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”)

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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.
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]

**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]

**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:  
Mahabilir Prashad Gupta [Panama]

**Secretary General**  
Ajay K. Sood [India]

**Ex-officio Council Member**  
Fernando Quevedo [Guatemala]  
Director, Abdus Salam International Centre for Theoretical Physics [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. 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.
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
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.
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)
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)
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 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
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.

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### Women Fellows

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>13.1%</td>
</tr>
<tr>
<td>1984</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

165 WOMEN OUT OF 1,260 MEMBERS

### New Fellows

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>28.2%</td>
</tr>
</tbody>
</table>

13 OUT OF 46 TWAS FELLOWS ELECTED IN 2018 WERE WOMEN

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

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More info: [www.twas.org/membership-overview](http://www.twas.org/membership-overview)
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
- 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
TWAS PARTNERS

**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

**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
- 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 of Insect Physiology and Ecology (icipe), Kenya
- National Research Foundation (NRF), South Africa
- Sudanese National Academy of Sciences (SNAS)
- Tanzania Academy of Sciences (TAAS)

**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)

**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)
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.
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 plenipotentary 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 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.
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

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

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

Learn more: 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/

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/

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/

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/

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/

The 2018 Atta-ur-Rahman Award went to Chakouté 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/

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

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

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

"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

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**Home country for new 2018 PhD recipients**

<table>
<thead>
<tr>
<th>Country</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria; Argentina; Belarus; Cambodia; Côte d’Ivoire; Egypt; Kenya; Mongolia; Morocco; Mozambique; Sri Lanka; Sudan Tajikistan; Tanzania</td>
<td>1</td>
</tr>
<tr>
<td>Cuba; Ghana; Uzbekistan; Vietnam; Yemen</td>
<td>2</td>
</tr>
<tr>
<td>Iran</td>
<td>3</td>
</tr>
<tr>
<td>Rwanda</td>
<td>4</td>
</tr>
<tr>
<td>Cameroon; India</td>
<td>5</td>
</tr>
<tr>
<td>Ethiopia; Nepal</td>
<td>6</td>
</tr>
<tr>
<td>Pakistan</td>
<td>45</td>
</tr>
<tr>
<td>Nigeria</td>
<td>18</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>125</td>
</tr>
</tbody>
</table>

**Country of training for new PhDs**

<table>
<thead>
<tr>
<th>Country</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>6</td>
</tr>
<tr>
<td>Botswana*</td>
<td>1</td>
</tr>
<tr>
<td>Malaysia</td>
<td>5</td>
</tr>
<tr>
<td>China</td>
<td>84</td>
</tr>
<tr>
<td>India</td>
<td>19</td>
</tr>
<tr>
<td>Brazil</td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>125</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Rank</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Congo, Dem. Rep.; Congo, Rep.; Egypt; Ethiopia; Indonesia; Jordan; Kazakhstan; Madagascar; Niger; Nigeria; Sri Lanka; Sudan; Swaziland; Turkey; Zambia; Zimbabwe</td>
</tr>
<tr>
<td>2</td>
<td>Kenya; Malawi; Mongolia; Paraguay; Senegal; Togo; Uzbekistan</td>
</tr>
<tr>
<td>3</td>
<td>Burkina Faso; Cameroon; Iran, Isl. Rep.; Uganda</td>
</tr>
<tr>
<td>4</td>
<td>Benin; Ghana; Malaysia</td>
</tr>
<tr>
<td>6</td>
<td>Nepal; Pakistan</td>
</tr>
<tr>
<td>10</td>
<td>Bangladesh</td>
</tr>
</tbody>
</table>

**Total 76**
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

**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/
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

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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

**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/
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.
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/

**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
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.

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

Out of 125 PhDs created by TWAS and partner institutions in 2018, 20 (16%) were awarded to women. Out of 317 PhD fellowships awarded by TWAS in 2018, 67 (21%) were received by women.

