



A N N U A L R E P O R T
2016

THE WORLD ACADEMY OF SCIENCES

for the advancement of science in developing countries

twas



ANNUAL REPORT
2016

THE WORLD ACADEMY OF SCIENCES

for the advancement of science in developing countries



“ Scientists and technologists have not yet fully played their role in the development process. They have to get involved in the political process. They have to convince politicians that investing in science ... is money well spent. ”

Abdus Salam, Nobel Prize in Physics, Founder of TWAS



▲ Rwandan president Paul Kagame arrives at the opening ceremony of the Academy's 27th General Meeting with TWAS President Bai Chunli and Rwandan Education Minister Musafiri Papias Malimba. [Photo: Robert Mugabe/Rwanda Ministry of Education]

Cover photo: TWAS Prize winner Argentinian biologist María Isabel Colombo, seated, works with her students in her lab at Institute of Histology and Embryology in Mendoza, Argentina. [Photo provided]

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THE TWAS COUNCIL

The Council, elected by members every three years, is responsible for supervising all Academy affairs. The current council was seated in January 2016 and will serve until the end of 2018.

President

Bai Chunli [China]

Immediate Past President

Jacob Palis [Brazil]

Vice-Presidents

Africa:

Moctar Toure [Senegal]

Arab Region:

Mohammed Hamdan [Jordan]

Central and South Asia:

Rabia Hussain [Pakistan]

East and Southeast Asia:

Khatijah M. Yusoff [Malaysia]

Latin America and Caribbean:

Manuel Limonta-Vidal [Cuba]

Secretary General

Ajay K. Sood [India]

Treasurer

Samira Omar Asem [Kuwait]

Council Members

Africa:

Robin Crewe [South Africa]

Arab Region:

Abdel Nasser Tawfik [Egypt]

Central and South Asia:

Habib Firouzabadi [Iran]

East and Southeast Asia:

Bishal Nath Upreti [Nepal]

Latin America and Caribbean:

Mahabir Prashad Gupta [Panama]

Ex-officio Council Member

Fernando Quevedo [Guatemala]

[Director, ICTP]

THE TWAS MISSION

TWAS – The World Academy of Sciences for the advancement of science in developing countries – works to advance 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 nearly 1,200 elected Fellows representing 96 countries; 15 of them are Nobel laureates. The Academy is based in Trieste, Italy, on the campus of the Abdus Salam International Centre for Theoretical Physics (ICTP). It receives core funding from the government of Italy and key programmatic support from the Swedish International Development Cooperation Agency (Sida). The United Nations Educational, Scientific and Cultural Organization (UNESCO) administers TWAS funds and personnel.

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 research and sharing of experiences in solving major problems facing developing countries.

2016:

INSPIRATION AND IMPACT



by **Bai Chunli**,
TWAS President

Over the course of three decades, TWAS has established a reputation as an influential advocate for science in the developing world. Even in its early years, the Academy was embraced by leaders at the highest levels, both South and North, and dozens of countries have come to share our dedication to development driven by science and technology.

The strategy is proven and the message has an enduring power, but we have never grown complacent about our mission. Indeed, we were reminded throughout 2016 that our work – in cooperation with many partners – advances science and human prosperity across the developing world, while helping to inform policy at the highest levels.

Consider the example of TWAS Research Grants. In April, TWAS and the Swedish International Development Cooperation Agency (Sida) brought more than 40 past grant awardees from 23 countries to TWAS headquarters in Trieste, Italy, for the first-ever conference to explore the programme's impact. Started in 1991, the programme has distributed some 2,400 grants in partnership with Sida and,

more recently, with COMSTECH, the Organisation of Islamic Cooperation's Standing Committee on Scientific and Technological Cooperation.

In May, UN Secretary General Ban Ki-moon's Scientific Advisory Board met in Trieste to consider climate change, indigenous knowledge, food security and other global challenges. The meeting was hosted by UNESCO, with critical support provided by TWAS, the InterAcademy Partnership [IAP] and other Trieste science bodies, as well as the Italian Ministry of Foreign Affairs and International Cooperation and the regional government of Friuli Venezia Giulia.

In November, the 27th TWAS General Meeting was held in Kigali, Rwanda. The keynote speech by His Excellency President Paul Kagame eloquently affirmed the importance of science



▲ Rwandan President Paul Kagame is greeted by TWAS President Bai Chunli at the 27th TWAS General Meeting in Kigali, Rwanda. With them are, from left, Rwandan education Minister: Musafiri Papias Malimba; TWAS Secretary General Ajay K. Sood; TWAS Executive Director Mohamed H.A. Hassan [a.i.]; TWAS Treasurer Samira Omar Asem; and Romain Murenzi, director of science policy and capacity building in UNESCO's Natural Sciences sector. [Photo: Robert Mugabe/Rwanda Ministry of Education]

for humanity. We were honoured to support the launch of the Rwanda Academy of Sciences, and we were continually inspired by the commitment and accomplishments of researchers in this rising science leader.

This year the TWAS-Lenovo Science Prize was awarded to Chinese materials scientist Zhao Dongyuan, a 2010 TWAS Fellow, for innovative nano-scale applications that brought valuable advances to medical care, water purification and batteries. Lenovo, the global leader in consumer, commercial, and enterprise technology, also provided support for the new TWAS Young Affiliates Network [TYAN], which held its first meeting in Rwanda.

For the TWAS Council, it is a top priority to strengthen the role of young scientists and women in the Academy, and to broaden our

geographic representation. Over the past three years, 24% of our new Fellows have been women, and we have elected Fellows from countries such as Kazakhstan, the Democratic Republic of the Congo and the Central African Republic, where previously there had been none.

We are proud of this progress, but the effort must be sustained through the coming years. The Council this year approved new initiatives to focus on poorly represented countries, regions and groups, sub-Saharan Africa and the Least Developed Countries [LDCs] in particular. Our membership committees will give more balanced consideration to candidates from poorly represented countries and to women.

We owe a great deal of thanks to the TWAS Secretariat in Trieste for effectively implementing these policies and guiding our programmes. We are particularly grateful to former Executive Director Romain Murenzi, who was transferred at mid-year to a leadership position in the UNESCO Natural Sciences Sector in Paris. We are most fortunate that Mohamed Hassan, the Academy's founding executive director, agreed to return to his old post on an interim basis. His vision and experience have been essential in guiding TWAS through this transition in the midst of a very productive year.

► From left: Mohamed H.A. Hassan; Romain Murenzi.



A YEAR O

For TWAS, 2016 was a year of continued growth and high-level visibility. Its programmes continue to provide critical opportunities to developing world researchers. Its reputation as a focal point for science policy and science diplomacy is rising. But a few accomplishments stood out.

1 Rwanda hosts 27th General Meeting

Rwanda has made a sustained commitment to development through science, and today it is emerging as an African innovation leader. In 2016, its capital city of Kigali hosted the TWAS General Meeting for the first time. It drew about 300 high-level scientists, policymakers, educators and others from more than 50 nations, including science ministers, high-level policymakers and elite researchers. Rwandan President Paul Kagame addressed the meeting during its opening ceremonies. [See page 14]

2 UNSAB comes to Trieste

United Nations Secretary-General Ban Ki-moon's Scientific Advisory Board seeks to inform the UN's work by providing advice on science, technology and innovation for sustainable development. The board's meeting in May was hosted by UNESCO, the Italian Ministry of Foreign Affairs and International Cooperation, TWAS, The Abdus Salam International Centre for Theoretical Physics, the InterAcademy Partnership, and other Italy-based government



and science organisations. UNSAB members deliberated on the Sustainable Development Goals for climate-related risk, indigenous and local knowledge for development, food security and health. [See page 22]

F IMPACT



2

3 Princess Sumaya speaks at TWAS

Princess Sumaya bint El Hassan of Jordan came to Trieste to take part in the annual summer course in science diplomacy organized by the American Association for the Advancement of Science [AAAS] and TWAS. Princess Sumaya, an influential advocate for scientific research, said that in a time of social and political crisis, science and science diplomacy can create a more hopeful future. [See page 24]



3



4

4 First-ever research grants conference

Past TWAS research grant awardees gathered in Trieste for the first-ever TWAS Research Grants Conference, supported by the Swedish International Development Cooperation Agency [Sida]. Participants came from 26 nations in the developing world, including Sudan, Mali, Senegal, Nigeria, Chile, Argentina, Sri Lanka, Uzbekistan and Nepal; their work spanned from biology to mathematics and medical research. Women made up 52% of the participants. [See page 18]

5 Introducing TWAS Online Forms

TWAS launched new online applications for its popular research grants programme, and continued to develop the new system for nearly all of its programmes and meetings. TWAS Online Forms, based on innovative new technology, makes the application process simpler and more efficient for both applicants and TWAS staff. It is accessed through www.twas.org. [See page 34]

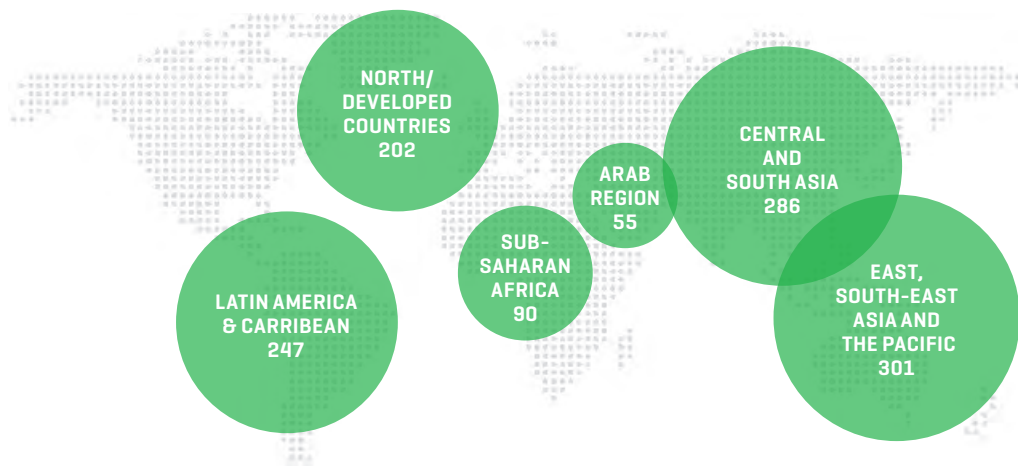
5

twas Online Forms

WHO W

TWAS is a global, merit-based science academy, representing the elite of scientific accomplishment in or related to the developing world. Only those scientists who have achieved the highest level of international standards and have made significant contributions to the advancement of science can be elected as Fellows. They remain Fellows for life.

