



United Nations  
Educational, Scientific and  
Cultural Organization

*twas*

# ANNUAL REPORT 2018

THE WORLD ACADEMY OF SCIENCES

*for the advancement of science in developing countries*





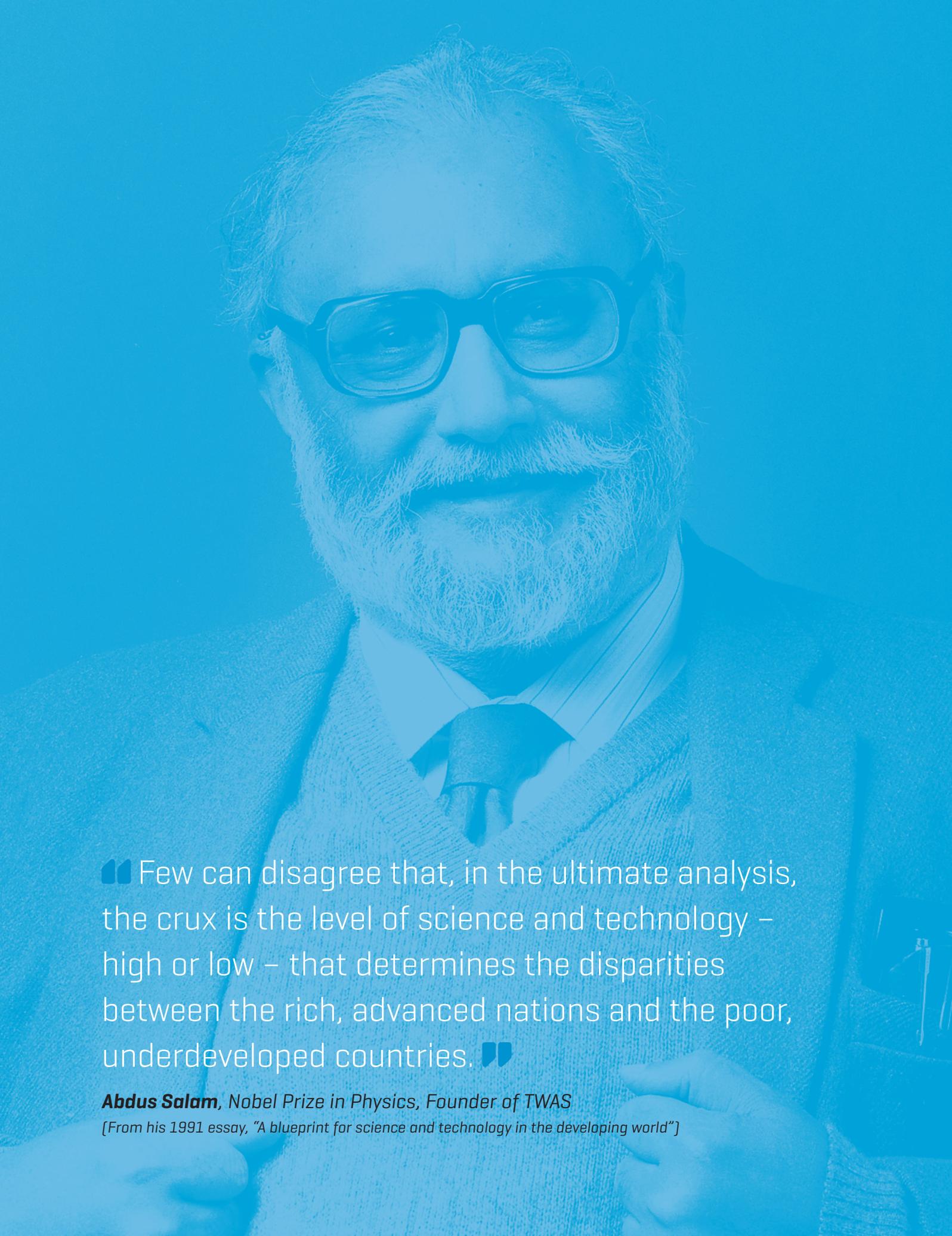
*twas*

A large, light blue world map composed of a grid of small dots, serving as a background for the title text.

**A N N U A L R E P O R T**  
**2018**

THE WORLD ACADEMY OF SCIENCES

*for the advancement of science in developing countries*



“Few can disagree that, in the ultimate analysis, the crux is the level of science and technology – high or low – that determines the disparities between the rich, advanced nations and the poor, underdeveloped countries.”

**Abdus Salam**, Nobel Prize in Physics, Founder of TWAS

[From his 1991 essay, “A blueprint for science and technology in the developing world”]



▲ Zelalem Urgessa of Ethiopia (second from right) interacts with colleagues at Justus Liebig University in Giessen, Germany. He was there through the TWAS-DFG Cooperation Visits Programme.

**Cover photo:** Emmanuel Unuabonah (in gray), is a Nigerian chemist, TWAS research grant recipient and TWAS Young Affiliate Alumnus. A number of his students are now going on to seek PhDs.

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# THE TWAS COUNCIL

*The TWAS Council, elected by members every three years, is responsible for supervising all Academy affairs. This Council was elected in January 2016 and served until the end of 2018.*

*President*

**Bai Chunli** [China]

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*Immediate Past President*

**Jacob Palis** [Brazil]

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*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]

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*Secretary General*

**Ajay K. Sood** [India]

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*Treasurer*

**Samira Omar Asem** [Kuwait]

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*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, Abdus Salam International Centre for Theoretical Physics [ICTP]

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# THE TWAS MISSION

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*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. By the end of 2018, TWAS had about 1,260 elected Fellows representing 104 countries; 14 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. The Swedish International Development Cooperation Agency – Sida – provides essential programmatic funding. 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.

# 2018:

## RECENT SUCCESSES, FUTURE CHALLENGES



by **Bai Chunli**  
TWAS President

*Since the founding of TWAS 35 years ago, the mission defined by founder Abdus Salam has remained consistent: To build science for sustainable prosperity in the developing world. Following the remarkable achievements of Salam, each TWAS president has worked to build on the achievements of those who preceded him.*

Throughout the Academy's history, each year has brought challenges, and yet we consistently have been defined by our positive influence. 2018 follows that precedent. Our programmes are growing, as are our global presence and impact. But as this year ends, so does my second term as TWAS president, and I find myself reflecting on the progress that we have achieved not just this year, but during our six years working together.

- TWAS membership has extended to more than a dozen new countries, including four of the Least Developed Countries [LDCs]: the Central African Republic, the Democratic Republic of Congo, Zambia and the Lao People's Democratic Republic. For the first time, we have members representing 100 countries – 104, to be exact. And women now comprise 13.2%

of our membership, compared to 9.8% at the start of 2013.

- For the first time in TWAS history, over 1,000 young scientists are studying for their PhDs in TWAS programmes. We created over 200 new PhDs in these six years – nearly 50 in LDCs. And hundreds of others are still working toward their degrees.
- Thanks to support from Sida and COMSTECH, we have distributed 470 research grants since 2013, totaling USD7.9 million. These grants have gone to scientists in 52 countries – including 147 grants in 17 LDCs.
- We have established a number of new prizes: the TWAS-Lenovo Science Prize, thanks to our generous friends at Lenovo, along with awards named for several illustrious TWAS Fellows.
- We have supported the founding of new



▲ TWAS Council Members at the 28th General Meeting, from left: Mahabir Prashad Gupta of Panama; TWAS Vice President Manuel Limonta-Vidal of Cuba; Bishal Nath Upreti of Nepal; TWAS Vice President Khatijah M. Yusoff of Malaysia; Abdel Nasser Tawfik of Egypt; TWAS Secretary General Ajay Sood of India; TWAS President Bai Chunli of China; and TWAS Vice President Mohammed Hamdan of Jordan. Furthest right is TWAS Executive Director Romain Murenzi. [Photo: Paola Di Bella for TWAS]

▼ Mohamed H.A. Hassan.



science academies in countries such as Ecuador and Rwanda.

- And the TWAS Young Affiliates Network, founded in 2016, is having an international impact thanks to the energy and commitment of its members.

All of these accomplishments are a great source of pride for our Academy – for the Council, for our Fellows and Young Affiliates, for our many partners, and for our Secretariat in Trieste and our colleagues in the five Regional Partnerships.

But I must repeat an observation that has been made by the distinguished leaders who preceded me as TWAS president, and no doubt by Prof. Salam himself:

There is still so much important work that remains to be done.

Africa is a continent of growing skill and confidence. But we also know that its needs are great – in the production and distribution of food, clean water and energy, for example, or providing health care and protecting biodiversity. To achieve its full potential, Africa will need hundreds of thousands of new scientists, engineers and science teachers.

In Africa – and in other regions of the developing world – what shall we do to increase our impact?

How will we increase the presence of women in science, and in our Academy? How will we extend into countries where there currently are no TWAS members?

The challenges are urgent, not just for the strength of TWAS, but for the progress of science in the developing world.

Therefore I am honoured, now, to hand these challenges to a scholar and diplomat who is uniquely equipped to address them: new TWAS President Mohamed H.A. Hassan, the Academy's founding executive director and former treasurer. Prof. Hassan is a globally known advocate for science and science policy in the developing world. His experience is unmatched, and his networks are vast.

In these six years, we have accomplished many good things. It is my sincere hope that, as I move into the role of past-president, we will continue to work together to achieve the advance of science that has been envisioned by TWAS leaders and members throughout our history.

# A YEAR O

*For TWAS, 2018 was a year of significant expansion in programmes, networks and the reach of its communication. The Academy continues to provide important opportunities to researchers from the developing world, and it is increasingly influential globally as a centre for science policy and diplomacy. Among the Academy's central accomplishments:*

## 1 Trieste hosts 28th General Meeting

The Academy's strong partnership with Italy has long been essential for its work around the globe. In 2018, TWAS held its 14th General Conference and 28th General Meeting in Trieste, Italy, its headquarters city. The meeting drew some 250 scientists, policymakers and educators from more than 60 nations. At the meeting, such subjects as the use of stem cells to restore eyesight and the promise and problems posed by artificial intelligence were explored by experts in those fields. [For more on the General Meeting, see page 14]

## 2 Initiatives for displaced researchers

The Academy took part in several initiatives designed to assist scientists displaced by conflict. Among them was a gathering under the banner of Science International of



four organizations, including TWAS and the InterAcademy Partnership (IAP), to explore policy and programmes for at-risk scientists. Science institutions in Trieste and Friuli Venezia Giulia signed an agreement to support researchers displaced by war. Finally, TWAS's film on the subject, "Science in Exile", was shown in two dozen countries on six continents. [For more on science diplomacy, please see page 24]

# F IMPACT



### 3 Bringing grantees together in Africa

TWAS hosted its first regional research grants conference in August in Dar es Salaam, Tanzania, convening 28 past TWAS research grant winners from 17 African countries. The aim: provide African scientists with tools to sharpen their skills, increase their competitiveness and improve scientific outcomes and networking. The conference was underwritten by the Swedish International Development Cooperation Agency [Sida]. [For more on TWAS Research Grants, see page 20]



### 4 An online directory of TWAS scientists

The new TWAS Online Directory of Fellows and Young Affiliates for the first time offered the public a view of the strength and impact of the Academy's global membership. The Directory provides profiles of some 1,260 elected lifetime Fellows and nearly 100 Young Affiliates. Replacing the printed TWAS Yearbook, the directory is a highly interactive digital advancement that anyone can access. [For more on the TWAS communication, see page 34]



