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NEWSLETTER

A PUBLICATION OF THE WORLD ACADEMY OF SCIENCES



TWAS Research Grants Programme

Nearly four decades of excellent results
of TWAS flagship programme



TWAS Research Grants

Building laboratories
in the developing world



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▲ Top: TWAS research grantees engaging in a simulation aimed at building new connections, at TWAS Research Grants Conference in Dar es Salaam, United Republic of Tanzania, 28–31 August 2018. Above: Photochemist and 2012 TWAS research grant awardee Tatas Brotosudarmo at TWAS Research Grants workshop in Nepal, 4–7 June 2019. [Photo: Tatas Brotosudarmo]

Cover picture: TWAS grantee Rondro Harinisainana Baohanta of Madagascar (left).

▼ TWAS research grant awardee Emmanuel Unuabonah (second right) and his colleagues, in Ede, Nigeria, in 2017. [Photo: Emmanuel Unuabonah]



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EDITORIAL

TWAS-SIDA RESEARCH GRANTS: AN EVER-GROWING PARTNERSHIP



▲ Khatijah Yusoff, TWAS Vice-President for East and South-East Asia
[Photo: UNESCO-TWAS website]

If the mission and activities of The World Academy of Sciences for the advancement of science in developing countries (UNESCO-TWAS) could be summarized in one single term, that would certainly be capacity-building.

An essential aspect of capacity-building is a transformation that is initiated by, and sustained over time, from within a community. Capacity-building aims to develop and strengthen the skills, processes and resources that communities need to thrive. The pièce de résistance of TWAS capacity-building is undoubtedly its Research Grants Programme, which was launched in 1986.

The programme started with just one scheme, in basic sciences—biology, chemistry, mathematics and physics—and grew up to the four of today¹. As countries such as Argentina, Brazil, China and India became more scientifically proficient, TWAS narrowed the focus of the programme to target countries lagging in science and technology². Over time, the programme has become the pillar of UNESCO-TWAS activities.

The year 2022 was proclaimed the International Year of Basic Sciences for Sustainable Development, with a focus on the links between basic sciences and the Sustainable Development Goals. Basic sciences provide the essential foundation onto which applied sciences can be built. TWAS had the vision about the importance of basic sciences 36 years ago, when its Research Grants Programme started!

To translate that vision into reality for scientists of the global South, however, TWAS needed the equally visionary support of international partners sharing with the Academy its goals and foresight.

Since 1991, the Swedish International Development Cooperation Agency [Sida] has been the driving force that has enabled the successful execution of TWAS Research Grants

Programme, both in terms of input to the development of the programme itself, as well as vital financial support. Today, the long-standing, successful partnership between Sida and TWAS extends also to TWAS PhD fellowships, TWAS Regional Offices and the Academy's science diplomacy programme.

More recently, UNESCO-TWAS established novel partnerships with other donors, whose support enabled it to start new and different programmes, also through grants: the Elsevier Foundation, the Federal Ministry of Education and Research of Germany [BMBF], the Islamic Development Bank, and the Solar Radiation Management Governance Initiative.

Between January 1991 to December 2021, 2,239 TWAS-Sida Research Grants were awarded to scientists from 84 developing countries. A total of 681 awards were assigned to female scientists. In the last fifteen years, Sida provided to TWAS \$22 million, and recently committed itself to contribute additional \$13 million by 2026.

Thanks to Sida generous donations, in 2022 TWAS was able to support a much-increased version of its Research Grants Programme with two new schemes: the Collaborative Grants and the Maintenance Grants. The former grants are assigned to interdisciplinary research projects. The latter grants enable past awardees who purchased equipment with a TWAS Research Grant to apply for new funds for the maintenance and servicing of that equipment.

TWAS Research Grants Programme has grown with the Academy itself. This issue of TWAS Newsletter wants to share the stories of a few of those researchers who, like many others, coupled their talent with The World Academy of Sciences, thus impacting both their communities and science as whole.

Khatijah Yusoff, TWAS Vice-President
for East and South-East Asia

¹ TWAS-Sida Research Grants in Basic Sciences to Individuals, TWAS-Sida Research Grants in Basic Sciences to Groups, TWAS-Sida Research Collaborative Grants, and TWAS-Sida Research Maintenance Grants.

² TWAS identified 66 countries lagging in science and technology. The list includes the 46 least developed countries identified by the United Nations, to which 20 other countries were added, because of their low-income levels and specific needs for support in building research capacity.

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IN THE NEWS

Floating solar power could prove key to sustainable energy

The question of where to place solar panels isn't trivial. There is fierce competition for land that is also needed for food production and biodiversity conservation. One emerging solution is to deploy floating solar panels—or 'floatovoltaics'—on reservoirs. The idea of floatovoltaics holds much promise, and there has been a rapid rise in installation and investments. But many unknowns about the technology's impacts.

Source: [Nature](#)

Report tracks COVID-19 impact on higher education

What was initially expected to be a short, temporary closure of higher education activities after the onset of COVID-19 became two years of constant adaptation and, sometimes, transformation. Cases presented throughout UNESCO report titled "Resuming or Reforming? Tracking the global impact of the COVID-19 pandemic on higher education after two years of disruption" provide a global overview of efforts by governments and higher education to cope with the pandemic.

Source: [UNESCO](#)

African biodiversity sequencing effort seeks \$1 billion

To help protect Africa's biodiversity and aid its agriculture, bioinformatician ThankGod Echezona Ebenezer and colleagues founded the African BioGenome Project to sequence every plant, animal, and other eukaryotes native to the continent, estimated at more than 100,000 species. Ebenezer is calling on governments—in Africa and beyond—international partners, and donors to commit \$1 billion over the next decade.

Source: [Science](#)



Amid pandemic, bottled water sales rose in poor areas

Families in some of the poorest parts of the world turned to buying bottled water as the pandemic sent countries into lockdown, shows an analysis by SciDev.Net. Lack of access to safe water or adequate infrastructure, coupled with health concerns, drove up sales of bottled water worldwide in many poor countries. Countries reliant on tourism, however, saw a decline in sales.

Source: [SciDev.Net](#)

Study: Indian grasslands hold many new plant species

Global efforts to promote biodiversity conservation are expected to get a new boost, with a group of scientists finding that the grasslands in the Eastern Ghats and the eastern edge of the Western Ghats—two mountain ranges that run parallel to India's eastern and western coasts—could be rich sources for discovering new plant species. A new study found that 206 endemic plant species have so far been discovered from the Indian savanna and 43 per cent were described in just the last two decades.

Source: [Down To Earth](#)



TWAS RESEARCH GRANTS

NEARLY FOUR DECADES OF EXCELLENCE



TWAS Research Grants have been nurturing science in the global South for decades

 by Cristina Serra and Sean Treacy

Promoting science-driven development and strengthening scientific research has been at the core of the Academy's mission since its inception. UNESCO-TWAS continues to honour its original commitments through one of its most successful and long-standing programmes: TWAS Research Grants.

