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Science for Sustainability

26th General Meeting | Vienna, Austria





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▲ Seaweed farming at Nusa Lembongan, Bali, Indonesia [Photo: Jean-Marie Hullot | Wikimedia Commons | CC by-SA 2.0]; A street market in Vietnam. [Photo: Peter van der Sluijs/ Wikimedia Commons]

Cover picture: Sprawling Mexico City rolls across the landscape, displacing the natural habitat. [Photo: Pablo Lopez Luz]

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▼ The headquarters of the Kuwait Institute for Scientific Research in Kuwait City. [Photo provided]



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EDITORIAL

DEVELOPING OUR FULL POTENTIAL IN SCIENCE



TWAS President Bai Chunli

At the first TWAS meeting in 1985, 250 delegates representing 50 science academies and councils from the developing world came to Trieste in support of an idea: that developing nations would be more prosperous, more independent and more stable if they built their research capacity. Academy Founder Abdus Salam made this point clear in his opening address. He said: “Our major task is – first and foremost – the health of science itself in the South.”

The 30th anniversary of that meeting is a good moment to assess the Academy’s impact and its future. TWAS has made a historic contribution thanks to the commitment and energy of its leaders and Fellows, its staff, and many partners. Today, we have a responsibility to maintain the vision of our Founders. In the past three years, we have continued to achieve progress.

We have exerted ourselves to find new Fellows from nations where we have little or no representation. We have elected members from the Central African Republic, the Republic of Congo, the Palestinian Territories, Hungary, Austria and Sweden, among others.

Of the 44 TWAS Fellows elected in 2015 in Vienna, 10 are women, and women now comprise nearly 11 percent of our membership. This is up significantly from years past, but it is not enough. If TWAS is going to be a global leader, we must increase the ratio of women in our membership and leadership.

Programmes in education and training are achieving impressive growth. In 2012, we had 163 PhD fellowships; by the end of 2015, that has nearly tripled – to 441 fellowships. The CAS-TWAS President’s PhD Fellowship programme since 2013 has awarded 540 fellowships to young scientists from 49 countries, most of them in the developing world.

A new agreement with South Africa will provide 80 new TWAS fellowships per year. And an agreement with India is expected to provide

100 fellowships over five years, plus training in science diplomacy.

Over the past three years, TWAS has been a key voice in discussion of the post-2015 Sustainable Development Goals [SDGs]. Global science leaders are looking to TWAS for perspective on a range of issues.

Our initiatives in communication are extending the global reach of our ideas and our work. Our online and print publications have a new, dynamic focus. TWAS and CAS recently released an excellent film about young scientists at the CAS-TWAS Centres of Excellence.

There is another important goal, and I think it is often overlooked: We need to continually build networks for South-North cooperation.

This is not a new idea. The theme for the first TWAS meeting was “South-South and South-North Cooperation in Sciences”.

But we are living in a new era: Today, we face regional and global challenges detailed in the SDGs – climate change and biodiversity loss, threats to our oceans, and the need for sustainable food and energy.

To address these challenges, South-South networks are essential. But so is South-North collaboration. All of us can learn from the North – from the way that their policies, R&D investment, and their universities and research centres shape a powerful ecosystem for innovation.

Of course TWAS is focused on science in the developing world. That will always be our mission. But for The World Academy of Sciences, it is a natural role to bring South and North together, to help the world develop its full potential in science and engineering.

Bai Chunli, *president, TWAS*

TWAS NEWSLETTER

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IN THE NEWS

Poor countries can copy patented drugs

The World Trade Organisation agreed to extend a waiver set to expire in January 2016 that allows poor countries to copy patented medicines to 2033.

The countries that will benefit from the waiver are “Least Developed Countries” – or LDCs – and include many African and some Asian countries. About half of the 900 million people in these countries live on less than US\$1.25 a day. The waiver is critical for the LDCs, because they have high rates of infectious diseases such as HIV and malaria.

The Conversation:
www.bit.ly/1HjKpUV

In Mongolia, open data may aid air quality

Mongolians are increasingly turning to open data and smartphone apps to monitor air quality as the country’s government plans to cut funds for clean air efforts, according to advocates. The country’s capital, Ulaanbaatar, is among the five cities with the worst air pollution in the world due to heavy industry and coal-based household cooking and heating. Yet data on pollution hotspots and trends is rare. A prototype smartphone creates an online database and global map of air pollution. They hope the public and scientists will exchange real-time information about pollution and take action.

SciDevNet:
www.bit.ly/1P9eDNj



China becoming global leader in renewable energy

In the past five years, China has become the top investor in renewable energy, far outstripping the European Union, the former market leader. The country will likely overtake the EU in installations of new wind and solar technology in the next five years, if its plans hold up, said climate change think tank E3G. Last year, cumulative sales of electric vehicles in China reached 450,000, 50% higher than in the EU.

Quartz:
www.bit.ly/1pRqK70

Zimbabwe gets its first supercomputer

Zimbabwe has launched its first ever supercomputer, at a cost of \$5.4 million, becoming the third African country to have such information technology as it aims to address the needs of the country’s scientists. Supercomputers are used for complex jobs such as processing massive sets of data to find information, run simulations and solve large and complex problems. The supercomputer is being kept at the University of Zimbabwe and was built by Chinese computer manufacturer Inspur Group with a loan from the Chinese government.

The Herald-Zimbabwe:
www.bit.ly/1P2FZ4R

ATMs bring cheap, safe water to Nairobi

Last year a public-private partnership between Nairobi Water and Sewerage Company, the city’s main water distribution company, and Grundfos, a Danish water engineering firm, resulted in the installation of water vending machines. The machines are expected to revolutionise water availability and distribution to populations that have long been at the mercy of water cartels and a changing, unreliable climate. By a simple swipe of a smart card on the ATM’s sensor, water is released from the main storage and into a waiting container.

The Guardian:
www.bit.ly/1onD7qs



A HIGH-LEVEL PLEDGE FOR COOPERATION

At the opening ceremony of the TWAS General Meeting, Austrian President Heinz Fischer and other leaders urged science to take a front-line role in advancing sustainable development and peace.

 by Edward W. Lempinen

Science and policy leaders from Europe and the developing world urged a strong commitment to international cooperation on innovation, sustainable development and global peace during the opening ceremony of the 26th TWAS General Meeting.

Lead by Austrian Federal President Heinz Fischer, speakers at the ceremony acknowledged a range of challenges confronting the world, from hunger and climate change to terrorism. Only by working together can the challenges be addressed, they said, and science cooperation must play a central role.

"I regard scientific institutions as important and in fact indispensable for the positive development of a country or of a society," said



▲ Austrian Federal President Heinz Fischer

◀ TWAS President Bai Chunli



Fischer. "Promoting international cooperation in science is one of the core issues in our globalized world ... in particular in Europe."

Scientific networks in the developing world are gaining importance, he added, and he called TWAS "foremost among these networks... [in] playing a key role in international scientific cooperation."

TWAS President Bai Chunli also endorsed expanded cooperation. Through much of its existence, Bai said, TWAS and scientists in the developing world have had vital support from Italy, Sweden, the UK and other partners in the developed world – and now, from Austria.

"We have much to learn from our colleagues in the North," Bai said in his opening address. "But our research centres in the developing and emerging countries are making great progress... As this progress continues, we will find that we have much to learn from each other, and that we can join as equals in projects that benefit all people."

TWAS is an important organisation for bringing nations together, both through science and science diplomacy, said Giorgio Marrapodi, Italy's ambassador to Austria. "Italy strongly believes that TWAS can act globally and locally with an integrated approach to the local scientific communities and an expanding global vision," Marrapodi said.

More than 300 high-level policymakers, diplomats, researchers and others convened for the opening ceremony at TWAS's annual meeting, held 18-21 November 2015 at the Austrian Academy of Sciences, one of Europe's premier institutions for science and research.

The event also was supported by the Austrian Federal Ministry of Science, Research and Economy; the Austrian Federal Ministry for Transport, Innovation and Technology; the Mayor and the Cultural Department of the City of Vienna; the Austrian Federal Ministry of Foreign Affairs; the Hannes Androsch Foundation; and the Federation of Austrian Industries.

Grave global tensions formed a backdrop for the meeting, and the opening ceremony began with a moment of silence for the victims of terror attacks in Egypt, Beirut, Paris and other locations.

"This terrorist wave of violence strikes at the aspiration to live in a world where dialogue, mutual understanding and cooperation participate to bolster peace and scientific progress toward sustainable development," said Flavia Schlegel, assistant director general for natural sciences, in a recorded message.

Reinhold Mitterlehner, Austria's vice chancellor and federal minister of Science, Research and Economy, also cited the threat of terrorism – and the need for scientific research on the phenomenon.

"Terrorism is a constant threat to our freedom and our will to live together in peace," Mitterlehner said. "Governments, politicians,



▲ From top: Flavia Schlegel, assistant director general for natural sciences, UNESCO; Giorgio Marrapodi, Italian ambassador to Austria; Reinhold Mitterlehner, Austria's vice chancellor and federal minister of Science, Research and Economy.

scientists and civil society – the efforts of each and every one are needed. We all have the responsibility to help ensure that racism and the fear of unknown stand no chance in our society."

Speakers at the opening ceremony focused on a range of other challenges that may impede prosperity, many identified in the United Nations' Sustainable Development Goals. The 17 goals, contained in the framework of the 2030 Agenda, call for an end to poverty and hunger, sustainable use of resources, gender equality, efforts to limit climate change and other objectives.

"Investing in science and technology is necessary to achieve the SDGs," said Harald Mahrer, State Secretary of Austria's Federal Ministry of Science, Research and Economy. "Science provides us with potential solutions that, for us politicians, serve as a basis for targeted decision-making."

Other speakers emphasised that international cooperation is the core mechanism to drive progress and peace, today and in the future.

"In the global South, there is an abundance of talented young minds with fresh perspectives on the challenges that they face every day," Schlegel said. "It is the responsibility of the global scientific community to nurture the next generation of scientists and to ensure their research gains attention and policy focus."

"North-South and South-South relations are essential for disseminating knowledge around the globe," she said.

Marrapodi, the Italian ambassador, described TWAS as a hub for such relations, working with the international scientific organisations of the "Trieste System" to advance the cause.

Bai echoed that theme. While the Academy is known for building South-South research networks, he said, South-North partnerships have been crucial to TWAS since its founding more than 30 years ago.