### 5 Hassan elected TWAS president

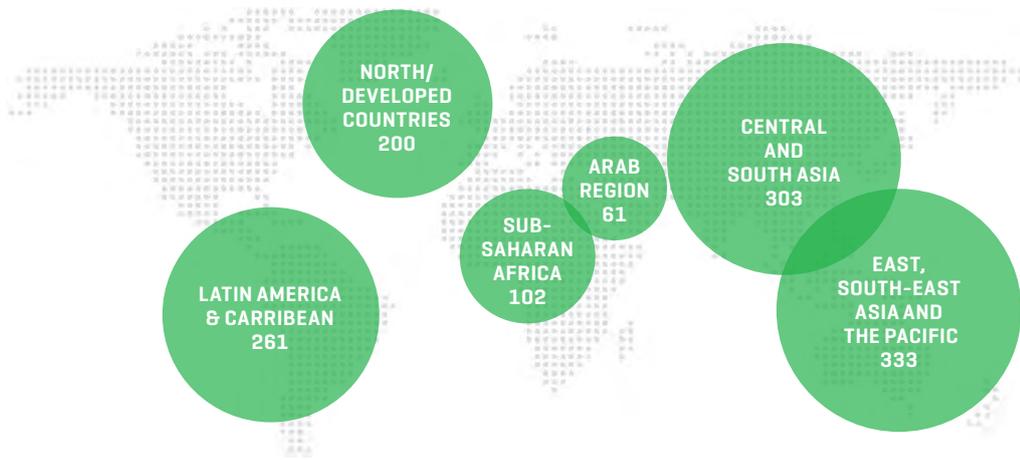
Mohamed H.A. Hassan, the founding executive director who helped to build TWAS into a global voice for science in the developing world, is returning as its president in January 2019. Hassan [at right in photo] will succeed TWAS President Bai Chunli of China, who took office in 2013 and served two three-year terms. Hassan is a prominent and influential leader in international science and science policy. [For more on science and policy, see page 22]

# WHO W

**T**WAS 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 lifetime Fellows.

In 2017, the TWAS Council decided that Fellows elected in December of one year would be inducted 1 January of the following year. The charts below represent the membership including those elected in 2018 but inducted for 2019.

## Fellows from developing countries, by region



## TWAS Fellows elected in 2018, by region



For a full list of fellows inducted in 2018, please see page 42

## Fellows

-  **1,260**  
TOTAL FELLOWS
-  **104**  
COUNTRIES
-  **82%**  
LIVE AND WORK  
IN DEVELOPING  
COUNTRIES
-  **14**  
NOBEL PRIZE  
LAUREATES

## TWAS Fellows elected in 2018 by country:

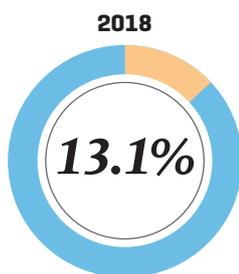
- 14** CHINA
- 6** INDIA
- 5** BRAZIL
- 2** ARGENTINA; LAO PDR\*; TAIWAN, CHINA; UNITED STATES
- 1** BOLIVIA\*; IRAQ; JORDAN; KENYA; LIBYA\*; NICARAGUA\*; NIGERIA; REPUBLIC OF KOREA; SOUTH AFRICA; SUDAN; TURKEY; UZBEKISTAN; ZAMBIA\*

\* The first Fellows elected from these countries.

# E ARE

## FELLOWS AND YOUNG AFFILIATES

### Women Fellows



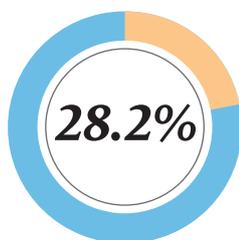
165 WOMEN OUT OF 1,260 MEMBERS

1984



2 WOMEN OUT OF 55 MEMBERS

### New Fellows



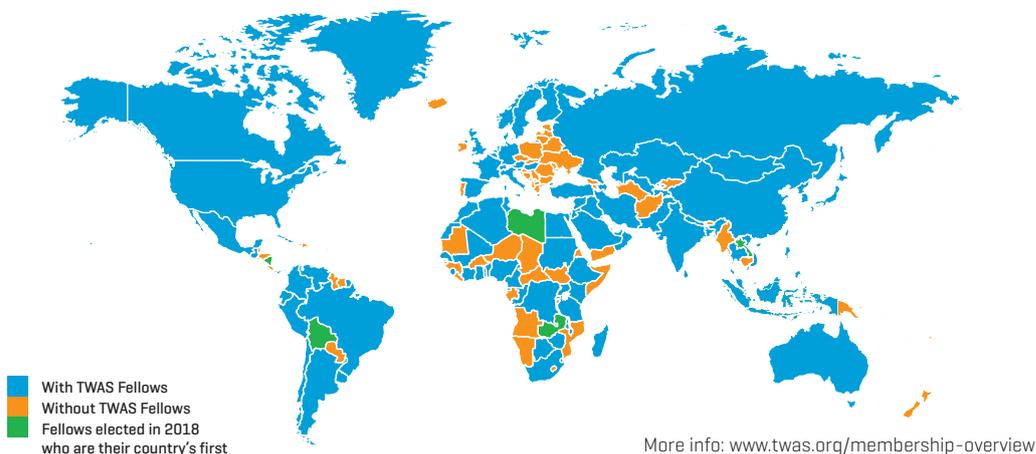
13 OUT OF 46 TWAS FELLOWS ELECTED IN 2018 WERE WOMEN

For a list of Fellows elected in 2018, please see page 42.

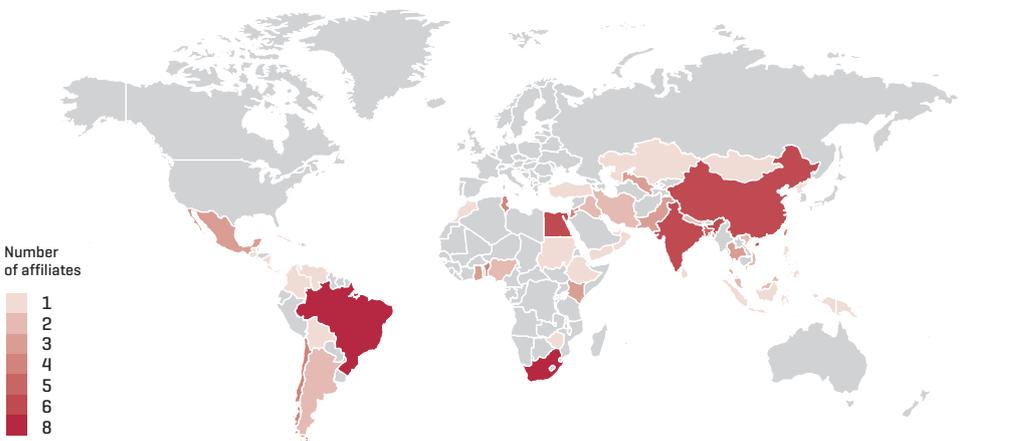
Four long-time allies provide indispensable support that makes the work of TWAS possible:

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

### Countries with and without TWAS Fellows



### TWAS Young Affiliates in 2018 by country of residence



# TWAS PA

## INTERNATIONAL/NORTH

- Abdus Salam International Centre for Theoretical Physics [ICTP]
- Accademia dei Lincei, Italy
- Al-Fanar Media of Alexandria Trust
- Alexander von Humboldt Foundation [AvH], Germany
- American Association for the Advancement of Science [AAAS]
- Biovision, France
- Council for At-Risk Academics [CARA]
- Elsevier Foundation, Netherlands
- Environmental Defense Fund [EDF], U.S.
- Euro-Mediterranean University [EMUNI], Slovenia
- EuroScience Open Forum [ESOF], France
- Fondazione Internazionale Trieste [FIT]
- French Foundation for Rare Diseases
- GenderInSITE
- German Research Foundation [DFG]
- Global Research Council [GRC]
- Global Young Academy [GYA]
- Institute for International Education - Scholar Rescue Fund
- The InterAcademy Partnership [IAP]
- International Development Research Centre [IDRC], Canada
- International Mathematical Union [IMU], Germany

- International Network of Government Science Advice [INGSA]
- International Science Council [ISC], France
- Islamic Development Bank [IsDB]
- Istituto Nazionale di Oceanografia e di Geofisica Sperimentale [OGS], Italy
- Italian National Agency for New Technologies, Energy and Sustainable Economic Development [ENEA]
- International School of Advanced Studies [SISSA]
- Italian Ministry of Foreign Affairs and International Cooperation [MAECI]
- Japan Science and Technology Agency [JST]
- Joint Research Centre [European Commission]
- 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.
- Scholars at Risk
- SciDev.Net
- Science Initiative Group [SIG]
- The Solar Radiation Management Governance Initiative [SRMGI]
- Swedish International Development Cooperation Agency [Sida]
- TWAS Young Affiliates Network

- World Meteorological Organization [WMO]
- United Nations Educational, Scientific and Cultural Organization [UNESCO]
- U.S. National Academies of Sciences, Engineering and Medicine



## LATIN AMERICA & THE CARIBBEAN

- Academia Chilena de Ciencias, Chile
- Academy of Sciences of Ecuador [ACE]
- Brazilian Academy of Sciences [ABC]
- Brazilian Council for Scientific and Technological Development [CNPq]
- Ministry of Science, Technology and Innovation, Brazil
- 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

## ARAB REGION

- Bibliotheca Alexandrina, Egypt
- Kuwait Foundation for the Advancement of Sciences [KFAS]
- Lebanese Association for Scientific Research [LAsER]
- OPEC Fund for International Development [OFID]
- The Royal Scientific Society of Jordan

## EAST AND SOUTH-EAST ASIA AND THE PACIFIC

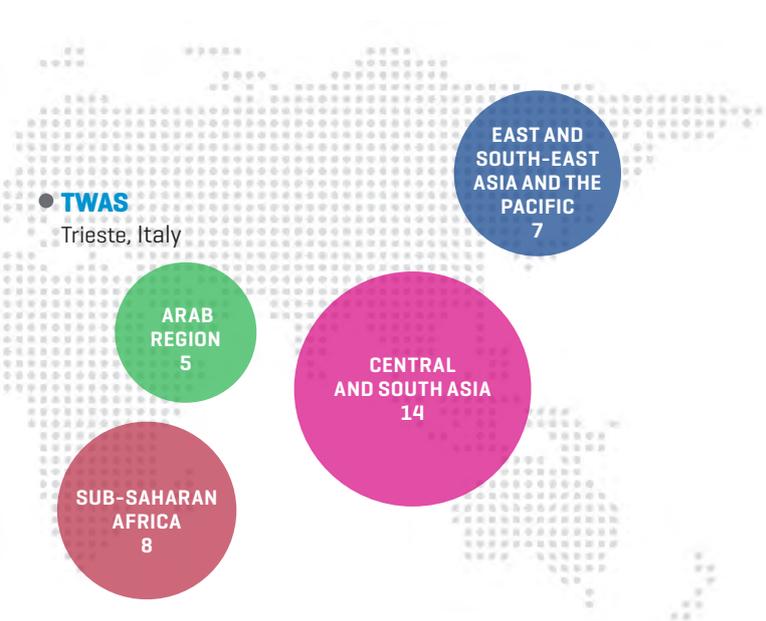
- Academia Sinica [Taiwan, China]
- Center for Genetic Engineering and Biotechnology [BIOTEC], Thailand
- Chinese Academy of Sciences [CAS]
- International Science, Technology and Innovation Centre for South-South Cooperation [ISTIC], Malaysia
- Lenovo Group Ltd., China
- Universiti Putra Malaysia [UPM]
- 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 [COMSTEC], Pakistan
- Council of Scientific and Industrial Research [CSIR], India
- Dawood Foundation, Pakistan
- 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, India
- National Centre for Physics [NCP], Pakistan
- S.N. Bose National Centre for Basic Sciences, India

## 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
- National Research Foundation [NRF], South Africa
- Sudanese National Academy of Sciences [SNAS]
- Tanzania Academy of Sciences [TAAS]



# 28<sup>TH</sup> GENERAL MEETING TRIESTE

Drawing on an international community of researchers and policy experts, TWAS convened its 14th General Conference and 28th General Meeting in its home city of Trieste, Italy, from 25 to 29 November 2018. The gathering featured Academy business meetings, plus lectures by prominent researchers, symposia on cutting-edge science, and ceremonies to honour some of the most accomplished scientists in the developing world.