Initiated in 1986—one year after the Academy became operational in Trieste, Italy, by the then-United Nations Secretary-General Javier Pérez de Cuéllar—TWAS Research Grants Programme in Basic Sciences was one of the earliest and immediately successful programmes. It has grown to a flagship project that has international recognition for supporting scientific careers in the global South.

"Thanks to the continued support provided by the Swedish International Development Cooperation Agency [Sida], TWAS Research Grants Programme has evolved over the years including schemes for MSc training, as well as collaborations that are proving to be extremely effective for building capacity in science," said TWAS Programme Coordinator Max Paoli.

In its first formulation, the programme was devised to award innovative young researchers in the South, who were carrying out research in experimental physics or in pure and applied mathematics. Grants were worth \$5,000 and were life-changing for scientists from developing countries.

Due to its growing success, the programme was expanded in 1987 to include biochemistry and molecular biology, and then again in 1989, to include pure and applied chemistry. From 1986–1991, the Academy awarded 612 grants, supporting projects in 60 developing countries.

During that time, for example, Maria Isabel Berría, a grantee from Argentina, was awarded for her project on using mathematical models

to disclose cell features in brain cells called astrocytes. Another grantee, Mohammed Baaziz of Morocco, received financial support for his project on preparing an early test to assess date palm resistance to Bayoud disease, a fungal disease reported for the first time in Morocco at the end of the nineteenth century. Kedar Nath Baral, a grantee from Nepal, received financial support for his project on studying temporal and spatial variations of lightning electrostatic discharges in Kathmandu.

The year 1991 marked a turning point in the programme's management: the Swedish International Development Cooperation Agency began funding the programme, which only confirmed its validity and impact. Since then, Sida support has been continually renewed.

Sida also provides substantial support to a TWAS-affiliated organization, the Organization for Women in Science for the Developing World, which offers opportunities to women scientists at different stages in their career throughout the developing world.

"TWAS and OWSD are very important partners in our efforts to build research capacity in developing countries," said Claire Lyngå, the then-Research Advisor in Sida Unit for Research Cooperation. "The support to TWAS has a specific focus on basic sciences—mathematics, physics, chemistry and biology—which often are not a priority among funders."

"The results we have seen have been quite remarkable," Lyngå added.

Currently, grants are worth \$15,000 for individual scientists and \$30,000 for research groups, and are highly competitive. Applications undergo deep scrutiny by a panel of expert evaluators.

In line with a rapidly changing world, today's grants support projects that address global

TWAS research grantees at TWAS Research Grants Conference in Dar es Salaam, United Republic of Tanzania, 28–31 August 2018.



problems from a local perspective, and help scientists maximize the impact they may have in their own communities. Through the grants, researchers in science- and technology-lagging countries can establish their own laboratory, and train less experienced scientists. Additionally, having received a TWAS grant can help developing world scientists attract more funding, expanding their collaboration networks, and give international resonance to their work.

In nearly four decades, the number of research grants awarded has grown annually, with a steady increase in the years before the COVID-19 outbreak (a peak of 100 grants awarded was registered in 2017), and a slight decline due to the pandemic.

Food productivity, strategies to control infectious diseases, conservation of coastal ecosystems, waste management, and pollution control are just a few of many recent research areas investigated by more than 2,600 grantees [28 per cent of whom are women] thanks to TWAS Research Grants.

FROM OPPORTUNITY TO COMMUNITY

One of the remarkable developments about TWAS Research Grants in recent years has been the formation of a community of global South scientists whose careers have been accelerated by the grants. To complement this rising community, TWAS Programmes Office began organizing dedicated events, at which TWAS grantees could meet and network, starting collaborations and sharing work and life experiences.

The first ever TWAS Research Grants Conference, titled “Shaping Careers in Science”, was held in Trieste from 18–22 April 2016, with scientists from 26 countries of the global South. [For more about this conference, see page 14]. This conference led to two more events, both in the developing world, that brought together grantees around the common opportunity they received, and sought to further advance their careers in the spirit of international collaboration.

The following event, “Building Skills for Science in Africa”, took place in Dar es Salaam, United Republic of Tanzania, from 28–31 August 2018. It hosted 28 past TWAS Research Grant winners from 17 African countries.

“Scientists like you need to be ambassadors of science and speak to policymakers and politicians,” urged on that occasion Esther Mwaikambo, then-President of the Tanzania Academy of Sciences and a Senior Paediatrician at the Hubert Kairuki Memorial University, to grantees present in her keynote speech. “Winning a TWAS Research Grant was just the beginning. Now you have to be even more competitive.”

In a meeting in Kathmandu, Nepal, from 4–6 June 2019, TWAS Research Grant awardees explored how non-scientific skills—writing grants, publication strategies and avoiding plagiarism—can help propel scientific success. The event, titled “Building Skills for Scientific Research”, assembled more than 40 participants from 11 developing countries—including Bangladesh, the Plurinational State of Bolivia, Chile, Guatemala, Mongolia, Nepal, Sri Lanka and Venezuela. It was followed on 7 June by a tour of top Nepalese research facilities such as Tribhuvan University and the Research Institute for Bioscience and Biotechnology.

“Building skills is an integral part of research and development worldwide,” said conference speaker Vijaya Gopal, a former Senior Principal Scientist at Centre for Cellular and Molecular Biology in Hyderabad, India. “Initiatives such as those of TWAS aimed to foster scientists and grantees from Nepal and other countries will inculcate the spirit of learning.”

Plans for further regional grants conferences in the developing world have since been

► TWAS research grantees engaging in a simulation aimed at building new connections, at TWAS Research Grants Conference in Dar es Salaam, United Republic of Tanzania, 28–31 August 2018.

▼ TWAS research grantees posing for a group photo after the conference in Dar es Salaam, on 31 August 2018.





“Thanks to the continued support provided by Sida, TWAS Research Grants Programme has evolved over the years including schemes for MSc training, as well as collaborations that are proving to be extremely effective for building capacity in science.”

TWAS Programme Coordinator Max Paoli

halted by the COVID-19 pandemic, though the Academy is gradually resuming in-presence events. In the meantime, in June of this year, TWAS Grants Programme hosted several professional skill-development webinars for TWAS grantees. They included a webinar titled “Publishing and predatory journals”, on 7 June, that attracted 96 participants (a [YouTube presentation](#) is available). Predatory journals seek articles for publication, and exploit the authors by asking for a fee, but fail to provide peer-review or editing services.

Another webinar on the United Nations Sustainable Development Goals, education for sustainable development, and climate action on 13 June had 47 participants; and a third webinar on open science on 15 June with 44 participants.