"This is why our meeting in Vienna is so important," Bai added. "It is a signal to the world: South and North have shared interests, and we are working together." ■



A FOCUS ON SUSTAINABILITY

SCIENCE FOR A SUSTAINABLE FUTURE

Education for these children in Banozai, Afghanistan, and hundreds of millions of others worldwide, is essential for a sustainable future. [Photo: Capt. John Severns, U.S. Air Force | Wikimedia Commons]



How do we live sustainably? At the TWAS General Meeting, speakers sounded a common theme: sustainability requires an understanding that our challenges are interconnected – and that cooperation unlocks solutions.

 by Edward W. Lempinen

In the common language of policy, journalism and marketing, sustainability often is cast as the answer to a specific challenge: a farming technique, a water conservation plan, technology to reduce air pollution. But the United Nation's Sustainable Development Goals reflect a deeper truth: As population grows, resources decline and the climate warms, sustainability is the only way to assure that healthy human communities can live in balance with a healthy planet.

The 17 goals – SDGs, for short – recognize that everything is connected: water, food and health; education, gender equality and poverty; climate change, biodiversity, governance and economic development. At its General Meeting in Vienna, Austria, TWAS convened an international conversation that explored the many dimensions of the SDGs and what it will take to achieve them by 2030.

The goals “embrace the need for a global transformation that leaves no one behind and gives every person a fair chance of leading a decent life,” said Naledi Pandor, South Africa's Minister of Science and Technology, at the annual Ministerial Session. “The SDGs will only succeed, however, if they are pursued through a deliberate strategy that is targeted at the most vulnerable and poor communities.”

Harald Mahrer, state secretary of Austria's Federal Ministry of Science, Research and Economy, struck a similar note. Under the UN initiative, he said, “every country is asked to contribute to the implementation of the SDGs by asking itself two questions: What can I do to improve the situation in my own country? And what can I do to improve the situation in countries which are not so well off?”

Mahrer and Pandor described specific

initiatives launched by their governments, but they also urged a comprehensive approach across disciplines and borders. It was a theme revisited throughout the 26th TWAS General Meeting, held from 18-21 November at the Austrian Academy of Sciences.

In September 2015, all 193 UN member states adopted Agenda 2030, with the SDGs at the heart of the plan. Comprising 17 goals and 169 related targets, Agenda 2030 may be the single most ambitious effort in history to improve life on Earth.

The TWAS presentations touched many of these themes – food security, urban design and energy, but also education, policy, funding and diplomacy, even the spiritual underpinnings of sustainability. The conclusion: Local work with a holistic orientation – and an emphasis on international cooperation – will be essential for success.

A LEADING ROLE FOR SCIENCE

Vaughan Turekian, the science adviser to the U.S. Secretary of State, identified several specific roles for scientists: They can identify challenges to sustainable development, conduct research to identify new solutions and build networks to gather data and other evidence needed to evaluate success.

In other presentations, leading researchers focused on specific research initiatives that are supporting progress on Agenda 2030.

Food security: Science and technology already have produced powerful new practices and technology to improve food production and nutrition, said TWAS Fellow Moctar Toure, vice president of the Senegalese National Academy of Sciences. But he posed a question:



How can they be rolled out and scaled up to have a global impact?

Quick action is essential, Toure said at a high-level symposium on food security. Despite significant progress in recent decades, about 795 million people worldwide still suffer from undernourishment. If world population approaches 10 billion by 2050, up from 7.4 billion today, that means another 2.6 billion people to feed. Crop production alone will have to rise by 70%, Toure said.

Some of the improved tools are familiar: crop breeding, soil and water management, and food storage. Others will seem futuristic: Real-time satellite monitoring of weather and

“ Sustainable development can only be realised with a high degree of urbanisation. ”

TWAS Fellow Hans J.A. van Ginkel

planting conditions. High-powered data analysis to predict food needs and potential disasters. Even robots that can do agricultural work.

But the technology must be used in a way that “draws on ecological principles,” Toure wrote after the TWAS meeting. “The wide consensus is that an agricultural paradigm shift is required.”

Urban design: TWAS Fellow Hans J.A. van Ginkel is a social scientist focused on geography of cities. He previously served as undersecretary-general of the United Nations and rector of United Nations University in Tokyo and Utrecht University in the Netherlands. In a TWAS Medal lecture, van Ginkel agreed that the



world must prioritize agriculture while planning for massive urban migration.

Today in the developing world, some 2 billion people live in cities; by 2050, that will grow to 5 billion. The conventional view is that urbanisation is a problem, said van Ginkel.

In fact, he argued, “sustainable development can only be realised with a high degree of urbanisation.” Cities can reduce environmental stress: Wastewater treatment, solid waste management and food distribution are all easier in a city. The real challenges are population growth and wasteful behaviour; inefficient production and consumption styles; and the quality of urban development.

▼ From left: Naledi Pandor, South African minister of science and technology; Harald Mahrer, state secretary of Austria’s Federal Ministry of Science, Research and Economy; Vaughan Turekian, science adviser to the U.S. Secretary of State; TWAS Fellow Hans J.A. van Ginkel, former undersecretary-general of the United Nations; Mirabbos Hojamberdiev, senior researcher, Turin Polytechnic University in Uzbekistan.





▲ Kuala Lumpur, the capital of Malaysia, and its Petronas Twin Towers. [Photo: Zukiman Mohamad/Pexels]

► Asian farmers cultivating tea.

▼ TWAS Fellow Lu Yonglong, co-director of Research Center for Eco-Environmental Sciences at the Chinese Academy of Sciences.



“The challenge will be gigantic in developing countries,” he said.

A key to solving these challenges will be to design and manage rural and urban areas as integrated parts of a unified whole.

Energy: Innovation in fields such as chemistry and materials science can have profound applications for sustainable energy, said Mirabbos Hojamberdiev, a senior researcher in the department of natural and mathematic sciences at Turin Polytechnic University in Uzbekistan. Hojamberdiev won the 2015 Attatur-Rahman Prize for growing inorganic crystals that can split hydrogen from water molecules when hit with solar light.

Hydrogen has significant potential as a source of renewable energy. But hydrogen production is a complex, energy-intensive industrial process. Hojamberdiev’s research looks for a more efficient way. His procedure also has potential to purify polluted water.

“The whole system is in its infancy now,” he said. “Today we are working to make the

Sciences at the Chinese Academy of Sciences [CAS], defined the challenge clearly: How to make 17 SDGs and 169 targets measurable and comparable?

He offered a set of priorities: devise metrics for assessing progress; establish monitoring mechanisms to measure everything from water and energy use to human behaviour; enhance infrastructure for evaluating progress, including Earth observation and information technology; and develop standards and instrumentation to standardise and verify data.

LEADERSHIP FROM POLICYMAKERS

In the quest to achieve Agenda 2030, few partnerships are more important than that between policymakers and scientists.

“Science, policy, politics and governance – those are very difficult to combine,” said TWAS Fellow Elisa Reis, a professor of political sociology at the Federal University of Rio de Janeiro in Brazil. “But unless you combine those four aspects, there won’t be a very



process even more efficient and feasible for scaling-up.”

The measure of success: The social sciences will have a crucial role in achieving Agenda 2030 – that was confirmed in a series of lectures in Vienna. Social sciences are critical for assessing human learning, or the psychology of consumption and conservation. They also will be critical in developing the ways to measure progress.

TWAS Fellow Lu Yonglong, co-director of Research Center for Eco-Environmental

big contribution of science in general to the Sustainable Development Goals.”

Mahrer, the state secretary for Austria’s Ministry of Science, Research and Economy, advocated an “ecosocial market economy”. Unlike the social market economic model that prevails in much of Europe, he said, the ecosocial market model seeks a positive impact in three dimensions: ecological, social and economic. It seeks a society that “is sustainable, keeping in mind generations to come.”

Mahrer outlined a number of specific



initiatives undertaken by his country. One, the Austrian Business Partnership Programme, links the private and public sectors in Austria and developing countries with a focus on fields such as energy, food processing and Internet technology.

Since 2004, 148 partnerships have been established, Mahrer reported, with funding of Euro27.4 million. Nearly 4,400 companies and 878,000 individuals have benefitted, and thousands of jobs have been created.

TWAS Fellow Cheng Jin-Pei, representing Chinese Minister of Science and Technology Wan Gang, said policy in his country has been shaped by multiple challenges: a large population, consumption of limited resources, ecological damage and social development that is lagging behind economic growth.

Cheng, director of the Center of Basic Molecular Science at Tsinghua University, said China is seeking answers in innovation driven by fundamental research carried out at a muscular network of national labs, state key labs and major scientific facilities. The results, he said, are evident in such areas as rice-breeding, where breakthrough hybrids set records for productivity, and photoelectric materials that “have laid a solid foundation for commercialization of renewables.”

EDUCATION: ONE OF THE BEST INVESTMENTS?

In a symposium focused on Austrian science, TWAS Fellow Wolfgang Lutz made a powerful case that policymakers should invest in schools to propel sustainable development.

Every learning experience builds new synapses in the brain, Lutz explained. Improved cognitive skills help people to learn from past experience, change high-risk behaviour and better chart their futures.

Lutz’s research has shown that women with higher levels of education tend to have fewer children. By some analysis, he said, improved global education could reduce global population by more than 1 billion people by 2050. Plus, he has found that education is associated with better health and lower mortality.

Education also is linked to higher personal or household income, he said. Over time, that can drive a nation’s economic and human development.



▲ TWAS Fellow and sociologist Elisa Reis, top; TWAS Fellow and education researcher Wolfgang Lutz.

▼ Students in Samangan, Afghanistan. [Photo: USAID]

WORKING ACROSS BORDERS

Achieving the goals of Agenda 2030 will require a third critical element: commitment to international cooperation. Research partnerships between developed and developing countries can bring benefits to all sides; for less-affluent countries, scientific partnerships are essential.

“North-South and South-South cooperation is vital to building science, technology and innovation capacity for sustainable development – there are deep reservoirs of talent to be tapped,” said Turekian, the science adviser to the U.S. secretary of state.

These partnerships can extend across sectors – governments, research centres, universities and private enterprise.

For Swedish policymakers, a priority is to support “research of high quality and of relevance to poverty reduction and sustainable development,” said Claire Lyngå, research adviser in the research cooperation unit at the Swedish International Development Cooperation Agency [Sida].

Sida pursues that goal, Lyngå said, through support for capacity-building research in developing countries and for research that





▲ It is essential to remember the needs of poor people even as we protect the environment, said South African legal and human rights activist Albert Louis Sachs. [Photo: Jonathan McIntosh | Wikimedia Commons | CC BY 2.0]



can drive innovation to address poverty and sustainable development.

Elsevier, a global leader in science, health and technology information, is committed to the goal of universal access to research publications in those fields. Michiel Kolman, senior vice president for global academic relations, said that Elsevier's commitment is reflected in Research4Life programme, which

“Mega-science facilities, by bringing together scientists and experts from all over the world, play a valuable role in building international friendship... and reinforcing solidarity.”