Trieste is recognised as an influential European city of science, with local institutions working internationally in fields such as physics, biotechnology and astronomy.

Forty-six new TWAS Fellows were elected during the meeting, raising the total membership to 1,260. In addition, the academy elected a new president, long-time TWAS Executive Director Mohamed H.A. Hassan, and a new Council. The meeting marked the Academy's 35th anniversary.

▼ Left: Attendees during the 28th TWAS General Meeting waiting for ceremonies to begin. Right: Hala El-Khozondar, receiving her honor as a TWAS Medal Lecturer at the meeting from TWAS President Bai Chunli.



...  
News from the  
28th General Meeting:  
[www.twas.org/meeting/  
twas-28th-general-meeting](http://www.twas.org/meeting/twas-28th-general-meeting)  
...

► Fabrizio Nicoletti, minister plenipotentiary in the Italian Ministry of Foreign Affairs and International Cooperation, delivered remarks at the opening ceremony of the 14th TWAS General Conference and 28th General Meeting. To the right is TWAS Executive Director Romain Murenzi. [Photo: Paola Di Bella]



### Number of Attendees



**246**  
ATTENDEES



**62**  
REPRESENTED  
COUNTRIES



**138**  
TWAS FELLOWS



**45**  
YOUNG  
AFFILIATES



**11**  
YOUNG  
AFFILIATE  
ALUMNI



**84**  
WOMEN

▼ TWAS Medal Lecturer  
Subra Suresh.



“The Academy ... has proved to be a very dynamic organisation that ensures strong and active support to young scientists from developing and emerging countries with the aim of reducing and eventually removing the existing gaps in terms of knowledge and scientific capacity.”

*Fabrizio Nicoletti, minister plenipotentiary of the Italian Ministry of Foreign Affairs and International Cooperation*

**Symposia on stem cells and big data:** The meeting served as an opportunity to highlight some of the most important advances in science relevant to the developing world.

In one symposium, experts discussed the promise of regenerative medicine based on stem cells, and how this research has become routine in procedures to restore sight. The other, sponsored by the Elsevier Foundation, brought together global experts in big data and machine learning to explain the promise of the technology – and the new dilemmas it poses.

**TWAS Medal Lectures:** Another highlight was the TWAS Medal Lectures, featuring discussions on pioneering work by leading scientists in their fields.

One lecture was by Palestinian materials scientist and 2011 TWAS Fellow Hala J. El-Khozondar, who discussed how special “metamaterials” have provided researchers

Three Trieste scientific institutions provided important support for the 28th TWAS General Meeting: the **Abdus Salam International Centre for Theoretical Physics (ICTP)**; Italy’s **National Institute of Oceanography and Applied Geophysics [Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, or OGS]**; and the **International School for Advanced Studies (SISSA)**.

with new and exciting ways to control the behaviour of light, with implications for wireless communication, optical communication, optical fibre sensors and renewable energy. The other was by 2004 TWAS Fellow Subra Suresh, an Indian-born researcher renowned for his work on connections between cell mechanics and human diseases.

# HONOURING SCIENTIFIC EXCELLENCE

Prizes and awards provide an incentive for scientists to excel on new levels, while bringing global recognition to discoveries achieved by researchers in the developing world.

The **2018 TWAS-Lenovo Prize** went to Indian polymer scientist **R.A. Mashelkar** for his

pioneering research on smart polymer gels that have yielded a long list of useful innovations. His work has had an impact on drug delivery, oil exploration, healing wounds and even the creation of superior synthetic bone grafts.

The TWAS-Lenovo Prize includes USD100,000 provided by Lenovo, the largest PC company in the

▼ From left: Fernando Quevedo and Hazir F.A. Elhaj.



...  
For a list of all  
who won 2018 TWAS  
prizes and awards,  
see page 42  
...



▲ From left: R.A. Mashelkar, Tchakouté Kouamo Hervé, Sedaminou Judith Gbenoudon, Lydie-Stella Koutika and Yeya Tiemoko Touré.

“It is a great pleasure and honour that my efforts are appreciated and brought to the international level. This recognition will help me to expand my work and will encourage other researchers in the field, which will bring real progress for the country.”

*Hazir F.A. Elhaj of Sudan, winner of the 2018 TWAS-Samira Omar Innovation For Sustainability Prize*

### Winners of Young Scientist Prizes from 2018



(Two winners each)

- BANGLADESH
- JORDAN
- MONGOLIA
- NEPAL



(One winner each)

- COLOMBIA
- COSTA RICA
- CUBA
- GUATEMALA
- IRAN, ISL. REP.
- PAKISTAN
- PANAMA
- PERU
- PHILIPPINES
- SRI LANKA
- THAILAND
- UZBEKISTAN
- VIETNAM

world. It is one of the most prestigious honours given to scientists from the developing world.

[Learn more: www.twas.org/node/14551/](http://www.twas.org/node/14551/)

TWAS Fellow **Fernando Quevedo** was awarded the **Abdus Salam Medal** for his strong leadership of the Abdus Salam International Centre for Theoretical Physics (ICTP) and his efforts to build science in the developing world.

[Learn more: www.twas.org/node/14548/](http://www.twas.org/node/14548/)

The Academy has a series of prizes, established in recent years, focused on women from the developing world.

The **TWAS-Abdool Karim Prize** for women scientists in low-income African countries for achievements in biology went to immunologist **Sedaminou Judith Gbenoudon** from Benin for her studies of how malaria and other diseases interact, affecting diagnostic practise.

[Learn more: www.twas.org/node/14554/](http://www.twas.org/node/14554/)

The **TWAS-Samira Omar Innovation for Sustainability Prize**, dedicated to scientists from Least Developed Countries, was awarded to Sudanese researcher **Hazir F.A. Elhaj**, whose work explores the potential of cost-effective bioenergy technologies to provide for the country’s fuel needs while reducing wood and

charcoal use. [The prize is exclusive to women every other year; researchers of both genders were eligible in 2018.]

[Learn more: www.twas.org/node/14541/](http://www.twas.org/node/14541/)

The **Fayzah M. Al-Kharafi Prize**, an annual award that recognizes exceptional women scientists from science- and technology-lagging countries, honoured soil scientist **Lydie-Stella Koutika** of the Republic of the Congo. Her work explores how to enrich nutrient-poor farm and forest soil to address growing poverty and climate change.

[Learn more: www.twas.org/node/14550/](http://www.twas.org/node/14550/)

The **2018 C.N.R. Rao Award** went to Malian medical entomologist and 1997 TWAS Fellow **Yeya Tiemoko Touré** for work that has revealed new understanding of the genetics of *Anopheles gambiae*, one of the mosquitos that transmits malaria.

[Learn more: www.twas.org/node/14540/](http://www.twas.org/node/14540/)

The **2018 Atta-ur-Rahman Award** went to **Tchakouté Kouamo Hervé**, an inorganic chemist in Cameroon, for advances in creating “green” cement that could make construction more sustainable.

[Learn more: www.twas.org/node/14549/](http://www.twas.org/node/14549/)

# 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, Malaysia, Mexico, Pakistan, Thailand and South Africa.

In 2018, a record 1,111 scholars were pursuing their PhDs in TWAS programmes; that

number had passed 1,000 for the first time a year earlier. The number of PhD researchers who graduate also accelerated, climbing from 36 in 2016 to 113 in 2017 and then to 125 in 2018.

Also, TWAS worked with the Islamic Development Bank to develop a new programme of postdoctoral fellowships and research grants, underwritten by USD2.4 million in funding from the Bank. The new programmes will launch in 2019.



## PhD fellowships

 **368**  
OFFERED

 **7** PARTNERS

 **6** COUNTRIES

## Postdoctoral fellowships

 **93**  
OFFERED

 **8** PARTNERS

 **5** COUNTRIES

◀ TWAS-UNESCO Associateship recipient and environmental scientist Elizabeth Oloruntoba, left, conducts field work in Colombo, Sri Lanka.

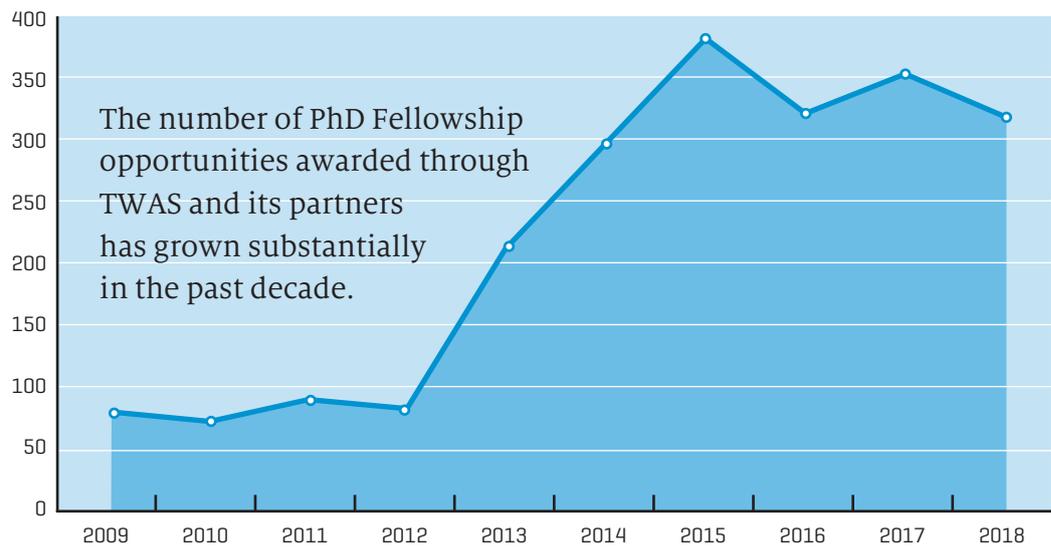
PhD fellows in 2018



1,111

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

TWAS PhD fellowships

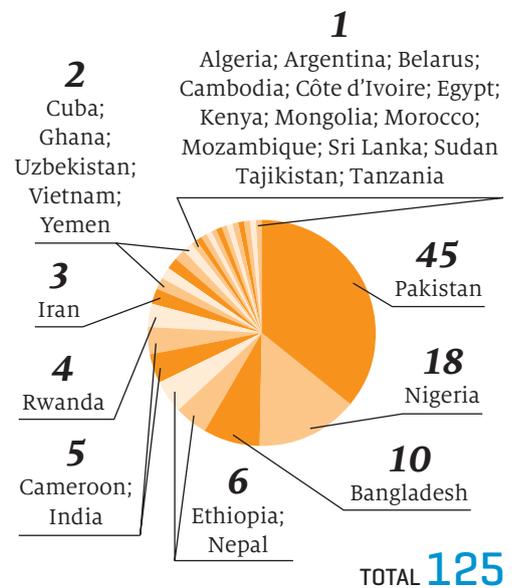


VISITING SCIENTISTS

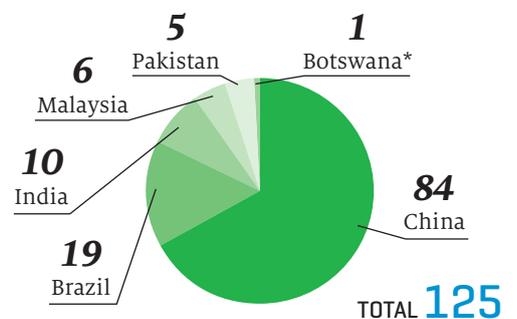
TWAS provides opportunities to established researchers from the South to pursue collaborative research and education or provide needed expertise in a country other than their own. In 2018, the programmes included:

- **TWAS-DFG Cooperation Visits Programme:** 36 new early-career African scientists from ten countries doing three-month postdoctoral research visits in Germany through Deutsche Forschungsgemeinschaft [DFG, or German Research Foundation]
- **TWAS-UNESCO Associateship:** 15 developing-world scientists from 12 countries
- **TWAS Research and Advanced Training Fellowship Programme:** Ten developing-world scientists from eight countries
- **TWAS-Elsevier Foundation Sustainability Visiting Experts:** Seven awardees from six countries
- **Visiting Expert Programme:** Four experts from three countries aiding scientific development in the Global South

Home country for new 2018 PhD recipients



Country of training for new PhDs



(\*Through the International Mathematical Union Breakout Graduate Fellowships in Mathematics, which allows awardees to study in a developing country of their choice.)

“My overall opinion about the TWAS-DFG collaboration programme is that this programme is very useful and valuable. It was a privilege and honour to have a TWAS-DFG fellowship.”

**Sahar Abdalla**, a Sudanese chemist who conducted research on solar cells in Germany through the TWAS-DFG Cooperation Visits Programme

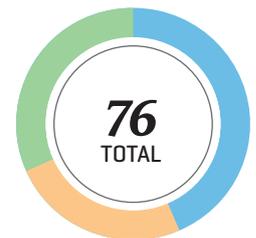
# PROGRESS THROUGH RESEARCH

TWAS provides grants to researchers in targeted developing countries for specialized equipment, consumable supplies, scientific publications, conference participation and the training of master's degree students. These grants help to lay

a foundation for research in countries with scarce resources.

In 2018, the Academy held its second TWAS Research Grants Conference from 28 to 31 August in Dar es Salaam, Tanzania. The conference was organized with funding from

## Research grants awarded in 2018



**33** INDIVIDUAL GRANTS [43.4%]

**19** GROUP GRANTS [25%]

**24** TWAS-COMSTech GRANTS [31.6%]



◀ TWAS convened its second Research Grants conference in Dar es Salaam, Tanzania, giving past grant recipients a chance to network and explore joint projects. From left are 2016 grantee Margaret Samiji from Tanzania; 2017 grantee Milohum Mikesokpo Dzagli from Togo; and 2017 grantee Ibrahim Malidou from Niger.

► Amadou Hamadou Dicko, an agronomer based in Bamako, Mali, is the recipient of a 2017-2019 TWAS grant. [Photo provided]

**Total number of research grants**



**2,446**

RESEARCH GRANTS SINCE THE PROGRAMME BEGAN

**Research grants awarded in 2018**

**38** GRANTS TO LDCS [50% OF 76 TOTAL]

**30** GRANTS TO WOMEN [39.5%]

**Field of research**

**24** BIOLOGY

**17** CHEMISTRY

**8** PHYSICS

**6** PHARMACEUTICAL SCIENCES

**5** ENGINEERING SCIENCES

**5** MATERIAL SCIENCES AND NANOTECHNOLOGY

**3** MATHEMATICS

**3** RENEWABLE ENERGY

**3** INFORMATION TECHNOLOGY AND COMPUTER SCIENCES

**2** EARTH SCIENCES

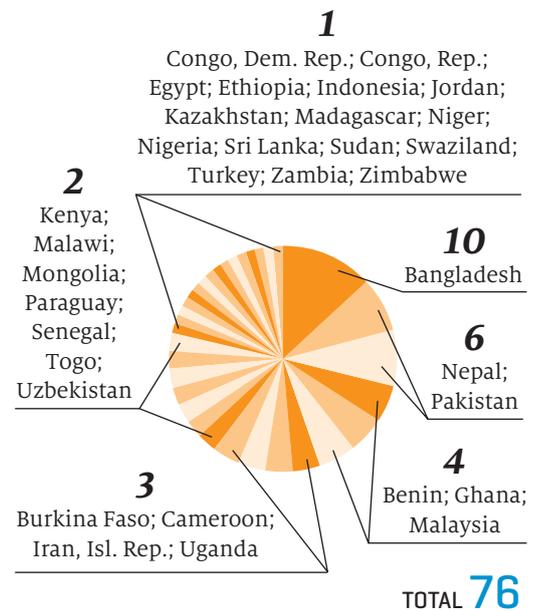


the Swedish International Development Cooperation Agency [Sida] and local support from the Tanzania Academy of Sciences.

The conference hosted 28 past TWAS research grant-winners from 17 African countries. Grantees explored topics such as the principles of intellectual property, writing good proposals and avoiding predatory journals. It was also an opportunity to build their networks across a continent where scientific cooperation is more important than ever.

There were three categories of TWAS Research Grants in 2018. TWAS Research Grants for Individuals provided up to USD15,000

**Where did TWAS research grants go in 2018?**



to early-career researchers in 66 developing countries identified as lagging in science and technology. TWAS Research Grants for Groups provided up to USD30,000 to small research groups in those same countries. Sida supports both grant programmes, totalling USD920,000.

The third is the TWAS-COMSTEC Joint Research Grants programme, which provides 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 [COMSTEC]. These grants totalled USD200,000.



“Funds are difficult to obtain in Burkina Faso. Our national fund committee gives about ten grants per year. But thanks to conferences like TWAS's, we get to know each other, and in the future we may get the best of our expertise and help our communities.”

Grant recipient **Awa Gneme**, who traps mosquitoes and studies their DNA

# SUPPORTING SCIENCE POLICY

With an elite network of over 1,200 scientists from 100-plus countries and 35 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.

**Key support for sustainable development:**

TWAS participated in several initiatives designed to support sustainability science in the developing world and to advance progress toward the Sustainable Development Goals (SDGs).

TWAS joined with the Islamic Development Bank (IsDB) to establish a USD2.5 million investment in scientific capability for the Bank's member countries. The programme under development, for launch in 2019, includes postdoctoral fellowships for early-career scientists from IsDB's least-developed member countries and new grants for joint research and technology transfer projects in IsDB member countries, focused on the SDGs.

[Learn more: www.bit.do/IsDBFund](http://www.bit.do/IsDBFund)

**The Elsevier Foundation-TWAS Sustainability Visiting Expert Programme** sponsored travel



**Hassan elected TWAS president:** Mohamed H.A. Hassan, a distinguished and highly influential Sudanese advocate for science in the South, was elected to serve as the sixth president of TWAS. Hassan was TWAS's founding executive director and served 26 years in that role. He is a globally respected expert on science policy in the developing world, and has served in numerous high-level positions. Currently Hassan serves as chair of the Governing Council for the United Nations' Technology Bank for Least-Developed Countries. Beginning 1 January 2019, he succeeds TWAS President Bai Chunli of China, who took office in 2013 and served two three-year terms.

Hassan in 2018 received a lifetime appointment by Pope Francis to the Pontifical Academy of Sciences. [Learn more: www.twas.org/node/14555/](http://www.twas.org/node/14555/)



▲ Finnish microbial ecologist Merja Itävaara, in the foreground, teaches a class at Yangon University in Myanmar to help the country develop urgently needed research for environmental controls under the Elsevier Foundation-TWAS Sustainability Visiting Expert Programme. [Photo provided]

“ I think Burmese scientists ... are working hard to raise the education level of students and young scientists in their country. The activity and interest of these people give me motivation to work for them. ”

**Merja Itävaara**

for six experts to build sustainability sciences in developing countries. It provided institutions in the Global South with outside contacts that could lead to long-term links with experts in the field. Visiting experts interacted closely with faculty and students at the host institutions to strengthen their work and open new lines of research. That research is complemented by lectures, seminars and discussion of future collaboration.

[Learn more: www.twas.org/node/14433](http://www.twas.org/node/14433)

#### **Research fund on geoengineering**

**assessment:** In 2018, research teams from eight developing countries were awarded grants by TWAS and the Solar Radiation Management Governance Initiative [SRMGI] to explore how solar radiation management geoengineering [SRM] could reduce or add to climate change risks in the Global South. These were the

first grants awarded by the new DECIMALS Fund [Developing Country Impacts Modelling Analysis for SRM]. DECIMALS is the world's first international SRM research fund – and the first exclusively for scientists from developing countries. The fund supports researchers who want to analyse the possible effects SRM could have on their regions. Their findings will be published at the end of 2020.

SRM geoengineering is a controversial proposal for reducing the risks of climate change by reflecting away a small amount of solar energy, for instance by injecting reflective particles into the upper atmosphere. However, there are still large uncertainties around the possible benefits and drawbacks, and SRMGI is exploring how such geoengineering could add to the risks of global warming or provoke international tensions.

[Learn more: www.twas.org/node/14564/](http://www.twas.org/node/14564/)

# 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 essential financial support.

The programme's activities in 2018 were:

**Supporting at-risk scientists:** Following its 2017 workshop on war-displaced and refugee researchers, TWAS has emerged as a leader in efforts to support the scientists.

In June, TWAS was one of four international science organisations forming the **Science International** project that met in Trieste, Italy,



◀ Israeli, Jordanian and Palestinian mayors together in the Jordan River to promote its rehabilitation. [Photo: EcoPeace]



▲ Left: A special edition of the TWAS Newsletter on war-displaced scientists. Right: Attendees of the AAAS-TWAS Course on Science Diplomacy work together during a simulation.

to consider the needs of displaced scientists – and what can be done to support them. The other three organisations are the InterAcademy Partnership (IAP), also based in Trieste, and the International Council for Science (ICSU) and the International Social Science Council (ISSC), both based in Paris. [ICSU and ISSC merged in July 2018 to become the International Science Council.]

To focus attention on the issue, Science International organised a special session on displaced and refugee scientists at the 2018 World Social Science Forum in Fukuoka, Japan. The session included speakers who discussed their experiences as displaced scientists and a showing of the TWAS documentary, “**Science in Exile**”. [For more on the film, see page 34]

The Academy also published a special edition of the TWAS Newsletter on the issue. The issue included an overview of the refugee crisis and

essays by key TWAS partners. A centrepiece article in the issue concluded that there are at least 10,000 scientists, engineers, medical personnel and advanced students displaced by recent conflicts in the Middle East and South Asia.

Also, under a grant provided by the Islamic Development Bank, TWAS is developing a programme to provide support to displaced scientists.