“Over the past 4–5 years, TWAS worked closely with Sida Senior Research Adviser Eva Ohlsson, whose contribution to the evolution of the programme has been invaluable. In particular, Eva’s inputs in defining new programme components that were immediately integrated into it, were instrumental in shaping the way forward,” Paoli added.

Most recently—on 20 July 2022—[TWAS Research Grants Programme for Maintenance](#) was launched. These grants will be awarded to repair and fix any laboratory equipment previously purchased through a past TWAS Research Grant.

By adjusting to the constantly changing global needs, TWAS continues to demonstrate its unceasing commitment to building better conditions for scientists and their communities in the global South. ■



Q&A MERGING PUBLIC AND PRIVATE IN SCIENCE

by Cristina Serra

Partnerships with industry are vital for science, urges TWAS grantee Tatas Brotosudarmo

Win-win situations don't stem from stand-alone initiatives and today, more than ever, scientific research and technological advancement bring successful results through public-private partnerships that merge academic rhythms and financial constraints with industry's high gear, profit-oriented approach.

Tatas Brotosudarmo, a TWAS Research Grant winner of Indonesia, epitomizes the perfect blend of scientific mindset and entrepreneurial spirit. Brotosudarmo is a photochemist and a pioneer on the use of photosynthetic natural pigments in food technology and in finding environmentally friendly solutions, such as new tools to produce renewable bioenergy.

Today, Brotosudarmo is an Associate Professor in the Department of Food Technology, Universitas Ciputra, Surabaya, Indonesia. He advocates linking basic sciences to industry because, he says, learning how to provide good research to companies may widen not only individual perspectives, but those of an entire nation.

In 2010, Brotosudarmo obtained his PhD in biochemistry from the University of Glasgow, in the UK. He then carried out postdoctoral research working in an exchange programme called Photosynthetic Antenna Research

Center at Northwestern University, United States.

Upon his return to Indonesia, he initially had difficulties in establishing his laboratory. After receiving a TWAS Research Grant, however, in 2012, he could purchase both equipment and supplies, thus widening his research aspirations.

In June 2019, Brotosudarmo participated as a speaker in TWAS Research Grants workshop, in Kathmandu, Nepal. The event was sponsored by the Swedish International Development Cooperation Agency [Sida], which has provided key support to UNESCO-TWAS since 1991.

The workshops sought to expose participants—all of them past awardees of TWAS Research Grants Programme—to ideas and stimuli that could make their careers more robust. More than 40 attendees convened in Nepal from 11 developing countries, including Bangladesh, the Plurinational State of Bolivia, Chile, Guatemala, Mongolia, Nepal, Sri Lanka and Venezuela.

Brotosudarmo's presentation was titled "Transformational research: links with industry". What follows is

► TWAS Research Grant awardee Tatas Brotosudarmo performing pigments extraction in his laboratory, in Indonesia, in 2016. (Photo: Tatas Brotosudarmo)

an excerpt of an interview of June 2019 with TWAS staff writer Cristina Serra, in which the scientist addressed the importance of innovation and shared his suggestion on how to build collaborations with the private sector.

Why does research need strong partnerships with industry, today more than in the past?

● In the past, research was mainly focused on the curiosity of what was happening in nature, which is what we may call a serendipity-driven innovation. Recently, research has evolved moving



towards targeted innovation, setting goals that we can measure through the return on innovation and, of course, the return on investment.

May we say that private-public collaborations could play an important role in building a more sustainable and human-centred society?

● Yes. I think that, in the future, scientific research will play an even more important role to support our society: big data, the Internet of things—the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data—artificial intelligence and robots will fuse into every industry and across all social segments. This is why, I talk of transformational research: research that involves ideas, discoveries or inventions that have an impact in driving society.

In 2012, you received a TWAS Research Grant. Did it boost your professional life?

● It certainly did. I received a TWAS Research Grant at a time when my research was very difficult to carry out. I used this grant to convince the Board of Founders of Ma Chung University, in Malang, Indonesia, that my research was unique and distinctive internationally. This changed my life, as the Board of Founders then decided to support me in establishing the Ma Chung Research Centre for Photosynthetic Pigments.

Your research is somehow unique: can you explain why?

● I try not to do common research, but locally-oriented research. I work on natural photosynthetic pigments, which are common in nature. They not only give beautiful colours, but can also be important for human health. When I

decided to focus on pigments, it was because I had made a market survey, and realized that people are much more careful about their health. People are more aware than in the past, and they do not want artificial chemicals in their food anymore.

Many scientists do not engage in partnerships with industry and big companies because they fear they will be taken advantage of. Did you offer any advice on the importance of overcoming this feeling at TWAS Research Grants workshop in Kathmandu?

● I suggested that, first, a scientist needs to have a strong entrepreneurial personality, and be willing to take risks and work on challenges. At the same time, she or he needs to learn laws and regulations concerning the protection of the discoveries—intellectual property rights—and how to deal with profit-sharing. This can be learned from our colleagues who study law. But most important is to be clear when endorsing a contract. Of course, before we approach an industry or before we are approached, it is better to study the company profile in detail, including their financial report.

What message do you think that workshop attendees have taken home for the future?

● My message is based on three key concepts: To attract industry, scientists need to create their own unique research, and enter the business world. Secondly, to ensure that a partnership is fruitful, they need to prepare a clear contract and protect their work with patents. Finally, they need to be selective towards partnerships, choosing those aiming at a long-term and win-win collaboration. ■





◀ Some of the participants to TWAS 2016 Research Grants Conference. From left: Denise Zezell of Brazil, Teketel Yohannes Anshebo of Ethiopia, Claudia Mongini of Argentina, Myrtha Karina Santjojo Rini of Indonesia, Sushila Maharjan of Nepal, Suliman Hamid of Sudan, and Luis Larrondo of Chile. (Photo: Paola Di Bella)

GLOBAL NETWORK, GLOBAL EXCELLENCE

✍ by Cristina Serra

TWAS research grantees stay connected through TWAS Research Links Network, designed to catalyse collaboration, network, and share ideas

When the world was preparing to lock down due to the COVID-19 pandemic, a parallel virtual world was hatching its wings. In February 2020, [TWAS Research Grants Programme](#) launched [TWAS Research Links Network](#), a platform designed to connect the ever-growing family of TWAS grant recipients, facilitating professional relationships and the sharing of skills and expertise.

The idea of a common virtual platform where TWAS grantees could come together and establish scientific collaborations was conceived at the first [Research Grants Conference](#) held in Trieste, Italy, in 2016, to which more

than 50 TWAS research grantees from the global South participated.

The event highlighted several unmet needs that were preventing participants' scientific capacity from taking off, which resulted into a project: establishing a user-friendly virtual hub where professional relationships and scientific growth could be nurtured.

In 2019, the Research Grants secretariat engaged in planning the layout of the platform, an exercise that culminated in a portal, which went live on 3 February 2020, granting access to TWAS grantees only, upon registration. It started with about 100 subscribers. Today, there are more than 400, from more than 20 countries.

