United Nations
Educational, Scientific and
Cultural Organization

twas

ANNUAL REPORT 2021

THE WORLD ACADEMY OF SCIENCES

for the advancement of science in developing countries

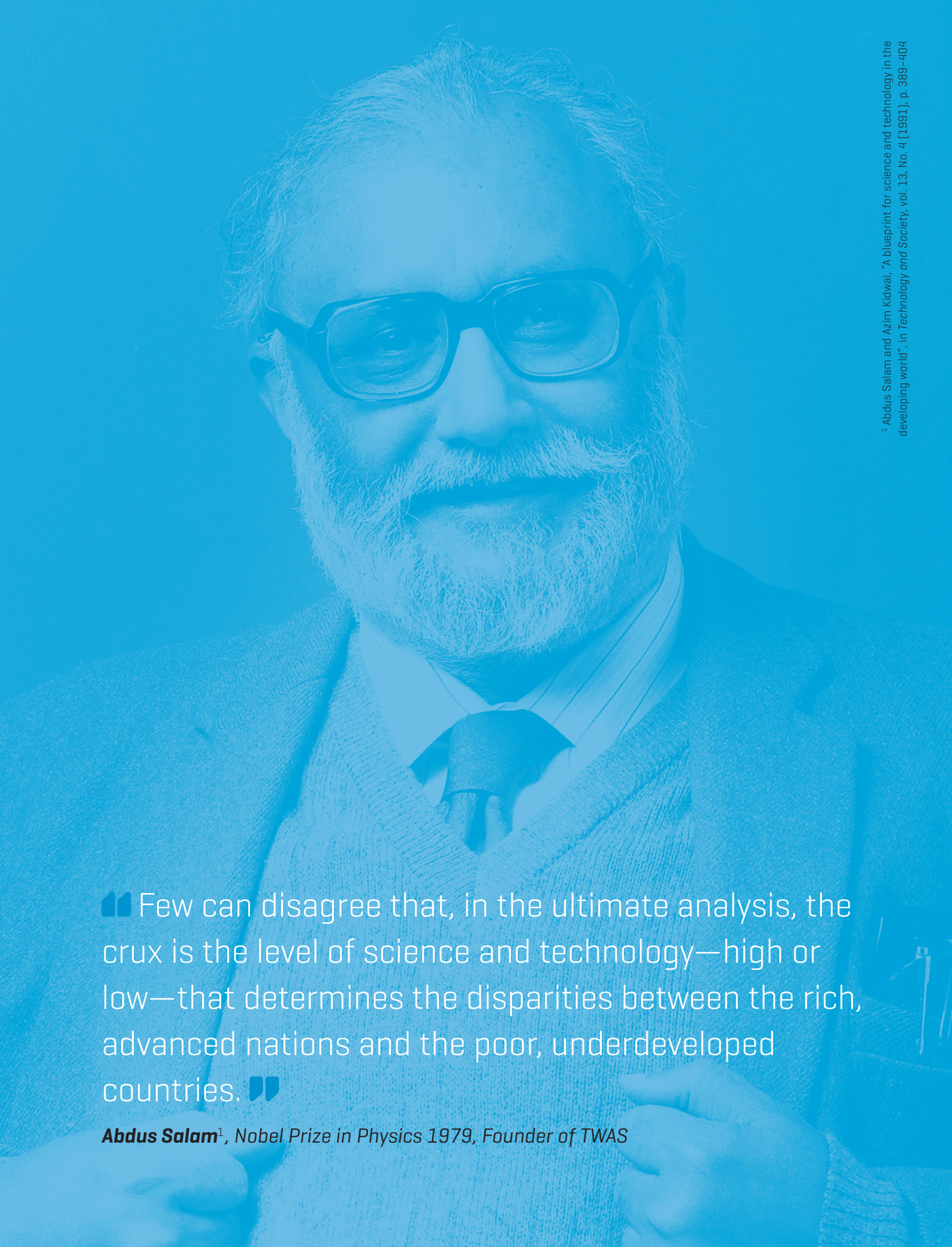
United Nations
Educational, Scientific and
Cultural Organization

twas

ANNUAL REPORT 2021

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[1], *Nobel Prize in Physics 1979, Founder of TWAS*

[1] Abdus Salam and Azim Kidwai, “A blueprint for science and technology in the developing world”, in *Technology and Society*, vol. 13, No. 4 (1991), p. 389–404

CONTENTS

▲ The virtual lobby for TWAS Fifteenth General Conference.

Cover photo: Babita Paudel-Bhattarai, TWAS Research Grant awardee and Research Director of the Center for Natural and Applied Sciences in Kathmandu, Nepal, isolating antidiabetic compounds from medicinal plants of Nepal. [Photo: Keshav Bhattarai]

TWAS COUNCIL

TWAS Council, elected by TWAS Fellows every four years, is responsible for supervising all of the Academy's affairs. The current Council was elected in January 2019 to serve until the end of 2022.

President
Mohamed Hassan [Sudan]

Immediate Past President
Bai Chunli [China]

Vice-Presidents
Africa:
Moctar Touré [Senegal]
Arab Region:
Sabah AlMomin [Kuwait]
[Elected in December 2020 to serve for the remainder of the term after TWAS Council Member **Mohammed Hamdan** passed away, in February 2020]
Central and South Asia:
Dorairajan Balasubramanian [India]
East and South-East Asia:
Khatijah Yusoff [Malaysia]
Latin America and the Caribbean:
Manuel Limonta-Vidal [Cuba]

Secretary General
Luiz Davidovich [Brazil]

Treasurer
Yang Wei [China]

Council Members
Africa:
Roseanne Diab [South Africa]
Arab Region:
Abdel Nasser Tawfik [Egypt]
Central and South Asia:
Mohammad Shamsher Ali [Bangladesh]
East and South-East Asia:
Bishal Nath Upreti [Nepal]
Latin America and the Caribbean:
Sandra Díaz [Argentina]
[Elected in May 2021 to serve for the remainder of the term after TWAS Council Member **Mahabir Prashad Gupta** passed away in December 2020]

Ex-officio Council Member
Atish Dabholkar [India]
[Director, Abdus Salam International Centre for Theoretical Physics]

TWAS MISSION

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

TWAS was founded in 1983 by a distinguished group of scientists from the developing world, under the leadership of Pakistani physicist Abdus Salam, Nobel Prize winner in 1979. By the end of 2021, UNESCO-TWAS had more than 1,300 elected Fellows—11 of them Nobel laureates—representing 108 countries. The Academy is based in Trieste, Italy, on the campus of the Abdus Salam International Centre for Theoretical Physics (ICTP). TWAS, a programme unit of the United Nations Educational, Scientific and Cultural Organization (UNESCO), receives its core funding from the Italian Ministry of Foreign Affairs and International Cooperation. The Swedish International Development Cooperation Agency (Sida) provides essential funding for TWAS programmes. Through more than three decades, TWAS mission has remained consistent, namely, to:

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

BUILDING CAPACITY AND NURTURING EXCELLENCE

by **Mohamed H.A. Hassan**, *TWAS President*

With the passing of another year in which the world is being reshaped to meet emerging challenges, The World Academy of Sciences for the advancement of science in developing countries has also changed, while marking numerous successes along the way

In the year 2021, the Academy busily developed and implemented new programmes to meet the increased demand, nurturing this growth with an eye towards critical questions, such as a broader inclusion of women in science and the need for swift climate actions.

This was also an auspicious year for one reason in particular: The successful convening of TWAS Fifteenth General Conference, which was held entirely online for the first time, and attracted major figures in scientific research and science policy.

The road to this accomplishment was complicated by the global COVID-19 pandemic, but its completion will stand out as a milestone in TWAS history. Indeed, profound thanks are given to our partners in Saudi Arabia—the event's host, the King Abdullah University of Science and Technology, and a key collaborator, the Islamic Development Bank. Their support and contribution made the first-of-its-kind conference possible.

And still, while we change, two important factors have remained consistent since the inception of the Academy, almost 40 years ago: **building capacity** in the South and the pursuit of **excellence** in doing so.

The United Nations defines **capacity-building** as the process of developing and strengthening the skills, processes and resources that communities need not only to survive, but also to adapt and ideally thrive in a fast-changing world. An essential ingredient in capacity-building is a transformation that is generated and sustained over time from within a community, a transformation that goes beyond performing tasks.

Sustainable Development Goal 17—Revitalizing the Global Partnership for Sustainable Development—lists two targets on capacity-building, including increasing technology and innovation in least developed countries (LDCs).

Target 17.8, in particular, which called for the operationalization of the technology bank for the LDCs was successfully accomplished in 2018: The United Nations Technology Bank for the Least Developed Countries is now up and running with its headquarters in Gebze, Türkiye. I am privileged to be the first Chair of the Bank Governing Council.

Academic and scientific institutions, in particular, serve as hubs for capacity-building, a mission that The World Academy of Sciences has been perfecting and expanding over the years. In 2021, TWAS continued to **build capacity** in the South in a holistic fashion: supporting education and training, funding research projects, fostering science policy, advocating for the relevance of science diplomacy.

The measure for all of our activities continues to be scientific excellence. Whether excellence refers to the recipients of our grants and

▲ Winners of TWAS Awards spanning three years, officially received their awards at TWAS Fifteenth General Conference, held online from 1–4 November 2021.

awards, of our Fellows, of our programmes, or our enhanced outreach activities, it is the key concept for TWAS, as it has always been.

We pursue excellence by continuing to elect to our membership the most distinguished scientists as TWAS Fellows, because they are the figures who shape the policies of the Academy. By the end of 2021, TWAS counted 1,339 members—11 of them Nobel Laureates—with women representing 15.76 per cent.

Gender representation from science- and technology-lagging countries (STLCs)[1] have become priorities for the Academy. Of the 58 Fellows elected in 2021, 20—or 34.5 per cent—were women, and we will continue to pursue these objectives.