Fellows from developing countries, by region



TWAS Fellows elected in 2016, by region



For a full list of fellows inducted in 2016, please see page 41

Fellows

 **1,189**
TOTAL FELLOWS

 **83%**
LIVE AND WORK
IN DEVELOPING
COUNTRIES

 **15**
NOBEL PRIZE
LAUREATES

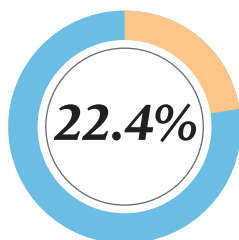
TWAS Fellows elected in 2016 by country of residence:

- 10**
CHINA
- INDIA
- 4**
BRAZIL
- 2**
TAIWAN, CHINA
- 1**
ARGENTINA
AUSTRALIA
CANADA
ECUADOR
ETHIOPIA
FINLAND
GERMANY
JAMAICA
JORDAN
KAZAKHSTAN
MEXICO
SOUTH AFRICA
TUNISIA
UGANDA

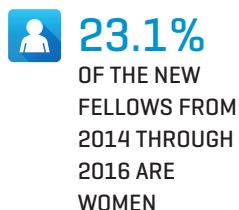
E ARE

FELLOWS AND YOUNG AFFILIATES

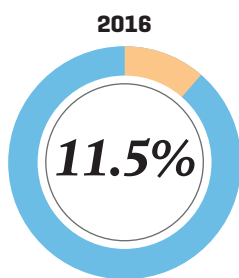
New Fellows



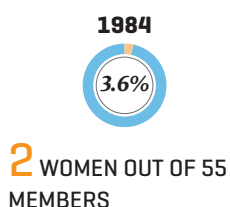
10 OUT OF **44**
 TWAS FELLOWS
 ELECTED IN 2016
 WERE WOMEN



Women Fellows



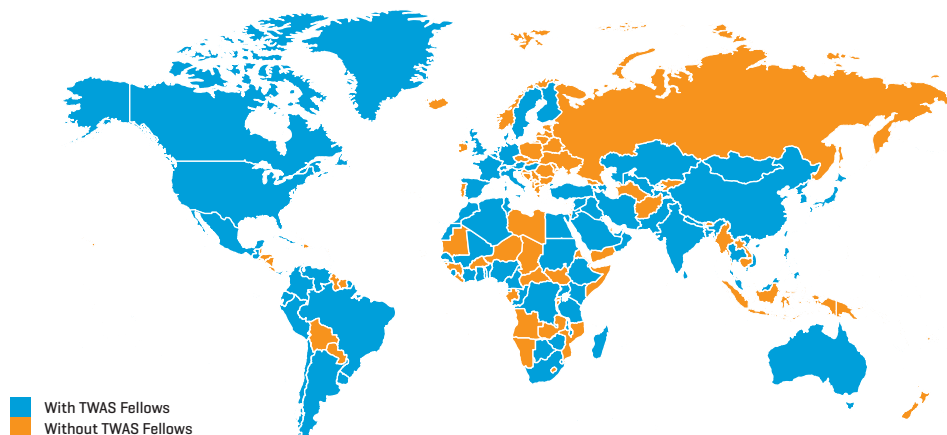
137 WOMEN OUT
 OF 1,189 MEMBERS



Four long-time allies provide indispensable support that makes the work of TWAS possible:

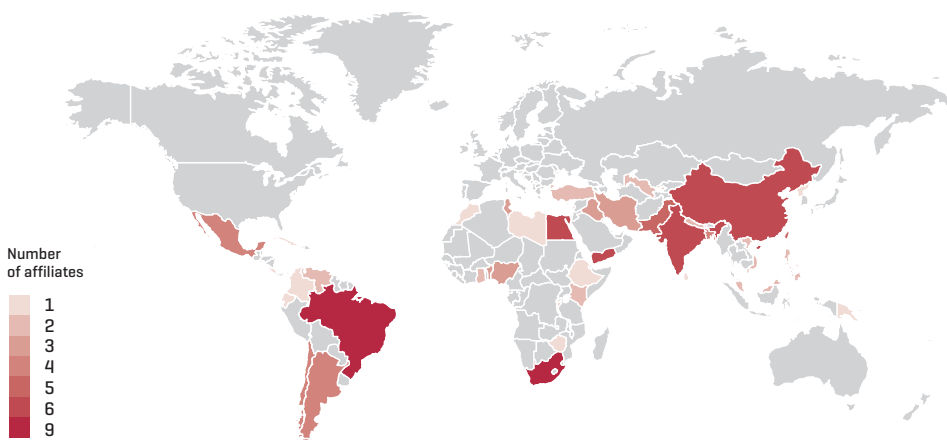
- **The Government of Italy** provides core funding.
- **The Swedish International Development Cooperation Agency (Sida)** supports TWAS research grants, science diplomacy initiatives, the five Regional Offices and programmes of the Organization for Women in Science for the Developing World (OWSD).
- **The Abdus Salam International Centre for Theoretical Physics (ICTP)** hosts TWAS on its campus in Trieste, Italy, and provides valuable administrative support.
- **The United Nations Educational, Scientific and Cultural Organization (UNESCO)** administers TWAS funds and personnel.

Countries with and without TWAS Fellows



More info: www.twas.org/membership-overview

TWAS Young Affiliates in 2016 by country of residence



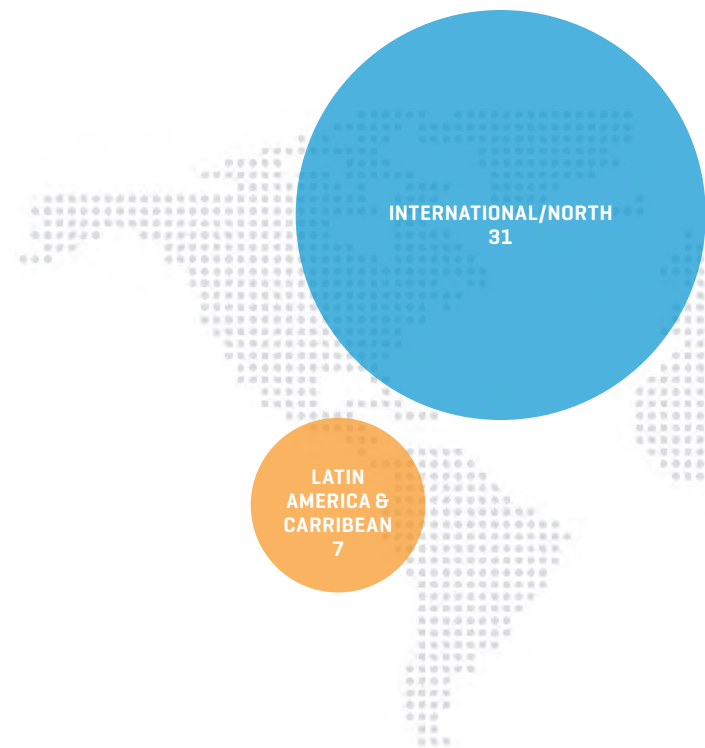
TWAS PA

INTERNATIONAL/NORTH

- Abdus Salam International Centre for Theoretical Physics [ICTP]
- Accademia dei Lincei, Italy
- Alexander von Humboldt Foundation [AvH], Germany
- American Association for the Advancement of Science [AAAS]
- Biovision, France
- Elsevier Foundation, Netherlands
- Environmental Defense Fund [EDF], U.S.
- Fondazione Internazionale Trieste [FIT]
- French Foundation for Rare Diseases
- GenderInSITE
- German Research Foundation [DFG]
- Global Research Council [GRC]
- Global Young Academy [GYA]
- InterAcademy Partnership [IAP]
- International Council for Science [ICSU]
- International Mathematical Union, Germany [IMU]
- International Network of Government Science Advice [INGSA]
- The International School for Advanced Studies [SISSA]
- International Social Science Council [ISSC]
- Italian Ministry of Foreign Affairs and International Cooperation [MAECI]
- Japan Science and Technology Agency [JST]
- Lindau Nobel Laureate Meetings, Germany
- New York Academy of Sciences [NYAS]
- Organization for Women in Science for the Developing World [OWSD]
- The Royal Society, U.K.
- SciDev.Net
- Science Initiative Group, U.S. [SIG]
- The Solar Radiation Management Governance Initiative [SRMGI]
- Swedish International Development Cooperation Agency [Sida]
- World Meteorological Organization [WMO]
- United Nations Organization for Education, Science and Culture [UNESCO]

ARAB REGION

- Bibliotheca Alexandrina, Egypt
- Kuwait Foundation for the Advancement of Sciences [KFAS]
- OPEC Fund for International Development [OFID]



LATIN AMERICA & THE CARIBBEAN

- Academy of Sciences of Ecuador [ACE]
- Brazilian Academy of Sciences [ABC]
- Brazilian Council for Scientific and Technological Development [CNPq]
- The Caribbean Community [CARICOM]
- Ministry of Science and Technology of Argentina
- National Council for S&T Research [CONICET], Argentina
- National Council on Science and Technology [CONACYT], Mexico

RTNERS

EAST AND SOUTH-EAST ASIA AND THE PACIFIC

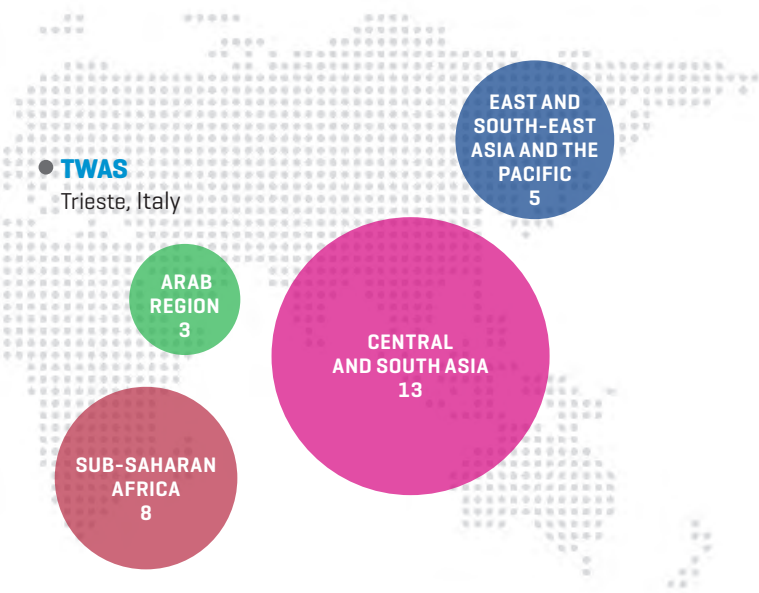
- Center for Genetic Engineering and Biotechnology [BIOTEC], Thailand
- Chinese Academy of Sciences [CAS]
- International Science, Technology and Innovation Centre for South-South Cooperation [ISTIC], Malaysia
- Universiti Putra Malaysia [UPM]
- Universiti Sains Malaysia [USM]

CENTRAL AND SOUTH ASIA

- Centre of Excellence in Molecular Biology [CEMB], Pakistan
- Commission on Science and Technology for Sustainable Development in the South [COMSATS], Pakistan
- COMSATS Institute of Information Technology [CIIT], Pakistan
- Standing Committee on Scientific and Technological Cooperation of the Organisation of Islamic Cooperation [COMSTECH], Pakistan
- Council of Scientific and Industrial Research [CSIR], India
- Department of Biotechnology [DBT], India
- Department of Science and Technology [DST], India
- Indian Association for the Cultivation of Science [IACS]
- International Center for Chemical and Biological Sciences [ICCBS], Pakistan
- Iranian Research Organization for Science and Technology [IROST]
- Jawaharlal Nehru Centre for Advanced Scientific Research [JNCASR]
- National Centre for Physics [NCP], Pakistan
- S.N. Bose National Centre for Basic Sciences [SNBNCBS]

SUB-SAHARAN AFRICA

- Academy of Science of South Africa [ASSAf]
- African Academy of Sciences [AAS]
- African Union [AU]
- Department of Science and Technology, South Africa [DST]
- International Centre of Insect Physiology and Ecology [icipe], Kenya
- Ministry of Education of Rwanda [MINEDUC]
- National Research Foundation [NRF], South Africa
- Sudanese National Academy of Sciences [SNAS]



With commitment and creativity – and sustained support from our community – we will strengthen our Academy and deepen our impact.