Naledi Pandor, South African minister of science

provides research papers for free or at low cost to institutions in the developing world.

For example, Kolman said, AGORA is the food security arm of Research4Life. It offers 28,000 agricultural books and journals from over 200 publishers to nearly 3,000 registered agricultural institutions. A quarter of the

publications in Research4Life are from Elsevier. “The field of food security research is high-quality and growing fast,” Kolman said, “and at Elsevier, we’ll do everything we can to foster growth in such a critical area of sustainability.”

Pandor, South Africa’s science minister, said African countries are increasingly forming African partnerships. But she urged broader collaboration on research that requires “mega-science” facilities such as the Large Hadron Collider in Switzerland or the Square Kilometre Array in South Africa and Australia. These facilities are too big and complex for countries to build on their own, she said.

“Mega-science facilities, by bringing together scientists and experts from all over the world, play a valuable role in building international friendship, improving transnational communication and understanding, and reinforcing solidarity,” Pandor said. “They are an essential element in sustainable growth and development globally.”

THE HUMAN SPIRIT OF SUSTAINABILITY

Science, and scientists, also must maintain solidarity with the public, said Albert Louis Sachs, a former South African judge and a leading figure in its break from apartheid. Sachs was the winner of the Tang Foundation’s 2014 Tang Prize in Rule of Law.

In a keynote address, he described a case he heard on the South African Constitutional Court: With winter rains coming, poor people living in shacks near Cape Town wanted to move to a site with better drainage. But government housing and sustainable development policies left them no suitable place to go.

The best practice of sustainable development “is not allowing one part of the equation to dominate and crush the other,” Sachs said. “It’s finding a way of managing the tensions in a principled manner, that preserves our world and environment, but also looks to the sustainability not only of the Earth and its resources, but of the human beings on the Earth.


“Human sustainability has got to be part of it.” ■

*Cristina Serra and Sean Treacy
contributed to this report*



DREAMERS WITHOUT BORDERS

Despite its small size, Austria is committed to supporting science in countries such as Palestine and Burkina Faso.

 by Sean Treacy

In the Palestinian territories, where instability is normal and mobility is limited, it is difficult to become a scientist. And when researchers and policymakers decided they wanted to help solve that problem by improving graduate education programmes there, at schools such as Birzeit University in the West Bank, they needed an EU-based programme coordinator. So they turned to Austria.

Starting about a decade ago, The Austrian Academy of Sciences (ÖAW) administered the finances and legal details of the initiative, called Capacity Building in Social Science Methodologies for Palestine, for years. Now Birzeit University and other institutes in Palestine have graduate programmes that are compatible with European Union universities.

This is just one example of how Austria has come to be an ally of some of the most distressed countries in the developing world, helping them join the global endeavour to provide science for a sustainable future.

Harald Mahrer, state secretary of Austria's Federal Ministry of Science, Research and Economy, detailed his country's work during TWAS's 26th General Meeting in Vienna. He listed examples, such as grants that support postdoctoral students from the South, research partnerships, and The Austrian Partnership Programme in Higher Education & Research

for Development (APPEAR), which funds partnerships between Austria and developing countries to address issues such as water supply, rural development and energy.

"I am convinced that science is an essential tool for understanding and consequently tackling global challenges," said Mahrer.

LASTING GOOD WILL

At the core of modern science in Austria and its global relationships is the Austrian Academy of Sciences (ÖAW), with a history stretching back to its predecessor, the Imperial Academy of Sciences in Vienna, in 1847. It endured decades of tumultuous European history and was reborn as ÖAW in 1921; it was energised in the late 1960s by an opportunity to mediate the politics of science on both sides of the Iron Curtain, because Austria belonged to neither NATO nor the Soviet bloc.

Austria is now in a special position among European nations because it's a small country and historically its colonialist inclinations never extended beyond Europe, making it easier for developing countries to trust. Austrian science's global reach is particularly present in the Arab Region, said 2015 TWAS Fellow Andre Gingrich of Austria, the director of ÖAW's Institute for Social Anthropology, partly because Austria has a long history with Islam through trade and diplomacy.

The work between Austria and Palestine set a framework that helps Birzeit University train Palestinian scientists in research despite Palestine's unstable situation and complex place in the world, Gingrich said. "We used French- and Arabic-speaking researchers in Vienna, some with legal skills, and did sojourns to the Middle East," he explained. "It creates a lot of goodwill."

Four master's students from Birzeit have come to Austria to do graduate-level work in 2009. One of them, social anthropologist Noura Kamal, finished a PhD about her home city of Nablus, Palestine, while it was under occupation in 2015.

While under siege, people in Nablus couldn't leave their homes except for short periods. Children couldn't even go to school. Her research, through observation and interviews, gathered information on how people worked

▼ From top: Andreas Obrecht, Andre Gingrich





“I am convinced that science is an essential tool for understanding and consequently tackling global challenges.”

Harald Mahrer, state secretary of Austria's Federal Ministry of Science, Research and Economy

around the siege to live their daily lives, even though the streets were full of soldiers. She found that they were steadfastly determined to advance their lives despite the situation, tapping into family networks that sometimes go back 4,000 years for support. People would get around curfews by gathering at teachers' homes in their respective neighbourhoods to educate their children.

The opportunity to develop her research about Palestine with a PhD in Austria was valuable, she said, because research is a struggle in

▲ Students from Burkina Faso and Austria look for fish samples using a high-tech fishing device in a project supported by the Austrian Partnership Programme in Higher Education & Research for Development. [Photo: Andreas Melcher]

Palestine. “Palestinians don't control the borders,” she said. “So it's really hard to have this kind of exchange and communication with scholars from different parts of the world.” But she hopes to teach and start projects in her homeland someday and motivate Palestinian students to pursue research. Their dreams, after all, have no borders.

SCIENCE THAT BRINGS WORLDS TOGETHER

Sub-Saharan Africa is another area of focus for Austria. APPEAR provides much of Austria's assistance to the development of research skills in Africa, with projects in fields ranging from agriculture to improving higher education.

“We see it more as a long-term sharing of knowledge and experiences with other worlds, to explore and generate new ideas and hopefully new ways and approaches to do science and research,” said Andreas Obrecht, APPEAR's programme head.

Obrecht cited several successful programmes. One collaboration in sociology between Austria, Kenya, Tanzania, Rwanda and Uganda provided social work education; PhD students from Africa came to Austria and went back with PhDs. Those African researchers then support very poor people in small African villages. Another project helped researchers in Burkina Faso learn how to monitor, assess and manage fisheries that had sprung up around reservoirs built in the 1950s.

Two-thirds of APPEAR's projects are in sub-Saharan Africa, but it works in other regions, too. It's supporting hydropower in Nepal by building a curriculum at Tribhuvan University in Kathmandu for hydropower management. Back in Palestine, in the Gaza Strip, they're supporting an on-going project to share knowledge about energy-efficient architecture and home construction.

The key, Obrecht said, is breaking down the educational wall between North and South. And it's especially important now as Europe is confronting an historic influx of refugees, forcing European leaders to confront economic and social inequalities in the world.

Explained Obrecht: “We see ourselves as a culturally open-minded agency, to get these worlds together.” ■



Q&A ANTON ZEILINGER: AUSTRIA'S S&T VISION

 by Cristina Serra

North-South cooperation is a driving force that can help shape a better future for developing countries, says TWAS Fellow Anton Zeilinger, president of the Austrian Academy of Sciences.

Austria has a strong tradition in international North-South cooperation: since the 1960s, this small, land-locked European country has engaged in programmes for development assistance and cooperation with Africa, Asia, Eastern and Southeastern Europe and the Caribbean.

As president of the Austrian Academy of Sciences (ÖAW), TWAS Fellow Anton Zeilinger, plays a key role in implementing the national priority of international cooperation in science.

In an interview, Zeilinger said Austria is in a strategic geographic position that has long favoured blending of cultures, identities and skills. And the Austrian Academy of Sciences, which today includes about 800 members [six of them TWAS Fellows], has long promoted engagement at the regional and international level.

In recent years, Austria has participated in the elaboration of the European Union-Africa strategy, and in the EU-Africa summit in Lisbon, Portugal, [2007] with African women active in business, politics and civil society. It has also supported the establishment of an office of the African Union in Vienna and launched several long-term projects to support self-help actions in developing countries.

The interview with Zeilinger was conducted by TWAS staff writer Cristina Serra.

The Austrian Academy of Sciences is a prestigious and historic institution in a relatively small nation. Why is ÖAW committed to international science cooperation?

- International cooperation in science has a very long tradition for Austria. Austria was always at a crossroads of different cultures due to its geographical location. The Austrian Academy of Sciences – ÖAW – supports all activities to improve international science cooperation. This is an important way to increase mutual understanding.

Why did ÖAW decide to host TWAS's 26th General Meeting and what do you feel were major outcomes from the event?

- For the ÖAW it was a big honour to host TWAS's 26th General Meeting. It was particularly important to have the meeting in an industrial country like Austria, in order to help extend the importance of TWAS beyond developing and emerging countries. As always with such conferences the major outcome are the numerous personal contacts, which resulted due to the meeting.

Austria has established scientific partnerships with developing countries worldwide. What are Austria's goals for such partnerships? What benefits does it hope to receive?

- In the long run, scientific partnerships only make sense on a worldwide scale. After all, science is

BIOGRAPHY

Anton Zeilinger, the president of the Austrian Academy of Sciences, is a physicist and the pioneer of studies on quantum computing and quantum teleportation [a process by which the exact state of an atom or photon can be transmitted from one location to another].

Zeilinger was elected to TWAS in 2014. He is the recipient of the Wolf Prize [2010] and of the UK Inaugural Isaac Newton Medal of the Institute of Physics [2008].

In 2009, the *New Statesman* included him among the 10 people who could change the world. The asteroid 48681 *Zeilinger* is named for him.



“ In the long run, scientific partnerships only make sense on a worldwide scale. ” Anton Zeilinger, ÖAW president

a general endeavour that should engage people from all backgrounds geographically, ethnically, religion, gender and so forth.

Austria has signed agreements with nations such as South Africa and Egypt. Is this a recent trend or it is something that your Academy has been engaged with historically?

● The Austrian Academy always has agreements with a number of academies worldwide. This helps to establish collaboration in many situations. It should be mentioned that the cooperation agreement with Egypt was already established in 1980, while the cooperation with South Africa was signed during the TWAS meeting in Vienna.

Are there other partnerships established by the Academy in recent years?

● A very recent example is the signing of a Memorandum of Understanding with Cuba.