The new members also include outstanding scientists from countries that were under-represented, such as Uzbekistan, the Republic of the Congo and Saudi Arabia. The Academy also elected 33 Young Affiliates under the age of 40, coming from 26 developing countries.

We pursue excellence by providing promising research projects in science- and technology-lagging countries with much-needed financial support through TWAS Research Grants, among numerous other programmes. In 2021, TWAS, with the support of the Swedish International Development Cooperation Agency, awarded a total of 67 research grants to scientists from STLCs.

Fifty-two per cent of those grants were given to women scientists and 52 per cent to researchers in least developed countries, thus achieving our targeted outreach activities. TWAS went also a step ahead by monitoring and evaluating the impact of its programmes more closely.

We pursue excellence by bestowing awards that acknowledge the achievements of expert and young scientists alike. In 2021, TWAS heralded recent awardees through its First TWAS Awards Webinar Series. The five webinars, in the lead up to the General Conference, showcased some of the most acclaimed scientific work in the developing world, and demonstrated the Academy's capacity to nurture and honour impressive research.

This is but a sampling of the Academy's achievements, laid out in our Annual Report for this year, as we continue to pursue capacity-building and excellence as part of the global scientific community. For it is as a community that we will find solutions to the complex challenges of our time, and fill the critical need for more and better science in the global South.

[1] TWAS has identified 66 developing countries in which capacity in science and technology is significantly lagging. The list includes the 46 least developed countries identified by the United Nations, plus countries selected because of their low-income levels and specific needs for support in building research capacity.

A YEAR O

In 2021, the Academy worked tirelessly to strengthen science capacity in the global South, and further involve research institutions and policymakers in the scientific discourse. Below are the Academy's highlights:

1 TWAS Fifteenth General Conference

The Conference, convened from 1–4 November, was the main highlight of 2021, and was organized by the King Abdullah University of Science and Technology in collaboration with the Islamic Development Bank—both important UNESCO-TWAS partners based in Saudi Arabia. Held entirely online due to the COVID-19 restrictions, the event drew an international audience of about 600 participants per day from 80 countries, including researchers and policy experts from developing and developed regions. [For more on the TWAS General Conference, see p. 14.]

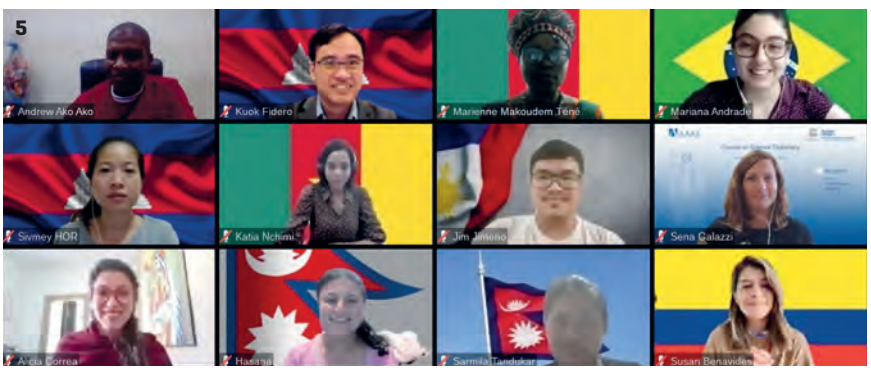
2 First TWAS Awards Webinar Series

For the first time, UNESCO-TWAS featured its distinguished awardees in a webinar series in the months leading up to TWAS General Conference—from June to October 2021. The webinars were livestreamed on the Academy's YouTube channel and were an opportunity for TWAS award winners to deliver brief presentations showcasing their accomplishments. After each presentation a question-and-answer session took place, allowing participants to ask those outstanding scientists their questions. [For more on TWAS Awards, see p. 16 and 34.]

3 A fellowship for women

The Academy's collaboration with the Islamic Development Bank (IsDB) for a postdoctoral

F IMPACT



programme for early-career researchers from IsDB least developed member countries had a unique feature in 2021, its third year. The programme, called TWAS-IsDB Postdoctoral Fellowship Programme for Women, only allowed participation of women candidates in an effort to foster gender equality and the participation of women in science. [For more on women in science, see p. 26.]

4 Programmes for least developed countries

In 2021, two programmes dedicated to early-career scientists from least developed countries were launched: one jointly organized by UNESCO-TWAS with the International School for Advanced Studies (SISSA) in Trieste, and the Accademia Nazionale dei Lincei in Rome, known as TWAS-SISSA-Lincei Research Cooperation Visits Programme; and the other organized with the United Nations Technology Bank for Least Developed Countries (UNTBLDC) and the International Centre for Genetic Engineering and Biotechnology (ICGEB), known as the ProgrAmme of CollaboraTions with LDCs (PACTs). [For figures on fellowships, see p. 18.]

5 Science diplomacy success

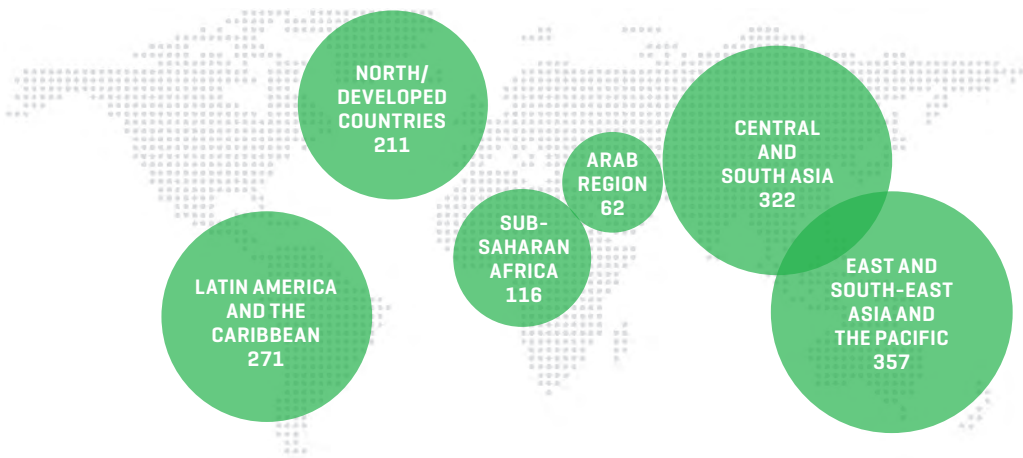
UNESCO-TWAS partnered with the American Association for the Advancement of Science (AAAS) to organize the Eighth AAAS-TWAS Science Diplomacy Course, from 30 August–3 September. The five-day all-virtual course included talks from experts in science diplomacy, and featured also break-out sessions in which participants collaborated to examine science diplomacy in a series of exchanges and simulations. [For more on science diplomacy, see p. 24]

WHO W

As a global, merit-based science academy, UNESCO-TWAS represents 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 TWAS Fellows.

In 2017, TWAS Council decided that Fellows elected in December of one year would be inducted on 1 January of the following year. The charts below represent TWAS membership as of 31 December 2021 (including TWAS Fellows elected in 2021 but officially inducted in 2022).

Total TWAS Fellows, by region



TWAS Fellows elected in 2021, by region

For a full list of Fellows elected in 2021, please see page 42

Fellows

1,339 TOTAL FELLOWS

108 COUNTRIES

84% FROM DEVELOPING COUNTRIES

11 NOBEL PRIZE LAUREATES

TWAS Fellows elected in 2021 by country

7 BRAZIL

6 CHINA; INDIA

3 CUBA

2 AUSTRALIA; BANGLADESH; IRAN (ISLAMIC REPUBLIC OF); MALAYSIA; SOUTH AFRICA; UNITED STATES OF AMERICA; UZBEKISTAN*

1 BOLIVIA (PLURINATIONAL STATE OF)*; CAMEROON; TAIWAN, CHINA; CONGO (THE)*; ETHIOPIA; FRANCE; GAMBIA (THE)*; GEORGIA*; GERMANY; ITALY; KENYA; MALI*; NEPAL*; NEW ZEALAND*; STATE OF PALESTINE (THE)*; PAKISTAN; SAUDI ARABIA*; SENEGAL; SERBIA*; SWITZERLAND; UNITED ARAB EMIRATES (THE)*; UNITED KINGDOM

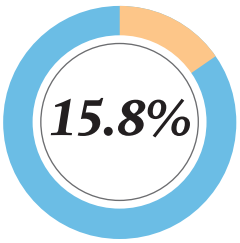
* From underrepresented countries.

E ARE

TWAS FELLOWS AND YOUNG AFFILIATES

Women Fellows

2021

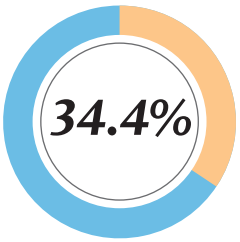


211 WOMEN OUT OF 1,339 MEMBERS

1984

2 WOMEN OUT OF 55 MEMBERS

New Fellows



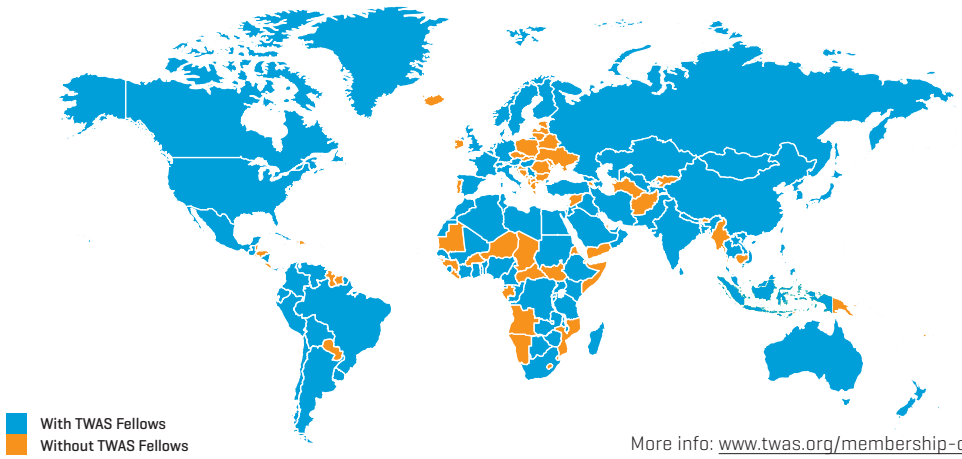
20 OUT OF 58 TWAS FELLOWS ELECTED IN 2021 WERE WOMEN

For a list of Fellows elected in 2021, please see page 42.