TWAS President **Bai Chunli** and TWAS Executive Director **Mohamed H.A. Hassan**

27TH GENERAL MEETING RWANDA

With a focus on innovation for sustainability, TWAS held its General Meeting in Kigali, Rwanda, from 14 to 17 November 2016. Presentations explored cutting-edge research across a range of disciplines, while also recognizing some of the year's top scientific accomplishments relevant to the developing world.

The meeting featured numerous prominent speakers, including Rwandan President Paul Kagame. It also included science ministers and other high-level policymakers from across the globe, elite researchers, and leaders from science associations, funding agencies and non-governmental organizations.

▼ Claire Lyngå, research adviser for the Swedish International Development Cooperation Agency (Sida), speaks during the General Meeting. [Photo: Robert Mugabe/Rwanda Ministry of Education]



...
News from the
27th General Meeting:
[www.twas.org/meeting/
twass-27th-general-meeting](http://www.twas.org/meeting/twass-27th-general-meeting)
...



▲ Dignitaries, from left, including TWAS President Bai Chunli, Rwandan President Paul Kagame, TWAS Secretary General Ajay Sood, Sida Research Adviser Claire Lyngå, and Italian Secretary of Legation Stefano Salmaso stand during the opening ceremony of the General Meeting.

► Rwandan Education Minister: Musafiri Papias Malimba. [Photos: Robert Mugabe/Rwanda Ministry of Education]

“ The transformative power of science is known, and we must harness it to serve our ambitious goals for sustainable development and prosperity. ”

Rwandan President Paul Kagame

Forty new TWAS Fellows were elected during the meeting, raising the total membership to 1,190.

Exemplar of innovation: The meeting served as an opportunity for Rwanda to showcase achievements from the last ten years in promoting science, technology, research and innovation. These efforts have had benefits for millions of Rwandans, ranging from scientists using advanced technology for their research to schoolchildren using the Internet for their education.

Rwanda has shown remarkable resilience after the shattering genocide of 1994. The nation has demonstrated determination to promote science, technology, research and innovation in finding solutions to its challenges – including the use of alternative sources



Number of Attendees

>350
ATTENDEES

50
REPRESENTED
COUNTRIES

104
TWAS FELLOWS

30
YOUNG
AFFILIATES



The 2016 General Meeting was hosted and co-organized by the Ministry of Education of Rwanda.

of energy and protecting biodiversity for sustainable development.

Additionally, Education Minister Musafiri Papias Malimba and other high-level policymakers were featured guests.

Finally, a symposium on astronomy featured a presentation on the Square Kilometre Array, the world’s largest radio telescope, being planned for South Africa and Australia. Another symposium, sponsored by the Elsevier Foundation, focused on confronting global epidemics.

HONOURING SCIENTIFIC EXCELLENCE

TWAS recognizes that prizes and awards provide an incentive for scientists to do their best work, while bringing global recognition to discoveries achieved by researchers in the developing world.

The TWAS-Lenovo Prize went to Chinese materials scientist **Zhao Dongyuan**. His work focuses on mesoporous materials – structures that feature tiny, microscopic holes. Across two decades, his research and nano-scale

applications have been used to clean water for drinking and agriculture, improve the capacity and efficiency of batteries, and deliver drugs with pinpoint precision in human bodies. The TWAS-Lenovo Prize is one of the most prestigious honours given to scientists from the South. It includes USD100,000 provided by Lenovo, the largest PC company in the world.

Learn more: www.twas.org/node/11954/

▼ Prizewinners honoured at the 27th TWAS General meeting in Kigali, Rwanda, joined Rwandan President Paul Kagame, TWAS President Bai Chunli and other dignitaries.

...
For a list of all who won 2016 TWAS prizes and awards, see page 42
...





◀ From top left, clockwise: TWAS-Lenovo Prize winner Zhao Dongyuan; Atta-ur-Rahman Prize winner Bijay Singh; Fayzah M. Al-Kharafi winner Marian Nkansah; C.N.R. Rao Prize winner Mahouton Norbert Hounkonnou; and TWAS Prize winners Zulfiqar Ahmed Bhutta and Mario Hamuy.

▣▣ The C.N.R. Rao prize... is a sort of encouragement and motivation to continue in the same direction, doing good research and promoting younger people in science. ▣▣

Mahouton Norbert Hounkonnou, 2004 TWAS Fellow and professor at the University of Abomey-Calavi in Benin

Winners of the 2016 Young Scientist and African Union Prizes



(2 winners each)

- BANGLADESH
- COLOMBIA
- COSTA RICA
- CUBA
- EGYPT
- IRAN, ISL. REP.
- MONGOLIA
- NEPAL
- NIGERIA
- SOUTH AFRICA
- SRI LANKA
- UZBEKISTAN



- BENIN
- BURKINA FASO
- GHANA
- GUATEMALA
- GUINEA
- JORDAN
- LESOTHO
- MALAWI
- PAKISTAN
- PANAMA
- PHILIPPINES
- THAILAND
- TRINIDAD AND TOBAGO

The winner of the first **Fayzah M. Al-Kharafi Prize** was **Marian Nkansah**, a Ghanaian chemist whose research has shed light on the presence of toxic heavy metals in tea, clay and dust in her home country. The annual Al-Kharafi Prize recognizes exceptional women scientists from scientifically and technologically lagging countries.

The prize is named for 2004 TWAS Fellow Fayzah M. Al-Kharafi. She is the former president of Kuwait University – the first woman to head a major university in the Middle East. She is a former TWAS vice president for the Arab Region, and currently serves on the Board of Directors of the Kuwait Foundation for the Advancement of Sciences.

[Learn more: www.twas.org/node/11955/](http://www.twas.org/node/11955/)

Among the 10 winners of the **2016 TWAS Prizes** was astronomer **Mario Hamuy** of University of Chile. His work observed the distant exploding stars known as supernovae, and by using them as a measure of cosmic distance he contributed to the discovery of cosmic acceleration.

Zulfiqar Ahmed Bhutta, of Aga Khan University in Pakistan, did research on pediatrics and public health that has shaped global policy for children's health.

[Learn more: www.twas.org/node/11957/](http://www.twas.org/node/11957/)

The 2016 C.N.R. Rao Prize went to Benin mathematician **Mahouton Norbert Hounkonnou**, a 2004 TWAS Fellow. His research in mathematics has applications in many fields, including physics, oceanography, health, management of water and ecosystems, climate studies and energy. He was also honoured for his commitment to mathematics education.

[Learn more: www.twas.org/node/11951/](http://www.twas.org/node/11951/)

The 2016 Atta-ur-Rahman Prize in chemistry went to Nepali biomaterials scientist **Bijay Singh**. His research focuses on a new category of carrier molecules that may encapsulate several compounds and direct the delivery of drugs, genes and vaccines with pinpoint accuracy.

[Learn more: www.twas.org/node/11953/](http://www.twas.org/node/11953/)

TWAS founding Executive Director **Mohamed H.A. Hassan** received the **Science Diplomacy Award** at Science Forum South Africa in recognition of his career-long work to foster international cooperation.

[Learn more: www.twas.org/node/12061/](http://www.twas.org/node/12061/)

EDUCATION & TRAINING

TWAS manages the world's largest South-South PhD and postdoctoral research fellowship programme. Through the Academy, its associated organizations and partners, early-career researchers can get education and experience at world-class science institutions in Brazil, China, India, Iran, Kenya, Malaysia, Mexico, Pakistan, Thailand and South Africa.

In 2016, TWAS also began a new fellowship programme in a joint effort with the International Mathematical Union (IMU), with additional help from the Friends of the IMU. The new fellowship provides up to eight scholars from the South with financial backing to pursue PhDs, with a goal of building a strong corps of mathematicians in developing countries.



PhD fellowships

 **391**
OFFERED

 **12** PARTNERS

 **8** COUNTRIES

Postdoctoral fellowships

 **126**
OFFERED

 **15** PARTNERS

 **8** COUNTRIES

◀ Galani Yamdeu Joseph Hubert of Cameroon took advantage of the TWAS Fellowship for Research and Advanced Training to improve his work on disease-resistant potatoes at Anand Agricultural University in Gujarat, India. [Photo provided]

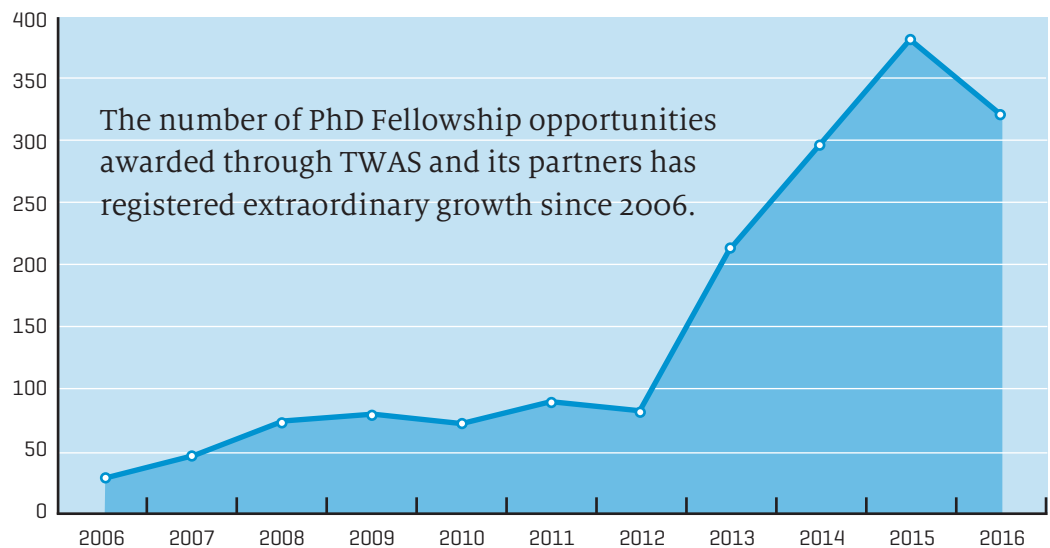
PhD fellows in 2016



801

TWAS PHD FELLOWS WERE ON-SITE AND WORKING TOWARD THEIR DEGREES.