**AAAS-TWAS Course in Science Diplomacy:** Held 20 to 24 August in Trieste, Italy, the annual course convened over 40 scientists and government officials from more than 20 countries including Bangladesh, Colombia, Malaysia, Sudan and Uganda. The course was the fifth organised by the American Association for the Advancement of Science (AAAS) and TWAS. During the week-long course, participants examined the complex workings and potential value of science diplomacy for addressing global challenges and improving relations among nations.

Learn more: [www.twas.org/node/14533/](http://www.twas.org/node/14533/)

**S4D4C:** TWAS has joined with S4D4C, a new project to support the development of science diplomacy in the European Union. TWAS is one of the main partners in the S4D4C Project, contributing to the creation of training material and running trainings for current and future science diplomats in Europe.

Learn more: [www.s4d4c.eu](http://www.s4d4c.eu)

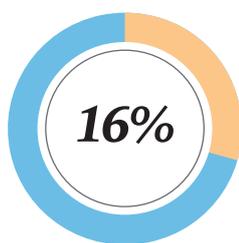
“For displaced scientists, the road home is not always direct, and the journey may take many years. ... This should be a target for South-South and South-North policy and diplomacy cooperation.”

TWAS Executive Director **Romain Murenzi**

# ADVANCING WOMEN

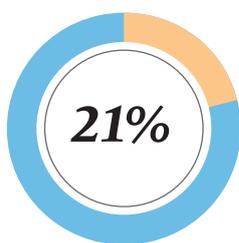
Supporting women in research is a central part of TWAS's mission. The Academy and its partners offer numerous opportunities to women in the developing world; they also help institutions learn how to support women researchers. This can be valuable for the careers of each individual researcher, but critical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

## PhDs created by TWAS in 2018



**20** OUT OF **125** PHDs CREATED BY TWAS AND PARTNER INSTITUTIONS IN 2018 ARE WOMEN

## PhD fellowships to women



**67** OUT OF **317** PHD FELLOWSHIPS AWARDED BY TWAS IN 2018 WERE RECEIVED BY WOMEN

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

**The Organization for Women in Science for the Developing World (OWSD)** celebrated its 25th anniversary in 2018. OWSD emerged from a conference organized by TWAS in 1988. It is the first international forum for women scientists from the developing and developed worlds to strengthen their roles in research and science leadership. At the end of 2018, OWSD had about 7,195 members, more than 90% of them women scientists in developing countries. A total of 1,057 of them registered in 2018, [15% of all memberships since 1993].

OWSD also launched its new Early Career Women Scientists fellowship in 2018, with a first cohort that included 19 fellows, 14 of them from Least Developed Countries (LDCs). They are each provided with up to USD50,000 over two years to establish high-level research centres at their institutions. The fellowship is supported by Canada's International Development Research Centre (IDRC). [Learn more: www.owsd.net/early-career-fellowship/early-career-fellows](http://www.owsd.net/early-career-fellowship/early-career-fellows)



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

 **436** TOTAL

 **254** HAVE GRADUATED [46%]

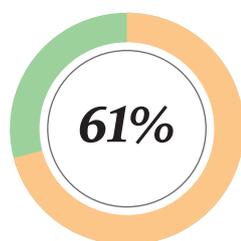
 **182** ARE ONSITE [47%]

Fellowships awarded 1998-2018.

► The winners of the 2018 OWSD-Elsevier Foundation Award for Women Scientists in the Developing World are, from left, Silvia González Pérez of Ecuador; Germaine Djuidje Kenmoe of Cameroon, Hasibun Naher of Bangladesh, Dawn Iona Fox of Guyana and Witri Wahyu Lestari of Indonesia, who couldn't be present to receive her award. [Photo: Alison Bert/Elsevier Foundation]



**Scientists awarded PhD fellowships through OWSD in 2018**



**11** OUT OF **18** WERE FROM LEAST DEVELOPED COUNTRIES (LDCs)

**Women who received PhDs through OWSD in 2018**



**16** OUT OF **30** WERE FROM LEAST DEVELOPED COUNTRIES (LDCs)

“ These scientists are living proof that, if given the opportunities and support, women all over the developing world can become leaders in their field. ”

*Jennifer Thomson, OWSD president, on the winners of the OWSD-Elsevier Foundation Awards*

That programme complements the OWSD PhD fellowships for women in science, supported by the Swedish International Development Cooperation Agency (Sida). [Learn more: www.owsd.net/career-development/phd-fellowship](http://www.owsd.net/career-development/phd-fellowship)

OWSD also partners with the Elsevier Foundation to organize annual Awards for Early Career Women Scientists in the Developing World. The 2018 winners were physical scientists from Bangladesh, Cameroon, Ecuador, Guyana and Indonesia, recognized for their work in mathematics, physics and chemistry. [Learn more: www.owsd.net/career-development/awards](http://www.owsd.net/career-development/awards)

**GenderInSITE (GIS)** is an initiative dedicated to advancing science, technology, innovation and engineering policies and programmes focused on the importance of gender equality. GIS works to raise awareness among policymakers, institutional leaders and others. It's hosted by OWSD and TWAS and supported by Sida.

In 2018, GenderInSITE's Regional Focal Point in Southern Africa made significant progress, publishing a report with policy recommendations from the 2017 Gender and Innovation Workshop and producing final drafts for a long-term project to produce fact sheets on gender and science statistics for Southern African countries. Progress was also made by the Latin America and the Caribbean Focal Point, which provided expert advice and input on gender-sensitive STEM policies to national and international policy-making bodies.

GenderInSITE also published a report on women in science leadership, 'Pathways to Success'. It contains seven policy recommendations based on interviews with scientists, an analysis of existing gender and science policies from international organisations and a blueprint for gender-equal science. [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.

**The InterAcademy Partnership (IAP)**, brings together more than 130 national and regional member academies to support the work of science to address the world's most challenging problems. IAP's secretariat is based at TWAS headquarters in Trieste, Italy, and at the U.S. National Academies of Science, Engineering and Medicine in Washington, D.C.

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



the interacademy partnership

Several major accomplishments of IAP in 2018 stand out:

- Released a global synthesis report on future research and innovation on food and nutrition security and agriculture. The report is built on the

## READ THE IAP STATEMENTS

- IAP S20 Statement on Food and Nutrition Security and Agriculture: [www.bit.do/S20Statement](http://www.bit.do/S20Statement)
- IAP for Health - A call for action to tackle the growing burden of dementia: [www.bit.do/DementiaStatement](http://www.bit.do/DementiaStatement)

findings of four individual regional reports, three of which were completed in 2018.

Learn more: [www.bit.do/Synth\\_Report](http://www.bit.do/Synth_Report)

- Worked with the Association of Academies and Societies of Sciences in Asia (AASSA) to publish

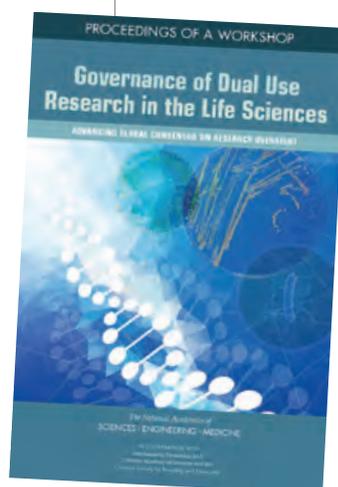
a book of profiles of women scientists in Asia.

Learn more: [www.bit.do/ProfilesWomenScis](http://www.bit.do/ProfilesWomenScis)

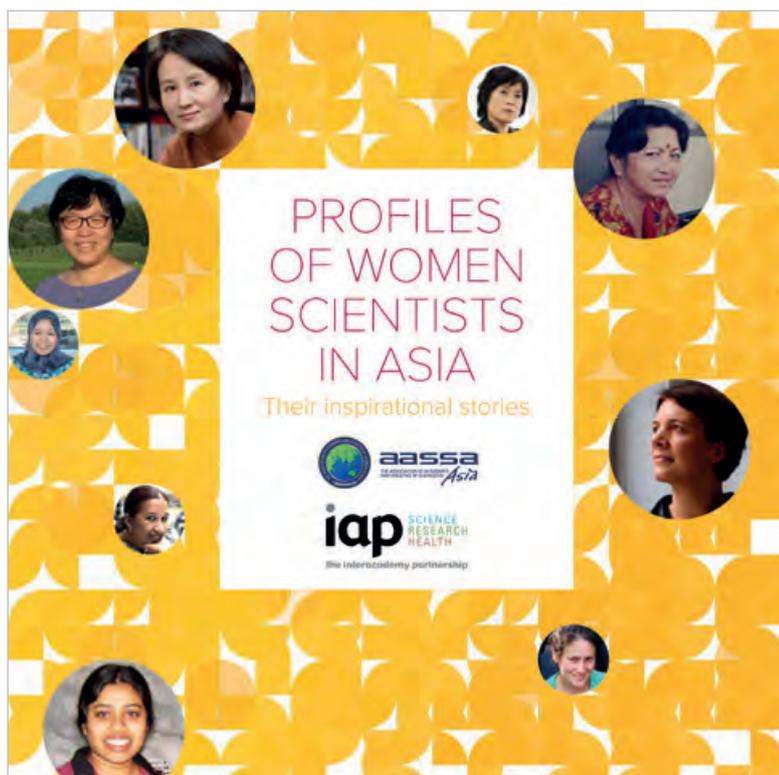
- Co-organized an event with the U.S.

National Academies on assessing security and governance issues of modern biotechnology at the Biological and Toxin Weapons Convention.

Learn more: [www.bit.do/BioToxinCon](http://www.bit.do/BioToxinCon)



◀ IAP collaborated on an international workshop in June 2018 in Zagreb, Croatia, called "The Governance of Dual Use Research in the Life Sciences: Advancing Global Consensus on Research Oversight" and produced a report.



“We salute the courage of these scientists, and of women scientists around the world, for their dedication and passion to use science to make the world a better place.”

**Cheryl E. Praeger**, chair of the AASSA Special Committee for Women in Science and Engineering, on the booklet “Profiles of Women Scientists in Asia”

- Held the 8th IAP for Health Young Physician Leaders Programme in conjunction with the 10th World Health Summit in Berlin, Germany.

**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, providing the majority of TWAS’s PhD fellowships in 2018. CAS also joined with TWAS to hold the 17th CAS-TWAS-WMO Forum on Ecohydrology and Climate Change in Beijing,



China. CAS hosts the TWAS Regional Partner for East and South-East Asia and the Pacific.

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

#### **The TWAS Young Affiliates Network (TYAN)**

was formed in 2016 to reinforce ties among the Academy’s Young Affiliates. In 2018, TYAN held several events, including a thematic workshop in photo-electrochemistry in Chascomus, Argentina, in April. They also partnered with the Young Scientists Network (YSN) to hold the TYAN-YSN International Thematic Workshop on Cancer from 30 October to 1 November near Kuala Lumpur, Malaysia. TYAN receives support from Lenovo, the global tech and computing leader.

[Learn more: tyan.twas.org/](http://tyan.twas.org/)

#### **The Academy of Science of South Africa (ASSAf)**

is one of Africa’s leading advocates for science and technology, and hosts TWAS Sub-Saharan Africa Regional Partner at their headquarters in Pretoria.

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

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

#### **The Brazilian Academy of Sciences (ABC)**

unites the most eminent scientists in Brazil. It focuses on the country’s scientific development and promotes the interaction among Brazilian scientists with their colleagues in other nations. ABC hosts TWAS’s Regional Partner for Latin America and the Caribbean.