We live in times of great challenges and changes. Perhaps old-fashioned North-South cooperation should be redesigned with an eye to the future. In your opinion, how should we shape new forms of cooperation?

● The ÖAW wants to emphasise that cooperation should be mutual. For that purpose the ÖAW has started a programme to support short-time visits of young scientists particularly from emerging and developing

◀ Austrian Academy of Sciences President Anton Zeilinger at the opening ceremonies of the 26th TWAS General Meeting in Vienna, Austria.

countries. The aim is to encourage more scientists in their home institutions.

Today the EU is facing the problem of a huge number of refugees knocking on Austria's doors, a number of whom are scientists. Does the ÖAW take part in the societal debate on refugees in an active and science-based manner?

● The ÖAW has started a program to offer fellowships to officially recognized refugees in Austria in order to help them establish themselves in the new environment.

There's a growing interest – both in developed and in developing countries – on how science can most effectively provide advice to governments. Is ÖAW an influential voice with the Austrian Government? Perhaps you can describe the relationship. In your view, what's the most effective approach for the scientific community?

● For the ÖAW, the dialogue with society and with politics is very important. On the one hand, the ÖAW investigates specific scientific questions, which are put forward to the ÖAW and analysed on a high scientific level. It is important to notice that the investigations are outcome-open and not influenced at all politically. Another approach, which is important, is to meet members of Parliament occasionally and discuss mutual topics of interests. ■



▼ TWAS Executive Director Romain Murenzi speaks during the meeting.

▲ From left are Austrian President Heinz Fischer; Naledi Pandor, Minister of Science and Technology, South Africa; Reinhold Mitterlehner, Vice-Chancellor and Federal Minister of Science, Research and Economy, Austria; TWAS President Bai Chunli; ÖAW President Anton Zeilinger.

▼ ÖAW President Anton Zeilinger speaks during the opening ceremony in ÖAW's historic Festive Hall.





▲ Albert Louis Sachs, a former judge and a leading figure in South Africa's break from apartheid, gives the keynote lecture at the meeting.

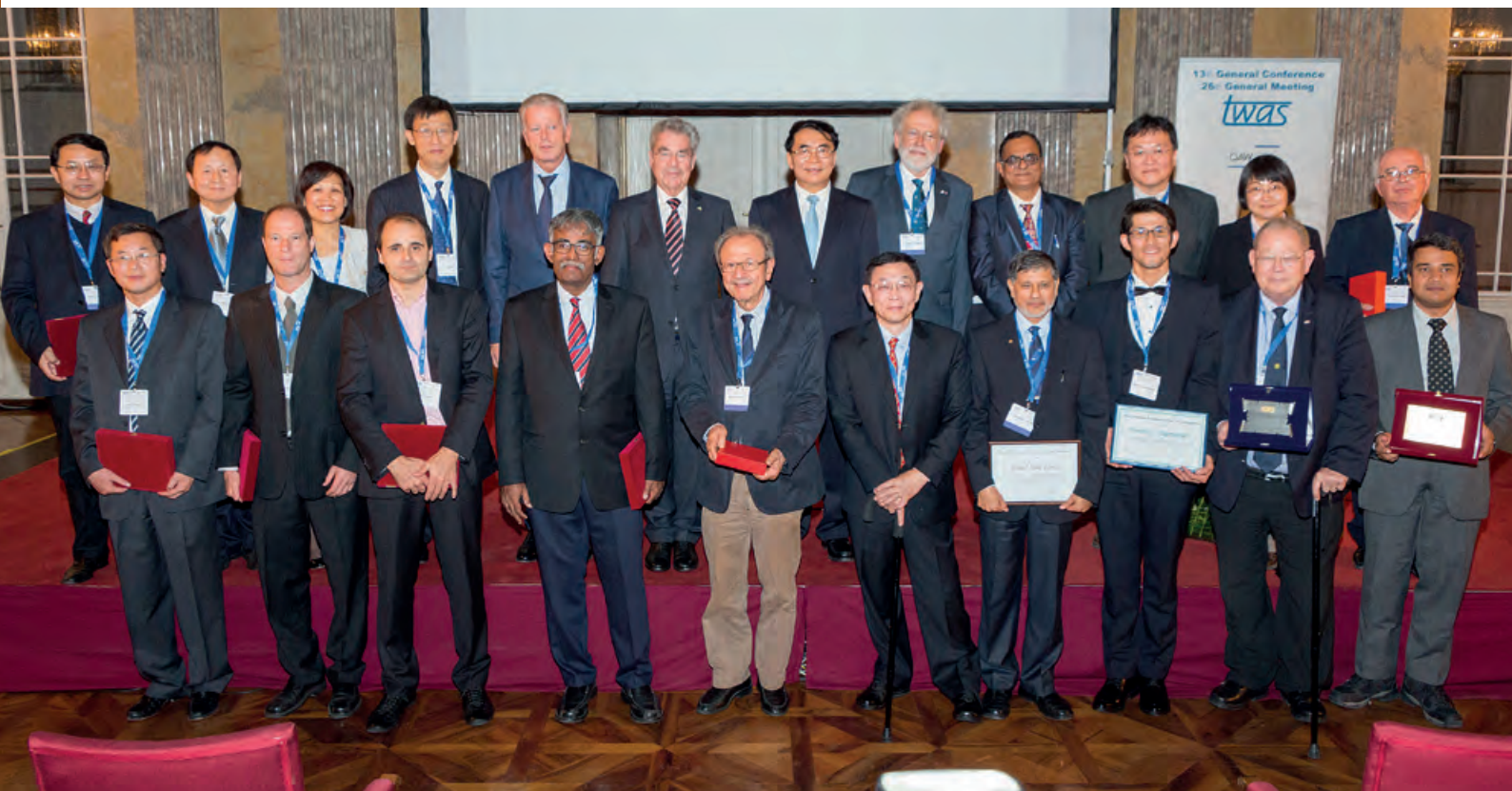


▲ Sabah Ahmed Abdul-Wahab Al-Sulaiman, a professor of chemical engineering at Sultan Qaboos University in Oman, signs her name into the book of TWAS Fellows.

▼ TWAS's award winners at the opening ceremonies of the 26th TWAS General Meeting in Vienna, Austria.

For more photos from the meeting, see TWAS's Flickr page: www.flickr.com/photos/twas

All photos are by Michael Weiwurm/ÖAW-TWAS - © www.fotoweiwurm.at





FEEDING THE FUTURE

At the General Meeting symposium on food security, leading thinkers examined current knowledge on food practices and strategies to feed the world's growing population.

 by Cristina Serra

Extrême weather events, energy demand, water scarcity and carbon emissions place stress on food production, making food security one of the most daunting issues to solve in the future.

According to the Food and Agriculture Organization (FAO), crop production must rise by 70% to feed some 10 billion people who will live on Earth by 2050. That makes food security a linchpin among the 17 United Nations Sustainable Development Goals.

“Food insecurity is not only about calories,” warned TWAS Fellow Moutar Toure, the chair of a symposium on Science for Food Security organised at TWAS’s General Meeting in Vienna. “Malnutrition means lack of vitamins and minerals essential to preserve health. And chronic conditions such as anemia or iodine deficiency caused by poor diets have become major cause of illness, and even death, worldwide.”

Toure, vice chair of the Senegalese National Academy of Science and Technology, is an expert in soil chemistry and environment. He previously served as director of the department of agricultural and agro-industrial research at Senegal’s Ministry of Sciences and Technology.

At the Vienna meeting, he called for new perspectives on sustainable intensification. “Science can harness existing technologies and boost research and technology development

▼ From top: Moutar Toure, Hans Herren



into long-term solutions able to increase agricultural resilience,” he said.

INTENSIFY AGRICULTURE, INTENSIFY PROBLEMS?

For decades, agricultural practices have focused on boosting yields. Today rich harvests are not the only goal, especially given that 795 million people worldwide suffer from malnutrition and 1.5 billion are overweight – 300 million of them obese – and at high risk of cardiovascular diseases.

Hans Herren, the president of the Millennium Institute, founder and chairman of Biovision Foundation, cited “the scandalous level of surpluses and waste” that affect about half the world’s population. But what, he asked, could science do to re-establish equilibrium in the food system?

A series of reports called “Agriculture at a Crossroads”, commissioned by six UN agencies and the World Bank in 2002 and published in 2009, calls for urgent transformation of the world’s food system. Herren was among the reports’ editors, and at the General Meeting he summarised core concepts that should drive a “paradigm change” in agriculture.

“Business as usual is not a feasible option,” he maintained. “Governments should move from short-term thinking to long-term planning and devise better consumer-driven policies. The huge pre- and post-retail food wastage, added to pre-harvest losses, would more than make up the extra food needed by 2050.”

Nations should adopt sustainable agricultural practices such as agroecology, organic farming, regenerative agriculture Herren said. These practices would rebuild soil health, allow the growth of healthy plants, the raising of healthy animals and sequester much of the carbon that is causing climate change. Thus, sustainable agriculture can not only be carbon neutral, it can help reverse climate change. What the green revolution focused on was supply of food, but it failed to address a key related issues – access to food, healthy and diverse nutrition.

MORE FOOD IS NOT BETTER FOOD

Lifestyle-linked diseases are emerging in countries of the Caribbean Community



▲ From left: Neela Badrie, Ajmal Khan, Michiel Kolman

[CARICOM], with some stemming from a combination of poor food quality and low physical activity.

“Chronic diseases pose high costs to individuals and to the nation itself, in terms of human suffering, expensive treatments and loss of productiveness,” observed Neela Badrie, who spoke at the food session in Vienna. Badrie is a 2011 TWAS Fellow and a professor and researcher in food microbiology and safety at the University of the West Indies in St. Augustine, Trinidad and Tobago.

▼ Bananas for sale at market in Trivandrum, India. [Photo: Adam Jones, adamjones.freeseervers.com/Wikimedia Commons]



Poor food quality in the Caribbean region, she observed, is linked to lack of interest in agricultural careers among young people. “In 1991 there were 43,000 registered farmers,” Badrie said. In 2004, there were 19,000 – and this means more food imports, and a drag on the local economy.

That’s why the government of Trinidad and Tobago launched the National Food Production Plan [2012-2015], with the aim of reducing food imports and national inflation and boosting long-term employment and economic diversification.

INVESTING IN RESEARCH

Other nations face different challenges. For example, about 25% of irrigated land in Pakistan is affected by high salinity. “Salt-affected lands and brackish water should not be treated as waste: they are precious resources available to mankind,” said TWAS Fellow Ajmal Khan, Distinguished National Professor at the

“Business as usual is not a feasible option.”