Four long-time supporters make the work of TWAS possible:

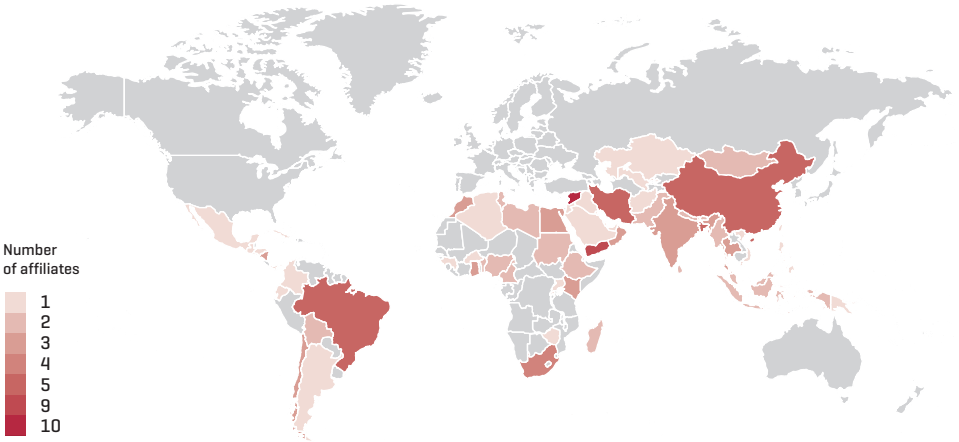
- **The Government of Italy, through the Ministry of Foreign Affairs and International Cooperation (MAECI)**, provides core funding
- **The Swedish International Development Cooperation Agency (Sida)** supports TWAS research grants, science diplomacy and communications initiatives
- **The United Nations Educational, Scientific and Cultural Organization (UNESCO)** administers TWAS funds and personnel, and
- **The Abdus Salam International Centre for Theoretical Physics (ICTP)** hosts TWAS on its campus in Trieste, Italy, and provides administrative support.

Countries with and without TWAS Fellows



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

TWAS Young Affiliates in 2021 by country of residence*

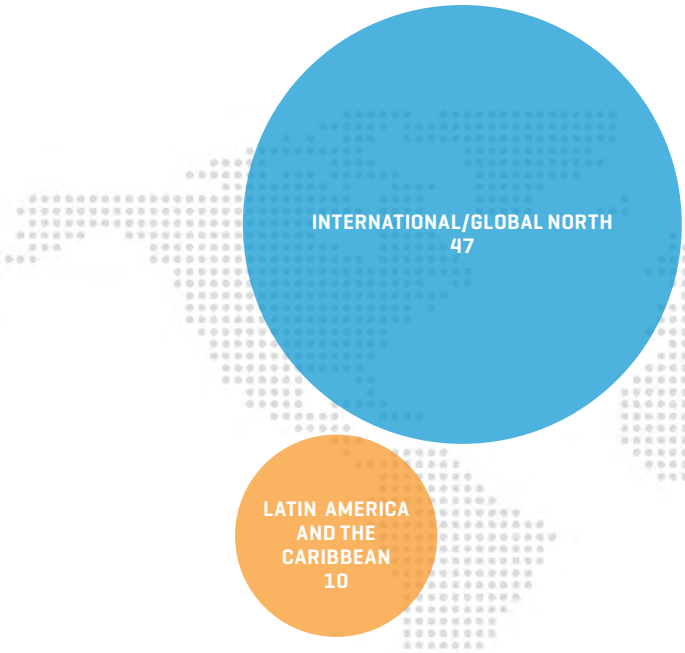


* Scientists selected under the Islamic Development Bank-TWAS Refugee and Displaced Young Scientists Programme are classified by country of origin.

TWAS PA

INTERNATIONAL/GLOBAL NORTH

- Abdus Salam International Centre for Theoretical Physics (ICTP), Italy
- Accademia Nazionale dei Lincei, Italy
- Al-Fanar Media, Alexandria Trust, United Kingdom*
- Alexander von Humboldt Foundation**, Germany
- American Association for the Advancement of Science (AAAS), United States
- Biovision, France
- Council for At-Risk Academics (CARA), United Kingdom*
- Elsevier Foundation, Netherlands
- Environmental Defense Fund (EDF), United States*
- Euro-Mediterranean University (EMUNI), Slovenia
- Fondazione Internazionale Trieste per il Progresso e la Libertà delle Science (FIT), Italy
- Federal Ministry of Education and Research (BMBF)**, Germany
- Foundation for Rare Diseases**, France
- German Research Foundation (DFG)**, Germany
- Global Research Council (GRC), United Kingdom*
- Global Young Academy (GYA), Germany
- Institute for International Education, Scholar Rescue Fund, United States*
- InterAcademy Partnership (IAP), Italy
- International Centre for Genetic Engineering and Biotechnology (ICGEB), Italy
- International Development Research Centre (IDRC), Canada
- International Institute for Applied Systems Analysis (IIASA), Austria
- International Mathematical Union (IMU), Germany
- International Network of Government Science Advice (INGSA), New Zealand
- International Science Council (ISC), France
- Islamic Development Bank (IsDB), Saudi Arabia
- Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)**, Italy
- Ministry of Foreign Affairs and International Cooperation (MAECI)**, Italy
- Japan Science and Technology Agency (JST), Japan
- Joint Research Centre, European Commission, Belgium
- Lindau Nobel Laureate Meetings, Germany
- National Academies of Sciences, Engineering and Medicine, United States*
- National Institute of Oceanography and Applied Geophysics (OGS)**, Italy
- New York Academy of Sciences (NYAS), United States
- OPEC Fund for International Development (OFID), Austria
- Organization for Women in Science for the Developing World (OWSD), Italy
- Regione Autonoma Friuli Venezia Giulia (Regione FVG), Italy
- [The] Royal Society, United Kingdom*
- Scholars at Risk (SAR), United States*
- SciDev.Net, United Kingdom*
- Scuola Internazionale Superiore di Studi Avanzati (SISSA), Italy
- Swedish International Development Cooperation Agency (Sida), Sweden
- The Scientific and Technological Research Council of Turkey (TÜBİTAK)**, Türkiye



- TWAS Young Affiliates Network (TYAN), Italy
- United Nations Educational, Scientific and Cultural Organization (UNESCO), France
- Technology Bank for the Least Developed Countries (UNTB), United Nations, Türkiye
- Using Science For/In Diplomacy For Addressing Global Challenges (S4D4C), European Union
- World Meteorological Organization (WMO), Switzerland

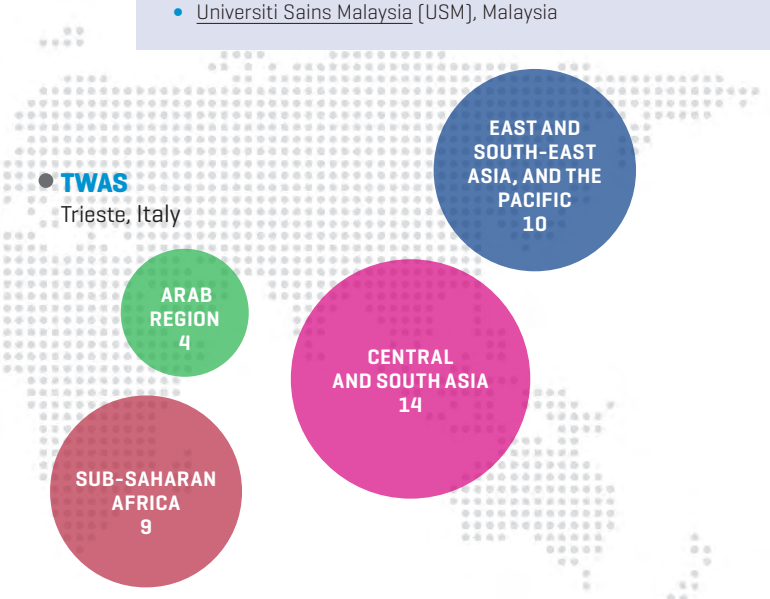
* For practical reasons, "United Kingdom" is used instead of the full name, "United Kingdom of Great Britain and Northern Ireland". Similarly, "United States" is used instead of the full name, "United States of America".

** To ease consultation, the English version of the institution's name is provided, when available on the relevant websites and actually used. This is the reason why acronyms may not correspond to the English name, but to the name in the original language.