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



#### **The International Mathematical Union (IMU)**

collaborates with TWAS to sponsor a fellowship that provides 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. Three such scholars were on-site conducting their studies in 2018.

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

# REGIONAL PARTNERS

*TWAS partners 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.*

...  
The 2018 TWAS Regional Prizes were awarded for Science Diplomacy.  
...

## RIO DE JANEIRO, Brazil ●

Brazilian Academy of Sciences



► 2018 TWAS Regional Prize Winner: **Hernan Chaimovich**, Brazil

### LATIN AMERICAN AND THE CARIBBEAN (TWAS-LACREP)

Organized the young scientist conference “Promoting Gender Equity in Science: the View of Young Scientists”, in Rio de Janeiro, Brazil, from 20 to 22 August. LACREP also put together the workshop “Sustainable Water Management in Mining and Post-Mining Landscapes”, in Rio de Janeiro from 1 to 5 October, drawing 50 participants, 23 of them young scientists.

► 2018 TWAS Regional Prize Winner: **Thula Sizwe Dlamini**, Swaziland

► 2018 TWAS Regional Prize Winner: **Yang Min**, China



**EAST AND SOUTH-EAST ASIA AND THE PACIFIC (TWAS-SAPREP)**

Helped organize a workshop on integrated management of mountain ecosystems, drawing 24 participants from 11 countries, including 11 from five Least Developed Countries (LDCs). The workshop focused on the development of conservation practices specific to mountains, as well as the need for mountain systems to benefit from digital management of croplands and water resources.

▼ 2018 TWAS Regional Prize Winner: **Hala El-Khozondar**, Palestine [Gaza Strip and West Bank]



**ARAB REGION (TWAS-AREP)**

Worked in 2018 to promote TWAS activities during several events, starting with the “International Funding Opportunities for Health Sector” conference held on 22 March 2018 at Kasr Alainy Faculty of Medicine, Cairo University. Also, AREP promoted its activities through a series called “The Alexandria Dialogues” held in cooperation with Bibliotheca Alexandrina and the United Nations, hosting discussions on education, inclusivity and sustainability.

▼ 2018 TWAS Regional Prize Winner: **Renu Swarup**, India



● **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-CASAREP)**

Organised a workshop on climate change attended by 25 participants from 13 Least Developed Countries or S&T-lagging countries. Fifteen of the 25 participants were women. Topics covered climate change’s relevance to developing countries, ranging from the effects of glaciers to designing early-warning systems for disasters and space- and ground-based observation.

**SUB-SAHARAN AFRICA (TWAS-SAREP)**

Hosted an interactive and inaugural regional science diplomacy workshop from 21-25 May 2018 in Pretoria, South Africa. SAREP also selected five young scientists from Mali, Mauritius, Nigeria, Uganda and South Africa to participate in the ninth International Biennial Conference, BioVisionAlexandria [BVA] 2018. Finally, SAREP collaborated to hold several events, including a regional young scientists’ conference in Sudan and a food security and policy workshop in South Africa.



# TWAS & ITALY

For 35 years, TWAS has had a strong partnership with the Italian government, with the Italian Ministry of Foreign Affairs and International Cooperation 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, creating an environment that supports innovation.

Here are highlights of the TWAS-Italy partnership from 2018:

**Royal Society visits Trieste:** On 18 October, a delegation from the UK's Royal Society visited Trieste, Italy, to meet with TWAS and the Trieste International Foundation for Freedom and Progress in Science (FIT). The meeting affirmed these longstanding partnerships, and allowed TWAS to introduce the Royal Society to FIT, which is coordinating Trieste's role as the European capital of science during the EuroScience Open Forum 2020 (ESOF).  
[Learn more: www.twas.org/node/14516](http://www.twas.org/node/14516)

**Report on Trieste-to-Africa science ties:**  
A report prepared for the Italian Ministry of

Foreign Affairs and International Cooperation showed that TWAS and other scientific institutions based in Trieste are making significant contributions to the development of research and education in Africa.

The report also includes the Abdus Salam International Centre for Theoretical Physics (ICTP); the Organization for Women in Science for the Developing World (OWSD); the InterAcademy Partnership (IAP); and the International Centre for Genetic Engineering and Biotechnology (ICGEB). TWAS hosts the secretariats of IAP and OWSD in its offices on the ICTP campus. The report noted that all five organisations have a strong focus on Africa, where many countries continue to lag in R&D

▼ TWAS's panelists at Trieste Next. From left to right: Davide Zanchettin, Helene Muri, and Asfawossen Asrat Kassaye.



► Young Italian students from Scuola Secondaria di Primo Grado Statale Lionello Stock participate in group discussions on the Sustainable Development Goals at the workshop “Training and science for sustainable development” held in Trieste on 23 May. The workshop was organized by TWAS.



investment, research publications and higher education.

[Learn more: www.twas.org/node/14320](http://www.twas.org/node/14320)

**Trieste Next:** TWAS sponsored a roundtable at the annual Trieste Next science festival on 28 September, examining the potential benefits and risks of geoengineering for solar radiation management as a means of controlling climate change. It included Asfawossen Asrat Kassaye, a TWAS Young Affiliate Alumnus and a professor of geology at the School of Earth Sciences, Addis Ababa University in Ethiopia; Helene

Muri, a researcher in the industrial ecology programme at the Norwegian University of Science and Technology; and Davide Zanchettin, a researcher at Ca’ Foscari University of Venice, in the department of environmental sciences, informatics and statistics.

[Learn more: www.twas.org/node/14537](http://www.twas.org/node/14537)

**An accord for displaced scientists:** TWAS was one of 10 high-level science centres based in Trieste and Friuli-Venezia Giulia that agreed to develop research and study opportunities for scientists forced to flee from war and conflict in their home countries. The accord is the outcome of a year-long initiative by the research institutions.

[Learn more: www.twas.org/node/14496](http://www.twas.org/node/14496)

**Festival éStoria:** Former TWAS Executive Director Mohamed H.A. Hassan spoke about the usefulness of science diplomacy at Festival éStoria, an international event that explores fascinating historical and contemporary themes and issues. The festival’s 14th edition offered about 220 talks with more than 400 speakers, attracting an audience of 60,000 people.

[Learn more: www.twas.org/node/14464](http://www.twas.org/node/14464)

“ Science is a global endeavour and few places embody that as well as Trieste. Scientific progress is also heavily dependent on collaboration and so I am delighted to be in Trieste to meet with TWAS and FIT to discuss how we can continue to work together. ”

**Julie Maxton**, Royal Society executive director

# A STORY TO COMMUNICATE

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

several projects to support the Academy's initiatives.

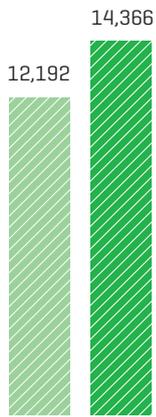
The TWAS documentary "**Science in Exile**", about the struggles faced by scientists displaced by war and conflict, has been a resounding success. In 2018 it was screened

▼ TWAS's film about displaced scientists, "Science in Exile", was screened at universities and other locations all over the world. Shown is Ghanya Naji Al-Naqeb, a Yemeni nutritional scientist whose story is told by the film.





Facebook



LIKES  
IN 2018

+ 17.8%



Twitter



FOLLOWERS  
IN 2018

+ 26.3%

From 1 January to 31 December 2018.



more than 40 times in two dozen countries on six continents, at major science meetings, top research institutions, international science film festivals and universities. “Science in Exile” was directed by Italian filmmaker Nicole Leghissa.

Learn more: [www.twas.org/article/science-exile](http://www.twas.org/article/science-exile)

TWAS launched its **Online Directory** in June 2018, designed to give unprecedented global visibility to TWAS Fellows and Young Affiliates. The directory, replacing the printed TWAS Yearbook, offers powerful search tools and infographics to show the work and impact of its worldwide community. At the same time, the digital directory lightens the Academy’s environmental footprint and reduces costs.

Development of the Online Directory was supported by the Swedish International Development Cooperation Agency [Sida] and the Kuwait Foundation for the Advancement of Sciences [KFAS].

Visit the **Online Directory**: [www.twas.org/directory](http://www.twas.org/directory)

TWAS expanded its successful **Online Forms**. The easy-to-use system now includes all of the Academy’s fellowships, almost all of its visiting scientist programmes, more of its prizes, and

a form for membership applications. With the system, all nominations and supporting documents can be completed and submitted online at a single location, resulting in a highly efficient process for applicants, nominators, nominees and judges.



New issues of the **TWAS Newsletter** focused on the needs of young scientists in the developing world and also the TWAS Young Affiliates Network [TYAN], as well as the success of the 28th TWAS General Meeting, held in Trieste, Italy.

The Academy’s bi-monthly e-bulletin, **TWAS Plus**, saw a 30.6% increase in subscribers, climbing from 28,641 at the beginning of 2018 to 37,414 at year’s end.



# FINANCIAL REPORT 2018

*TWAS received a total of USD5,496,292.87 in funding for 2018, including USD1,133.80 in individual contributions. We are grateful for the generous contributions from our supporters – some who have aided our work for many years, and others who have joined them more recently. Their investments make possible our challenging and critical work in the developing world.*

## FINANCIAL REPORT 2018 (IN USD)

<b>INCOME<sup>1</sup> 2018</b>	
Balance brought forward 01.01.2018	474,217.35
1) Ministry of Foreign Affairs, Italy	1,524,308.97
2) Swedish International Development Cooperation (Sida)	1,405,709.22
3) Environmental Defense Fund, USA	1,160,653.00
4) Lenovo Group Limited, China	270,000.00
5) COMSTECH, Pakistan	107,000.00
6) Kuwait Foundation for the Advancement of Sciences (KFAS)	100,000.00
7) Ministry of Science, Technology and Innovation – MCTI, Brazil	99,938.00
8) Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA), Italy	97,963.05
9) Elsevier Foundation, USA	80,000.00
10) Regione Autonoma Friuli Venezia Giulia, Italy	60,386.50
11) Academia Sinica, Taiwan, China	50,000.00
12) International Mathematical Union, Germany	24,600.00
13) American Association for the Advancement of Science	10,000.00
14) Richard Lounsbery Foundation, USA	10,000.00
15) Quarraisha Abdool Karim, South Africa	7,000.00
16) CNR Rao, India	6,980.00
17) Dawood Foundation, Pakistan	6,965.00
18) F.M.A. Al-Kharafi, Kuwait	6,000.00
19) Samira Omar Asem, Kuwait	5,975.00
20) Academia Chilena de Ciencias, Chile	5,555.57
21) Other membership fees <sup>2</sup>	1,133.80
22) Other miscellaneous income	10,605.92
23) Interest income	115,268.00
24) Exchange difference	[32.37]
25) Funds returned to Sida	[143,934.24]
	<b>5,496,292.87</b>

<sup>1</sup> 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.

<sup>2</sup> This amount comprises donations from TWAS members, Young Affiliates and other individuals (details next page).