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

- 436 TOTAL
- 254 HAVE GRADUATED (46%)
- 182 ARE ONSITE (47%)

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 Biudje 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]

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

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

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

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

In 2018, 11 out of 18 scientists awarded PhD fellowships through OWSD were from least developed countries (LDCs). In 2018, 16 out of 30 women who received PhDs through OWSD were from LDCs.
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

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

• 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

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.
China. CAS hosts the TWAS Regional Partner for East and South-East Asia and the Pacific.
Learn more: 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/

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
Regional Partner website: 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

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.

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”

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
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.

**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.

**RIO DE JANEIRO, Brazil**
Brazilian Academy of Sciences

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

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

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

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.

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.

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.

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.

TRIESTE, Italy
ITCP Campus

ALEXANDRIA, Egypt
Bibliotheca Alexandrina

BANGALORE, India
Jawaharlal Nehru Centre for Advanced Scientific Research

PRETORIA, South Africa
Academy of Science of South Africa

BEIJING, China
Chinese Academy of Sciences

2018 TWAS Regional Prize Winner: Hala El-Khozondar, Palestine (Gaza Strip and West Bank)

2018 TWAS Regional Prize Winner: Renu Swarup, India

2018 TWAS Regional Prize Winner: Yang Min, China

2018 TWAS Regional Prize Winner: Hala El-Khozondar, Palestine (Gaza Strip and West Bank)
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

**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
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

**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

**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

**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

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*
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 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.
A STORY TO COMMUNICATE

A New Generation, Rising

TWAS early-career researchers are emerging as science leaders.

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

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

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.

Visit the Online Directory: www.twas.org/directory

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.
TWAS received a total of USD 5,496,292.87 in funding for 2018, including USD 1,133.80 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)**

**INCOME**

1. Balance brought forward 01.01.2018 474,217.35
2. Ministry of Foreign Affairs, Italy 1,524,308.97
3. Swedish International Development Cooperation (Sida) 1,405,709.22
4. Environmental Defense Fund, USA 1,160,653.00
5. Lenovo Group Limited, China 270,000.00
6. COMSTECH, Pakistan 107,000.00
7. Kuwait Foundation for the Advancement of Sciences (KFAS) 100,000.00
8. Ministry of Science, Technology and Innovation - MCTI, Brazil 99,938.00
9. Agenzia nazionale per le nuove tecnologie, l’energia e lo sviluppo economico sostenibile (ENEA), Italy 97,963.05
10. Elsevier Foundation, USA 80,000.00
11. Regione Autonoma Friuli Venezia Giulia, Italy 66,386.50
12. Academia Sinica, Taiwan, China 50,000.00
13. International Mathematical Union, Germany 24,600.00
14. American Association for the Advancement of Science 10,000.00
15. Richard Lounsbery Foundation, USA 10,000.00
16. Quarraisha Abdool Karim, South Africa 7,000.00
17. CNR Rao, India 6,980.00
18. Dawood Foundation, Pakistan 6,965.00
19. F.M.A. Al-Kharafi, Kuwait 6,000.00
20. Samira Omar Asem, Kuwait 5,975.00
21. Academia Chilena de Ciencias, Chile 5,555.57
22. Other membership fees 1,133.80
23. Interest income 115,268.00
24. Exchange difference (32.37)
25. Funds returned to Sida (143,934.24)

**5,496,292.87**
### EXPENDITURES 2018

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<td><strong>4) Meetings</strong></td>
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<td>4.3) Trieste Next 2018</td>
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<td>4.4) Official visits to TWAS Executive Director in Trieste</td>
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<td><strong>5) Publications</strong></td>
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<tr>
<td>5.1) Publications</td>
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<td>35,000</td>
<td>34,385.99</td>
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<td>5.2) Other costs</td>
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<td><strong>Sub-total for (5)</strong></td>
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Continue next page
<table>
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<tr>
<th>EXPENDITURES 2018</th>
<th>App. Budget</th>
<th>Rev. Budget</th>
<th>Spent</th>
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<td>6.1) TWAS Regional Partners</td>
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<td>134,988</td>
<td>49,811.22</td>
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<td>6.5) TWAS-Elsevier Project</td>
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<td>6.6) TWAS-SRMGI Project</td>
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<td>6.7) TWAS-Lounsbery Project</td>
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<td>319,158</td>
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<td>6.8) TWAS-IMU Project</td>
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<td>6.9) TWAS-IsDB Project</td>
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</table>

**Sub-Total for (6)** | 2,083,914 | 1,711,908 | 1,313,757.40 |
The purpose of the Reserve Fund is to cover the end-of-service entitlements of TWAS staff.