The portal then led to the creation of a new grant, called [TWAS Research Grants Programme for Interdisciplinary Research: Collaborative Grants](#), launched in March 2022. For this grant, two principal investigators from two countries come together to conduct interdisciplinary research, and it's through the portal that scientists come

together and submit their application.

The portal has an articulated frame that displays [to members only] the members' list and a forum area where members can exchange opinions and ideas. The portal also provides regular updates on grant opportunities, conference and webinar announcements, and is a repository where documents of general interest can be found.

Posts include requests for sharing expertise and collaborations, equipment, free resources, vacancy notices and links to the most recent scientific articles published in peer-reviewed journals.

"Through this portal, TWAS met at least four important objectives," said TWAS Programme Coordinator Max Paoli. "It fuelled mentorships, eased conference and workshops dissemination, provided support for publications and, most importantly, paved the way to an international network that we expect will grow further in the years ahead".

TWAS Research Links is one of the projects of the [TWAS Research Grants Programme](#), one of TWAS core units established in 1986. The financial support is now granted by the [Swedish International Development Cooperation Agency](#) (Sida), and offers over \$1 million in research grants annually to equip laboratories, provide support for scientific conference participation, open access publications and MSc students.

Between 1986 and 2021, TWAS-Sida programme awarded more than 2,690 grants. ■

NO MORE CHEMICALS ON LAND

by Cristina Serra

Malian scientist and TWAS research grantee Amadou Dicko studies useful microbes that promote plants' growth avoiding the use of chemicals

There is a narrow region of soil called rhizosphere, which is governed by complex interactions between plants and the organisms that are in close association with the root, thus being influenced by root secretions and microorganisms. In this region, bacteria of all kinds thrive and communicate with plants and with members of their community.

Some bacteria fix useful elements such as nitrogen; some dissolve phosphorous, an element which is essential for root development, plant growth and crop productivity; others sense danger and, by activating inner plant defenses, they act as natural biopesticides.

The research of agricultural microbiologist Amadou Dicko of Mali aims to identify the beneficial effects of such bacteria, thus turning them into useful tools for Malian farmers, as they learn to enrich their fields in natural ways using good bacteria instead of chemical substances.

"Some soil bacteria are very helpful: they act as sentries," explained Dicko, now an Assistant Professor in the Faculty of Agronomy and Animal Medicine, at University of Ségou, Mali.

"Upon perceiving the danger posed

by ill-causing bacteria [pathogens], they [good bacteria] produce hormones that sound as an alarm. This triggers a quick response: plants react by releasing smelly chemicals that kill dangerous microbes, or keep them at a distance."

Dicko—who earned his PhD in microbial biotechnology from the University of Sciences, Techniques and Technologies of Bamako [2016]—was one of the 30 African scientists who attended the 2018 TWAS Research Grants Conference in the United Republic of Tanzania [28–31 August 2018].

The event, organized with funding from the Swedish International Development Cooperation Agency [Sida] and local support from The Tanzania Academy of Sciences, aimed



▲ Amadou Dicko, a TWAS grantee and an Assistant Professor in the Faculty of Agronomy and Animal Medicine at University of Ségou, Mali, during a field demonstration to farmers. (Photo: Amadou Dicko)

to help scientists sharpen their skills in drafting effective scientific proposals, protecting intellectual property and building networks.

"TWAS grant allowed me to purchase the fermentor I needed to grow bacteria, which are the core of my work," Dicko explained.

Dicko's research is focused mainly on potatoes and rice, important sources of food for the African continent, and for Mali in particular. Both potatoes and rice, unfortunately, are susceptible to various diseases, which can destroy great part of the local production.

This is where Dicko's research comes in. He studies a specific group of bacteria that act as plant growth-promoting or pathogen-suppressing agents, helping the plant to enhance its resistance to various kinds of stress.

"I provide farmers with bacteria against pathogens, and ask them to observe the effect of inocula on their crops," Dicko said. "They cannot believe their eyes. I make inocula around the roots, to help the plant grow better."

A new field of investigation that Dicko is currently pursuing is equally promising. With funds from the Malian Government, he is testing the use of biochar—a charcoal-like substance obtained by burning organic material from agricultural and forestry wastes—for sustainable agricultural development, checking its impact on soil fertility and crop yield in Mali.

"Results from the first year of this study showed that the use of rice husk-based biochar increases by 26 per cent fruit yields of okra, and by 18 per cent eggplant," he explained with enthusiasm. ■







AN INSPIRING GATHERING FOR GRANTEES

A unique TWAS Grants Conference created collaborations and produced results

 by Sean Treacy and Cristina Serra

In 2016, UNESCO-TWAS hosted a special conference in its home city of Trieste, Italy, for awardees of TWAS Research Grants. The event, the first of its kind, showcased how passion, enthusiasm—and financial support—can achieve valuable results for science in the global South.

That year, over 40 outstanding scientists from developing countries came to Trieste from 18–22 April for “TWAS Research Grants Conference: Shaping Careers in Science”, all past recipients of a TWAS Research Grant, which the Academy has been offering all along to individual scientists, groups and consortia to help equip and supply laboratories, as well as support access to publications. Consortia grants, for collaborations between multiple research groups, were discontinued in 2016.

Scientists at the conference came from 26 nations—including Argentina, Chile, Mali, Nepal, Nigeria, Senegal, Sri Lanka, the Sudan and Uzbekistan—spanning fields ranging from biology to mathematics. They discussed their career challenges and the role that TWAS grant played in shaping their professional lives, enabling their discoveries and building new collaborations. Women accounted for 52 per cent of participants.

The pioneering TWAS Research Grants Programme has historically been a key component of the Academy’s mission to build scientific capacity in the developing world. The grants receive critical financial backing from the Swedish International Development Cooperation Agency [Sida].

“Over the course of many years, UNESCO-TWAS and Sida have supported hundreds of

laboratories in the developing world,” said TWAS Executive Director Romain Murenzi, before the conference. “Grant by grant, this partnership has built basic science capacity at universities and research centres, where scientists are working to improve health and food production, to protect water supplies, and to support innovation in manufacturing.”

THE FIRST SPARK

Conference attendees had been successful across a vast number of diverse fields, from laser-based dentistry in Brazil to genetic research in India. Through assembling their wide interdisciplinary insight, the conference demonstrated that TWAS Research Grants build careers, advance science and even help influence policy and industry.