TWAS PhD fellowships

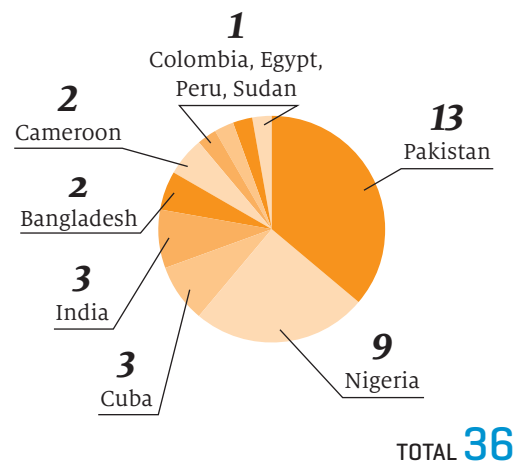


VISITING SCIENTISTS

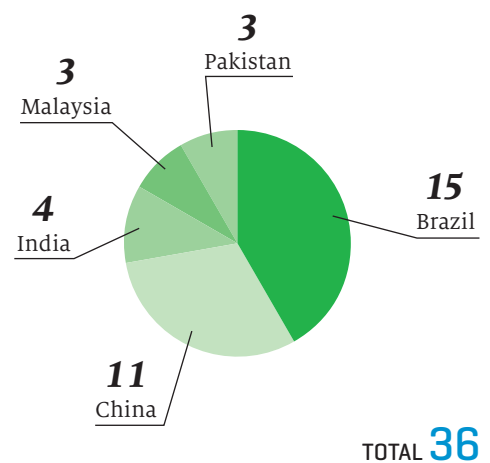
TWAS provides opportunities to established researchers from the South to pursue collaborative research and education or provide needed expertise in a country other than their own. The visits can range from two weeks to a full year. In 2016, the programmes included:

- **TWAS-UNESCO Associateship scheme:** 24 developing-world scientists from 15 countries
- **TWAS Research and Advanced Training Fellowship Programme:** Ten developing-world scientists from seven countries
- **Visiting Expert Programme:** Four experts aiding scientific development in host countries
- **TWAS-DFG Cooperation Visits Programme:** 30 early-career African scientists did postdoctoral research in Germany under the guidance of the German Research Foundation (*Deutsche Forschungsgemeinschaft* - DFG)

Home country for new 2016 PhD recipients



Country of training for new PhDs



“This programme ... allows scientists from developing countries like Tanzania to get trained and hence gain knowledge on the trending research.”

Shubi Felix Kaijage, a Tanzanian who conducted research on semiconductors at a German lab through the TWAS-DFG Cooperation Visits Programme

PROGRESS THROUGH RESEARCH

TWAS provides grants to researchers in targeted developing countries for specialized equipment, supplies and scientific publications. These grants help to lay a foundation for research in countries with scarce resources.

In 2106 TWAS held its first-ever Research Grants Conference, which drew over 40 past awardees to Trieste from 18 to 22 April. They came from 26 nations in the South – including Sudan, Mali, Senegal, Nigeria, Chile, Argentina, Sri Lanka, Uzbekistan and Nepal.



Research grants awarded in 2016



38 INDIVIDUAL GRANTS [56.7%]

22 GROUP GRANTS [32.8%]

7 TWAS-COMSTECH GRANTS [10.5%]

◀ Malaria researcher Luna Kamau speaks during the TWAS Research Grants Conference in April. [Photo: Paola di Bella]

► The Nigerian research team of TWAS grant recipient Emmanuel Unuabonah included numerous masters students and a PhD student. [Photo provided]

Field of research

- 29** BIOLOGY
- 20** CHEMISTRY
- 8** PHYSICS
- 3** MATHEMATICS
- 2** INFORMATION TECHNOLOGY AND COMPUTER SCIENCES
- 1** EARTH SCIENCES,
- 1** ENGINEERING SCIENCES
- 1** MATERIAL SCIENCES AND NANOTECHNOLOGY
- 1** PHARMACEUTICAL SCIENCES
- 1** RENEWABLE ENERGY



Women accounted for 52% of the conference participants. They discussed their career challenges and the role the TWAS grant played in shaping their professional lives.

Also in 2016, the grants were split into three categories. TWAS Research Grants for Individuals provided up to USD15,000 to young researchers in 81 developing countries identified by the Academy as lagging in science and technology. TWAS Research Grants for Groups provided up to USD30,000 to small research groups in those same countries. The Swedish International Development Cooperation Agency [Sida] supports both grant programmes.

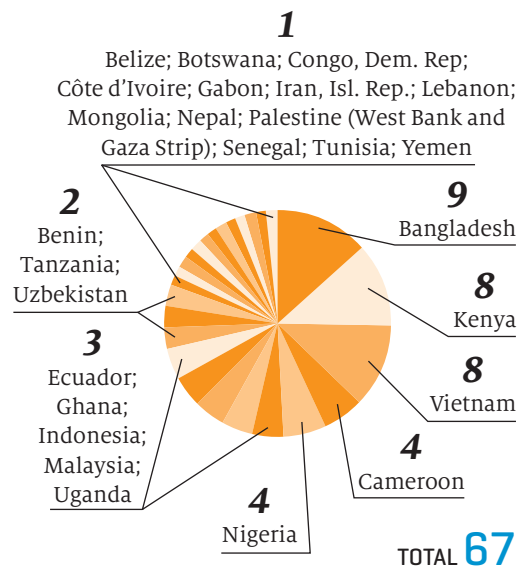
The TWAS-COMSTech Joint Research Grants programme awards grants of up to USD15,000 to scientists in member states of the

Organisation of Islamic Cooperation (OIC). The programme is supported by the OIC’s Standing Committee on Scientific and Technological Cooperation [COMSTech].

[See a new film on the TWAS Research Grants: www.bit.do/TWASGrantsFilm](http://www.bit.do/TWASGrantsFilm)

[For more about the research grants conference: www.twas.org/node/11712/](http://www.twas.org/node/11712/)

Where did TWAS research grants go in 2016?



“The TWAS grant helped me to be one of the pioneers in establishing biology research in Ecuador.”

Eugenia del Pino Veintimilla, developmental biologist and TWAS Fellow, who received her first grant from the Academy in the 1998, worth USD2,000.

SUPPORTING SCIENCE POLICY

With an elite network of nearly 1,200 scientists from 90-plus countries and more than 30 years of experience in the global science community, TWAS is ideally positioned to provide advice on science policy for the developing world and support for the United Nations Sustainable Development Goals (SDGs).

In 2016, TWAS was a key participant in several initiatives in which policymakers explored new avenues for using science to support sustainable development and address challenges.

UN Secretary-General Ban Ki-moon's Scientific Advisory Board (UNSAB): The board met in Trieste 24-25 May for a meeting hosted by UNESCO and organized by four international institutions of the Trieste Science System: the Abdus Salam International Centre for Theoretical Physics (ICTP); the International Centre for Genetic Engineering and Biotechnology (ICGEB); the InterAcademy Partnership (IAP); and TWAS. The meeting was held in partnership with the Italian Ministry of Foreign Affairs and International Cooperation, the regional government of Friuli Venezia Giulia, and CNR, the Italian national research council.

The board brings together 25 eminent scientists from all regions of the world – including five members of TWAS.

After discussion and debate, UNSAB members developed recommendations for implementation of the SDGs in critically important areas such as climate-related risk, indigenous and local knowledge for development, food security and health. These

▼ Sir Peter Gluckman, chief science adviser to the Prime Minister of New Zealand, guided a group exercise at a science advice workshop in February in Hermanus, South Africa. TWAS representatives were among the workshop participants, and it was held just before the General Assembly and Conference of IAP.





“ The 2030 Agenda is a people-centred, planet-friendly framework to build a life of dignity for all and leave no one behind. Science is essential to moving this ambitious agenda forward.... That means integrating cutting-edge science into policy. ”

*UN Secretary General **Ban Ki-moon** in a video address at the UNSAB meeting in Trieste, Italy*

▲ TWAS hosted the UN Secretary-General Ban Ki-moon’s Scientific Advisory Board in May. [Photo: ICTP]

were finalized as part of a report released in September that, for example, calls on all countries to invest at least 1% of their GDP on research and urges the most advanced countries to spend at least 3% of GDP on research and development.

[Learn more: www.twas.org/node/11744/](http://www.twas.org/node/11744/)
Watch a short film on the UNSAB meeting, plus interviews with members: www.bit.do/UNSABfilms

Geoengineering workshop in Jamaica: In 2016, the Solar Radiation Management Governance Initiative (SRMGI), held a one-day discussion workshop in Kingston, Jamaica, attended by 50 people, including local academics, policymakers and NGO representatives. SRMGI is coordinated by the Royal Society of the UK, the Environmental Defense Fund and the TWAS science diplomacy programme.

[Learn more: www.srmgi.org/events/srmgi-workshop-jamaica/](http://www.srmgi.org/events/srmgi-workshop-jamaica/)

Science International: The initiative convenes four world science organizations – ICSU, ISSC, IAP and TWAS – to promote strong policies for science at the global level. In 2016, Science International launched an endorsement campaign and a new website to support its effort to promote open access to big data.

[Learn more: www.science-international.org](http://www.science-international.org)

SCIENCE DIPLOMACY

To address regional and global challenges, the world requires effective partnerships between scientists, policymakers and diplomats. TWAS, based in Italy and with networks that span the world, is uniquely positioned to help bring these communities together.

Key partners of the science diplomacy programme include the American Association for the Advancement of Science [AAAS], which collaborates with TWAS on an annual summer course, and the Swedish International Development Cooperation Agency [Sida], which provides indispensable financial support.

The programme's activities in 2016 were:

AAAS-TWAS summer course in science diplomacy. Held from 11 to 16 July in Trieste, Italy, the annual course featured a complex simulation of a high-stakes diplomatic negotiation, challenging participants to reconcile one fictional nation's interest in economic growth with another's desire for environmental conservation.

The course brought together about 30 participants from 22 nations, and included a high-profile list of speakers, including Princess Sumaya bint El Hassan, the president of the

Royal Scientific Society of Jordan; Vaughan Turekian, science and technology adviser to the U.S. Secretary of State; and science communicator Liz Neeley, the executive director at The Story Collider.

Princess Sumaya gave a special interview for the event, describing her path to scientific leadership, the role of science and engineering in addressing the refugee crisis, and the crucial role of international partnerships. Science and science diplomacy, she said, give nations in

▼ Participants in the AAAS-TWAS summer course in science diplomacy look on. [Photo: Demis Albertacci]





“ We’re talking about lives and we’re talking about protecting and safeguarding people. That’s the most important thing that science can really do. ” *Princess Sumaya of Jordan*



▲ From top: Vaughan Turekian, science adviser to the US Secretary of State; science communication expert Liz Neeley; and Princess Sumaya bint El Hassan of Jordan. Other photos: Participants in the science diplomacy simulation during the summer course. [Photos: Demis Albertacci]

the Middle East and North Africa a means of opening dialogue about issues that affect tens of millions of people across the region.

[Learn more about the summer course:](http://www.twas.org/node/11822/)

www.twas.org/node/11822/

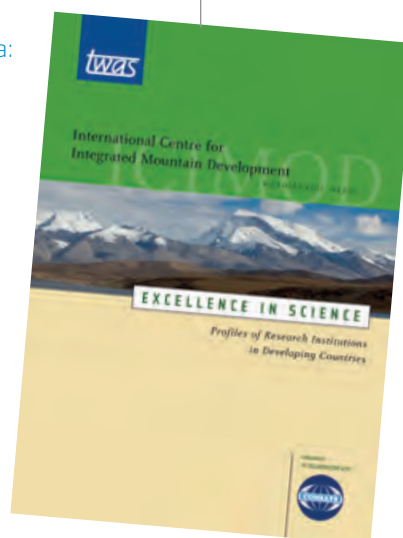
[See a film of the TWAS interview with Princess Sumaya:](#)
www.twas.org/node/11864/

Monograph on Himalayan science: The International Centre for Integrated Mountain Development, or ICIMOD, is the creation of eight countries in the Hindu Kush Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. Science diplomacy

is central to the centre’s influential work.

ICIMOD’s impact is captured in a new monograph – the latest in the TWAS Excellence in Science series. The publication explores the ICIMOD’s history, projects and challenges, from efforts to help nations address flooding and climate change to its essential help after the devastating 2015 earthquake in Nepal. The monograph was published with support from COMSATS, the Commission on Science and Technology for Sustainable Development in the South.