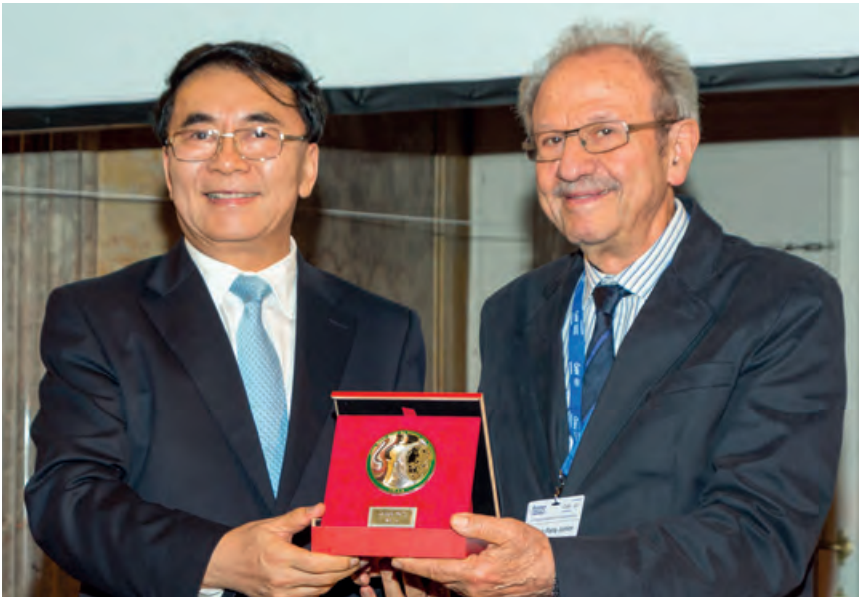
Hans Herren, president of the Millennium Institute, on food security

Institute of Sustainable Halophyte Utilization at the University of Karachi in Pakistan.

Scientists in Pakistan and elsewhere are investigating the use of halophytes – plants that can live in saline environments – for food. They also may be used as forage or fodder [at least 95 varieties are apt for this purpose in Pakistan], biofuel, edible oil, and for medical purposes.

Research – and communication of the results – are essential for driving scientific advances related to food security, said Michiel Kolman, senior vice president at Elsevier. Kolman noted that annual food security research nearly doubled over the period 2010-2014.

“Food security research is growing at a rate of 16% per year,” he explained. That signals that the research “should remain a key priority for governments, funding bodies and institutions.”



◀ Former TWAS President Jacob Palis receives the Abdus Salam Medal in Vienna.

IN THE SPIRIT OF ABDUS SALAM

✍ by Cristina Serra

In a joyous ceremony at the TWAS General Meeting, former President Jacob Palis received the Abdus Salam Medal and recalled the guidance and friendship of TWAS's founder.

Brazilian mathematician Jacob Palis has been a prominent presence in TWAS's life, shaping the Academy's programmes and global presence since the turn of the century. For his achievements and dedication to the Academy, Palis was awarded the prestigious Abdus Salam Medal at the 26th General Meeting in Vienna.

In a warm, intimate remembrance

at the prize ceremony, Palis recalled the work that earned him this latest recognition – and the friends he met along the way. "Perhaps," he said, "this most special honour ... was bestowed upon me in view of my great passion for TWAS, designed by its founder Abdus Salam to carry on the building up of science all over the world, with much focus on developing countries."

Indian chemist C.N.R. Rao, a TWAS Founding Fellow who preceded Palis as president, introduced him to the audience. Palis, as Rao recalled, served as the secretary-general from 2001 to 2006, and then was elected president [2007-2012]. He also has served as president of the Brazilian Academy of Sciences since 2007.

A native of Uberaba, in the Brazilian state of Minas Gerais, Palis earned his master's degree in mathematics [1966] and PhD [1968] at the

University of California at Berkeley [USA]. In 1968 he returned to Brazil to begin a career as a researcher at the *Instituto Nacional de Matemática Pura e Aplicada*. From 1993-2003, he served as the institute's director.

As he delivered the Vienna lecture, "The Spirit of Abdus Salam", Palis' shared heartfelt emotion with the audience in the ornate Festive Hall at the Austrian Academy of Sciences.

"The title I chose for this lecture is indicative of my feelings with respect to Salam," said Palis, beginning his speech. Then he shared with the audience personal memories of a pivotal chapter of science history – written by Salam, by himself and other eminent scientists at the International Centre for Theoretical Physics in Trieste from the 1960s onward.

"For scientists from the developing world," Palis said, "coming to ICTP was an important step towards the realization of Salam's dream...as this confirmed their faith in their own talents and the importance of the work they were doing."

He recalled when TWAS created its PhD Fellowship Programme, which has now grown to more than 460 positions for applicants of developing countries. "We hope, not too far in the future, to achieve as much as 1,000 fellowships," said the Brazilian scientist, triggering a sustained ovation.

Palis also paid a special tribute to longtime friends and colleagues: Rao, founding Executive Director Mohamed Hassan, current President Bai Chunli, secretary-general Ajay Sood, the TWAS Council, and current Executive Director Romain Murenzi. ■

Learn more:
www.twas.org/node/11470/

“A VOICE FOR SCIENCE IN THE SOUTH”

 by Edward W. Lempinen

Key TWAS leaders reflect on the history of science in the developing world – and the history and future of TWAS – in a new book.

Thirty years after the first TWAS General Meeting, a new book explores the Academy’s past and future in a series of essays by TWAS leaders and prominent Fellows from the developing world.

“A Voice for Science in the South” serves as window into one of the most significant changes of our era: how nations once trapped in poverty have invested in science, technology and education to drive development and improve human conditions.

The book “will serve as a lasting reminder of the commitment that motivated Abdus Salam, Paolo Budinich and the others who founded the Academy and guided its work for the first 30 years,” writes TWAS President Bai Chunli in the Foreword. “Though the world may change, their ideals remain constant. At the same time, this volume reminds us of the hard work and creativity that will be required to build on their legacy, so that TWAS remains an effective leader and advocate for science in the service of human progress.”

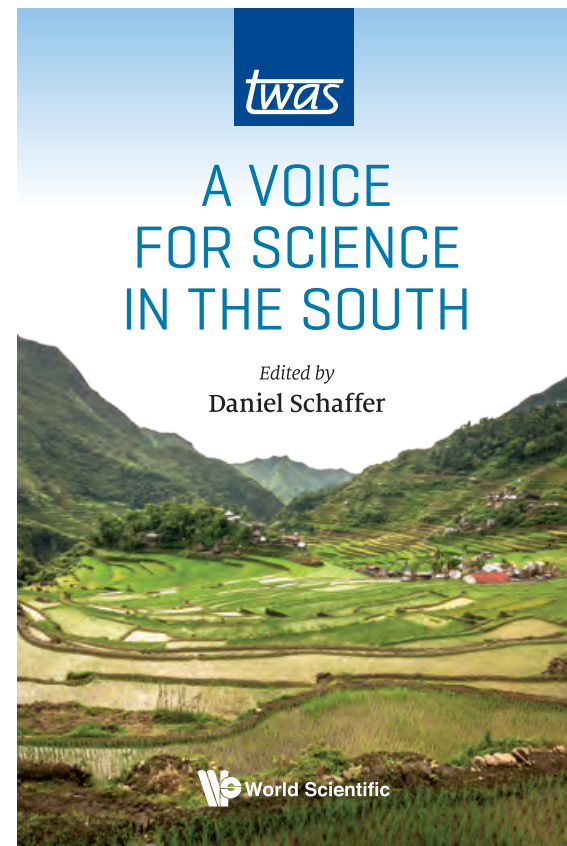
“A Voice for Science in the South” was edited by Daniel Schaffer, the

former TWAS public information officer, and published by Singapore-based World Scientific. In an introductory essay, Schaffer reflects on the vision and commitment of Salam, the Pakistani physicist who founded the International Centre for Theoretical Physics (ICTP) in 1964 and won the Nobel Prize in 1979.

Following that reflection are essays by four pioneering TWAS leaders: former Presidents José I. Vargas of Brazil; C.N.R. Rao of India; and Jacob Palis of Brazil; and longtime Executive Director Mohamed H.A. Hassan of Sudan.

“A Voice for Science in the South” also features essays by:

- TWAS Fellow Ana María Cetto Kramis of Mexico, who has played a globally influential role in supporting women in science;
- TWAS Fellow Adnan Badran, who served as prime minister of Jordan during a distinguished career of scholarship, political engagement and diplomacy;
- Zakri Abdul Hamid, a TWAS Fellow who serves as science adviser to the government of Malaysia, a member of the UN Secretary-General’s Science Advisory Board, and founding chair of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services;
- Keto Mshigeni, a TWAS Council vice president and one of Africa’s pre-eminent natural scientists, known



▲ In a new book from TWAS, key figures in the Academy’s history discuss its past and future.

- for his research into seaweed and mushrooms as food sources;
- TWAS Fellow Yu Lu, a renowned Chinese physicist who served as the first permanent member of the ICTP scientific staff;
- Roseanne Diab, a TWAS Fellow and executive director of the Academy of Sciences of South Africa; and
- TWAS Young Affiliate Maria Corazon A. De Ungria of the Philippines, head of the DNA Analysis Laboratory at the University of the Philippines. ■

To order “A Voice for Science in the South”, visit World Scientific: www.bit.ly/2bfD671



JOINING FORCES TO BUILD SUCCESS

Four key TWAS partners – from Sweden, Kuwait, the Netherlands and Austria – delivered a vital message in Vienna: cooperation is essential to achieve results.

 by Cristina Serra

Four important partner organisations celebrated their partnerships with TWAS and urged further links between North and South to support sustainable development during the General Meeting in Vienna.

Representatives of the partner organizations cited a range of important benefits of collaboration: advancing women in science, saving children from disease and building private enterprise to boost development.

The speakers were Claire Lyngå, research adviser in the unit for research cooperation at the Swedish International Development Cooperation Agency (Sida); Ylann Schemm, programme director at the Elsevier Foundation based in The Netherlands; and Georg Kapsch, president of the Federation of Austrian Industries, one of the institutions that provided official support to the TWAS 26th General Meeting. Adnan A. Shihab-Eldin, director general of Kuwait Foundation for the Advancement of Sciences (KFAS) was unable to attend, but he delivered an inspiring written message.

Lyngå recalled the fruitful collaboration that TWAS and Sida have established in TWAS’s earliest years, with both committed to support for high-quality research to reduce poverty. Basic science is a prerequisite for development and independence, she observed, and scientifically lagging countries may achieve independence through well-focused programmes for development.

For example, Lyngå cited Sida’s support

to the International Centre for Diarrhoeal Disease Research in Bangladesh, where ready-to-use therapeutic food developed locally is now used to treat severe acute malnutrition. Local ingredients are used which means that the product is inexpensive and the taste is acceptable to the children.