In the mid-1990s, physicist and conference attendee Denise Zezell of Brazil received a grant from TWAS to pay for some simple equipment

▼ Seven of the participants in TWAS Research Grants Conference, held in Trieste, Italy, from 18–22 April 2016. From left: Denise Zezell of Brazil, Teketel Yohannes Anshebo of Ethiopia, Claudia Mongini of Argentina, Myrtha Karina Santjojo Rini of Indonesia, Sushila Maharjan of Nepal, Suliman Hamid of Sudan, and Luis Larrondo of Chile. [Photo: Paola Di Bella]





▲ Microbiologist, TWAS Award Winner and TWAS Fellow Difuza Egamberdieva of Uzbekistan speaking during a group discussion at the TWAS Research Grants Conference, held in Trieste, Italy, from 18–22 April 2016. [Photo: Paola Di Bella]

that measured energy from lasers. The device was the first of its kind in her laboratory, but, in time, it started a chain of events that nobody initially expected.

The School of Dentistry at the University of São Paulo became interested. Along with the physicists at Brazil's Nuclear and Energy Research Institute, they began to collaborate with Zezell on research exploring how lasers could be useful to dentists. As the laser dentistry field grew, more funding for the field began to pour in. "We began to offer classes for clinicians," Zezell said at the conference. "From those students, a research line for lasers in dentistry grew."

Brazil's industry in low-intensity lasers for dentistry were just one instance of the impact of TWAS Research Grants, which may start by supplying small amounts of financial support—ranging from just a few thousand dollars, when the programme began in 1986 to up to \$40,000 in 2022. Even small amounts, however, help early-career scientists in resource-lacking countries establish laboratories that go on to conduct important research, attract more funding, and train more scientists. This makes a difference by boosting careers and even creating economic growth.

Research on the lasers—the use of which can, for example, stimulate tissues in gums, and teeth so that they heal more quickly after surgery—set in motion a swell in expertise that created a demand for laser equipment in Brazil. The materials industry responded by beginning

to build their own lasers. And as of 2016, Brazil had become one of the global leaders in the field, with about 100 researchers working on how lasers can be useful to dentists and at least 10 companies manufacturing medical and dental lasers. Brazil's strength and keen participation in laser dentistry has continued, for example, the "First Symposium of Laser in Dentistry from Rio Doce Valley, Brazil" held entirely online in 13–14 August 2020, attracted 1,505 attendees, 1,466 of them confirmed to be Brazilian, according to the event's experience report.

Another participant in the conference, Balakrishna Pisupati of India, began his career over 30 years ago as a geneticist with an interest in biodiversity, particularly in agricultural biodiversity and in how to help crops handle high levels of salt in the environment. He returned to India from the UK, suspending his work at the University of Cambridge for a job in India developing a research facility for an NGO.

Science should inform policymaking and policy should support science. The absence of a dialogue hurts both sides.

Geneticist Balakrishna Pisupati of India

Pisupati was successful in starting the facility after receiving a TWAS Research Grant for a \$5,000 device replicating DNA for studying genetic diversity. "This work initiated a new area of focus in understanding the variations of rice available in India for future breeding to improve the staple crop of India: rice," he said at the conference.

His work shifted toward how to bring biodiversity science into policy, so that the Indian Government can come up with stronger legal and policy measures to protect native biodiversity. Currently, he is the Head of Biodiversity, Land and Governance Programme for the United Nations Environment Programme,



with Division of Environmental Law and Conventions based in Nairobi, Kenya.

Getting that first grant, Pisupati said, does not only mean a lot for the advancement of scientific careers, but also shows researchers how organizations use science. “Science should inform policymaking and policy should support science,” Pisupati said. “The absence of a dialogue hurts both sides.”

HOW PARTNERSHIPS START

In 2017, the year following the conference, three TWAS Research Grant recipients launched a collaboration designed for the long term.

Modou Fall of Senegal, Myrtha Karina of Indonesia and Sabu Thomas of India met at the conference, where they began to think about collaborating. Both Fall and Karina agreed to spend some time in Thomas’s laboratory to learn cutting-edge techniques not available in their countries. The aim was to apply these techniques back home to help local science and economic development.

“Prof. Thomas listened to me introducing myself in Trieste: he seemed immediately very attracted by my research on corrosion,” said Fall, a Chemistry Professor at Cheikh Anta Diop University in Dakar, Senegal. Fall won TWAS Research Grants in 1996, 2004, 2007 and 2016, for projects aimed at devising energy storage, environmental remediation and anti-corrosion coating materials.

Thomas, another TWAS Research Grant recipient, mixes polymers—large molecules

made of repeated units—with other substances to prepare new materials with innovative features. For his research, he earned TWAS Research Grants in 1995 and 2002 that allowed him to set up his laboratory, recruit students for his research team, and publish scientific papers.

Karina, a Principal Investigator in the Research Unit for Clean Technology at the Indonesian Institute of Sciences in Jakarta, received grants in 1998, 2000, 2009 and 2012. “With Prof. Thomas, we agreed to create a research collaboration, because we have similar research topics on cellulose,” she said. “We also agreed that I will send my young students to carry out research work at his laboratory, aiming at having several international publications as our output targets.”

Since the success of the 2016 event, TWAS organized other regional conferences on its Research Grants, including one in Dar es Salaam, United Republic of Tanzania, 28–31 August 2018; and another in Kathmandu, Nepal, from 4–6 June 2019. The Academy will be able to resume such events after the COVID-19 restrictions will be lifted completely. In the meantime, TWAS Research Grants Programme hosted three professional skill-development webinars for TWAS grantees last June: on predatory journals; the [Global Goals](#), sustainable development education and climate; and open science. ■

▲ From left: Chemist Sabu Thomas of India speaking during a group discussion at TWAS Research Grants Conference, held in Trieste, Italy, from 18–22 April 2016. (Photo: Paola Di Bella); Balakrishna Pisupati, Head of Biodiversity, Land and Governance Programme for the United Nations Environment Programme, and a TWAS Research Grant recipient over 30 years ago, at TWAS Research Grants Conference, held in Trieste, Italy, from 18–22 April 2016. (Photo: Paola Di Bella)

STUDYING MOSQUITOES' BEHAVIOURS

by Cristina Serra

TWAS research grant recipient Awa Gnémé studies mosquitoes' urban distribution and instructs people how to avoid their presence

Entomologist Awa Gnémé, an Associate Professor in the Department of Animal Biology and Physiology at the [Université Joseph Ki-Zerbo](#) in Ouagadougou, Burkina Faso, leads a project aimed at understanding if, and how, growing urbanization affects mosquitoes' habitat preferences.

Mosquitoes carry the malaria parasite and are a serious problem in Burkina Faso, especially for children: According to a [UNICEF report](#), in 2019, in Burkina Faso, 27 per cent of children under five years of age died of malaria.

When sunset comes, people in Burkina Faso attend to family matters, but for Gnémé sunset is the time to start collecting these mosquitoes, to study their feeding and environment preferences.

"Changes in land use have an impact on the mosquitoes' abundance and community composition, which deserve investigation," Gnémé said at TWAS Research Grants conference, held in Dar es Salaam, the United Republic of Tanzania, from 28–31 August 2018.