RTNERS

EAST AND SOUTH-EAST ASIA, AND THE PACIFIC

- Academia Sinica, Taiwan, China
- Akademi Sains Malaysia, Malaysia
- China Association for Science and Technology (CAST), China
- Chinese Academy of Sciences (CAS), China
- International Science, Technology and Innovation Centre for South-South Cooperation (ISTIC), a UNESCO Category 2 Centre, Malaysia
- Lenovo Group Limited, China
- Ministry of Science and Technology, China
- National Center for Genetic Engineering and Biotechnology (BIOTEC), Thailand
- Universiti Putra Malaysia (UPM), Malaysia
- Universiti Sains Malaysia (USM), Malaysia



LATIN AMERICA AND THE CARIBBEAN

- Academia Chilena de Ciencias, Instituto de Chile, Chile
- Academia de Ciencias del Ecuador, Ecuador
- [The] Brazilian Academy of Sciences, Brazil
- [The] Caribbean Community (CARICOM), Guyana
- Consejo Nacional de Ciencia y Tecnología (CONACYT), Mexico
- Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina
- Conselho Nacional de Desenvolvimento Cientifico e Tecnológico (CNPq), Brazil
- Ministério da Ciência, Tecnologia e Inovações, Brazil
- Ministerio de Ciencia, Tecnología e Innovación, Argentina
- São Paulo Innovation and Science Diplomacy School (InnSciD SP), Brazil

CENTRAL AND SOUTH ASIA

- Centre of Excellence in Molecular Biology (CEMB), University of the Punjab, Pakistan
- Commission on Science and Technology for Sustainable Development in the South (COMSATS), Pakistan
- COMSATS University Islamabad (CUI), Pakistan
- Council of Scientific and Industrial Research (CSIR), Ministry of Science and Technology, Government of India
- Department of Biotechnology, Ministry of Science and Technology, Government of India
- Department of Science and Technology (DST), Ministry of Science and Technology, India
- Indian Association for the Cultivation of Science (IACS), India
- International Center for Chemical and Biological Sciences (ICCBS), Pakistan
- Iranian Research Organization for Science and Technology (IROST), Ministry of Science, Research and Technology, Iran (Islamic Republic of)
- Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), India
- [Organization of Islamic Cooperation (OIC) Ministerial] Standing Committee on Scientific and Technological Cooperation (COMSTECH), Pakistan
- National Centre for Physics (NCP), Pakistan
- S.N. Bose National Centre for Basic Sciences (SNBNCBS), India
- The Dawood Foundation, Pakistan

ARAB REGION

- Bibliotheca Alexandrina (BA), Egypt
- King Abdullah University of Science and Technology (KAUST), Saudi Arabia
- Lebanese Association for Scientific Research (LASeR), Lebanon
- [The] Royal Scientific Society, Jordan

SUB-SAHARAN AFRICA

- Academy of Science of South Africa (ASSAf), South Africa
- African Academy of Sciences (AAS), Kenya
- African Union (AU), Ethiopia
- Department of Science and Innovation (DSI), South Africa
- International Centre of Insect Physiology and Ecology (icipe), Kenya
- Ministry of Higher Education, Science, Technology and Innovation, Angola
- National Research Foundation (NRF), South Africa
- [The] Sudanese National Academy of Sciences (SNAS), Sudan
- [The] Tanzania Academy of Sciences (TAAS), Tanzania

TWAS FIFTEENTH GENERAL CONFERENCE JEDDAH

Drawing on an international community of researchers and policy experts, UNESCO-TWAS convened its Fifteenth General Conference in an all-virtual format for the first time in its history, from 1–4 November 2021.

The event was originally planned to take place in person in the city of Jeddah, Saudi Arabia, in 2020. In light of the COVID-19 pandemic, however, the Conference was postponed until 2021 and took place online. The virtual format made it possible for TWAS connections all over the world to participate, making this the largest General Conference on record with about 600 attendees daily.

Furthermore, TWAS Council authorized opening participation to those outside the traditional community of TWAS Fellows and the TWAS Young Affiliates Network, and so beneficiaries of TWAS programmes, such as fellowship holders and grantees, from the Arab region were invited to attend.

Two institutions based in Saudi Arabia provided important support for TWAS Fifteenth General Conference: the King Abdullah University of Science and Technology (KAUST) and the Islamic Development Bank (IsDB), both based in Jeddah.

Highlights included:

Lecture by Nobel Laureate: World-renowned chemist Jean-Marie Lehn was a keynote speaker at the Conference. In his talk, he

▶ Munir Eldesouki, Assistant Minister at the Ministry of Communications and Information Technology of Saudi Arabia and Acting President of the King Abdul-Aziz City for Science and Technology.

◀ From left: TWAS Medallist Hayat Sindi, Nobel Laureate and keynote speaker Jean-Marie Lehn, TWAS Medallist Roseanne Diab, and TWAS Medallist Mandyam Srinivasan.

▶ TWAS President Mohamed Hassan speaking during the closing ceremony of TWAS Fifteenth General Conference on 4 November.

Number of attendees

411* ATTENDEES

84 REPRESENTED COUNTRIES

233 TWAS FELLOWS

56 YOUNG AFFILIATES

45 YOUNG AFFILIATE ALUMNI

95 WOMEN

23** PROGRAMME BENEFICIARIES

* The total number of participants was in reality 618. Detailed information, as broken down above, however, was available only for 422 of them. Additionally, the numbers above are not meant to add up to 422, as some categories overlap.
** From the Arab region only

highlighted the importance of modern chemistry, and invited younger generations to enter science with an open heart.

TWAS Medal Lectures: Three TWAS Medallists were named: Hayat Sindi, Chief Advisor for Science, Technology and Innovation to the President of the Islamic Development Bank (IsDB), who spoke on how biotechnology is 'learning' to develop new technologies that improve our lives; Roseanne Diab, Emeritus Professor at the School of Environmental Sciences of the University of KwaZulu-Natal in Durban, South Africa, who spoke on why international organizations should propel gender equality in science globally; and

> There can be no global solution unless we empower all nations to do their part.
>
> ***Tony Chan**, President of the King Abdullah University of Science and Technology, at the opening ceremony of TWAS Fifteenth General Conference*

Mandyam Srinivasan, Emeritus Professor of Visual and Sensor Neuroscience at the University of Queensland in St. Lucia, Australia, who discussed his research on how bees and other animals perceive and navigate through their environments.

Jeddah Declaration: On the final day of the successful event, the Conference adopted the Jeddah Declaration—an action that touched on numerous key issues in science, including calling for the systematic use of risk- and evidence-based analysis and scientific approaches to reduce the negative impact of "infodemics" on health behaviours, as well as advocating for the principles of open science and calling for academies around the world to promote gender responsiveness commitments to achieve and encourage gender equality.

HONOURING SCIENTIFIC EXCELLENCE

TWAS Awards provide a powerful incentive for scientists to excel on new levels, while bringing global recognition to the achievement of researchers from the developing world.

The Academy administers numerous awards, some of which are annual, others being biennial. These awards are often named after generous and highly accomplished TWAS Fellows.

Additionally, this year saw a first-of-its-kind initiative for TWAS, the TWAS Awards Webinar Series. [To learn more about how the Academy made use of its virtual platform to highlight its exceptional winners, see p. 34.]

The Academy's highest prize, the TWAS-Lenovo Award, was not given in 2021, and will next be given in 2022.

• The **2021 TWAS-Abdool Karim Award in Biological Sciences**—named after TWAS Fellow Professor Quarraisha Abdool Karim—for women scientists nationals of a low-income African country recognizing scientific achievements in biological sciences, went to Malian biologist **Djeneba Dabitao** for her research on inflammatory cytokine responses in health and disease. Her research led to a better

▼ Left: Djeneba Dabitao of Mali, Winner of the 2021 TWAS-Abdool Karim Award in Biological Sciences, working in her laboratory, in 2019. [Photo provided] Right: Huda Omer Basaleem of Yemen, Winner of the 2021 Fayzah M. Al-Kharafi Award, during a visit to Trieste, Italy.

For a complete list of all 2021 TWAS Awards, see p. 42

▲ Laura Pérez of Chile, Winner of the 2021 TWAS-CAS Young Scientist Award for Frontier Science, teaching her students, in 2021. [Photo provided]

▼ Award winners Nigist Asfaw of Ethiopia (top) and Zubair Hasan of Bangladesh (bottom).

understanding of the variances of the most common form of HIV, and of how it develops in populations with different ancestries.

• The **2021 Fayzah M. Al-Kharafi Award**—named after TWAS Fellow Professor Fayzah M. Al-Kharafi—recognizing exceptional women scientists from science- and technology-lagging countries, and rotating among various fields of science, honoured environmental scientist **Huda Omer Basaleem** of Yemen. Her work in community medicine, public health, women and child health, bioethics, and non-communicable diseases brought her to be the principal investigator or a consultant for international organizations, including the World Health Organization, the World Bank, and the United Nations Children Fund (UNICEF).

• The **2021 TWAS-Samira Omar Innovation for Sustainability Award**—named after TWAS Fellow Professor Samira Omar—dedicated to scientists from least developed countries working in an area directly relevant to sustainability, went to Ethiopian chemist **Nigist Asfaw** for her work in 'green chemistry' in her region since 2003. Her research focused on the extraction of the antimalarial drug artemisinin from artemisia plants. She has also been a tireless advocate for women in chemistry.

• The **2021 Atta-ur-Rahman Award in Chemistry**—named after TWAS Fellow Professor Atta-ur-Rahman—went to Bangladeshi materials scientist **Zubair Hasan**, for his standout work on technologies for eliminating pollutants. Examples include materials that remove toxic compounds containing sulfur or nitrogen from model fuel, as well as removing pharmaceutical products, personal care products, or textile dyes from liquid environments.

• The **2021 TWAS-CAS Young Scientist Award for Frontier Science**—reflecting the long-standing partnership between the Chinese Academy of Sciences (CAS) and TWAS, and funded by the Chinese technology company Lenovo—was awarded to astronomer **Laura Pérez** of Chile. Her work focuses on observing the concealed properties of planet-forming disks. Pérez also discovered the first evidence for spiral density waves in a protoplanetary disk using observations from the Atacama Large Millimeter Array radio telescope, and, in later studies, drew conclusions that gravitational instabilities are responsible for these spiral features.

EDUCATION AND 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 continue their education and gather experience at world-class science institutions in the developing world. In 2021, this included India, Pakistan, South Africa and Thailand.

In 2021, 1,013 scholars were pursuing their PhDs through TWAS programmes—the fifth year in a row with over 1,000 participants—with 103 PhD scholars graduated.