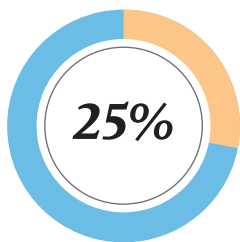
[Learn more: www.twas.org/node/11753/](http://www.twas.org/node/11753/)



ADVANCING WOMEN

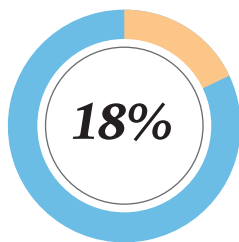
Supporting women in research and leadership is a central part of TWAS's mission. The Academy and its partners offer numerous opportunities to women in the developing world, and they help institutions learn how to support women researchers. This can be valuable for the careers of each individual researcher, and critical for activating a nation's full scientific potential.

PhDs created by TWAS in 2016



9 OUT OF **36** PHDs CREATED BY TWAS AND PARTNER INSTITUTIONS IN 2016 ARE WOMEN

PhD fellowships to women



55 OUT OF **306** PHD FELLOWSHIPS AWARDED BY TWAS IN 2016 WENT TO WOMEN

TWAS hosts two influential partners at its offices in Trieste, Italy:

The Organization for Women in Science for the Developing World (OWSD) emerged from a conference organized by TWAS in 1988. OWSD is the first international forum for women scientists from the developing and developed worlds to strengthen their roles in research and science leadership. It has some 5,500 members, more than 90% of them women scientists in developing countries. OWSD PhD fellowships for women researchers receive support from the Swedish International Development Cooperation Agency [Sida].

OWSD partnered with the Elsevier Foundation and TWAS to organize the annual OWSD-Elsevier



“I feel proud to be part of this new generation of women scientists who are trying to make a difference in their country and in the world.”

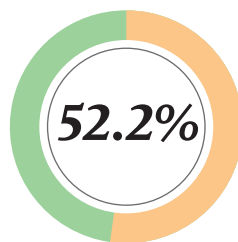
2016 Elsevier Award winner **Magaly Blas** of Peru



...
 See an inspiring film
 on the 2016 OWSD-Elsevier
 Award winners: [https://
 youtu.be/IDI31HcQnRs](https://youtu.be/IDI31HcQnRs)
 ...

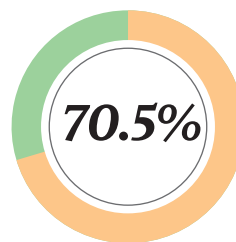
▲ The winners of the 2016 OWSD-Elsevier Awards for Early-Career Women in Science in the Developing World, from left: Sri Fatmawati, Indonesia; Etheldreda Nakimuli-Mpungu, Uganda; Ghanya Al-Naqeb, Yemen; Magaly Blas, Peru; and Sushila Maharjan, Nepal. [Photo: Elsevier Foundation]

Scientists awarded PhD fellowships through OWSD in 2016



23 OUT OF **44**
 WERE FROM
 LEAST DEVELOPED
 COUNTRIES (LDCs)

Women who received PhD fellowships through OWSD in 2016



12 OUT OF **17**
 WERE FROM
 LEAST DEVELOPED
 COUNTRIES (LDCs)

OWSD PhD fellowships for women from sub-Saharan Africa, LDCs

423
 TOTAL

195 HAVE
 GRADUATED
 [46%]

199 ARE
 ONSITE [47%]

Fellowships awarded 1998-2016.

Foundation Awards for Early Career Women Scientists in the Developing World. The 2016 winners were biologists from Indonesia, Nepal, Peru, Uganda and Yemen who contributed life-enhancing research in health and nutrition. [Learn more about OWSD: www.owsd.net](http://www.owsd.net) [Learn more about the Elsevier Awards: www.twas.org/node/8676/](http://www.twas.org/node/8676/)

GenderInSITE (GIS) is an initiative to inform policymakers on how considering the role of gender in science, innovation, technology and engineering helps improve the impact of development policies. It is hosted by OWSD and TWAS and supported by Sida.

GenderInSITE made presentations throughout the year at high-level science and science policy meetings. Among them: the OWSD 5th General Assembly and International Conference; the first Open Science Forum for Latin America and the Caribbean in September; Gender Summit 8 in North America; Gender Summit 9 in Europe, and the ASSAf Annual Young Scientists Conference in South Africa.

GIS provided a gender perspective on influential scientific panels, including the UNESCO STEM and Gender Advancement Advisory Committee. It commissioned video interviews with women scientists and policy leaders, viewed over 10,000 times.

[Learn more: www.genderinsite.net](http://www.genderinsite.net)

GenderInSITE

GLOBAL ACADEMY NETWORKS

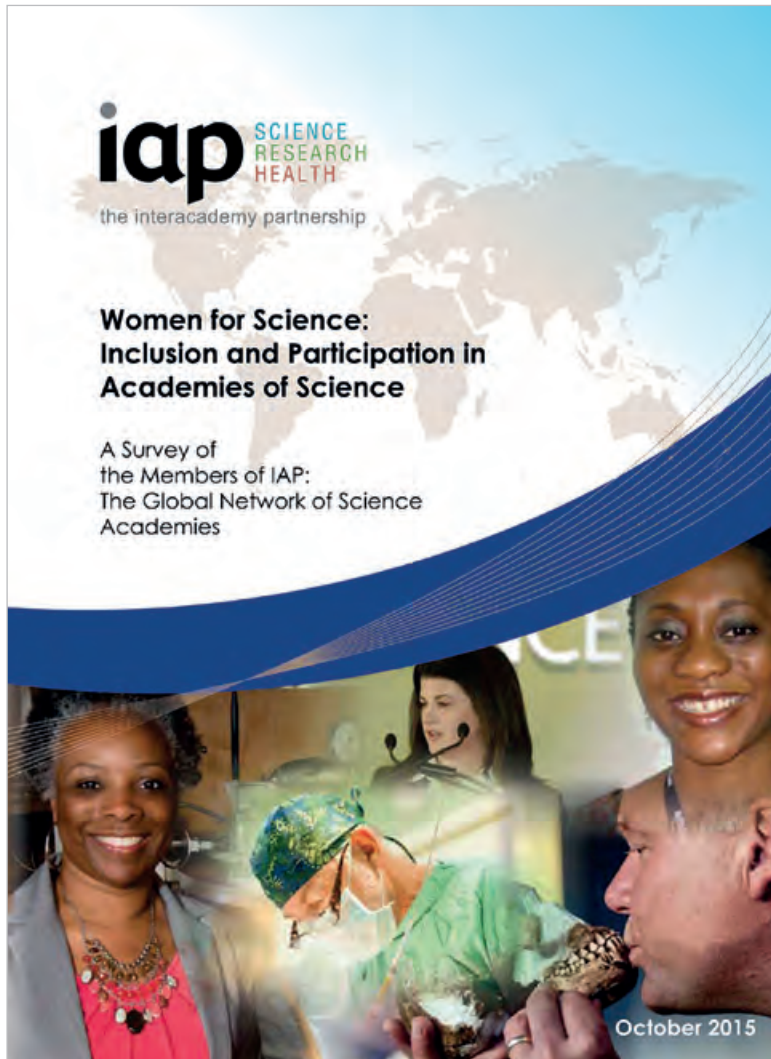
TWAS works in close association with several international science academies dedicated to advancing science in the developing world and promoting sustainable development.

Two international academies based in TWAS's Trieste office, – IAP: the global network of science academies and the InterAcademy Medical Panel (IAMP) – joined with the InterAcademy Council (IAC) in 2016 to

establish a single umbrella organization. That organization, **The InterAcademy Panel (IAP)**, is based in TWAS's Trieste offices. With more than 130 national and regional member academies, it supports the special role of science and its efforts to seek solutions to address the world's most challenging problems.

Two major accomplishments of IAP in 2016 stand out. One is a first-of-its-kind survey of 69 science academies across the world assessing





READ THE IAP REPORTS

- Women for Science: Inclusion and Participation in Academies of Science: www.bit.do/WomenAcademies
- A Call for Action to Improve the Reproducibility of Biomedical Research: www.bit.do/Reproducibility

inclusion and participation of women in science – finding that women make up only 12% of their membership on average. Another was a call to action on the importance of reproducible results in science, outlining the causes of irreproducible results and recognising the leading role the academies can play in addressing this challenge in their own countries and worldwide.

[Learn more: www.interacademies.org](http://www.interacademies.org)

◀ From left: China's Vice Premier Liu Yandong speaks at the IAP for Health Conference 2016 in Beijing, China; Participants in the 2016 IAP for Health Young Physician Leaders training workshop in Berlin.

The TWAS Young Affiliates Network (TYAN)

was formed in 2016 to reinforce ties among the Academy's Young Affiliates. They met for the first time during the TWAS's 27th General Meeting in Kigali, Rwanda, where they officially established the network and began planning to build relationships with various academies, such as the Global Young Academy, and to establish new cooperation programmes.

[Learn more: www.twas.org/node/12053/](http://www.twas.org/node/12053/)

The Chinese Academy of Sciences (CAS) is the hub of China's ambitious research enterprise, and it has historically had close ties with TWAS. Eminent researcher Bai Chunli serves as president of both academies. CAS collaborates with TWAS on the CAS-TWAS President's PhD Fellowship programme and the five CAS-TWAS Centres of Excellence. CAS also hosts the TWAS Regional Office for East and South-East Asia and the Pacific.

[Learn more: english.cas.cn](http://english.cas.cn)



The Academy of Science of South Africa (ASSAf)

is one of Africa's leading advocates for science and technology. In 2015, ASSAf's headquarters in Pretoria was selected as the new host of TWAS's Regional Office for sub-Saharan Africa, and in 2016 the regional office launched a new website. ASSAf also contributed to the IAP report on women in science.

ASSAf hosted the high-level workshop on the best way to provide science advice to African governments in February, held back-to-back with the General Assembly and Conference of IAP, in Hermanus, South Africa.

[Learn more: www.assaf.co.za](http://www.assaf.co.za)

[Regional office website: www.twas-rossa.org.za](http://www.twas-rossa.org.za)

The International Mathematical Union (IMU)

collaborated with TWAS to create a new fellowship that will provide up to eight scholars from the South with the financial backing to pursue PhDs in maths, with a goal of building a strong corps of mathematicians in developing countries.

[Learn more: www.twas.org/node/11682/](http://www.twas.org/node/11682/)

REGIONAL OFFICES

...

The 2016 TWAS Regional Prizes were awarded for Building Scientific Institutions or Public Understanding and Popularisation of Science.

...

TWAS offices in five major regions of the developing world perform vital Academy functions: They nominate scientists for membership and prizes and select Young Affiliates. They organize conferences, and in the process they raise awareness of TWAS and its programmes among scientists in each region. And they help to advance support globally for science among policymakers and the public.

RIO DE JANEIRO, Brazil ●
Brazilian Academy of Sciences



► 2016 TWAS Regional Prize in Building Scientific Institutions: Pablo Valenzuela, Chile

LATIN AMERICAN AND THE CARIBBEAN (TWAS-ROLAC)

Held a young scientists' conference in November, welcoming over 700 participants to San Salvador, El Salvador. Young scientists gave 18 presentations there. The office also supported nine young scientists at the 2016 BioVision World Life Science Forum in Lyon, France, and provided scholarship support to an early-career Cuban bioengineer working in Brazil.