Gnémé was the recipient of a 2015 TWAS Research Grant and one of about 30 grantees who participated in the 2018 conference, organized by TWAS with funding from the [Swedish International Development Cooperation Agency](#) [Sida], a long-standing TWAS partner, and local support from [The Tanzania Academy of Sciences](#).

"Land use alterations—including deforestation, agricultural development, water control systems and urbanization—may affect the mosquitoes' presence, biodiversity and human-biting behaviour," Gnémé said.

These insects are vectors that may transmit important pathologies, she added. If a mosquito infected with the malaria parasite [a parasite of the *Plasmodium* family] bites a human being, it can inoculate the malaria-causing agent. "Therefore, it is very important to understand what environmental variables drive their living choices, and to instruct people on the best way to avoid their presence."

"With TWAS help, I planned a two-year project and bought equipment to set up a molecular biology laboratory, to study the genetics of mosquitoes," explained the scientist. The equipment was then shared by the whole department, with more than 20 researchers and more than 50 PhD and master's degree students benefiting from it.

To create a distribution map of the different mosquitoes and help doctors



▲ Awa Gnémé, checking mosquito cages in the insectarium of the Department of Animal Biology and Physiology at the [Université Joseph Ki-Zerbo](#) in Ouagadougou, in 2018.


to make better therapeutic choices, Gnémé caught more than 12,000 insects in areas with various degrees of human alteration. Both larvae and adults were collected: the former were reared in an insectarium until adult, while the latter were analysed for their blood meal.

"We found that many *Anopheles* had mainly fed on human blood (71.9 per cent), with a minority on mixed blood from humans and animals." The study showed that about 8 per cent of mosquitoes of the *Anopheles* family coming from the peri-urban area were infected, because when feeding on people with malaria they receive back the parasite. It also shed light on the distribution of *Aedes* mosquitoes—a vector insect that transmits dengue, yellow fever and other diseases—giving a preliminary view of dengue's epidemiology. ■



PURE WATER IN NIGERIA

Chemist and TWAS grant recipient Emmanuel Unuabonah studies solutions to purify water

 by Cristina Serra

Chemical contaminants of industrial and human origin are polluting Nigeria's rivers and freshwater sources, changing dramatically the water's look and taste and, most importantly, posing serious threats to human health.

Emmanuel Unuabonah, a Nigerian chemist from Benin City, in Nigeria, who specializes in water purification, is testing cheap and innovative solutions, such as a mixture of clay and papaya seeds, to remove heavy metals, organic chemicals and noxious substances from water supplies. He is currently developing photocatalytic materials from the same mixture for the transformation of organic contaminants in water.

"My interest in water purification rose during my undergraduate work at the University of

Benin in Nigeria," says Unuabonah. "Today, I am deeply committed to find useful solutions to obtain drinkable water in my country."

Early in his career, Unuabonah was Lecturer at the Nigerian Federal University of Petroleum Resources, Effurun. He was also Lecturer at the Department of Chemical Sciences of the Nigerian Redeemer's University where he currently serves as a Professor.

In 2009, during the TWAS Twentieth General Meeting, held in Durban, South Africa, he was inducted for a five-year term as a TWAS Young Affiliate and, in 2012, was awarded a TWAS-Swedish International Development Cooperation Agency (Sida) research grant with a pioneering project aimed at removing from water toxic compounds and bacteria using novel porous adsorbent materials.

“TWAS grants meant a lot to me: they propelled me to success in my career, for which I am most grateful to TWAS.”

Chemist Emmanuel Unuabonah of Nigeria

TWAS Research Grants Programme was launched in 1986 to support promising high-level projects in basic sciences—biology, chemistry, mathematics and physics—and allowing scientists to purchase equipment, consumable supplies and release scientific publications.

The programme awards both individual researchers and groups and it is generously funded by Sida. Between 1986 and 2021, the Academy distributed more than 2,690 grants.

Today, Unuabonah is the Founding President and an Alumnus of the Nigerian Young Academy, and a focal point for his country on issues related to water and public health. He is also the Director of the African Centre of Excellence for Water and Environmental Research, at Redeemer's University.

Unuabonah and his team are collaborating with another TWAS Young Affiliate, Victorien Dognon, and his team, of University of Abomey

▼ Nigerian chemist Emmanuel Unuabonah in his office at Redeemer's University.





Calavi, Benin, at a TWAS-Islamic Development Bank collaborative research project.

Nigeria is a hot spot for biodiversity. But it is also home to oil refineries and industrial activities that cause spilling of benzene, dyes, toluene and antibiotics in the environment, with harmful effects on living organisms and humans.

Unuabonah's research was classified as 'reverse innovation', because he is focusing on the direct need of sub-Saharan Africa for potable water by treating water and wastewater with low-cost materials found in the region.

In this context, one of his research projects investigates the properties of the hybrid clay he obtained from kaolinite, a white soft clay, and *Carica papaya* seeds, both found locally. Unuabonah showed that this material is very efficient in the removal of heavy metal pollutants from water. And when appropriately modified, it is also able to remove antibiotic chemicals, estrogens and other harmful chemicals through catalytic processes.

The new catalytic material is able to convert

▲ Emmanuel Unuabonah and his colleague Martins Omorogie (in the backrow), with undergraduate and postgraduate students from Unuabonah's research group, in 2018, in Ede, Nigeria. (Photo: Emmanuel Unuabonah)

▼ Papaya fruit



these contaminants, including antibiotic-resistance genes and bacteria that have the potential to form biofilms and pollute treated water, into CO₂ and water.

This scientific success has been providing a new and more efficient technology that can replace the obsolete water chlorination technique, which is not only less efficient in removing chemicals from drinking water, but releases also carcinogenic by-products, endangering the health of consumers. This new technique, on the other hand, is simple and safe, as it releases only by-products like water, CO₂ and other non-harmful small organic and inorganic molecules.

"TWAS grants meant a lot to me," Unuabonah says. "They were the catalysts for the ideas that propelled me to success in my career, for which I am most grateful to TWAS." ■



SEEKING ANSWERS IN SEEDS

Using a TWAS Research Grant, a Bangladeshi scientist hunted for potential Alzheimer's treatments by testing a local plant extract in rats

 by Sean Treacy

Some of the most successful pharmaceuticals have come from the plants that surround us in nature—the most famous of which being aspirin, which was first discovered in the bark of willow trees. But there are hundreds of thousands of plant species, so it's up to scientists to look into them and figure out how their extracts might be useful to medicine.

One place to start is with plants that are already used in traditional healing practices passed down generation to generation since before recorded memory.