In 2019, TWAS partnered with the Islamic Development Bank (IsDB) to develop a Postdoctoral Fellowship Programme, underwritten by funding from the Bank. The programme launched in 2019 with 20 awardees,

▼ Nigerian geographer and TWAS-DFG Cooperation Visits Programme awardee Adebayo Oluwole Eludoyin, at the Forschungszentrum Jülich, in Jülich, Germany, with the equipment necessary to research the effects of deforestation.

VISITING SCIENTISTS

TWAS also provides opportunities to established researchers from the South to pursue collaborations and education, or to gain experience in a country other than their own. In 2021, the programmes included:

- **TWAS-DFG Cooperation Visits Programme**: 50 new early-career African scientists from 10 countries doing three-month postdoctoral research visits in Germany through the Deutsche Forschungsgemeinschaft (DFG or German Research Foundation)
- **TWAS-UNESCO Associateship Scheme**: 8 developing-world scientists from 6 countries
- **TWAS Research and Advanced Training Fellowship Programme**: 15 developing-world scientists from 9 countries
- **Visiting Expert Programme**: 10 experts from 9 countries aiding scientific development in the global South

PhD fellowships

70 AWARDED

6 PARTNERS

3 HOST COUNTRIES

Postdoctoral fellowships

58 AWARDED

3 PARTNERS

15 HOST COUNTRIES

PhD fellowships

2,329 TWAS PHD FELLOWSHIPS AWARDED IN THE LAST DECADE

IsDB postdoctoral awardees by field

7 SUSTAINABLE AGRICULTURE

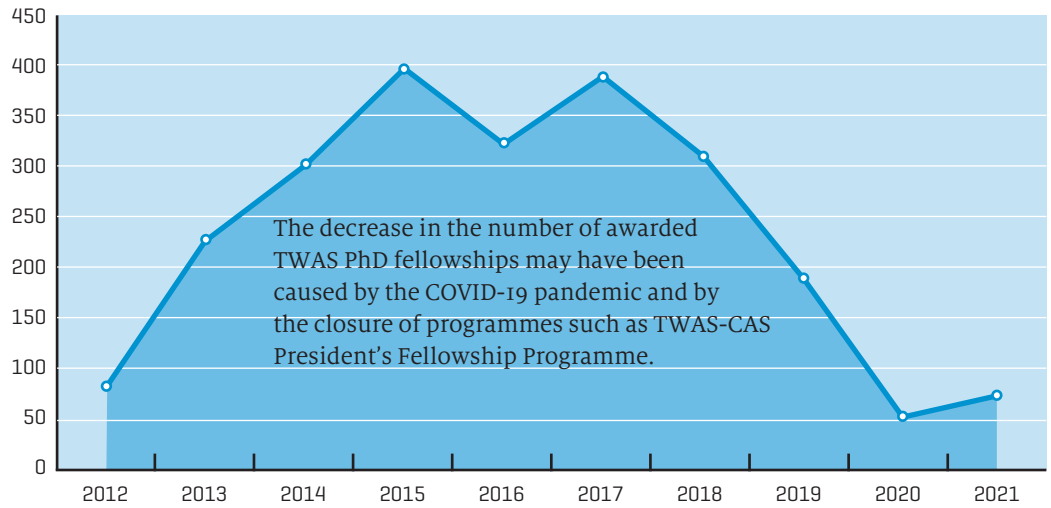
3 BIODIVERSITY; CLIMATE CHANGE; WATER AND HYGIENE

2 EDUCATION FOR SUSTAINABLE DEVELOPMENT; ENERGY; GREEN CHEMISTRY

1 EDUCATION; SUSTAINABLE CITIES; WASTE MANAGEMENT

For more on this fellowship, see p. 26

TWAS PhD fellowships awarded

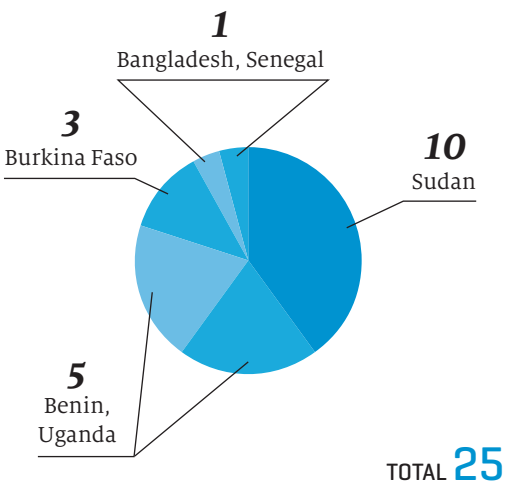


> Experience gained through participation in this programme is amazing.

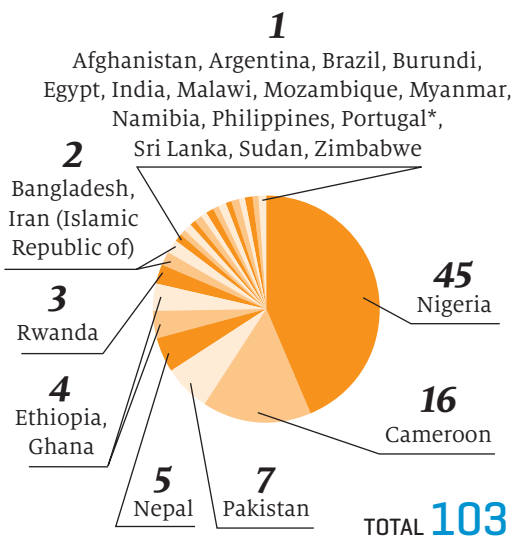
***Adebayo Oluwole Eludoyin**, TWAS-DFG Cooperation Visits Programme awardee*

of whom 6 were women; added 28 in 2020, of whom 8 were women; and then 25 more—all women—in 2021, for a total of 73 awardees, of whom 39 were female awardees. For the year 2021, it was decided to open the call to women only.

Awardees of TWAS-IsDB Postdoctoral Fellowship Programme for Women*

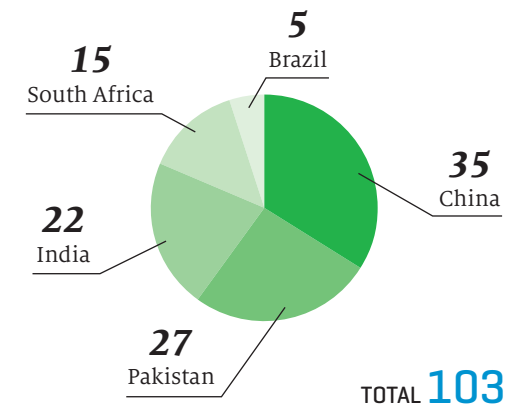


Home country for new 2021 PhD recipients



*Exceptionally, CAS-TWAS President's PhD Fellowship Programme was open to candidates from any country in the world, including developed countries. TWAS, however, only covered travel expenses for awardees from developing countries.

Country of training for new PhDs



PROGRESS THROUGH RESEARCH

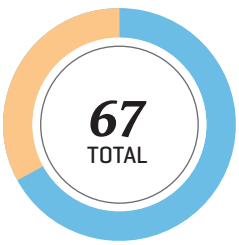
UNESCO-TWAS provides grants to researchers for specialized equipment, consumable supplies, scientific publications in targeted developing countries. Grants are also allocated for training of master's degree students. All grants help to lay a foundation for research in countries with scarce resources.

In 2021, TWAS, with the support of the German Federal Ministry of Education and Research (BMBF), launched a new grant programme called Seed Grants for New African Principal Investigators (SG-NAPI). The programme awards up to $67,700 per grant to projects in sub-Saharan Africa with a focus on least developed countries (LDCs), and seeks to facilitate the return of young scientists to Africa and help local researchers to establish their own laboratories.

Total number of Sida-funded Research Grants

2,697 RESEARCH GRANTS SINCE THE PROGRAMME BEGAN IN 1986

TWAS Research Grants awarded in 2021



48 INDIVIDUAL GRANTS (71.6%)

19 GROUP GRANTS (28.4%)

◀ TWAS Research Grant awardee Komlan Segbeya Gadedjisso-Tossou of Togo in his laboratory in 2020.

▶ TWAS Research Grant awardee Rondro Harinisainana Baohanta (left) of Madagascar in her laboratory in 2017.

Amount of TWAS Research Grants awarded in 2021

$1,477,069

TWAS Research Grants awarded in 2021

35 GRANTS TO LDCs (52.2% OF 67 TOTAL)

35 GRANTS TO WOMEN (52,2%)

Field of research of TWAS Research Grants

27 BIOLOGY

21 CHEMISTRY

12 PHYSICS

7 MATHEMATICS

Field of research of SG-NAPI Grants

5 MEDICAL SCIENCES:

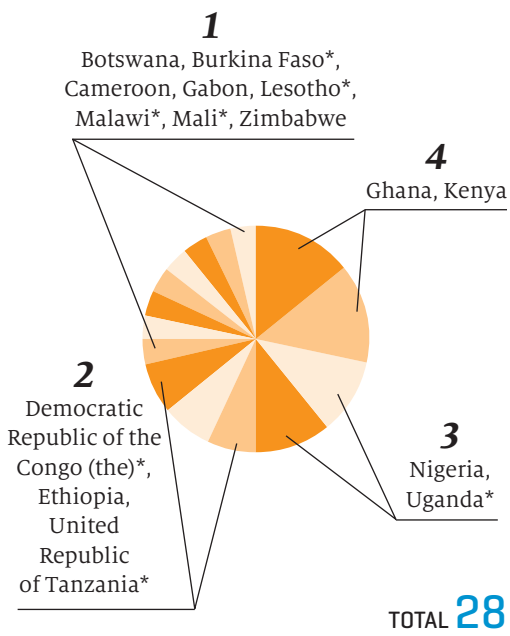
4 AGRICULTURE; BIOLOGY; CHEMISTRY

3 EARTH SCIENCES; ENGINEERING

2 INFORMATION TECHNOLOGY; PHYSICS

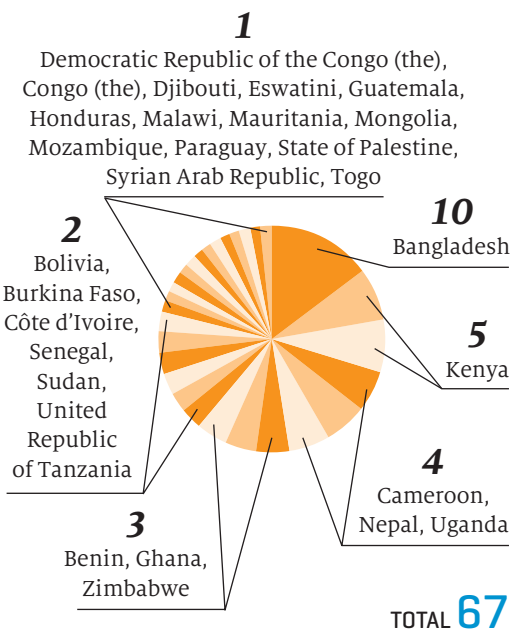
1 MATHEMATICS

Where did SG-NAPI Grants go in 2021?