<b>EXPENDITURES 2018</b>	<b>App. Budget</b>	<b>Rev. Budget</b>	<b>Spent</b>
<b>1) Prizes</b>			
1.1) TWAS Lenovo Science Prize:	124,000	124,000	124,000.00
1.1.1) Prize cost:	100,000	100,000	100,000.00
1.1.2) Other costs:	24,000	24,000	24,000.00
1.2) TWAS Prizes and Medals:	147,000	147,000	147,000.00
1.2.1) Prizes costs:	135,000	135,000	135,000.00
1.2.2) Medals and other costs:	12,000	12,000	12,000.00
1.3) Prizes for Young Scientists:	31,000	31,000	30,800.00
1.4) Fellows Prizes:	33,000	33,000	33,000.00
1.4.1) Prizes costs:	23,000	23,000	23,000.00
1.4.2) Other costs:	10,000	10,000	10,000.00
1.5) TWAS - Siwei Cheng Prize in Economic Sciences:	16,000	16,000	136.36
1.5.1) Prizes costs:	10,000	10,000	
1.5.2) Other costs:	6,000	6,000	136.36
<i>Sub-total for [1]</i>	<i>351,000</i>	<i>351,000</i>	<i>334,936.36</i>
<b>2) Research Grants</b>			
2.1) Grants to Individual Scientists	357,230	357,230	336,425.65
2.2) Grants to Research Units	470,430	470,430	428,968.27
2.3) Support for MSc Students	153,550	153,550	144,039.00
2.4) Research Grants Meeting	32,990	32,990	30,950.77
2.5) Research Grants Network	2,290	2,290	
2.6) Support for Inter Meeting	16,500	16,500	
2.7) Support for Open Acces	16,500	16,500	15,470.00
2.8) Regional Conference Young Scientists	109,390	109,390	76,959.00
2.9) Selection Committee	2,290	2,290	2,040.00
2.10) Science Diplomacy	38,320	38,320	35,859.10
2.11) Communications	21,880	21,880	19,243.48
2.12) Monitoring	27,360	27,360	
2.13) Staff and office space	274,110	274,110	239,837.22
2.14) Additional Research Grants	47,856	47,856	23,022.80
2.14.1) Communications	275	275	274.99
2.14.2) Monitoring	24,755	24,755	
2.14.3) Other costs for staff and office space	22,826	22,826	22,747.81
<i>Sub-total for [2]</i>	<i>1,570,696</i>	<i>1,570,696</i>	<i>1,352,815.29</i>
<b>3) Fellowships, Associateships and Professorships</b>			
3.1) Fellowship Programmes	250,000	250,000	97,306.04
3.2) Associateship, Professorship & Visiting Programmes	110,000	110,000	108,712.41
<i>Sub-total for [3]</i>	<i>360,000</i>	<i>360,000</i>	<i>206,018.45</i>
<b>4) Meetings</b>			
4.1) Council and General Meetings	150,000	500,000	280,003.44
4.2) Steering Committee and Other Official Meetings in Trieste	20,000	20,000	16,025.15
4.3) Trieste Next 2018	5,000	5,000	4,767.97
4.4) Official visits to TWAS Executive Director in Trieste	10,000	10,000	1,677.48
<i>Sub-total for [4]</i>	<i>180,000</i>	<i>535,000</i>	<i>302,474.04</i>
<b>5) Publications</b>			
5.1) Publications	35,000	35,000	34,385.99
5.2) Other costs	15,000	15,000	13,000.00
<i>Sub-total for [5]</i>	<i>50,000</i>	<i>50,000</i>	<i>47,385.99</i>

Continue next page

<b>EXPENDITURES 2018</b>	<b>App. Budget</b>	<b>Rev. Budget</b>	<b>Spent</b>
<b>6] Joint Projects</b>			
6.1] TWAS Regional Partners	64,000	74,000	57,041.00
6.2] TWAS-ARO-KFAS Project	50,000	50,000	50,000.00
6.2.1] Regional Conference for Young Scientists	25,000	25,000	25,000.00
6.2.2] Regional Awards	6,000	6,000	6,000.00
6.2.3] Biovision Conference	5,000	5,000	5,000.00
6.2.4] Young Affiliates	7,000	7,000	7,000.00
6.2.5] Other costs	7,000	7,000	7,000.00
6.3] TWAS/COMSTEC Research Grant	200,000	200,000	200,963.39
6.4] TWAS-AAAS Science Diplomacy Programme	10,000	10,000	10,000.00
6.5] TWAS-Elsevier Project	134,988	134,988	49,811.22
6.5.1] Symposium, Fellowships and South-North Exchange Programme	124,988	124,988	39,811.22
6.5.2] Other costs	10,000	10,000	10,000.00
6.6] TWAS-SRMGI Project	557,708	655,202	559,555.49
6.6.1] Workshops	150,000	450,850	438,704.00
6.6.2] Meetings	60,000	25,000	16,702.05
6.6.3] Global Forum Meeting	50,000		
6.6.4] Other activities	30,000	10,000	
6.6.5] Staff costs	140,000	40,000	13,280.09
6.6.6] Other costs	55,900	55,003	46,677.50
6.6.7] Additional new activities	71,808	74,349	44,191.85
6.7] TWAS-IMU Project	24,600	24,600	24,600.00
6.7.1] Fellowships	19,600	19,600	19,600.00
6.7.2] Other costs	5,000	5,000	5,000.00
6.8] TWAS-Lenovo Young Affiliates Network	345,158	345,158	143,769.69
6.8.1] Fellowships	319,158	319,158	119,202.80
6.8.2] Other costs	26,000	26,000	24,566.89
6.9] TWAS - ENEA Project	97,960	97,960	97,960.00
6.9.1] Fellowships	86,350	86,350	86,350.00
6.9.2] Other costs	11,610	11,610	11,610.00
6.10] TWAS-IsDB Project	599,500		
6.10.1] TWAS-IsDB fellowships and grants	320,500		
6.10.1.1] Programme	280,000		
6.10.1.2] Implementation costs	40,500		
6.10.2] Grants for joint research and technology transfer projects	116,500		
6.10.2.1] Programme	100,000		
6.10.2.2] Implementation costs	16,500		
6.10.3] High-level training workshops in the areas of science-policy-diplomacy	134,300		
6.10.3.1] Programme	85,000		
6.10.3.2] Implementation costs	49,300		
6.10.4] Support for refugee scientists and other scientists at risk in IsDB member countries	28,200		
6.10.4.1] Programme	15,000		
6.10.4.2] Implementation costs	13,200		
6.10b] TWAS-Regione Friuli Venezia Giulia Project		60,000	60,386.50
6.11] TWAS-Lounsbery Project		10,000	9,670.11
6.12] TWAS-ICTP Project		50,000	50,000.00
<b>Sub-Total for [6]</b>	<b>2,083,914</b>	<b>1,711,908</b>	<b>1,313,757.40</b>

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<b>EXPENDITURES 2018</b>	<b>App. Budget</b>	<b>Rev. Budget</b>	<b>Spent</b>
<b>7) Operational Expenses</b>			
7.1) Staff costs	1,200,000	1,200,000	1,104,573.17
7.2) ICTP services	45,000	45,000	45,000.00
7.3) Communications	25,000	15,000	11,316.78
7.4) Travels	30,000	40,000	37,042.07
7.5) Library, office and other supplies	65,000	65,000	41,887.37
7.5.1) General supplies	15,000	15,000	7,850.86
7.5.2) Equipment	50,000	50,000	34,036.51
7.6) Other general operating expenses	25,000	25,000	22,925.38
<i>Sub-total for [7]</i>	<i>1,390,000</i>	<i>1,390,000</i>	<i>1,262,744.77</i>
<b>Management costs</b>			<b>196,610.55</b>
<b>Total expenditure</b>	<b>5,990,610</b>	<b>5,968,604</b>	<b>5,016,742.85</b>
Savings on prior years' obligations			291,910.53
Excess (shortfall) of income over expenditure			771,460.55
<b>Reserve Fund<sup>1</sup></b>			
Amount available at the beginning of period			2,038,141.60
End of service entitlements			0.00
<b>Reserve fund balance end of period</b>			<b>2,038,141.60</b>

### **TWAS ENDOWMENT FUND 1994-2018<sup>2</sup> (IN USD)**

<b>ORGANIZATIONS</b>	<b>CONTRIBUTIONS RECEIVED</b>
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)	714,155
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>	<b>8,368,964</b>
<i>Plus other contributions<sup>3</sup></i>	181,572
<i>Plus interest earned</i>	6,406,548
<i>Transfer to/from TWAS Fund in 2011 and 2013, 2014, 2015 and 2016</i>	(2,025,768)
<b>TOTAL</b>	<b>12,931,316</b>

<sup>1</sup> The purpose of the Reserve Fund is to cover the end-of-service entitlements of TWAS staff

<sup>2</sup> 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.

<sup>3</sup> 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 (1994-2018)**

Wook Hyun Kwon, Korea Rep.	30,000	Cheng, Hui-Ming, China	985	Yu Lu, China	300
Bai Chunli, China	21,770	P. Ciarlet, France	985	R.P. Bambah, India	300
M.H.A. Hassan, Sudan	13,104	Lee Yuan T., Taiwan, China	977	Zhao Zhongxian, China	300
J. Palis, Brazil	10,079	E.K.A. Edee, Togo	900	Zhai Mingguo, China	300
Science Initiative Group, USA	6,250	Mei Hong, China	879	B. Tsetseg, Mongolia	300
J.I. Vargas, Brazil	5,287	Jean-Marie Lehn, France	840	S. Sivaram, India	300
S.S. Katiyar, India	4,100	J. Döbereiner, Brazil	800	Long Yiming, China	300
A.V. Rama Rao, India	3,000	M. Munasinghe, Sri Lanka	750	R. Garruto, USA	300
Fuchu He, China	2,726	M. Akhtar, Pakistan	700	Sang Yup Lee, Korea Rep.	300
A. Hamoui, Syria	2,500	B.L. Deekshatulu, India	700	Li Jinghai, China	296
M. Peimbert, Mexico	2,500	Wu Yue-Liang, China	666	Chao-Jun Li, China	292
Lu Yong Xiang, China	2,300	D. Balasubramanian, India	650	M. O’Kane, Australia	288
P. McGrath, UK	2,046	L. de la Pena Auerbach, Mexico	642	J.S. Yadav, India	285
M. Iqbal Parker, South Africa	2,000	Un-Chul Paek, USA	634	Zhang Ya-Ping, China	285
K. Namsrai, Mongolia	1,858	F.R.I. Kayanja, Uganda	600	Wang Fosong, China	280
M.V. Griffiths, USA	1,750	Dong Shaojun, China	600	B.M. Abegaz, Ethiopia	272
B.N. Upreti, Nepal	1,440	L.F. Rodriguez, Mexico	600	M. Limonta, Mexico	250
R. Miledi, USA	1,320	Wang Erkang, China	600	T. Durrani, UK	200
L.N. Johnson, UK	1,281	Zhao Jincai, China	525	A.K. Sood, India	200
J. Garidkhuu, Mongolia	1,221	J. Allende, Chile	500	R. Ramaswamy, India	200
F. El-Baz, Egypt	1,200	E.H.S. Diop, Senegal	500	Chen Sai-Juan, China	200
C.N.R. Rao, India	1,131	M.V. George, India	500	Chen Zhu, China	200
E.W. Thulstrup, Denmark	1,062	D.T. Lê, Vietnam	500	A. Falodun, Nigeria	200
A. Badran, Jordan	1,045	Li Desheng, China	500	E. Igbinosa, Nigeria	200
ANSTS, Senegal	1,029	G. Thottappilly, India	500	S. I. Ola, Nigeria	200
E.M. Essien, Nigeria	1,000	C. Vieira, Brazil	500	E. Unuabonah, Nigeria	200
M. Klein, USA	1,000	Z.H. Zaidi, Pakistan	500	A. Bahri, Tunisia	143
A. Kornhauser, Slovenia	1,000	R. Crewe, South Africa	496	H. Roesky, Germany	106
A.O. Kuku, Nigeria	1,000	S. Ayupov, Uzbekistan	495	R. Zare, USA	100
G.S. Khush, Philippines	1,000	M. Clegg, USA	494	M.A.J. Mariscotti, Argentina	100
R. Murenzi, USA/Rwanda [KIST]	1,000	Girish Agrawal, USA	488	H.K. Majumder, India	100
Sang-Dai Park, Korea Rep.	1,000	Li Yiyi, China	465	K. Basu, USA	100
G.T. Prance, UK	1,000	I. Saavedra, Chile	443	U. Aswathanaray, India	100
I. Serageldin, Egypt	1,000	A.H.O. Hajiyev, Azerbaijan	400	N. Kumar, India	100
Y. Sobouti, Iran, I.R.	1,000	S. J. Jabbur, Lebanon	400	S.M. Muhongo, South Africa	100
H.E. Varmus, USA	1,000	M. Tchuente, Cameroon	400	U. Colombo, Italy	97
Y. Yuthavong, Thailand	1,000	T. Obi, Nigeria	400	A. Peeraly, Canada	86
J.L. Moran Lopez, Mexico	1,000	S.S. Hasnain, UK	400	A.M. Cetto, Mexico	51
K.E. Mshigeni, Tanzania	1,000	M.P. Alpers, Australia	331	Ingrid Daubechies	48
Wong Henry Nai Ching, China	1,000	Mu Guoguang, China	330	M.A.J. Mariscotti, Argentina	100
Yam Vivian Wing-Wah, China	1,000	H. Van Ginkel, The Netherlands	327	H.K. Majumder, India	100
M. Hamdan, Jordan	1,000	A.C. Cerda, Chile	300	K. Basu, USA	100
S.Q. Mehdi, Pakistan	1,000	H. Chaimovich, Brazil	300	U. Aswathanaray, India	100
Shui-Chin Foundation, Taiwan, China	1,000	S. Datta, India	300	N. Kumar, India	100
Pei Gang, China	1,000	L. Davidovich, Brazil	300	S.M. Muhongo, South Africa	100
CAPRISA, South Africa	1,000	Min Enze, China	300	U. Colombo, Italy	97
P. Littlewood, UK	1,000	M.M. Peixoto, Brazil	300	A. Peeraly, Canada	86
I. Eltayeb, Oman	1,000	H. Ramkissoon, Trinidad & Tobago	300	A.M. Cetto, Mexico	51
Lee Wu Yan-Hwa, Taiwan, China	1,000	Shi Changxu, China	300	Ingrid Daubechies, USA	48
A. Paulrai, USA	992	Su Zhao-Bin, China	300	<b>Total</b>	<b>181,572</b>