► 2016 TWAS Regional Prize in Building Scientific Institutions: Glenda Gray, South Africa

▶ 2016: TWAS Regional Prize in Public Understanding and Popularisation of Science: Zhong Qi, China



EAST AND SOUTH-EAST ASIA AND THE PACIFIC (TWAS-ROESEAP)

Held a workshop on synthetic biology for new and improved food products at Kasetsart University in Bangkok, Thailand, in December. It was sponsored by UNESCO, and attracted 69 participants from throughout the region. The workshop included a discussion to form a collaboration network among representatives from each country to work on how biotechnology could help improve global food security.

▼ 2016 TWAS Regional Prize in Building Scientific Institutions: Mohammed Shabat, Palestine [West Bank and Gaza Strip]



ARAB REGION (TWAS-ARO)

Held its 12th Annual Meeting in December. The meeting, on food security and water scarcity in the Arab region, was held outside of Alexandria for the first time, instead taking place at the Dead Sea in Jordan. The office also held the 4th BioVisionAlexandria.NXT in Alexandria in April, exploring research ethics and social responsibility in science.

▼ 2016 TWAS Regional Prize in Building Scientific Institutions: Eric Karunanayake, Sri Lanka



● **TRIESTE, Italy**
ITCP Campus

● **ALEXANDRIA, Egypt**
Bibliotheca Alexandrina

● **BEIJING, China**
Chinese Academy of Sciences

● **BANGALORE, India**
Jawaharlal Nehru Centre for Advanced Scientific Research

● **PRETORIA, South Africa**
Academy of Science of South Africa

CENTRAL AND SOUTH ASIA (TWAS-ROCASA)

Provided travel support to five young researchers, three of them women, to attend the “Young Scientists Congress and Women Scientists Mentor-Mentee Programme” in Dhaka, Bangladesh, in October. The office also organised a conclave for young scientists in the region on climate and Earth sciences in December in Bangalore, India. It attracted 62 participants from 22 countries.

SUB-SAHARAN AFRICA (TWAS-ROSSA)

Held the 2016 Young Scientists’ Conference at Ikeja Lagos in August, which attracted 105 participants from across Africa. The office also held a breakfast meeting for TWAS Fellows during the InterAcademy Partnership [IAP] meeting hosted by ASSAf in February in Hermanus, South Africa, to discuss ways to better connect TWAS Fellows to the regional office. TWAS-ROSSA also launched a new website [www.twas-rossa.org.za] and social media initiative on Twitter [@TWAS_ROSSA].



TWAS & ITALY

For over 30 years, TWAS has had a strong partnership with the Italian government, with the Italian Ministry of Foreign Affairs and International Cooperation [MAECI] serving as a focal point. Italy provides core funding to the Academy and makes possible its work to advance science in the developing world. Together, Italy and TWAS have helped developing countries build important skills within their own borders, creating an environment that supports innovation.

Here are highlights of the TWAS-Italy partnership from 2016:

UN Scientific Advisory Board: The Italian government, Italian Ministry of Foreign Affairs and International Cooperation [MAECI], the regional government of Friuli Venezia Giulia [FVG], and CNR, the Italian national research council, were key hosts of the board's deliberations in Trieste. The event included speeches by Italian dignitaries such as Debora

▼ From left: Debora Serracchiani, president of the Friuli Venezia Giulia region [Photo: ICTP]; Paolo Budinich being interviewed in 1989. [TWAS archives]





▲ U.N. Scientific Advisory Board members, from left: Tanya Abrahamse, CEO of the South African National Biodiversity Institute; Fabiola Gianotti, director-general of the European Organization for Nuclear Research [CERN]; and Flavia Schlegel, the U.N.'s Assistant Director-General for Natural Sciences.

Serracchiani, president of FVG, and Vincenzo De Luca, MAECI director-general for Cultural and Economic Promotion and Innovation. The meeting was co-chaired by UNSAB member Fabiola Gianotti, the Italian physicist and director-general of the European Organization for Nuclear Research [CERN].

[Learn more: www.twas.org/node/11720](http://www.twas.org/node/11720)

Trieste Next: The importance of big data for development in the South was the focus of a roundtable organised by TWAS at Trieste Next 2016 in September. Two speakers drew a large crowd to a tent in Piazza Unitá, Trieste's main square.

They were: Leonida Mutuku, the co-founder and CEO of Intelipro, a Kenyan consultancy that builds data products and analytical tools for financial and retail organisations; and Claudio Sartori, a full professor of information

processing systems in the department of computer science and engineering, University of Bologna.

[Learn more: www.twas.org/node/11874/](http://www.twas.org/node/11874/)

Paolo Budinich event: To celebrate the centennial of the birth of Italian physicist Paolo Budinich, TWAS organised a discussion in Trieste in September, "*TWAS: Paolo Budinich and the dream of science in the South.*" Budinich's dream, nurtured along with his fellow physicist and Nobel laureate Abdus Salam, led to the establishment of the International Centre for Theoretical Physics [ICTP] and TWAS. The event was part of a month-long celebration of the Budinich centennial organised by SISSA and Immaginario Scientifico, in collaboration with other Trieste science organisations and the Trieste city government.

[Learn more: www.twas.org/node/11867/](http://www.twas.org/node/11867/)

“Over time, Friuli Venezia Giulia has become renowned for its international receptiveness and for being a pole of attraction for highly qualified human capital in the field of research.”

Debora Serracchiani, president of the Friuli Venezia Giulia region in northeastern Italy

A STORY TO COMMUNICATE

To have an impact on global science and policy, TWAS must convey its ideas and work to an audience that includes not just scientists, but policymakers, journalists, educators, students and the public. Building on its successful digital platform and publications, the Public Information Office (PIO) initiated several projects to expand the TWAS audience.

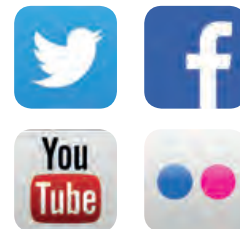
When the **UN Scientific Advisory Board** met in Trieste, TWAS, ICTP and three other Trieste institutions combined their communications efforts, using the web, social media, radio


and film to generate extensive media coverage in Italy and abroad.

[Learn more: www.twas.org/node/11720/](http://www.twas.org/node/11720/)

TWAS also produced new **films** to highlight its programmes. Among them:

- An interview with Princess Sumaya bint El Hassan, president of the Royal Scientific Society of Jordan, on how science diplomacy can help to create a more hopeful future: www.twas.org/node/11864/
- A film on how TWAS research grants empower the work of developing world scientists: www.twas.org/node/11950/







United Nations Secretary-General's


Scientific Advisory Board

24-25 May 2016 | Trieste, Italy


5TH MEETING

Hosted by:



In cooperation with:





The Abdus Salam
**International Centre
for Theoretical Physics**





**International Centre for Genetic
Engineering and Biotechnology**
Developing Knowledge



iap SCIENCE RESEARCH HEALTH
the interacademy partnership

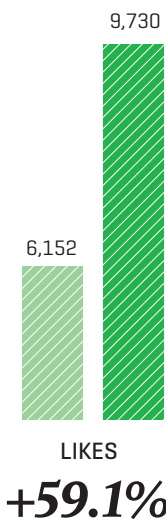
In partnership with:




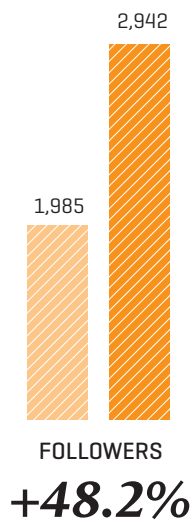




Facebook



Twitter



From 1 January to 31 December 2016.

▲ Top of page: A still from a film about TWAS research grants featuring Romain Lucas Glele Kakai, a biostatistician with the University of Abomey-Calavi in Benin; Centre image: Debora Serracchiani, president of the Friuli Venezia Giulia region, tweets during the U.N. Scientific Advisory Board meeting in Trieste.

TWAS launched the first web-based applications for its programmes, called **TWAS Online Forms**. The project began with TWAS's research grants programme in March, with a plan to implement Online Forms for every TWAS programme and meeting. The new system is both easier to use for applicants and more efficient for staff, and is expected to increase the number of applications to TWAS programmes.

[Learn more: www.twas.org/node/11608/](http://www.twas.org/node/11608/)



The Academy inaugurated an **online donation system**, making it easier than ever to donate to TWAS through a secure link to PayPal. The link allows donors to contribute through a PayPal

account or with a credit card. It's even possible to create an automatic monthly contribution. [Learn more: www.twas.org/node/11929/](http://www.twas.org/node/11929/)

New issues of the **TWAS Newsletter** focused on science for development, the UNSAB and the importance of big data in the developing world.

The Academy's bi-monthly e-bulletin, **TWAS Plus**, saw a 24.2% jump in subscribers, climbing from 15,976 at the beginning of 2016 to 19,840 at the end.



FINANCIAL REPORT 2016

TWAS received a total of USD4,628,966 in funding for 2016, including USD15,252 in individual contributions. We are grateful for the generous contributions from our numerous supporters – some who have aided our work for many years, and others who have joined our mission more recently. Their investments make possible our critical work in the developing world.

FINANCIAL REPORT 2016 (IN USD)

INCOME¹ 2016	
Balance brought forward 01.01.2016	14,351.62
1) Ministry of Foreign Affairs and International Cooperation, Italy	1,616,503.50
2) Swedish International Development Cooperation Agency (Sida)	1,436,158.28
3) Lenovo Group Limited, China	270,000.00
4) Opec Fund for International Development, Austria	150,000.00
5) Kuwait Foundation for the Advancement of Sciences (KFAS)	100,000.00
6) COMSTECH, Pakistan	99,880.00
7) Environmental Defense Fund, USA	90,000.00
8) Elsevier Foundation, USA	80,000.00
9) Academia Sinica, Taiwan, China	50,000.00
10) International Mathematical Union	34,300.00
11) American Association for the Advancement of Science	24,304.00
12) CNR Rao, India	7,000.00
13) Dawood Foundation, Pakistan	6,965.00
14) F.M.A. Al-Kharafi, Kuwait	6,000.00
15) Academia Chilena de Ciencias, Chile	5,436.00
16) Feng-Min Li, China.	7,500.00
17) Other Membership Fees ²	13,386.43
18) Other Credits ²	1,865.89
19) Interest income	40,353.00
20) Exchange difference	(37.09)
21) Net Transfer from TWAS Endowment Fund (Interest)	575,000.00
	4,628,966.63