* LDC

Where did TWAS Research Grants go in 2021?



To respond to the COVID-19 pandemic, the Academy launched a special research grant programme as part of its partnership with the Islamic Development Bank (IsDB) in 2020, called the IsDB-TWAS Joint Research & Technology Transfer Grant: Quick-Response Research on COVID-19. In 2021, the grant split $100,000 between two researchers, one in Pakistan and the other in Benin, both carrying out research on health approaches to antimicrobial resistance in the context of the pandemic.

Additionally, two categories of TWAS Research Grants were available in 2021, part of a programme that has been operational since 1986. TWAS Research Grants for Individuals offered up to $15,000 to early-career researchers in 66 developing countries identified as lagging in science and technology. TWAS Research Grants for Groups provided up to $30,000 to small research groups in the same countries. The Swedish International Development Cooperation Agency (Sida) supports both grant programmes, for a total amount of approximately $1.4 million per year.

SUPPORTING SCIENCE POLICY

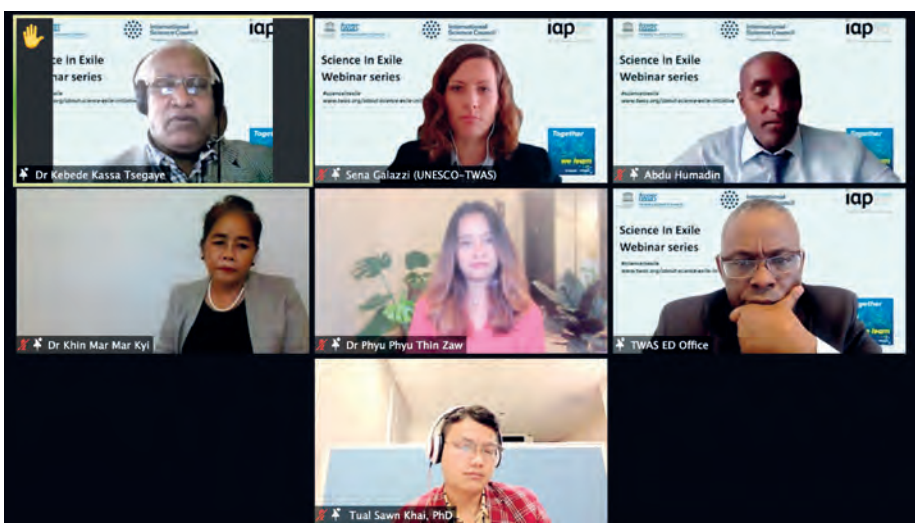
With an elite network of over 1,300 scientists from 108 countries and nearly 40 years of experience in the global science community, UNESCO-TWAS is ideally positioned to provide advice on science policy for the developing world and support for the United Nations Sustainable Development Goals.

TWAS Fifteenth General Conference outcome document: the Jeddah Declaration. The Jeddah Declaration was adopted on 4 November and addressed issues that are high on the agenda of scientific institutions and of policymakers alike: the COVID-19 pandemic, open science, inequality, energy, gender equity, science literacy, biodiversity and digital inclusion.

Approved by the membership of TWAS, the Declaration also touched on topics such as countering the negative impact of 'infodemics' on health behaviours. The Declaration also called for increased efforts at decarbonization, and a bigger focus on the role of methane emissions and the unsustainable usage of resources.

The Declaration also recalled that TWAS is one of the science stakeholders in UNESCO Global Open Science Partnership, and recalled UNESCO Draft Recommendation on Open Science, which was soon after—on 23 November—officially adopted as UNESCO Recommendations on Open Science during UNESCO Forty-first General Conference.

The Declaration also called for global leaders to build organizations that raise gender equality higher on their agenda, to achieve gender parity and inclusivity, particularly in science and at the senior level.



▼ Participants discussing the issue of displaced scientists in Ethiopia and Myanmar at the first Science in Exile webinar, held 22 June.

▶ UNESCO-TWAS Secretary-General Luiz Davidovich introducing the outcome document of TWAS Fifteenth General Conference, the Jeddah Declaration, on 4 November.

TWAS Sixth Strategic Plan: In February, 2021, TWAS Council approved TWAS Sixth Strategic Plan, which encompasses a five-year period from 2021 to 2025. The Plan identifies 10 strategic priorities: recognizing and rewarding outstanding scientists; fostering the next generation of scientists in the developing world; supporting research groups in science- and technology-lagging countries; promoting South-South cooperation in education and research; promoting South-North collaboration in education and research; promoting science, technology and innovation, and science-policy diplomacy links for the achievement of the Sustainable Development Goals; strengthening partnership with other organizations; expanding impact through communication and building capacity in science communication; strengthening governance, management and operational procedures; and developing a fundraising strategy.

> "Preparedness is key to address future pandemics: this requires international collaboration and conferences involving participants from developed and developing nations, as well as an efficient global governance ready to promote the fast dissemination of knowledge and the distribution of tests and vaccines."
>
> *From the Jeddah Declaration of TWAS Fifteenth General Conference*

Science in Exile initiative: Of the record-high numbers of forcibly displaced people, many are scientists. To respond to this challenge, UNESCO-TWAS, the International Science Council and the InterAcademy Partnership launched a project in 2020 aiming to develop a coordinated response to assist scientists who became refugees or were displaced by crises in their home countries.

In 2021, the initiative was named Science in Exile, and its activities progressed swiftly. Such initiatives included a workshop, held online on 30 March, and 1 and 12 April, which involved over 60 participants, and four-part webinar series with 330 participants and 20 speakers in total. The advocacy campaign also includes a six-part podcast series, a monthly newsletter, and a chapter in UNESCO Science Report 2021.

By the end of 2021, the initiative had grown to a global network with more than 80 collaborators—including the Office of the United Nations High Commissioner for Refugees, UNESCO National Office to Afghanistan, and UNESCO Natural Sciences Sector—and engaging nearly 100 at-risk, displaced and refugee scientists.

Science advice: On 30 August, TWAS Executive Director Romain Murenzi served as a moderator for a plenary panel during the Fourth International Conference on Science Advice to Governments, organized by the International Network for Government Science Advice, on 30 August. The panel was titled "Science advice during Covid-19: What factors made the difference?", and can be viewed on YouTube.

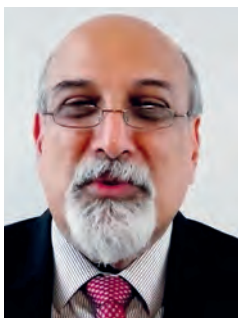
SCIENCE DIPLOMACY

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.

In 2021, the Academy expanded its use of digital meetings, continuing its flagship science diplomacy course and also holding two regionally themed gatherings online.

AAAS-TWAS Science Diplomacy Course: The seventh edition of this prestigious course, held from 30 August to 3 September, took place entirely online. And for the first time, attendees



▲ TWAS Fellow Salim Abdool Karim of Centre for the AIDS Programme of Research in South Africa, South Africa, participating as a panellist in the 2021 AAAS-TWAS Science Diplomacy Course.

◀ A virtual simulation in which AAAS-TWAS Science Diplomacy Course participants represented scientific and diplomatic interests in conflict, introduced by Piotr Magnuszewski of Social Simulations, Poland.

▶ South Africa's Minister of International Relations and Cooperation Naledi Pandor making her keynote address at the 2021 AAAS-TWAS Science Diplomacy Course on 30 August.

> "Successful diplomacy requires authoritative scientific advice, and I believe international cooperation is more crucial than ever for the progress of science."
>
> ***Naledi Pandor**, South Africa's Minister of International Relations and Cooperation, during her keynote address at the 2021 AAAS-TWAS Science Diplomacy Course*

AAAS-TWAS Science Diplomacy Course

52 PARTICIPANTS FROM

22 COUNTRIES

Divided as follows (gender and age):

39 WOMEN (75%)

25 YOUNG SCIENTISTS (AGE 40 OR BELOW) (48%)

50 FROM DEVELOPING COUNTRIES (96%) OF WHICH,

22 FROM SCIENCE-AND-TECHNOLOGY LAGGING COUNTRIES (42%)

10 LEAST-DEVELOPED COUNTRIES (19%)

24 SPEAKERS (15 FROM THE SOUTH)

were placed in "participant pairs" matching a young scientist with an established policymaker, in an effort to boost the impact of the training by exposing the young scientist to institutional approaches, and by making policymakers more familiar with the scientific rationale behind certain stances.

The event featured a simulation in which participants were assigned to represent various government and research organizations during a tense negotiation. The attendees met in virtual rooms and lobbied for their interests during a simulated controversy surrounding critical minerals mining and their effects on the production of electric car batteries, as news continuously emerged during their negotiations.

South Africa's Minister of International Relations and Cooperation, Naledi Pandor, delivered the keynote address. Her message to the attendees was that more than ever before, global solidarity and multilateralism are needed to build a world where nobody is left behind, and science diplomacy is part of that formula.