At Makerere University, in Uganda, Sida funded 210 PhDs, 95 masters degree students and 20 postdoctoral researchers from 2010 to 2015. And its support for TWAS’s pioneering Research Grants programme has helped establish hundreds of research projects in Africa and other developing countries.

“All these achievements tell how essential research cooperation is,” Lyngå said.

“We have the honour of working closely with TWAS and the Organization for Women in Science for the Developing World (OWSD) since 2010,” said Ylann Schemm, programme director of the

▼ From left: Claire Lyngå, research adviser in the unit for research cooperation at the Swedish International Development Cooperation Agency (Sida); Adnan A. Shihab-Eldin, director general of Kuwait Foundation for the Advancement of Sciences (KFAS). [Photos provided]





“To be attractive to the international scientific community, a nation must offer basic and applied research facilities, and intensify relationships among scientists, business executives, politicians and the society.”

Georg Kapsch, president of the Federation of Austrian Industries

▲ From left: Georg Kapsch, president of the Federation of Austrian Industries; Ylann Schemm, programme director at the Elsevier Foundation. [Photos provided]

Elsevier Foundation. The foundation is a corporate charity funded by Elsevier, an Amsterdam-based Anglo-Dutch provider of scientific, technical and medical information products and services.

The organizations have worked in synergy to build scientific networks and promote knowledge dissemination. And the Elsevier Foundation Awards for Early-Career Women Scientists in the Developing World, organised with TWAS and OWSD, “sustains the career of talented women, who may become leaders of the future,” Schemm said.

At the meeting, TWAS and the Elsevier Foundation announced a new joint programme called “North-South Collaboration in Sustainability”. Said Schemm: “TWAS’ annual conference focused on sustainability demonstrates a powerful commitment from its distinguished members and guests.”

The Kuwait Foundation for the Advancement of Sciences [KFAS] is a private non-profit organization established in 1976, and a loyal partner of TWAS since 1987, when a first agreement was signed.

KFAS Director General Adnan Shihab-Eldin, though unable to attend, sent a heartfelt message to Vienna. “KFAS is proud to have been in support of TWAS activities...including holding the 4th General Conference in Kuwait [in 1992],” he wrote.

KFAS engages in international programmes and worldwide cooperation through grants, programmes and prizes for scientists and students from Arab countries as well as from other developing countries.

As an example, Shihab-Eldin mentioned the recently established Al-Sumait Prize [2015], named after a late Kuwaiti medical doctor who dedicated his humanitarian work to Africa. He also listed other international collaborative programmes with world-renowned universities including the London School of Economics and Political Science, the Massachusetts Institute of Technology [USA], and the Fondation Nationale des Sciences Politiques in France.

Regarding the importance of international collaborations, Georg Kapsch, president of the Federation of Austrian Industries, suggested that nations should develop an innovation ecosystem. “Sustainable growth needs an economic framework,” Kapsch said. “To be attractive to the international scientific community, a nation must offer basic and applied research facilities, and intensify relationships among scientists, business executives, politicians and the society.”

Innovation, he said, depends on enterprise and competition. But for developing countries, the absence of a stable political system can impede innovation. Fortunately, he noted, many developing countries recognise these needs. Ultimately, Kapsch added, technology is the only science that can cope with major global and regional challenges – and this, he added, is true both North and South.


The TWAS 26th General Meeting also was supported by the Austrian Federal Ministry of Science, Research and Economy; the Austrian Federal Ministry for Transport, Innovation and Technology; the Mayor and the Cultural Department of the City of Vienna; the Austrian Federal Ministry of Foreign Affairs; the Hannes Androsch Foundation; and the Federation of Austrian Industries. ■

Learn more:
www.twas.org/node/11517/



BRAZILIAN WINS TWAS-LENOVO PRIZE

Artur Avila received his PhD at 21, and at the age of 36 has already made great waves in multiple mathematical fields. The Brazilian prodigy-turned-professor won the Fields Medal in 2014. Now, he has been honoured with the TWAS-Lenovo Prize.

 by Sean Treacy

Brazilian mathematician Artur Avila's has solved daunting mathematical mysteries such as how chaos emerges from simplicity. Now, he has been named winner of the 2015 TWAS-Lenovo Science Prize, one of the most prestigious honours given to scientists from the developing world.

Avila's work has helped resolve some major mathematical quandaries and helped to bring a global awareness of the quality of mathematical research in Brazil. He also won the Fields Medal in 2014 and the TWAS Prize for Mathematics in 2013.

"Artur Avila is clearly an exceptional talent in the world of mathematics," said TWAS President Bai Chunli. "But he also is a symbol of the remarkable creativity that we can find among young researchers in the developing world. At TWAS, we are proud of our links to this scholar, and we are confident that he has many more years of important work ahead of him."

The annual prize includes an award of USD100,000 provided by Lenovo, the global leader in consumer, commercial and enterprise technology and the largest PC company in the world.

"I am very impressed by Dr. Artur Avila's achievements and contributions to his specialty areas such as dynamical systems and analysis," said Senior Vice President George He. "And I equally admire his collaborative spirit in working with peers around the globe to conquer world-

class open mathematics problems. As a China-rooted global company, Lenovo knows well the power of globalization and believes this holds true for business as well as science. I am glad to see more and more young talents like Dr. Avila from developing countries originally are playing increasingly important roles in the arena of science today."

▼ TWAS-Lenovo Prize Winner Artur Avila. [Photo provided]



At the age of 36, Avila is already one of mathematics' most prominent problem-solvers. Among his major accomplishments was a landmark work in dynamical systems — a branch of mathematics that studies how complex and seemingly chaotic behavior can arise over time from simple systems. Through his work, mathematicians now have a proof that can describe, for example, how a population of organisms will grow or decline over time.

Avila said it was an honour to receive the prize, and that it sends a message about the quality of mathematics being done in the developing world. He hopes it will help inspire mathematically gifted young people in developing countries to pursue research in pure mathematics, even though such a career can seem out-of-reach.

"Whenever we have such a prize, it gives us something to show to the larger public," Avila said, "to show that we are doing good mathematics in Brazil."

HOW EXPOSURE CAN SPARK A CAREER

Avila's parents were among those who had never heard of a career in pure mathematics. But Avila took strongly to the subject in school as a child while struggling mightily in other subjects. A teacher saw his potential, and encouraged him at age 13 to enter the Mathematical Olympiad. He excelled, and two years later went to the International Mathematical Olympiad in Toronto, Canada, where he won a gold medal.

Just as importantly, Avila said, the Olympiad exposed him to researchers from Brazil's Institute of Pure and Applied Mathematics (IMPA), and he was inspired to join them someday as a mathematician himself. Avila still does much of his research work as a fellow at IMPA, splitting his time between IMPA in Rio De Janeiro and the French National Centre for Scientific Research (CNRS) in Paris, where he is a research director.

A great many people, especially in developing nations, don't even think of mathematics as a potential career, he said, and the field thus loses out on the pool of potential talent.

"It's not on the spectrum of possibilities for many people," said Avila. "People have their talents, and people that might be attracted to

mathematics, you can't just expect them to be, say, a biologist. People start in math for several reasons. They're not necessarily thinking of the applications."

Avila's research also focuses on the dynamics of points in one dimension. This includes elements of mathematics that describe the movements of subatomic particles in models for quasicrystals, materials that have a more orderly molecular structure than a liquid, but less than a crystal. One of the questions solved by Avila is tied to the behavior of electrons in quasicrystals. It had been considered so difficult that late Polish mathematician Mark Kac had dubbed it the "Ten Martini Problem", offering 10 martinis to anyone who could solve it.

Even the purest mathematics still has consequences. Everything's connected in the mathematics world.

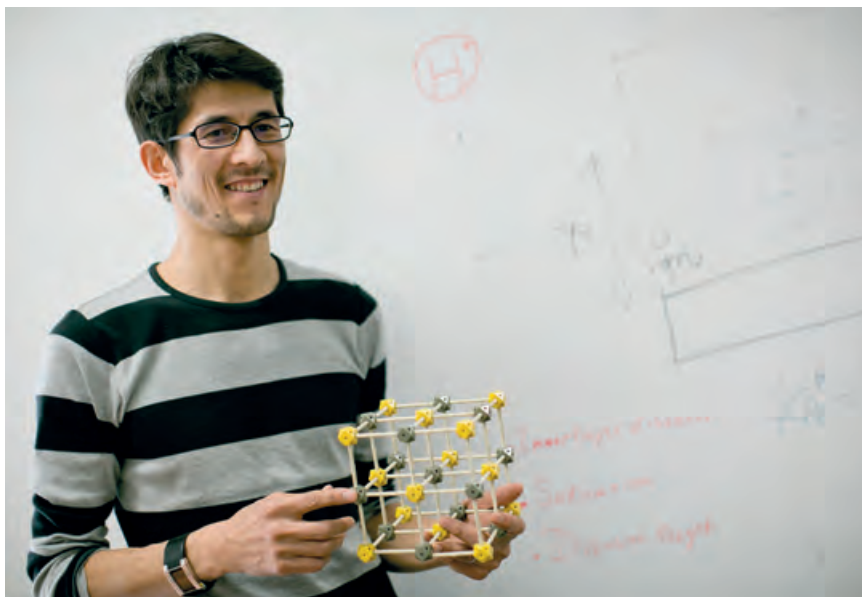
Artur Avila, 2015 TWAS-Lenovo Prize winner

Avila's work is purely conceptual. But it could have untold ripple effects throughout a number of scientific fields. Discoveries in pure, theoretical mathematics can later be used by applied mathematicians, which in turn can be used across many fields, from engineering to chemistry. So part of the excitement of Avila's discoveries is that we may some day see how they become useful in day-to-day life.

"A lot of mathematics, and particularly the kind of research that I do, is not with direct applications in mind. We do research not particularly likely to lead to direct applications," he explained. "Even the purest mathematics still has consequences. Everything's connected in the mathematics world." ■

Learn more:
www.twas.org/node/11456





◀ Mirabbos Hojamberdiev [Photo provided]

INNOVATION FOR CLEAN ENERGY

 by Cristina Serra

Mirabbos Hojamberdiev, winner of the 2015 Atta-ur-Rahman Prize, explores whether hydrogen could be the answer for clean energy needs.

The world's demand for energy is rising – according to some measures, by more than 70% from 2012 to 2040 in the developing world. The emission of greenhouse gases is rising, too, and many cities in the developing world are plagued by severe air pollution linked to the use of fossil fuels.

