with TWAS.

Argentina welcomes young scientists from other nations. At the same time, Salvarezza said, "we are very interested to promote the formation of our PhDs, not only in Argentina, but also in other countries."

Added Baraña: "Every scientist who comes back to the country brings back new knowledge and new ways of doing things."

Brazil, too, has established overseas study and research programmes as a pillar in the nation's campaign to build science capacity. Brazilian students need "exposure to an environment where competitiveness, innovation and entrepreneurship are already the standard", said Glaucius Oliva, president of Brazil's national research council, *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq).

Brain circulation helps to build strength in all the nations involved.

Today, as Brazil's enrolment in higher education nears 7 million students, it offers scholarships to the nation's best students to study abroad at the world's top universities. Of 100,000 total scholarships, 25% are being funded by the private sector, explained Oliva, a TWAS Fellow (2011). "That was a strategic decision at high levels of government to invest in people – in the development of skills and competencies needed for... the knowledge-based economy."

Brazil also welcomes students from overseas into its best universities and research centres. In 2013, CNPq offered 60 fellowships to early-career scientists

from the developing world through TWAS PhD and postgraduate programmes. Over the past decade, Oliva reported, CNPq welcomed more than 500 TWAS Fellowships from such nations as Egypt, China, Cameroon, Pakistan, Ethiopia,

India, Nigeria and Mozambique.

Clearly, brain circulation helps to build strength in all the nations involved, said Yasutaka Moriguchi, senior advisor to Japan's Ministry of Education, Culture, Sports, Science and Technology. But, he added, it's critically important for another reason: addressing global challenges.

"DRAW FROM EACH OTHER'S STRENGTH"

Ramasami, the Indian S&T secretary, called it "solution science". Moriguchi cited such issues as environment, climate change, natural disaster preparation, energy and infectious disease. For example, he said, Japan is supporting a joint research project with Argentina and



Chile to develop the social management system for atmospheric environmental risks in South America.

“The global challenges we face today are of a type and scale never before experienced by humanity, and not all of them can be overcome by existing technology and experience”, Moriguchi said. “These problems must be resolved while the world maintains sustainable development. What is important is that they cannot be solved by the efforts of any single country. Rather, they must be tackled through solidarity on a global scale.”

Hanekom, the South African science minister, agreed. “The global challenges of underdevelopment, poverty and inequality cast a huge burden on individual states and have little respect for borders”, he said. “We need to draw from each other’s strength and work in partnership by pooling resources – financial, human and institutional.”

Several speakers cited the importance of TWAS in building a culture of South-South cooperation. Hanekom extended the recognition to the “enlightened role” played by the Italian government, which provides core funding to TWAS and two other international research centres based in Trieste: the Abdus Salam International Centre for Theoretical Physics and the International Centre for Genetic Engineering and Biotechnology.

Hanekom called it “critical” to strengthen TWAS. The Academy should be “properly resourced to execute its mandate” of nurturing science and young scientists in the developing world, he explained. “It’s important that among the developing countries, those that have some advantages or who are slightly stronger take

greater responsibility to strengthen TWAS. And I include South Africa in that.”

A VISION OF SCIENCE WITHOUT BORDERS

From R&D investment to international collaboration, the imperative of building science in the developing world requires strong policy. For strong policy, commitment from science and education ministers and other high-ranking leaders is essential.

In his paper, Harvard scholar Calestous Juma wrote that the “most important challenge” for top policymakers will be to advance PhD training in science and technology by engaging a wide base of scientists, educators and leaders from business and politics. He acknowledged that can be a difficult challenge.

“The effectiveness of science and technology ministers in promoting the expansion of doctoral training will depend very much on their political courage”, he wrote. “But even more importantly, a great deal of political and diplomatic tact will need to be brought to the task so that the public good prevails.”

Barañao, the Argentine science minister, reminded the audience that building science is not just a matter of policy goals, but also a matter of spirit. He cited the famous quote of physiologist Bernardo Houssay, Argentina’s first Nobel laureate: “Science has no country, but scientists do.”

The TWAS General Meeting “enables us to confirm that science has no borders”, Barañao said. “Beyond our own languages and national borders, we have common values and shared work.” ■

◆ Edward W. Lempinen