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.

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

<table>
<thead>
<tr>
<th>EXPENDITURES 2018</th>
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<th>Rev. Budget</th>
<th>Spent</th>
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<tr>
<td>7) Operational Expenses</td>
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<td>7.5) Library, office and other supplies</td>
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<td>65,000</td>
<td>41,887.37</td>
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<tr>
<td>7.5.1) General supplies</td>
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<td>7,850.86</td>
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<td>7.5.2) Equipment</td>
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<td>7.6) Other general operating expenses</td>
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Management costs

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<th>5,968,604</th>
<th>5,016,742.85</th>
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<tr>
<td>Savings on prior years' obligations</td>
<td>291,910.53</td>
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<tr>
<td>Excess (shortfall) of income over expenditure</td>
<td>771,460.55</td>
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</table>

Reserve Fund

| Amount available at the beginning of period | 2,038,141.60 |
| End of service entitlements | 0.00 |
| Reserve fund balance end of period | 2,038,141.60 |

TWAS ENDOWMENT FUND 1994-2018² (IN USD)

<table>
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<tr>
<th>ORGANIZATIONS</th>
<th>CONTRIBUTIONS RECEIVED</th>
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<tbody>
<tr>
<td>1) Ministry of Sciences and Technology (China)</td>
<td>2,200,000</td>
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<tr>
<td>2) Ministry of Science &amp; Technology (Brazil)</td>
<td>1,933,107</td>
</tr>
<tr>
<td>3) Department of Science &amp; Technology (India)</td>
<td>1,000,000</td>
</tr>
<tr>
<td>4) National Science &amp; Technology Council (Mexico)</td>
<td>714,155</td>
</tr>
<tr>
<td>5) Academia Sinica (Taiwan, China)</td>
<td>608,915</td>
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<tr>
<td>6) Ministry of Science &amp; Technology (Nigeria)</td>
<td>586,779</td>
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<tr>
<td>7) Kuwait Foundation for the Advancement of Sciences, KFAS (Kuwait)</td>
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<tr>
<td>8) Ministry of Research, Science and Technology (Iran, I.R.)</td>
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<tr>
<td>9) Ministry of Science, Technology &amp; the Environment (Malaysia)</td>
<td>100,000</td>
</tr>
<tr>
<td>10) Ministry of Science &amp; Technology (Pakistan)</td>
<td>100,000</td>
</tr>
<tr>
<td>11) Secretariat of Science and Technology (Argentina)</td>
<td>55,000</td>
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<tr>
<td>12) Ministry of Modernization &amp; Technology (Senegal)</td>
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<tr>
<td>13) Colombian Institute for the Development of Science &amp; Technology – Colciencias (Colombia)</td>
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<tr>
<td>14) Ministry of State for Scientific Research (Egypt)</td>
<td>50,000</td>
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<tr>
<td>15) Atomic Energy Commission (Syria)</td>
<td>50,000</td>
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<tr>
<td>16) Ministry of Finance (Sudan)</td>
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<tr>
<td>17) National Centre for Science and Technology of Vietnam (Vietnam)</td>
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<tr>
<td>18) National Academy of Science and Technology (Philippines)</td>
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<tr>
<td>19) Ministry of Science &amp; Technology (Bangladesh)</td>
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<tr>
<td>20) Ministry of Science, Technology and Higher Education (Tanzania)</td>
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<td>21) Swedish Council of Higher Education (Sweden)</td>
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<tr>
<td>22) Office of the Prime Minister (Jamaica)</td>
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<tr>
<td>23) Instituto Venezolano de Investigaciones Científicas (IVIC) (Venezuela)</td>
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<tr>
<td>Subtotal</td>
<td>8,368,864</td>
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<tr>
<td>Plus other contributions³</td>
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<tr>
<td>Plus interest earned</td>
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<tr>
<td>Transfer to/from TWAS Fund in 2011 and 2013, 2014, 2015 and 2016</td>
<td>(2,025,768)</td>
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<tr>
<td>TOTAL</td>
<td>12,931,316</td>
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</table>

¹ The purpose of the Reserve Fund is to cover the end-of-service entitlements of TWAS staff.