EXPENDITURES 2016	Budget	Spent
1] Prizes		
1.1] TWAS - Lenovo Science Prize	120,000	120,000.00
1.2] TWAS Prizes and Medals	145,000	138,062.14
1.3] Prizes for Young Scientists	24,000	32,000.00
1.4] Fellows Prizes	18,000	20,000.00
<i>Sub-Total for [1]</i>	307,000	310,062.14
2] Research Grants	1,000,000	1,758,839.25
3] Fellowships, Associateships and Professorships		
3.1] Fellowship Programmes	290,000	283,580.25
3.2] Associateship, Professorship & Visiting Programmes	121,000	147,029.06
<i>Sub-Total for [3]</i>	411,000	430,609.31
4] Meetings		
4.1] Council and General Meetings	100,000	78,728.35
4.2] Officers and Steering Committee Meetings and Meetings in Trieste	30,000	25,890.34
4.3] Scientific Meetings in the South	60,000	58,867.01
4.4] UN Secretary-General Scientific Advisory Board (SAB), Spring Meeting	40,000	24,990.27
<i>Sub-Total for [4]</i>	230,000	188,475.97
5] Publications	50,000	50,000.00
6] Joint Projects		
6.1] TWAS Regional Offices	200,000	199,805.89
6.2] TWAS/COMSTEC Research Grant	200,000	237,863.01
6.3] TWAS - ICTP Projects	50,000	50,000.00
6.4] AU - TWAS Young Scientists National Award	65,000	
6.5] International Science Diplomacy Programme	55,000	26,631.12
6.6] TWAS - DST Project	148,000	
6.7] TWAS - OWSD Project	15,000	14,528.50
6.8] TWAS - ARO - KFAS Project	50,000	49,999.99
6.9] TWAS - Elsevier Project	80,000	48,484.64
6.10] TWAS - SRMGI Project	90,000	41,675.97
6.11] TWAS - IMU Project	30,000	34,300.00
6.12] TWAS - Lounsbery Project	50,000	
6.13] TWAS - OFID Project	150,000	143,846.48
6.14] TWAS - Lenovo Young Affiliates Network	150,000	17,707.31
<i>Sub-Total for [6]</i>	1,333,000	864,842.91
7] Operational Expenses		
7.1] Staff Costs	1,283,000	1,194,647.59
7.2] ICTP Services	90,000	81,000.00
7.3] Communications	35,000	12,760.29
7.4] Travels	35,000	24,540.50
7.5] Library, office and other supplies	30,000	20,724.38
7.6] Other general operating expenses	30,000	29,913.22
<i>Sub-Total for [7]</i>	1,503,000	1,363,585.98
<i>Total Expenditure</i>	4,834,000	4,966,415.56
<i>Savings on prior years' obligations</i>		701,404.89
Excess (shortfall) of income over expenditure		363,955.96
Reserve Fund³		
Amount available at the beginning of period		2,696,497.88
End of service entitlements		[605,901.29]
Reserve Fund balance end of period		2,090,596.59

¹ All contributions are expressed in US dollars and have been converted using the UN official rate of exchange in effect at the time the contributions were received.

² This amount comprises donations from TWAS members, individuals and other organisations' contributions [details next page].

³ The purpose of the Reserve Fund is to cover the end-of-service entitlements of TWAS staff.

TWAS ENDOWMENT FUND 1994-2016¹ (IN USD)

ORGANIZATIONS	CONTRIBUTIONS RECEIVED
1) Ministry of Sciences and Technology, [China]	2,200,000
2) Ministry of Science & Technology [Brazil]	1,933,107
3) Department of Science & Technology [India]	1,000,000
4) National Science & Technology Council [Mexico]	664,155
5) Academia Sinica [Taiwan, China]	608,915
6) Ministry of Science & Technology [Nigeria]	586,779
7) Kuwait Foundation for the Advancement of Sciences, KFAS [Kuwait]	500,000
8) Ministry of Research, Science and Technology [Iran, I.R.]	269,183
9) Ministry of Science, Technology & the Environment [Malaysia]	100,000
10) Ministry of Science & Technology [Pakistan]	100,000
11) Secretariat of Science and Technology [Argentina]	55,000
12) Ministry of Modernization & Technology [Senegal]	52,887
13) Colombian Institute for the Development of Science & Technology – Colciencias [Colombia]	50,000
14) Ministry of State for Scientific Research [Egypt]	50,000
15) Atomic Energy Commission [Syria]	50,000
16) Ministry of Finance, [Sudan]	49,850
17) National Centre for Science and Technology of Vietnam [Vietnam]	20,000
18) National Academy of Science and Technology [Philippines]	11,957
19) Ministry of Science & Technology [Bangladesh]	10,000
20) Ministry of Science, Technology and Higher Education [Tanzania]	4,529
21) Swedish Council of Higher Education [Sweden]	1,302
22) Office of the Prime Minister [Jamaica]	1,000
23) Instituto Venezolano de Investigaciones Científicas [IVIC] [Venezuela]	300
<i>Subtotal</i>	8,318,964
<i>Plus other contributions²</i>	176,878
<i>Plus interest earned</i>	5,886,421
<i>Transfer to/from TWAS Fund in 2011 and 2013, 2014, 2015 and 2016</i>	[2,225,768]
TOTAL	12,156,495

¹ The aim of setting up this endowment fund was to build a fund of USD25 million, with interest earnings to cover costs of the secretariat and basic programmes.

² This amount comprises donations from TWAS members, individuals and other organisations' contributions (see separate list, next page)

**CONTRIBUTIONS TO THE ENDOWMENT FUND FROM TWAS MEMBERS,
INDIVIDUALS AND OTHERS (1994-2016)**

Wook Hyun Kwon, Korea Rep.	30,000	H.E. Varmus, USA	1,000	H. Chaimovich, Brazil	300
Bai Chunli, China	21,770	Yam Vivian Wing-Wah, China	1,000	S. Datta, India	300
M.H.A. Hassan, Sudan	10,803	Wong Henry Nai Ching, China	1,000	L. Davidovich, Brazil	300
J. Palis, Brazil	10,079	Y. Yuthavong, Thailand	1,000	Min Enze, China	300
Science Initiative Group, USA	6,250	Cheng, Hui-Ming, China	985	R. Garruto, USA	300
J.I. Vargas, Brazil	5,287	P. Ciarlet, France	985	Long Yiming, China	300
S.S. Katiyar, India	4,100	Lee Yuan T., Taiwan, China	977	Mei Hong, China	300
A.V. Rama Rao, India	3,000	E.K.A. Edee, Togo	900	Sang Yup Lee, Korea Rep.	300
A. Hamoui, Syria	2,500	J.-M. Lehn, France	840	M.M. Peixoto, Brazil	300
M. Peimbert, Mexico	2,500	J. Döbereiner, Brazil	800	H. Ramkissoon, Trinidad & Tobago	300
Lu Yong Xiang, China	2,300	M. Munasinghe, Sri Lanka	750	Shi Changxu, China	300
P. McGrath, UK	2,046	M. Akhtar, Pakistan	700	S. Sivaram, India	300
M. Iqbal Parker, South Africa	2,000	B.L. Deekshatulu, India	700	Zhai Mingguo, China	300
K. Namsrai, Mongolia	1,858	A. Paulrai, USA	700	Su Zhao-Bin, China	300
P.A. Griffiths, USA	1,750	Wu Yue-Liang, China	666	B. Tsetseg, Mongolia	300
Fuchu He, China	1,620	D. Balasubramanian, India	650	Yu Lu, China	300
R. Miledi, USA	1,320	L. de la Pena Auerbach, Mexico	642	Zhao Zhongxian, China	300
L.N. Johnson, UK	1,281	Un-Chul Paek, USA	634	Li Jinghai, China	296
J. Garidkhuu, Mongolia	1,221	Dong Shaojun, China	600	M. O'Kane, Australia	288
F. El-Baz, Egypt	1,200	F.R.I. Kayanja, Uganda	600	J.S. Yadav, India	285
H. Fuchs, Germany	1,106	L.F. Rodriguez, Mexico	600	Zhang Ya-Ping, China	285
C.N.R. Rao, India	1,131	Wang Erkang, China	600	Wang Fosong, China	280
E.W. Thulstrup, Denmark	1,062	Zhao Jincai, China	525	B.M. Abegaz, Ethiopia	272
A. Badran, Jordan	1,045	J. Allende, Chile	500	M. Limonta, Mexico	250
B.N. Upreti, Nepal	1,037	E.H.S. Diop, Senegal	500	Chen Sai-Juan, China	200
ANSTS, Senegal	1,029	M.V. George, India	500	Chen Zhu, China	200
CAPRISA, South Africa	1,000	D.T. Lê, Vietnam	500	T. Durrani, UK	200
Shui-Chin Foundation, Taiwan, China	1,000	Li Desheng, China	500	A. Falodun, Nigeria	200
I. Eltayeb, Oman	1,000	G. Thottappilly, India	500	E. Igbinosa, Nigeria	200
E.M. Essien, Nigeria	1,000	C. Vieira, Brazil	500	S. I. Ola, Nigeria	200
M. Hamdan, Jordan	1,000	Z.H. Zaidi, Pakistan	500	R. Ramaswamy, India	200
M. Klein, USA	1,000	M. Clegg, USA	494	A.K. Sood, India	200
A. Kornhauser, Slovenia	1,000	Li Yiyi, China	465	E. Unuabonah, Nigeria	200
A.O. Kuku, Nigeria	1,000	I. Saavedra, Chile	443	A. Bahri, Tunisia	143
G.S. Khush, Philippines	1,000	R. Crewe, South Africa	400	H. Roesky, Germany	106
P. Littlewood, UK	1,000	A.H.O. Hajiyeve, Azerbaijan	400	U. Aswathanaray, India	100
Lee Wu Yan-Hwa, Taiwan, China	1,000	S.S. Hasnain, UK	400	K. Basu, USA	100
S.Q. Mehdi, Pakistan	1,000	S. J. Jabbur, Lebanon	400	N. Kumar, India	100
J.L. Moran Lopez, Mexico	1,000	T. Obi, Nigeria	400	M.A.J. Mariscotti, Argentina	100
K.E. Mshigeni, Tanzania	1,000	M. Tchuenta, Cameroon	400	H.K. Majumder, India	100
R. Murenzi, USA/Rwanda [KIST]	1,000	M.P. Alpers, Australia	331	S.M. Muhongo, South Africa	100
Sang-Dai Park, Korea Rep.	1,000	Mu Guoguang, China	330	R. Zare, USA	100
Pei Gang, China	1,000	H. Van Ginkel, The Netherlands	327	U. Colombo, Italy	97
G.T. Prance, UK	1,000	S. Ayupov, Uzbekistan	300	A. Peeraly, Canada	86
I. Serageldin, Egypt	1,000	R.P. Bambah, India	300	A.M. Cetto, Mexico	51
Y. Sobouti, Iran, I.R.	1,000	A.C. Cerda, Chile	300	Total	176,878

**VOLUNTARY CONTRIBUTIONS RECEIVED FROM TWAS MEMBERS,
INDIVIDUALS AND OTHER ORGANISATIONS**

Other TWAS Members	2,347.85	Tsai Ming-Daw, Taiwan, China	300.00
Swedish Council of Higher Education, Sweden	1,669.19	Ramkissoon, H., Trinidad and Tobago	300.00
Bai Chunli, China	1,255.00	Zhao, Jincai, China	300.00
Ciarlet, P.G., France	1,106.19	Limonta Vidal, M., Cuba	260.00
Daubechies, I., USA	1,000.00	Hounkonnou, M.N., Benin	200.00
Chan Sunney I., Taiwan, China	1,000.00	Sathyamurthy, N., India	200.00
Cheng Hui-Ming, China	1,000.00	Gros, F., France	145.25
Zichichi, A., Switzerland	549.33	Roesky, H. W., Germany	110.99
Ding Zhongli, China	500.00	Mutabingwa, T., Tanzania	100.00
Huang Jikun, China	500.00	Yuan Yaxiang, China	100.00
Toure, M., Senegal	487.70	Gupta, M.P., Panama	100.00
Rosswall, T., Sweden	443.95	Jarvis M. and Lempinen, E., USA	96.70
Phan Quoc Khanh, Vietnam	350.00	Cetto Kramis, A.M., Mexico	96.61
Alpers, M.P., Australia	336.96	de la Peña, J.A., Mexico	96.60
Diop, S., Senegal	300.00	TOTAL	15,252.32

Every donation, large or small, directly supports the advancement of science, engineering and technology in developing nations and demonstrates commitment to the Academy's vital mission. To make a donation, please visit www.twas.org/support-twas

2016 TWAS FELLOWS AND YOUNG AFFILIATES

TWAS FELLOWS ELECTED IN 2016

Agricultural Sciences

CAO, Xiaofeng [China]
 FANTA, Demel Teketay [Ethiopia]
 VARSHNEY, Rajeev Kumar [India]

Structural, Cell and Molecular Biology

LI, Peng [China]
 RUBINSTEIN, Marcelo [Argentina]

Biological Systems and Organisms

CHIANG, Ann-Shyn [Taiwan, China]
 KHURANA, Paramjit [India]
 RENTALA, Madhubala [India]
 VALENTE GAIESKY, Vera Lúcia da Silva [Brazil]

Medical and Health Sciences incl.