Shahdat Hossain, a neuroscientist with Jahangirnagar University in Bangladesh,

researched one such practice: the use of a plant commonly called the jamun tree. Native to South Asia, the jamun grows large, berry-like fruits. Traditional healers sometimes crush its seeds into a fine powder and give it to people suffering from digestive and respiratory problems. Hossain took the jamun seeds a few steps further. He tested the seed extracts in rats to see if they might help alleviate memory loss in Alzheimer's disease patients, and used a TWAS Research Grant to get the equipment he needed to do it.

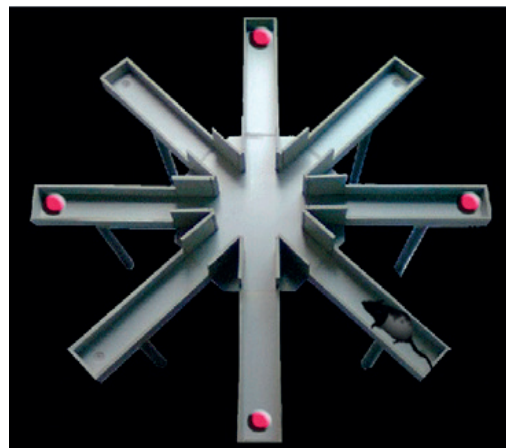
"Since ancient times, the people of Bangladesh have used hundreds of herbs and

▼ Neuroscientist Shahdat Hossain (front centre) with his research team at Jahangirnagar University in Bangladesh. [Photo: Shahdat Hossain]





▲ From left: The fruit of the jamun tree. [Photo: Ton Rulkens/Wikimedia Commons]
A diagram of the maze Hossain's team used to study rats fed jamun tree seed extract. [Photo: Shahdat Hossain]



plants as traditional medicine,” said Hossain. “The scientific grounds of the uses of these herbs and plants have remained largely unknown until recently. In my personal opinion, Bangladesh is simply a fertile place for doing such research.”

TWAS Research Grants provide specialized equipment, consumable material and scientific literature to applicants of countries where financial resources are scarce. The programme is supported by the [Swedish International Development Cooperation Agency](#).

Hossain's team fed the extract to about half their rats once a day, and compared them to rats who hadn't been fed it. They routinely placed rats from both groups in a maze with a small circular central room attached to eight linear corridors. Four of these corridors, the same every time, had food at the end. Rats that repeatedly went into the arms they already visited within the same day had a weaker short-term memory. Rats that went into corridors that didn't contain food the day before had a weaker long-term memory.

Afterward, the team used a special fluorescence microscope that cost \$12,000—the team's largest expenditure and more than 92 per cent of the total TWAS Research Grant Hossain had received. The microscope allowed the researchers to look at the rats' brain tissues in enough detail to determine whether the walls of brain cells were warped or leaking, and also whether the nuclei of those cells were in working order. Most importantly, they were able to colour-code different parts of those cells, and observe whether those parts were also

functioning properly. Their research, Hossain said, showed that the brain cells of rats fed the extract had healthier brains.

“The changes in the expression of a given protein can be detected by this fluorescence microscope,” added Hossain. “These experiments are not possible with a normal microscope.”

“TWAS helped me a lot to enhance our capacity in research, particularly in the visualization of brain slices and its cellular morphology.”

Neuroscientist Shahdat Hossain of Bangladesh


Hossain said the grant would help him and his team continue the research on extracts from various other plants native to Bangladesh to see if they also slowed down the memory loss from Alzheimer's disease; research that would have otherwise been impossible without TWAS Research Grant.

“TWAS helped me a lot to enhance our capacity in research, particularly in the visualization of brain slices and its cellular morphology,” he said.

Hossain added that the research also aided the careers of his students. “It enabled my MS and PhD students to do more sophisticated research work in neurochemistry.” ■



WATCHING THE STARS FROM AZERBAIJAN

 by Sean Treacy

Equipment used to photograph stars provided to developing world astronomers through TWAS Research Grant

The night sky belongs to everyone, and astronomers study it from all corners of the globe, including the mountains of Azerbaijan.

Azerbaijani astronomer Nariman Ismailov observes star systems at the earliest stages of their formation. He and his team work from Shamakhy Astrophysical Observatory, 150 kilometres northeast of Baku, Azerbaijan, and 1.5 kilometres above sea level in the Greater Caucasus Mountain range. There, they get 150 clear nights a year, optimal for

▼ Nariman Ismailov, in Beijing, China, in 2012. [Photo: Nariman Ismailov]



observing the night sky—so long as they have the modern tools to collect the data they need.

Through a TWAS Research Grant, Ismailov and his team received \$10,671 in equipment, including a \$6,948 ‘charge-coupled device’ [CCD] camera, a standard piece of equipment for astronomers observing stars at broad wavelengths of light. At least five young Azerbaijani astronomers gained experience from the research work that the grant enabled, he said.

TWAS Research Grants assist small research groups, or individual scientists, in countries lagging in science and technology. They are financially supported by the Swedish International Development Cooperation Agency.

There are several reasons why providing modern tools to developing world astronomers is important. The stars Ismailov studies are in the vicinity of the constellations Taurus, Auriga and Orion, which are also well-known cosmic nurseries rich with gas and dust, a sort of fertilizers from which young stars can sprout. The stars are not far, relatively speaking—only about 43 light-years away from Earth. But they’re so dim they require special equipment to be seen.

“Our stars have very weak brightness,” Ismailov said. “The brightest of them is nearly 100 times weaker than the faintest star which we can see with the naked eye.”



▲ A photo of a dim star taken using a special camera purchased through a TWAS Research Grant. [Photo: Nariman Ismailov]



▲ A special camera purchased through TWAS Research Grant to observe dim stars. [Photo: Nariman Ismailov]

These stars emit excessive ultraviolet and infrared light, which the human eye can’t normally see. Ismailov wants to know why these stars randomly but strongly emit infrared and ultraviolet light. But in order to learn that, astronomers must watch them, track them, and catalog their activity first. They can’t do that without a camera that can see and capture that light.

“This equipment opened up new possibilities for us to observe young stars,” he added. “Our young scientists have a very high interest in CCDs for this and future scientific projects. We will continue our relationship and collaborations with TWAS in future.” ■

STRENGTHENING SCIENTIFIC RESEARCH IN NEPAL

by Cristina Serra

A short film about two Nepalese scientists shows the impact of TWAS grants

With carbon dioxide emission rising above warning levels, many international institutions decided to take action and give their personal contribution to improving the situation at the global level. TWAS was one of them.

In 2021, TWAS produced an environment-friendly film, asking Shanta Nepali, a filmmaker from Nepal, to tell the story of two Nepalese scientists who received a TWAS Research Grant.

The film, available on [YouTube](#) and titled “TWAS—Empowering scientific research in Nepal”, endorsed the Academy’s unceasing commitment to promoting capacity-building in the least developed countries, and represented an impressive accomplishment in two ways.