Mirabbos Hojamberdiev, a chemist from Tashkent, Uzbekistan, is exploring

a novel method for generating clean energy: he is developing inorganic crystals that can generate hydrogen from water molecules when hit by solar light. For this work, Hojamberdiev has won the 2015 Atta-ur-Rahman Prize in Chemistry.

The prize acknowledges accomplished young chemists who live and work in scientifically lagging countries. The prize is worth USD5,000, and winners are invited to attend the TWAS General Meeting and give a lecture on their work. The prize is provided by TWAS Fellow Atta-ur-Rahman of Pakistan, a leading scholar in organic chemistry and a globally influential advocate of science education.

“The TWAS Atta-ur-Rahman Prize is an unique recognition in the world for young scientists coming from developing countries,” Hojamberdiev

said. “Being an important international prize, it will give even more motivation and encouragement to my work, and it will be a matter of pride for my country.”

Hojamberdiev is a senior researcher in the department of natural and mathematic sciences, Turin Polytechnic University in Tashkent, Uzbekistan. As an undergraduate, he developed an interest in environmental issues. Over time, he also developed an interest in materials science. For more than 12 years, he has worked with a range of international partners on the development of novel advanced materials.

Hydrogen has significant potential as a source of renewable energy, but current hydrogen production requires an inefficient industrial process.

“Using sustainable energy sources such as solar, wind, hydro, or biomass to reduce greenhouse gas emissions and non-renewable resource exploitation is becoming mandatory,” Hojamberdiev says. “Hydrogen is a clean source of energy ... but we need to find the way to produce it routinely and at little cost.”

The inorganic photocatalysts that Hojamberdiev uses to assemble crystals exhibit high photocatalytic activity for water splitting, and have several advantages: they are inexpensive, non-toxic, abundant – and recyclable. And some research suggests that a similar procedure can clean polluted water.

“The whole system is in its infancy now,” he said. “We have chosen some materials and tested their performance. Today we are working to make the process even more efficient and feasible for scaling-up.” ■

[Learn more: www.twas.org/node/11455](http://www.twas.org/node/11455)

LEARNING FROM THE HIMALAYAS

✍ by Cristina Serra

Bishal Upreti of Nepal, winner of the 2015 C.N.R. Rao Prize, is exploring the geology of the Himalayan region to help understand today's earthquakes.

The earthquake that has rocked the city of Katmandu, Nepal, on 25 April 2015 was just one devastating temblor among about 50 detectable quakes that occur each day on Earth. Nepal, in particular, is one of the most earthquake-prone areas in the world, and studying its geology provides important lessons for understanding and managing the risks of future disasters.

Bishal Upreti, a Nepali geologist elected to TWAS in 2006, has been studying the region for over 40 years. His findings are now being used to evaluate the seismic hazard in the Nepal Himalayan region. For his outstanding contributions, he has been selected as the recipient of the 2015 C.N.R. Rao prize for scientific research, receiving the award at TWAS's 26th General Meeting in Vienna, Austria.

The prize is named after TWAS Founding Fellow and former TWAS President C.N.R. Rao, an eminent Indian chemist who served as chairman of the Science Advisory Council to the Prime Minister of India from 2004-2014. The prize was established in 2006 to acknowledge scientists from developing countries who have made significant contributions.

"I am highly delighted to receive the prestigious C.N.R. Rao Prize from TWAS," Upreti said. "I consider this prize to be an honour not only to me but an honour to the entire geoscientific community of Nepal. This prize certainly motivates me to contribute more in science in the developing countries."

In his investigations of the Himalayan Mountains, Upreti has provided a valuable historical contribution to the knowledge of the region. His research explores the ancient history expressed in the rock and deep tectonic plates, but it has a direct value for the present – and the future.

Upreti has mapped active faults to build the chronology of the historic and prehistoric earthquakes in the Nepal Himalaya. In the first days after the 2015 quake, he was involved in

providing technical information on the disaster and on safety measures. His GPS data were analyzed and put to use within three days.

Upreti, recently named the TWAS Council Member for East and South-East Asia, is a professor of geology and TWAS Research Professor (2012-2017) at the University of Zambia in Lusaka.

He is also the president of the Disaster Preparedness Network-Nepal [DPNet Nepal], a network of more than 100 NGOs, UN agencies, Nepalese government ministries and other organisations working in disaster risk reduction.

Upreti is also involved in outreach activities: Through public and school lectures, radio and television programmes, he helps communities – and the world – to prepare for future earthquakes. ▣

Learn more:
www.twas.org/node/11451


▼ TWAS Fellow Bishal Nath Upreti of Tribhuvan University in Nepal accepts the 2015 C.N.R. Rao Prize at the opening ceremonies of the 26th TWAS General Meeting in Vienna. At left is TWAS President Bai Chunli.





IN KUWAIT, SCIENCE THAT SERVES PEOPLE

As the Kuwait Institute for Scientific Research looks to the future, it's exploring ways to use science to drive sustainable economic growth.

 by Sean Treacy

The Kuwait Institute for Scientific Research [KISR] has come a long way in its five decades of supporting scientific research and technological development at home.

At the dawn of the institute's work in 1967, the organization began by conducting research on Kuwait's petroleum and agriculture. But there's so much more to what they do. Now, on the cusp of its 50th anniversary, KISR has grown to support over 150 laboratories, managed through four research centres. These state-of-the-art, internationally standardized laboratories combine to run about 200 active projects in any given year. KISR also provides consultation services for labs across the country to improve their management and productivity.

But most importantly, KISR focuses on science with a direct effect on real-world problems, particularly in fields connected to pressing challenges in Kuwait, such as its rapidly growing population and increasing demand for power, food and clean water. The institute's researchers are developing new technologies to increase Kuwait's drinkable water supply, an initiative to strengthen renewable energy sources in the country, and a programme to keep the country's fish supply strong and sustainable. By producing economically relevant technologies, KISR brings the benefits of science directly into people's lives, says Director General Samira Omar.

"Our goal is to maximize the country's social

and economic development and contribute to the advancement of industry while protecting the environment. Our researchers also bring an understanding of technological options and the implications for policy adoption," Omar said in an interview.

Omar was appointed director general of KISR in February 2016, after some 40 years with the institute. She served as director of its food resources and marine sciences division from 2001 to 2013, and has led projects that monitor and evaluate the ecosystems of deserts, inventories of natural resources, the restoration of arid ecosystems, wildlife management and sustainable land-use planning. She also headed a national rehabilitation programme that resulted in a nearly US\$3 billion environmental compensation award to the state of Kuwait.

She was elected to TWAS in 2015 and, at the Academy's 2015 General Meeting in Vienna, she was elected treasurer. She also serves as the Arab Region vice president of TWAS's partner organization, the Organization for Women in Science for the Developing World.

Omar explained that KISR is a partially independent government research institute responsible for research and development in the country. "We have over 1,000 employees and most of them – about 79% – are Kuwaitis," she said.

As part of the move to create technologies that are in public demand, they are working on



developing commercially marketable products. For example, a KISR aquaculture project is producing local fish that are in high demand.

KISR's Environment and Life Sciences Research Centre recently finished a campaign to release 126,000 local fish called the shaoum and the subaiti in the country's regional waters in the Persian Gulf. The fish had been bred in the centre's aquaculture lab in Salmiya, Kuwait, which is capable of producing over 120,000 fish every fishing season. The fish were released daily in various spots along Kuwaiti coasts.



▲ Samira Omar

living tissue, and another project focused on producing shrimp.

KISR also has an innovative new water project: It pumps sea water through a locally developed salt-straining membrane to produce fresh water, and then bottles the water for sale. That's a promising initiative in a desert nation with a high level of water stress.

"Kuwait depends a lot on desalination of seawater, but we also develop these membranes for shallow water wells," said Omar. "We remove the salination to make it suitable for drinking, and now it's been operating for many years."

The institute also takes advantage of a wide range of global links to support its scientists on myriad projects.

“We are looking at the future now and I see a bright one for my institute and my country.”

KISR Director General Samira Omar

"Our international collaboration has been emphasized in the last few years by establishing a unit in our organization to develop a network of contacts with organizations worldwide," she said. "So far, we have been successful in developing collaboration with governments in Korea, and in the U.S., with NASA and universities like Berkeley."

But the organization's partnerships are also moving in a private direction. Their focus on developing products that can both boost the economy and meet local needs has attracted the eye of companies such as IBM as a potential partner in the future, though Omar noted that talks with IBM are very preliminary.

"We're interested in developing technology, and developing systems and sensors," said Omar. "We are looking at the future now and I see a bright one for my institute and my country. All the elements of success are within our reach and with our dedicated scientists and staff I am optimistic we will make headway in the years to come." ■



"We succeeded in developing know-how on growing the local fish, which is very difficult anywhere in the world," Omar said. They're trying to use their new knowledge to establish a local company. The institute is also exploring similar projects, including one producing high-quality date palm trees using cells gathered from

▲ The headquarters of the Kuwait Institute for Scientific Research in Kuwait City. [Photo provided]



PEOPLE, PLACES & EVENTS

SOOD ELECTED TO THE ROYAL SOCIETY

Indian experimental physicist **Ajay Kumar Sood**, elected to TWAS in 2001 and currently serving as the Academy's Secretary General, has been elected a Fellow of the Royal Society of London, 10 July 2015.

The Royal Society, founded in 1660, is one of the most prestigious scientific institutions in the world with about 1,600 distinguished fellows from all over the world.

Sood, a physicist from the department of physics at the Indian Institute of Science (IISc), Bangalore, India, is an expert in quantum and soft condensed matter, fields where his input, originality and dynamism have left a mark.

He has served as the president of the Indian Academy of Sciences (2010-12) and the vice-president of Indian National Science Academy. For his scientific contributions he has received the Padma Shri (2013), the fourth highest civilian award in the Republic of India, as well as the prestigious TWAS Prize in Physics (2000).



OBAMA HONOURS TWAS FELLOW

Cato Thomas Laurencin, elected a TWAS Fellow in 2006, has been honoured by US President Barak Obama with the National Medal of Technology and Innovation.

Laurencin is an expert in shoulder and knee surgery, currently engaging in research in tissue engineering, biomaterials science, nanotechnology



and stem cell science as well as in the emerging field of regenerative engineering.

He earned his PhD in biochemical engineering/biotechnology from the Massachusetts Institute of Technology, and serves as designated university professor at the University of Connecticut. In addition, Laurencin is the founding director of the Institute for Regenerative Engineering and of the Raymond and Beverly Sackler Center for Biomedical, Biological, Physical and Engineering Sciences at UConn Health.

The National Medal of Technology and Innovation is among the highest honours awarded to acknowledge special achievements and outstanding contributions to America's competitiveness. It was created in 1980 and is administered by the US Department of Commerce's Patent and Trademark Office.