Neurosciences

ALI, Nahid [India]
 BOUSKELA, Eliete [Brazil]
 FORRESTER, Terrence [Jamaica]
 STEIN, Dan [South Africa]

Chemical Sciences

LI, Chao-Jun [Canada]
 SINGH, Vinod Kumar [India]
 TAN, Weihong [China]
 YU, Jihong [China]

Engineering Sciences

AL-NIMR, Moh'd Ahmad Mohammad [Jordan]
 LIU, Weimin [China]
 LU, Gaoqing "Max" [Australia]
 PAL, Nikhil Ranjan [India]
 RAMAMURTY, Upadrasta [India]

Astronomy, Space and Earth Sciences

CHEN, Fahu [China]
 CHOUDHURI, Arnab Rai [India]

FERREIRA, Valderez P. [Brazil]
 KULMALA, Markku Tapio [Finland]

Mathematical Sciences

DE LOS REYES, Juan Carlos [Ecuador]
 GRÖTSCHHEL, Martin [Germany]
 KHANDUJA, Sudesh Kaur [India]
 PUJALS, Enrique [Argentina]
 ZHANG, Pingwen [China]

Physics

MENCHACA-ROCHA, Arturo [Mexico]
 TRIVEDI, Sandip [India]
 TURKI KAMOUN, Najoua [Tunisia]
 WANG, Wei Hua [China]
 WANG, Yifang [China]

Social and Economic Sciences

BAKIBINGA, David Justin [Uganda]
 CHU, Yun-han [Taiwan, China]
 YESPOLOV, Tlektas [Kazakhstan]
 ZHENG, Xiaoying [China]

NEW TWAS YOUNG AFFILIATES IN 2016

Sub-Saharan Africa:

- Olaniyi Fawole [South Africa]
- Michelle Greve [South Africa]
- Julius Kofi Hagan [Ghana]
- Huda Neeto [Mauritius]
- Victorien Tamegnon Dougnon [Benin]

Arab Region:

- Ahmed Farag Ali [Egypt]
- Murad Abdallah AlDamen [Jordan]
- Haikel Jelassi [Tunisia]
- Ramia Al Bakain [Jordan]
- Sayed Ali Maha Nasr [Egypt]

Latin America & Caribbean:

- Pablo Alberto Bolaños-Villegas [Costa Rica]
- Franco Martin Cabrerizo [Argentina]
- Ronald Eduardo Vargas Balda [Venezuela]
- Christian Andrés Marcelo Wilson Moya [Chile]
- Patricia Zancan [Brazil]

East and Southeast Asia and Pacific:

- Xiao Feng [China]
- Yu-Chin Hsu [Taiwan, China]
- Hiep Pham [Vietnam]

Central and South Asia:

- Abha Misra [India]
- Sushila Maharjan [Nepal]
- Mirabbos Hojamberdiev [Uzbekistan]
- Farhana Khanam [Bangladesh]
- Syed Ghulam Musharraf [Pakistan]

PRIZES AWARDED IN 2016

Prizes and awards create global recognition for discoveries and innovation by scientists in the South, while providing an incentive for other researchers to do their best work. Today, honours from TWAS and its partners are among the most prestigious given for research in the South. They range from the TWAS-Lenovo Science Prize, which celebrates research of the highest impact, to prizes for early-career scientists.

TWAS-Lenovo Prize (chemistry)

- Zhao Dongyuan [China]

TWAS Medal Lectures

- Samira Omar Asem [Kuwait]
- Daan Frenkel [UK]
- Jean Bosco Gahutu [Rwanda]

TWAS Prizes

- Ismail Cakmak [Turkey] won the agricultural science prize for his work on improving the nutritional quality of crops and effects of zinc on crops.
- Amitabha Chattopadhyay [India] shared the biology prize for his contribution researching the importance of cholesterol in cell membranes to health.
- Zhou Qi [China] shared the biology prize for his contributions to the science of how stem cell develop into functional bodily cells, as well basic research on stem cells and their applications.
- Zhao Yuliang [China] won the chemistry prize for his pioneering work on nanoscale safety analysis and chemistry, leading to an innovation in nanoscale cancer medicine.
- Mario Hamuy [Chile] won the Earth, astronomy and space sciences prize for his

work on supernovae, using their luminosities to determine the acceleration of the expansion of the universe.

- Carlos Artemio Coello Coello [Mexico] won the engineering prize for his contributions in developing new algorithms based on problem-solving techniques inspired by biology.
- Lorenzo Justiniano Díaz Casado [Brazil] won the mathematics prize for his fundamental contributions to dynamical systems theory.
- Shiraz Minwalla [India] won the physics prize for influential contributions to theoretical physics and the discoveries in charged relativistic hydrodynamics.
- Marilda Sotomayor [Brazil] won the social sciences prize for her contribution and innovative research on the ways mutually beneficial economic relations form over time.

C.N.R. Rao Prize for scientific research

- Mahouton Norbert Hounkonnou [Benin]

Atta-ur-Rahman Prize in Chemistry

- Bijay Singh [Nepal]

Fayzah M. Al-Kharafi Prize

- Marian Nkansah [Ghana]

TWAS Regional Prizes in Building Scientific Institutions

- Pablo Valenzuela [Chile]
- Eric Karunanayake [Sri Lanka]
- Mohammed Shabat [Palestine, West Bank and Gaza Strip]
- Glenda Gray [South Africa]

TWAS Regional Prize in Public Understanding and Popularization of Science

- Zhong Qi [China]

Elsevier Foundation Awards for Early-Career Women Scientists in the Developing World (biological sciences)

Award co-organized by the Organization for Women in Science for the Developing World [OWSD] and TWAS

- Etheldreda Nakimuli-Mpungu [Uganda]
- Sri Fatmawati [Indonesia]
- Sushila Maharjan [Nepal]
- Magaly Blas [Peru]
- Ghanya Al-Naqeb [Yemen]

TWAS Prizes for Young Scientists in Developing Countries

- Md. Asaduzzaman [Bangladesh], agricultural sciences
- Samia Subrina [Bangladesh], physical sciences
- Juan Carlos Galvis-Arrieta [Colombia], mathematics
- Mauricio Fernando Velasco [Colombia], mathematics
- Alvaro José Guevara Villalobos [Costa Rica], molecular biology and biotechnology
- Juliette Valdés-Infante Herrero [Cuba] basic sciences
- Roberto Cao Milan [Cuba], chemistry
- Maria Luisa Muller Theissen [Guatemala], infectious diseases
- Khatereh Rezaeian [Iran, Isl. Rep.], chemistry
- Mahdokht Arshadi [Iran, Isl. Rep.], biotechnology
- Amani Abdelhadi [Jordan], renewable energy
- Amarsanaa Badгаа [Mongolia], biology
- Otgonbayar Uuye [Mongolia], mathematics
- Saraswati Acharya [Nepal], mathematics
- Mubasher Jamil [Pakistan], basic sciences
- Rolando Gittens [Panama], medical sciences

- Manuel Joseph Loquias [Philippines], mathematics
- Kariyawasam M.G.G. Jayasuriya [Sri Lanka], biology
- Meththika Suharshani Vithanage [Sri Lanka], chemistry
- Duangkamon Baowan [Thailand], mathematics
- Nagarani Ponakala [Trinidad and Tobago], mathematics
- Khusniddin Olimov [Uzbekistan], physics

African Union-TWAS Awards (for young scientists)

- Victorien Tamégnon Dougnon [Benin], Earth and life sciences
- Rayim Wendé Alice Nare [Burkina Faso], Earth and life sciences
- Mohamed Abumandour [Egypt], Earth and life sciences
- Rehab N. Shamma [Egypt], basic sciences, technology and innovation
- Frederick Adzitey [Ghana], basic sciences, technology and innovation
- Lebajoa Mphatsi [Lesotho], basic sciences, technology and innovation
- Limbikani Matumba [Malawi], Earth and life sciences
- Etinosa O. Igbinosa [Nigeria], Earth and life sciences
- Sunny Abarikwu [Nigeria], basic sciences, technology and innovation
- Sabelo Dalton Mhlanga [South Africa], basic sciences, technology and innovation
- Ntakadzeni Madala [South Africa], Earth and life sciences
- Abdelrahman Ahmed Elbadawi Elbadawi [Sudan], basic sciences, technology and innovation
- Magda Mohammed Abed Algader Mohammed Ahmed [Sudan], Earth and life sciences

THE TWAS SECRETARIAT

Executive Director's Office

Executive Director: Romain Murenzi
[until 30 June 2016]

Interim Executive Director: Mohamed H.A. Hassan
[from 1 July 2016]

Special Adviser: Giusto Sciarabba

Helen Martin
Sandra Ravalico
Vanessa Varnier

Finance and Administration

Administrative Officer: Dag Harald Johannessen
[part-time]

Marco Beltramini
Sabina Caris
Antonino Coppola
Patricia Presiren
Paola Vespa
Ezio Vuck

Programmes and Activities

Programme Coordinator: Massimo Paoli
[from February 2016]

Sabina Caris
Sara Dalafi
Antonella Mastrolia
Fabrizia Niscio
Payal Patel
Cristina Simoes

Public Information Office

Public Information Officer: Edward W. Lempinen
Gisela Isten [until April 2016]
Francesca Pettoello [from February 2016]
Cristina Serra
Sean Treacy

OWSD - Organization for Women in Science for the Developing World

Coordinator: Tonya Blowers
Tanja Bole
Lucia Fanicchi [from June 2016]
Marina Juricev
Leena Mungapen [until June 2016]
Silke Rosemarie Pranzetti [from September 2016]
Zabeeh Ullah Sahil [from August 2016]

GenderInSITE

Director: Alice Abreu
Erin Johnson

InterAcademy Partnership (IAP)

Coordinator: Peter McGrath
Sabina Caris [from January 2016]
Muthoni Kareithi
Joanna Lacey [until March 2016]

For specific contact details, see:
www.twas.org/contacts

TWAS ANNUAL REPORT 2016

TWAS Executive Director

Romain Murenzi/
Mohamed Hassan [a.i.]

Public Information Officer

Edward W. Lempinen

Coordinator

Sean Treacy

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The American Association for the Advancement of Science (AAAS)

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