By recruiting a local professional, the film[making] avoided needless CO₂ emissions, and showcased the impactful results achieved by two TWAS research grantees, who received support from TWAS and its historical partner, the [Swedish International Development Cooperation Agency](#) [Sida].

Upon receiving the grant, the two scientists—Deena Shrestha and Basant Giri—devised innovative solutions to common medical and food

problems, developing new ideas and products.

A microbiologist at the [Centre for Health and Disease Studies Nepal](#), Deena Shrestha, received, in 2016, a TWAS grant to investigate an issue commonly referred to as multidrug resistance [MDR], which affects many hospitals worldwide.

MDR causes bacteria to resist most antibiotics: hence, many microorganisms cannot be eliminated from human hosts or animals. Her research showed that several Nepalese hospitals are not taking the issue seriously. Therefore, Shrestha focused on spotting the presence of resistant bacteria in waste workers, and, above all, on raising awareness among Nepalese communities and schools.

“TWAS has helped me obtain national and international visibility and recognition. Because of this grant, I was able to develop important national and international collaborations like the one with the Liverpool School of Tropical Medicine,” Shrestha said. Through her grant, she started building a dynamic group of young scientists who work with her and learn scientific thinking.

A chemist at the [Kathmandu Institute of Applied Sciences](#), Basant Giri received one individual grant in 2015, and another one as a group leader in 2019. The first grant changed his career by giving him the chance to establish his own laboratory and exposing him to the international scientific community.

Giri’s research addressed food and



▲ Deena Shrestha and Basant Giri, two Nepalese scientists who received a TWAS research grant.

water contamination by parasites like *Giardia lamblia*. His goal was the setting up of unconventional and inexpensive analytical tools on mobile phones. Another project examined the filtering performance of low-cost, locally available cloth masks, used to protect from particulate matter, believed to be responsible for lung inflammation and lung cancer, myocardial infarction, and worsening of conditions like asthma.

“The ultimate goal of any researcher and any scientist is to solve problems in his or her community. But by solving the problems of our Nepalese community, we also solve those of other communities in other countries, because some of the problems are common,” he said.

Choosing a young female Nepalese filmmaker for this project was in line with TWAS commitment to empower women and reduce carbon emissions by reducing travel. ■



PEOPLE, PLACES & EVENTS

HELENA NADER, PRESIDENT OF THE BRAZILIAN ACADEMY OF SCIENCES

Helena Nader, Professor and Head of the Institute of Pharmacology and Molecular Biology at the Federal University of São Paulo (UNIFESP), Brazil, and a TWAS Fellow since 2013, is the first woman elected President of the Brazilian Academy of Sciences. In May 2022, she has succeeded to exiting President Luiz Davidovich, also a professor at UNIFESP, and TWAS Fellow since 2002. She will serve in this capacity until 2025. Nader is also Co-Chair of the Inter-American Network of Academies of Sciences and a Governing Board member of the International Science Council.

Nader obtained her PhD at UNIFESP and carried out her postdoctoral training at the University of Southern California, US, between 1975 and 1977. Since 1985, she has had the highest level of research fellowship at the National Research Council for the Scientific and Technological Development (CNPq) of Brazil. Her research field is molecular and cell biology of glycoconjugates—carbohydrates linked to other biological molecules, such as amino acids, proteins and lipids. She is committed to empowering women in science: for this reason, she has become a role model for many young female scientists in Brazil.



SURESH KUMAR BHARGAVA, MEMBER OF THE ORDER OF AUSTRALIA

World-renowned expert in nanotechnology, **Suresh Kumar Bhargava**, a TWAS Fellow since 2022,

now a Distinguished Professor and Dean of Research and Innovation at the Royal Melbourne Institute of Technology in Melbourne, Australia, was appointed Member of the Order of Australia [General Division], an honour that recognizes outstanding service or exceptional achievements in the country. The award was announced in the Queen's Birthday 2022 Honours List, on 13 June 2022, and bestowed in recognition of Bhargava's 30 years of work. The Queen's Birthday Honours List recognises meritorious people who distinguished themselves for serving their community and making it better.

Bhargava has carried out cutting-edge research in the fields of nanotechnology, catalysis, applied electrochemistry, molecular engineering and supramolecular chemistry, and is the founding Director of the Centre for Advanced Materials and Industrial Chemistry, a multidisciplinary research centre based in Melbourne. For his ground-breaking scientific work, Bhargava holds 12 patents, including one for engineering gold-based molecules to use in cancer treatments. He holds distinguished professorships at top universities in six countries, is an outstanding ambassador of Australian higher education around the world. He is well known for his exploring sustainable solutions to global challenges.



ASHOK VIJH ELECTED TO THE CANADIAN ACADEMY OF ENGINEERING

Ashok Vijh, Research Director at the Hydro-Québec Research Institute since 1973, and a TWAS Fellow since 1987,

has received the highest Canadian honour: on 13 June 2022, he was elected an Honorary Fellow of the Canadian Academy of Engineering. The Canadian Academy is the national institution through which individuals who have made outstanding contributions to engineering in Canada, provide strategic advice on matters of importance to Canada and to Canadians.

Vijh is recognized as the "father of electrochemical physics", because of his commitment to science, and his scientific breakthroughs and innovations in fields ranging from energy, to electric industry, to cancer research. Vijh was President of the Academy of Science of the Royal Society of Canada from 2005 to 2007. He has received more than 40 prizes, awards and other distinctions, including three prestigious Canadian honours: the Chemical Institute of Canada Medal in 1990, the *Prix de l'excellence* of Québec in 1994, and the Queen Elizabeth II Golden Jubilee Medal in 2002. His personal interests include ethics and science, epistemology of science and the creative processes merging arts and science.



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



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The World Academy of Sciences for the advancement of science in developing countries (UNESCO-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 laureate. Today, UNESCO-TWAS has more than 1,300 elected Fellows representing 108 countries; 11 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, the Academy's mission has remained consistent, namely to:

- 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 and
- Encourage scientific and engineering research and sharing of experiences in solving major problems facing developing countries.

TWAS and its partners offer 260 fellowships per year to scientists of the developing world for PhD studies and postdoctoral research. TWAS awards are among the most prestigious given for scientific work in the developing world. The Academy distributes over \$2 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.

UNESCO-TWAS hosts and works in association with two organizations, also hosted on the ICTP campus: the **Organization for Women in Science for the Developing World (OWSD)** and the **InterAcademy Partnership (IAP)**.

At its founding in 1989, OWSD was the first international forum uniting women scientists from the developing and developed worlds. Today, the Organization has more than 8,200 members. Their objective is to strengthen the role of women in the development process and promote their representation in scientific and technological leadership.

IAP represents more than 140 national and regional science and medical academies worldwide. It provides high-quality analysis 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.

TWAS, a programme unit of UNESCO, receives its core funding from the Italian Ministry of Foreign Affairs and International Cooperation.

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