DASGUPTA WINS THE BLUE PLANET PRIZE AND THE TYLER PRIZE

Sir Partha Dasgupta, an illustrious economist elected to TWAS in 2001, is the recipient of the 2015 Blue Planet Prize, an international environmental award sponsored by the Asahi Glass Foundation. He has also been awarded the 2016 Tyler Prize for Environmental Achievement.

Through new insights and techniques of analysis, Dasgupta has unified two areas of economics that have always been addressed separately: environmental and resource economics and the economics



of poverty and development. His innovative perspective has given prominence to wealth and nature, which should be considered essential components of a country's gross domestic product (GDP).

A native of India, Dasgupta holds a PhD in economics from the University of Cambridge (1968). He is fellow of the British Academy and the Royal Society, and a Foreign Member of the US National Academy of Sciences, the American Academy of Arts and Sciences, and the American Philosophical Society.

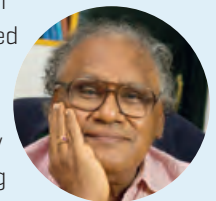
Dasgupta shared the Blue Planet Prize with Jeffrey Sachs, the director of the Earth Institute at Columbia University and the adviser to the UN Secretary-General on the Millennium Development Goals.

C.N.R. RAO RECEIVES PRESTIGIOUS RECOGNITIONS

C.N.R. Rao, a founding member and past president of TWAS, has received three prestigious honours in 2015.

He is the first Indian scientist ever elected as Corresponding Member of the Australian Academy of Sciences, sharing this title with professor Jill Banfield, an earth scientist at the University of California (Berkeley). For his contributions to science and to Indo-Japanese science cooperation, Rao has been conferred Japan's highest civilian award, the Order of the Rising Sun, Gold and Silver Star, by the Emperor of Japan.

In addition, he has been named an honorary member of the Nepal Academy of Science and Technology.



Rao, a fellow of the Royal Society, is an international authority in the field of solid state and materials chemistry. He is currently national research professor and president of the Jawaharlal Nehru Centre for Advanced Scientific Research in Bangalore, India. He has also served as the chief science adviser to the prime minister of India.

GUO HUADONG WINS PRZEWALSKI MEDAL

The Russian Geographical Society has awarded **Guo Huadong** the Nikolai Mikhailovich Przewalski Gold Medal, named after a renowned explorer and naturalist.

Guo, elected to TWAS in 2012, is a professor and founding director general of the Chinese Academy of Sciences [CAS] Institute of Remote Sensing and Digital Earth. He has been honoured for his scientific achievements in the field of radar remote sensing, digital Earth science, and space technology for global change research.

Guo serves as president of the International Society for Digital Earth, past-president of the ICSU Committee on Data for Science and Technology [CODATA], director of the International Center on Space Technologies for Natural and Cultural Heritage under the auspices of UNESCO, director of the CAS-TWAS Centre of Excellence on Space Technology for Disaster Mitigation, and editor-in-chief of the International Journal of Digital Earth.

RAGHAVENDRA GADAGKAR WINS AWARDS

Raghavendra Gadagkar, the president of the Indian National Science Academy and a 2000 TWAS Fellow, has received the German Cross of the Order of Merit, Germany's highest civilian

honour, for his scientific contributions in the field of behavioural ecology and sociobiology.

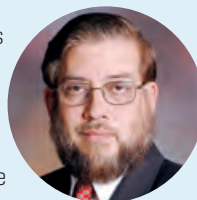
Gadagkar, who works at the Centre for Ecological Sciences, Bangalore [India] has also received the prestigious A.V. Rama Rao Technology Award 2014, instituted by the Indian Institute of Chemical Technology, Hyderabad, India.

He is decorated also for his efforts to consolidate scientific cooperation between India and Germany, with the Max Planck Institute for Chemical Ecology in Jena, the German Zoological Society in Halle and the universities of Freiburg and Offenburg.

Gadagkar's studies have examined the evolution of eusociality in insects, focusing on wasp species *Ropalidia marginata* as a model system. He is a member of the German Academy of Sciences Leopoldina and a foreign associate of the National Academy of Sciences, USA.

LOUNSBERY FOUNDATION SUPPORTS TWAS

TWAS's South-South Fellowship Programme has received financial support from the **Richard Lounsbury Foundation**. The grant [about USD60,000] will cover travel expenses, visa fees and other costs associated with the TWAS fellowship programmes. The Foundation, named for the late American businessman Richard Lounsbury, supports projects in science and technology policy; science and mathematics education; historical studies and contemporary assessments of trends in the physical and biomedical sciences; and establishing infrastructure for research projects. TWAS's South-South Fellowship Programme is the largest PhD and Postdoctoral research fellowships programme in the world. The



fellowships gives talented researchers the opportunity to develop their skills and build their careers by studying and working in top-class laboratories in TWAS partner countries.

Each year TWAS offers some 600 fellowships, and a current goal is to reach 1,000 fellowships per year.

PAKISTAN ACADEMY OF SCIENCES WELCOMES ANWAR NASIM

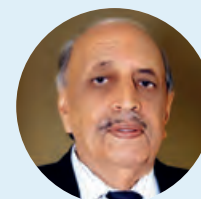
The Pakistan Academy of Sciences [PAS] in Islamabad has elected **Anwar Nasim**, a 1987 TWAS Fellow, as its new president. Nasim is a former science adviser to the secretariat of COMSTECH [the Organisation of Islamic Cooperation's Standing Committee on Scientific and Technological Cooperation].

Nasim, known for his efforts to promote the socio-economic development of Pakistan and Islamic countries, is a molecular geneticist skilled in DNA repair mechanisms. He will serve as the PAS president until 2017.

He earned his PhD in biochemical genetics at the

University of Edinburgh, UK, and is chairman of the task force on biosafety and biosecurity constituted

by Pakistan's Ministry of Foreign Affairs. PAS currently has 67 Pakistani fellows and 17 foreign fellows.



BE A CONTRIBUTOR

Do you have news for People, Places & Events?

Please send an email to Cristina Serra [cserra@twas.org] with a brief explanation, links to more details, and contact information.



VINCENT TITANJI: A FOCUS ON DISEASE PREVENTION

Vincent Titanji is a prominent African epidemiologist at the University of Buea in Cameroon. He is a 2004 TWAS Fellow, and has worked extensively on helping control infectious diseases in Africa, including river blindness, tuberculosis and malaria.

Here he describes vaccine research in response to the Ebola outbreak that captured global attention. And he explores disease prevention efforts in the developing world.

The Ebola epidemic that began last year in West Africa has killed more than 11,000 people and led to horrible suffering and worldwide apprehension and fear. But I was excited by the recent study of a new vaccine that appears extremely effective against the virus. This vaccine was also a signal on how to improve Africa's struggling health systems.

The early trial for the vaccine, called rVSV-ZEBOV, was conducted in an area of Guinea where Ebola was actively infecting people. It indicated that the vaccine is 100% effective, which is very rare. On top of that, it worked quickly and had few side effects. Health workers are now conducting another, bigger trial.

When the Ebola epidemic erupted, all of us were looking forward to a day when we would have such a tool in our hands to control this dreadful disease. Even though the outbreak did not reach Cameroon, it was still a major concern here because it could be spread by a traveler from a nearby country where health workers are still actively fighting the disease. But just as important as the good news, there are lessons that Africa and the rest of the world can draw from it about the importance of

vaccines and researchers working with communities.

The speed at which the vaccine was developed is a reflection of how much progress has been made in the science of immunology, and I hope the success of the Ebola vaccine will lead to further vaccine development for other infectious scourges. But medical scientists and health administrators should not *react* to disease outbreaks so much as *anticipate* that they may happen – and be better-prepared when they do. After all, how many lives might have been saved had the vaccines been available sooner?

In Sub-Saharan Africa, many countries give in to the temptation to imitate the North by focusing their health systems on the expensive, curative kinds of medicine that dominate developed countries. But building health centres and pharmacies doesn't solve a country's most pressing needs when it's staring down a threat from perfectly preventable, neglected tropical diseases. It's important to instead focus on developing and distributing the preventative tools, as well as water and sanitation.

Health planners, governments, multilateral organizations – I think



▲ Top, Vincent Titanji. Below, progress on Ebola research and policy have provided the world with cause for hope. [Photo: European Commission DG ECHO]

we need to put all this expertise together to design and customize health systems that can take care of prevention. The key is to involve everyone in the preventative efforts, from drug companies to researchers to local communities that can help on the ground. ▣



Support TWAS

A donation to TWAS directly contributes to the advancement of science, engineering and technology in developing nations.

To make a contribution: www.twas.org/support-twas



The World Academy of Sciences for the advancement of science in developing countries – TWAS – works to support sustainable prosperity through research, education, policy and diplomacy.

TWAS was founded in 1983 by a distinguished group of scientists from the developing world, under the leadership of Abdus Salam, the Pakistani physicist and Nobel Prize winner. Today, TWAS has over 1,170 elected Fellows from some 90 countries; 16 of them are Nobel laureates. It is based in Trieste, Italy, on the campus of the **Abdus Salam International Centre for Theoretical Physics [ICTP]**.

Through more than three decades, TWAS's mission has remained consistent:

- Recognize, support and promote excellence in scientific research in the developing world;
- Respond to the needs of young scientists in countries that are lagging in science and technology;
- Promote South-South and South-North cooperation in science, technology and innovation;
- Encourage scientific and engineering research and sharing of experiences in solving major problems facing developing countries.

TWAS and its partners offer over 600 fellowships per year to scientists in the developing world for PhD studies and post-doctoral research. TWAS prizes and awards are among the most prestigious given for scientific work in the developing world. The Academy distributes more than USD1 million in research grants every year to individual scientists and research groups. It supports

visiting scientists and provides funding for regional and international science meetings.

TWAS hosts and works in association with two allied organizations on the ICTP campus:

The Organization for Women in Science for the Developing World [OWSD]. At its founding in 1989, OWSD was the first international forum uniting women scientists from the developing and developed worlds. Today, OWSD has nearly 4,800 members. Their objective is to strengthen the role of women in the development process and promote their representation in scientific and technological leadership.

The InterAcademy Partnership [IAP] brings together three renowned global networks of academies of science and medicine, representing some 130 academies worldwide. Two of these networks, 'IAP for Science' [formerly IAP - the global network of science academies] and 'IAP for Health' [formerly the InterAcademy Medical Panel] are hosted by TWAS in Trieste. IAP provides high-quality independent information and advice on science, health and development to national and international policymakers and the public; supports programmes on scientific capacity-building, education and communication; leads efforts to expand international science cooperation; and promotes the involvement of women and young scientists in all its activities.

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iap

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