Regional science diplomacy workshops:
Two regional workshops were held on science diplomacy, both entirely online. One, for the South-East Asian Region, was held 16–19 March in collaboration between TWAS, AAAS and Akademi Sains Malaysia, and included 56 participants from 27 countries.

The other, for the Latin American and Caribbean Region, was the result of a collaboration between the TWAS Latin America and the Caribbean Regional Partner (TWAS-LACREP), the Brazilian Academy of Sciences and the São Paulo Innovation and Science Diplomacy School. It was held 4–13 August, and included 137 scientists and policymakers from 46 countries.

EMPOWERING WOMEN

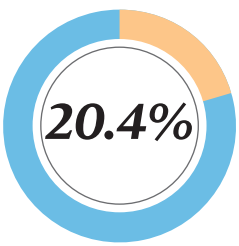
Supporting women in research is a central part of the mission of UNESCO-TWAS. The Academy and its partners offer numerous opportunities to women in the developing world, which is not only valuable for the careers of individual researchers, but critical for activating a nation's full scientific potential.

The Academy, along with the Islamic Development Bank (IsDB), launched the third edition of its postdoctoral programme for early-career researchers from IsDB least developed countries with a new focus on women. The 2021 edition—**TWAS-IsDB Postdoctoral Fellowship Programme for Women**— was opened exclusively to early-career female scientists to support their research related to the United Nations Sustainable Development Goals. Recipients were provided with high-level training at centres of excellence in developing countries in areas relevant to sustainability. The fellowship was awarded to 25 researchers from Bangladesh, Benin, Burkina Faso, Senegal, the Sudan and Uganda.

The Academy took great strides in bringing more women into TWAS family to achieve better gender balance, starting a long-term 'investment' in the next generation of scientists: In 2021, out of 124 TWAS Young Affiliates, 54.8 per cent were women. The Academy also launched the TWAS-IsDB Young Refugee and Displaced Scientists Programme for Women, which granted displaced women scientists the chance to become TWAS Young Affiliates.

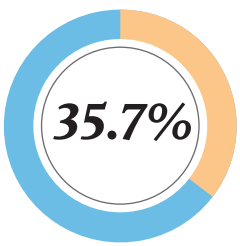
From 2018 to 2021, two TWAS programmes selected more women than men: TWAS-UNESCO Associateship Scheme provided 27 out of 52 associateships—amounting to

TWAS PhDs graduates 2021



21 OUT OF **103**
PHDs GRADUATES WERE WOMEN

PhD fellowships to women in 2021



25 OUT OF **70**
PHD FELLOWSHIPS WERE AWARDED TO WOMEN

▼ The 2021 OWSD-Elsevier Foundation Women in Science Awards were received by (from left): María Eugenia Cabrera Catalán of Guatemala, Khongorzul Dorjgotov of Mongolia, Ghada Dushaq of the State of Palestine, Imalka Munaweera of Sri Lanka, and Marian Asantewah Nkansah of Ghana, during a special ceremony broadcast online on 9 February. [Photos provided]

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

551 TOTAL

335 HAVE GRADUATED (67.8%)

161 ARE ONSITE (29.2%)

Fellowships awarded 1998-2021.

51.9 per cent—to women. Similarly, of the 41 scientists selected for TWAS Visiting Expert Programme, 26—amounting to 63.4 per cent—were women.

During the same time period, other programmes too achieved impressive numbers: for TWAS Fellowships for Research and Advanced Training, women were selected at a rate of 37.5 per cent, or 18 out of 48; and for TWAS-DFG[1] Cooperation Visits Programme, women were selected at a rate of 42.3 per cent, or 36 out of 85.

For two programmes started in 2021, UNTBLDC-TWAS-ICGEB[2] South-South Programme for Exchanges and Collaborations and its sister programme for South-North exchanges and collaborations, 5 out of 13 combined selectees were women.

TWAS events have also brought women into the field of science policy and science diplomacy. By the end of 2021, TWAS had organized 12 science diplomacy events with the American Association for the Advancement of Science (AAAS), for which, out of 475 participants, 55 per cent were women. Also, the number of women participating in the AAAS-TWAS Course on Science Diplomacy grew from 50 per cent in 2019 to 75 percent in 2021.

The Science in Exile initiative, which focuses on refugee, displaced and at-risk scientists, had women as 61 per cent of its event speakers.

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

The Organization for Women in Science for the Developing World (OWSD), emerged from a conference organized by TWAS in 1988, is the first international forum for women scientists from the developing and developed worlds with the objective of strengthening their roles in the development process and promoting their representation in science and technology leadership. As of the end of 2021, OWSD had 7,877 members and 44 national chapters.

GenderInSITE (GIS) is an initiative dedicated to advancing science, technology, innovation and engineering policies and programmes focused on the importance of gender equality. In 2021, two major reports were published: Gender Equality in Science: Inclusion and Participation of Women in Global Science Organizations, and Gender Dimension of Digital Technologies, in September and February, respectively.

GenderInSITE

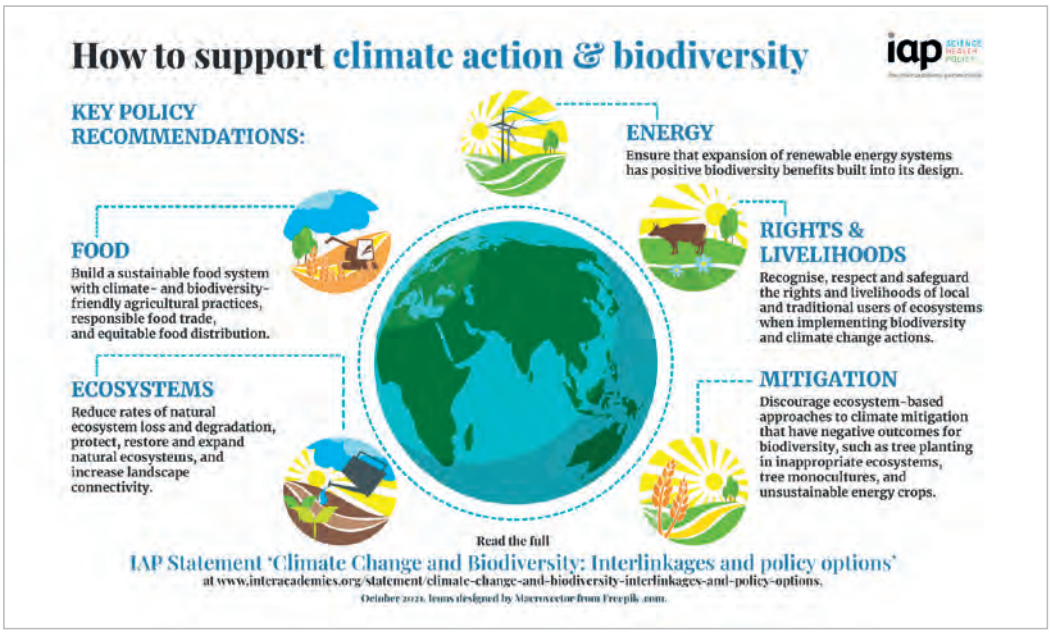
[1] DFG stands for Deutsche Forschungsgemeinschaft, or German Research Foundation, in English.

[2] UNTBLDC stands for United Nations Technology Bank for the Least Developed Countries, and ICGEB stands for International Centre for Genetic Engineering and Biotechnology.

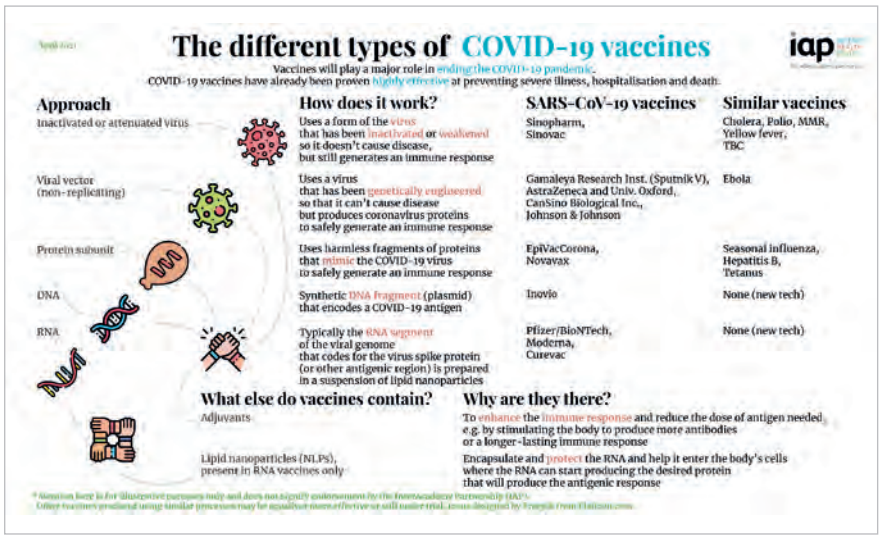
GLOBAL ACADEMY NETWORKS

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 140 national, regional and global member academies, which collaborate to support the vital role of science in seeking evidence-based solutions to the world's most challenging problems. In particular, IAP harnesses the expertise of the world's leading scientific minds to advance sound policies, improve public health, promote excellence in science education, and achieve other development goals.



◀ IAP infographic on how to support climate action and biodiversity.



▲ IAP infographic on the different types of vaccines.

Academy members constitute more than 30,000 leading scientists, engineers and health professionals in over 100 countries. IAP Science and IAP Health Secretariats are hosted by TWAS, in Trieste, while IAP Policy Secretariat is hosted by the U.S. National Academies of Sciences, Engineering, and Medicine in Washington, DC.