## VOLUNTARY CONTRIBUTIONS RECEIVED FROM TWAS MEMBERS, YOUNG AFFILIATES AND OTHER INDIVIDUALS (2018)

### Donations to the Programme Budget:

CIARLET Philippe (Hong Kong, China)	597.37
RAMKISSOON Harold (Trinidad and Tobago)	313.65
GUPTA Mahabir (Panama)	144.60
From anonymous donors	78.18
<b>Total</b>	<b>1,133.80</b>

### Donations to the Endowment Fund:

MEI Hong (China)	482.70
UPRETI, Bishan Nath (Nepal)	202.56
MEI Hong (China)	96.30
<b>Total</b>	<b>781.56</b>

**Total donations combined to both funds 1,915.36**

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](http://www.twas.org/support-twas)

# 2018 TWAS FELLOWS AND YOUNG AFFILIATES

## TWAS FELLOWS ELECTED IN 2018

### Agricultural Sciences

BOUAHOM, Bounthong [Lao PDR]  
CHEN, Hualan [China]  
GUHARAY, Falguni [Nicaragua]  
ZHANG, Fusuo [China]

### Structural, Cell and Molecular Biology

BASU, Joyoti [India]  
LIU, Leroy F. [Taiwan, China]  
XU, Tao [China]

### Biological Systems and Organisms

BUSTAMANTE, Mercedes [Brazil]  
MORAES R., Monica [Bolivia]  
SCHOLES, Mary [South Africa]  
VARSHNEY, Umesh [India]  
WEI, Fuwen [China]

### Medical and Health Sciences incl.

#### Neurosciences

DALKARA, Turgay [Turkey]  
FAHAL, Ahmed Hassan [Sudan]  
HUANG, He-Feng [China]  
MARSH, Kevin [Kenya]  
WYSE, Angela TS [Brazil]

### Chemical Sciences

AL-SARRAJ, Emad Yousif [Iraq]  
LITTER, Marta Irene [Argentina]  
PRADEEP, Thalappil [India]  
SIMUKANGA, Stephen [Zambia]  
VONGDARA, Boviengkham [Lao PDR]  
ZHANG, Tao [China]  
ZHAO, Yuliang [China]

### Engineering Sciences

ABDURRAHMAN, Naeem Mohamed [Libya]  
JAIN, Anil Kumar [USA]  
LIU, Ming [China]

MURTY, Budaraju Srinivasa [India]  
QU, Jiu-hui [China]

### Astronomy, Space and Earth Sciences

ADEYEMO, Olanike Kudirat [Nigeria]  
AHMEDOV, Bobomurat [Uzbekistan]  
MANDRINI, Cristina Hemilse [Argentina]  
MARENGO ORSINI, Jose Antonio [Brazil]

### Mathematical Sciences

AL-SALMAN, Ahmad [Jordan]  
FANG, Fuquan [China]  
KEUM, JongHae [Korea, Rep.]  
KOHAYAKAWA, Yoshiharu [Brazil]  
PARANJAPE, Kapil [India]

### Physics

CHOU, Mei-Yin [Taiwan, China]  
SAHA-DASGUPTA, Tanusri [India]  
TIAN, Yongjun [China]  
UGARTE, Daniel Mario [Brazil]  
XU, Hongxing [China]

### Social and Economic Sciences

BADIANE, Ousmane [USA]  
LIU, Yansui [China]  
ZENG, Yi [China]

## NEW TWAS YOUNG AFFILIATES IN 2018

### Sub-Saharan Africa:

- KAYITESI, Eugenie [Rwanda]
- BURMEN, Barbara Kabai [Kenya]
- LOOTS, Mattheus Theodor [South Africa]
- MAPIYE, Cletos [Zimbabwe]
- SOGBOHOSSOU, Etotepe A. [Benin]

### Arab Region:

- ELMOJTABA, Ibrahim Mohammed [Sudan]
- MOHAMMED ABDU DAUQAN, Eqbal [Yemen]
- EL GUEZAR, Fatima [Morocco]
- SEBAL, Hichem [Tunisia]
- ENANY, Shymaa [Egypt]

### Latin America & Caribbean:

- CASTILLO, Karen [Chile]
- DOMIC RIVADENEIRA, Alejandra Iboya [Bolivia]
- GODOY MESQUITA, Jaqueline [Brazil]
- GUERRA NORIEGA, Alex [Guatemala]
- JIMÉNEZ CALDERA, Oswalt Rafael [Nicaragua]

### East and Southeast Asia and Pacific:

- SIDDIQUI, Ruqaiyyah Bano [Malaysia]
- FU, Qiaomei [China]
- TAO, Nguyen Thien [Vietnam]
- NIMCHUA, Thidarat [Thailand]
- WANG, Han-Ching [Taiwan, China]

### Central and South Asia:

- ADNAN, Nihad [Bangladesh]
- ABDUJABBAROV, Ahmadjon [Uzbekistan]
- ERFANI, Encieh [Iran, Isl. Rep.]
- SHUKLA, Aparna [India]
- WANGDI, Norbu [Bhutan]

# PRIZES AWARDED IN 2018

## **TWAS-Lenovo Prize (Earth sciences)**

- R.A. Mashelkar [India]

## **TWAS Medal Lectures**

- Subra Suresh, USA
- Hala J. El-Khozondar, Palestine (West Bank and Gaza Strip)

## **Abdus Salam Medal**

- Fernando Quevedo [Guatemala]

## **TWAS Prizes**

- Zhang Dabing [China], agricultural science
- Luisa Lina Villa [Brazil], biology
- Thalappil Pradeep [India], chemistry
- Zhao Guochun [China], Earth, astronomy and space sciences
- Alejandro Raga [Mexico], Earth, astronomy and space sciences
- Yu-Chee Tseng [Taiwan, China], engineering
- Sanghamitra Bandyopadhyay [India], engineering
- Ricardo Guillermo Durán [Argentina], mathematics
- Lynn Morris [South Africa], medical sciences
- Seza Özen [Turkey], medical sciences
- Daniel Mario Ugarte [Brazil], physics
- Alex Chika Ezeh [Kenya], social sciences
- Liu Yansui [China], social sciences

## **C.N.R. Rao Prize for scientific research**

- Yeya Tiemoko Touré [Mali]

## **Atta-ur-Rahman Prize in Chemistry**

- Tchakouté Kouamo Hervé [Cameroon]

## **Fayzah M. Al-Kharafi Prize**

- Lydie-Stella Koutika [Republic of the Congo]

## **TWAS-Samira Omar Innovation for Sustainability Prize:**

- Hazir F.A. Elhaj [Sudan]

## **TWAS-Abdool Karim Prize:**

- Sedaminou Judith Gbenoudon [Benin]

## **TWAS Regional Prizes in Science Diplomacy**

- Hernan Chaimovich [Brazil]
- Renu Swarup [India]
- Hala El-Khozondar [Palestine - West Bank and Gaza Strip]
- Thula Sizwe Dlamini [Swaziland]
- Yang Min [China]

## **2018 OWSD-Elsevier Foundation Awards for Early-Career Women Scientists in the Developing World**

- Germaine Djuidje Kenmoe [Cameroon]
- Hasibun Naher [Bangladesh]
- Dawn Iona Fox [Guyana]
- Silvia González Pérez [Ecuador]
- Witri Wahyu Lestari [Indonesia]

## **TWAS Prizes for Young Scientists in Developing Countries**

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- Mohammad Jakir Hosen [Bangladesh], biology
- Leonardo Augusto Pachón-Contreras [Colombia], physics
- Ricardo Alonso Sánchez Murillo [Costa Rica], chemistry
- Yuslín González Abreu [Cuba], physics
- Claudia Suseth Romero Oliva [Guatemala], biology
- Mohammad Behbahani [Iran, Isl. Rep.], chemistry
- Omar Daoud [Jordan], engineering
- Suhair Sunogrot [Jordan], pharmaceutical science
- Gantulga Davaakhuu [Mongolia], biology
- Altannar Chinchuluun [Mongolia], mathematics
- Sudeep Thakuri [Nepal], environmental science
- Sabin Basi [Nepal], agricultural science
- Muhammad Tahir [Pakistan], physics
- Sergio Ismael Martínez-Luis [Panama], chemistry
- Ángel Enrique Ramírez Gutierrez [Peru], mathematics
- Alonzo A. Gabriel [Philippines], biology
- Ranil Jayawardena [Sri Lanka], biology
- Kornorn Srikulnath [Thailand], biology
- Aziz Ibragimov [Uzbekistan], chemistry
- Xuan Nhiem Nguyen [Vietnam], natural science

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## TWAS ANNUAL REPORT 2018

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