² 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.

³ This amount comprises donations from TWAS members, individuals and other organisations’ contributions (see separate list, next page).
## CONTRIBUTIONS TO THE ENDOowment FUND FROM TWAS MEMBERS, INDIVIDUALS AND OTHERS (1994-2018)

<table>
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<tr>
<th>Name</th>
<th>Contribution</th>
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<tr>
<td>J. Palis, Brazil</td>
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<td>Science Initiative Group, USA</td>
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<td>J.I. Vargas, Brazil</td>
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<tr>
<td>S.S. Katriva, India</td>
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<td>A.V. Rama Rao, India</td>
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<td>Fuchu He, China</td>
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<tr>
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<tr>
<td>M. Peimbirt, Mexico</td>
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<td>Lu Yong Xiang, China</td>
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<tr>
<td>P. McGrath, UK</td>
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<tr>
<td>M. Iqbal Parker, South Africa</td>
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<tr>
<td>K. Namsrai, Mongolia</td>
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<td>E.K.A. Edee, Togo</td>
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<tr>
<td>M. Peimbert, Mexico</td>
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<tr>
<td>P. Ciarlet, France</td>
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<td>Lee Yuan T., Taiwan, China</td>
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<td>Mei Hong, China</td>
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<td>Jean-Marie Lehn, France</td>
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<td>D. Balasubramian, India</td>
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<td>L. de la Pena Auerbach, Mexico</td>
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<td>Un-Chul Paek, USA</td>
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<td>Dong Shaojun, China</td>
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<td>L.F. Rodriguez, Mexico</td>
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<td>Wang Erkang, China</td>
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<td>Zhao Jincai, China</td>
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<td>J. Allende, Chile</td>
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<td>E.H.S. Diop, Senegal</td>
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<td>D.T. Lê, Vietnam</td>
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<td>J.S. Yadav, India</td>
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<td>H.K. Majumder, India</td>
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<td>K. Basu, USA</td>
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<td>U. Aswathananaray, India</td>
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<td>N. Kumar, India</td>
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<td>U. Colombo, Italy</td>
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<tr>
<td>Ingrid Daubechies</td>
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<td>H.K. Majumder, India</td>
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<td>K. Basu, USA</td>
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<td>U. Aswathananaray, India</td>
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<td>N. Kumar, India</td>
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<td>S.M. Muhongo, South Africa</td>
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<td>U. Colombo, Italy</td>
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<td>A. Peerally, Canada</td>
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<td>A.M. Cetto, Mexico</td>
<td>51</td>
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<tr>
<td>Ingrid Daubechies, USA</td>
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<tr>
<td><strong>Total</strong></td>
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</table>
### VOLUNTARY CONTRIBUTIONS RECEIVED FROM TWAS MEMBERS, YOUNG AFFILIATES AND OTHER INDIVIDUALS (2018)

<table>
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<th>Donations to the Programme Budget:</th>
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<tr>
<td>CIARLET Philippe (Hong Kong, China)</td>
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<tr>
<td>RAMKISSDON Harold (Trinidad and Tobago)</td>
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</tr>
<tr>
<td>GUPTA Mahabir (Panama)</td>
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</tr>
<tr>
<td>From anonymous donors</td>
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<td><strong>Total</strong></td>
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<th>Donations to the Endowment Fund:</th>
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<td>UPRETI, Bishan Nath (Nepal)</td>
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<tr>
<td>MEI Hong (China)</td>
<td>96.30</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>781.56</strong></td>
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</tbody>
</table>

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• Yuslín González Abreu [Cuba], physics
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