Here are some major accomplishments of IAP in 2021:

- Issuance of three official statements: Climate Change and Biodiversity: Interlinkages and policy options; IAP Statement on Regenerative Medicine; IAP Statement on Protection of Marine Environments
- In March 2021, about 100 academy leaders, fellows and members of communications teams attended the IAP Global Webinar on Countering Vaccine Hesitancy. Subsequently, IAP released an infographic to shed some light on the different types of COVID-19 vaccines, how they are developed, and how they work; and five short videos that present aspects of vaccine science, regulation and the "infodemic"—too much information, including false or misleading information, in digital and physical environments during a disease outbreak
- IAP was a key partner in the development of the Tianjin Biosecurity Guidelines for Codes of Conduct for Scientists, 10 guiding principles and standards of conduct designed to underpin biosecurity governance
- At the request of the chairs of the United Nations Food Systems Summit Scientific Group, IAP delivered four regional policy briefs based on the previous reports from its regional networks for the Food, Nutrition Security and Agriculture project, together with an updated global policy brief.

> "I knew I was nominated, and I felt very honoured and humbled when I received the news. I have high respect for TWAS and its activities connecting the international scientific community, especially developing countries. And I have huge respect for Abdus Salam, a major figure in modern physics."
>
> *Astrophysicist **Ajith Parameswaran**, Winner of the 2020 TWAS-CAS Young Scientist Award for Frontier Science*

The Chinese Academy of Sciences (CAS) is the hub of China's ambitious research enterprise, and it has long-standing ties with TWAS. CAS collaborates with TWAS on the six CAS-TWAS Centres of Excellence, and on the TWAS-CAS Young Scientists Award for Frontier Science. CAS also hosts TWAS East and South-East Asia and the Pacific Regional Partner.

The Academy of Science of South Africa (ASSAf) is one of Africa's leading institutions advocating for science and technology, and hosts TWAS Sub-Saharan Africa Regional Partner at its headquarters in Pretoria.

REGIONAL PARTNERS

UNESCO-TWAS partners in five regions of the developing world perform vital Academy functions

> *The 2021 TWAS Regional Awards were given for Public Understanding and Popularization of Science.*

They propose scientists for membership to TWAS and for TWAS awards, and select Young Affiliates; they organize conferences and raise awareness of TWAS and its programmes among scientists of their region; and they help to advance support globally for science among policymakers and with the general public.

In 2021, each regional partner organized at least one conference for young scientists, with eight events in total during the year, most held online, and reaching over 560 registered participants. Approximately 59 per cent of the participants were women, and an event held by TWAS Latin America and the Caribbean Regional Partner (TWAS-LACREP) reached a record-breaking 78 per cent attendance by women.

About 59 per cent of participants were from least developed countries (LDCs), including Benin, Burkina Faso, Burundi, Lesotho, Malawi, Mali and Zambia. The Regional Partners frequently collaborate with the TWAS Young Affiliates Network (TYAN) to advance the careers of young scientists in the regions.

RIO DE JANEIRO, Brazil
Brazilian Academy of Sciences

▼ 2021 TWAS Regional Award Winner: **Julia Tagüeña Parga**, Mexico

The **Latin America and the Caribbean Regional Partner (TWAS-LACREP)** held two online events. One, a regional science diplomacy workshop, was held 4–13 August. The other, the Eighth Workshop of TWAS/TYAN on Science Communication in South America and the Caribbean, was held 3–24 September, at which 108 of the 139 participants were women.

▼ 2021 TWAS Regional Award Winner: **Huang Li**, China

The **East and South-East Asia and the Pacific Regional Partner (TWAS-SAPREP)** invited young scientists to join a number of events organized by the Chinese Academy of Sciences (CAS) and its partners. According to CAS, this included the Forecast Verification Methods Workshop in April, the 2021 Training Workshop on Green Technology in October, and the First International Conference on Innovations in Agriculture to Ensure Global Food Security in November. In all, over 450 people participated, including about 340 young scientists, of which 130 were women. Approximately 200 participants were from least developed countries.

▼ 2021 TWAS Regional Award Winner: **Adel Ismail**, Egypt

The **Arab Regional Partner (TWAS-AREP)** held one online event, a TWAS-AREP Young Scientists Training Programme titled Climate Change: Lens on Priorities Workshop, from 7–8 December. Eight of the 41 young scientists in attendance were from LDCs, and 20 were women.

● **TRIESTE, Italy**
ICTP Campus

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

● **ALEXANDRIA, Egypt**
Bibliotheca Alexandrina

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

The **Central and South Asia Regional Partner (TWAS-CASAREP)** held a hybrid—in-person and online—gathering from 25–27 October, a CASAREP-TWAS Young Scientists Meeting titled Air Quality, Water Resources, Energy and Climate Change, in association with Divecha Centre for Climate Change of the Indian Institute of Science, India. Twenty of the 62 participants were women.

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

▼ 2021 TWAS Regional Award Winner: **Puleng Segalo**, South Africa

The **sub-Saharan Africa Regional Partner (TWAS-SAREP)**, held one online meeting: TWAS-SAREP Regional Dialogue on Climate Change Adaptation and Mitigation within a Pandemic in Africa, from 9–10 December. Eighty of the 183 participants were young women, 156 were young scientists, and 41 were from least developed countries.

▲ 2021 TWAS Regional Award Winner: **Sujata Sharma**, India

TWAS & ITALY

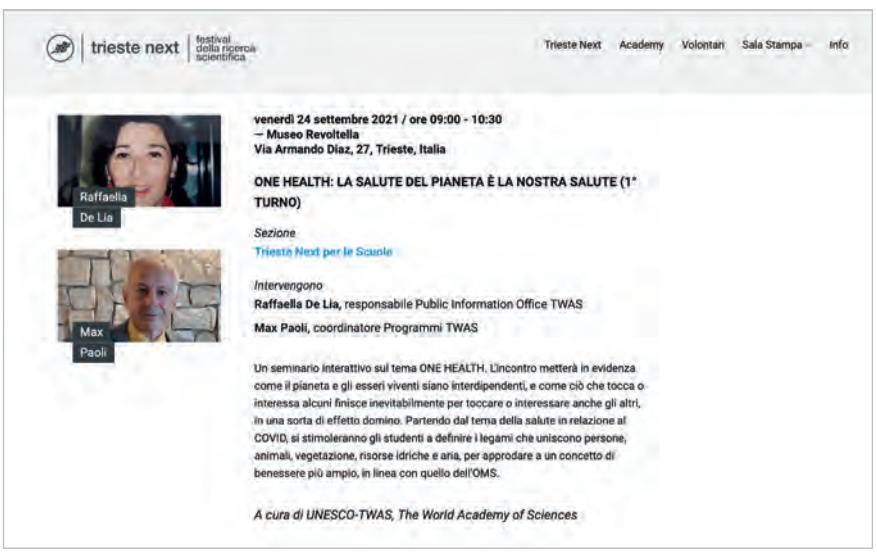
For over 35 years, UNESCO-TWAS has had a strong partnership with the Italian Government, through the Italian Ministry of Foreign Affairs and International Cooperation (MAECI). Italy provides core funding to the Academy, thus making its work to advance science in the developing world possible, and creating an environment that supports innovation. Together, Italy and TWAS have helped developing countries build critical skills in the global South. TWAS also cooperates closely with the Academy's host region, the Regione Autonoma Friuli Venezia Giulia, and host city, Trieste.

Here are highlights of the TWAS-Italy partnership in 2021:

New joint ventures: TWAS launched an ambitious new exchange visits programme resulting from an accord with the UN Technology Bank for the Least Developed Countries and the International Centre for Genetic Engineering and Biotechnology (ICGEB).

The programme is called the ProgrAmme of CollaboraTions with least developed countries (PACTs) and offers scientists from those countries training periods of up to six months with ICGEB scientists, either in Italy, New Delhi or Cape Town.

Another new initiative, TWAS-SISSA-Lincei Cooperation Visits Programme for sustainability science, is dedicated to early-career scientists from least developed countries. Through the programme, 10 promising scientists from those countries are selected to spend a three-month training period at the Scuola Internazionale Superiore di Studi Avanzati (SISSA).



▼ A slide announcing talks held by TWAS Public Information Officer Raffaella De Lia and TWAS Programme Coordinator Max Paoli on 24 September 2021, during the tenth edition of the international science festival Trieste Next.

▲ TWAS Executive Director Romain Murenzi (left) and Trieste Mayor Roberto Dipiazza during a meeting, held at Trieste City Hall on 16 December 2021.

Top right: TWAS booth in Piazza Unità d'Italia during the tenth edition of Trieste Next, where TWAS staff interacted with the event attendees and distributed free kits to play the United Nations GoGoals board game (offered both in Italian and in English).

Trieste Next: The tenth edition of Trieste Next, a science festival held annually in Trieste, Italy, took place 24–26 September. For the event, TWAS organized a two-part interactive workshop titled "One Health: la salute del pianeta è la nostra salute" (One Health: Earth planet's health is our health), dedicated to middle school students, which was hosted in the Auditorium of Museo Revoltella.

More than 40 students and their teachers participated in two talks held by TWAS Programme Coordinator and by TWAS Public Information Officer, both of which focused on different facets of the United Nations Sustainable Development Goals.

TWAS was also present at a hub at the entrance of Piazza Unità d'Italia, the main square of Trieste, along with all the other participating institutions' stands.

IAEA officials visit Trieste: TWAS hosted the visit of Deputy Director-General and Head of the Department of Nuclear Sciences and Applications of the International Atomic Energy Agency (IAEA) Najat Mokhtar, along with the Director of the Division of Physics and Chemistry of IAEA, Melissa Denecke.

Meeting with Trieste Mayor: On 16 December, TWAS Executive Director Romain Murenzi met with the Mayor of the Academy's home city of Trieste, Roberto Dipiazza, and with Deputy Mayor and City Councilor for Economic Policies Serena Tonel. The meeting took place in the grand Salotto Azzurro of Trieste City Hall, overlooking Piazza Unità d'Italia. As the Mayor of the "City of Science", Dipiazza encouraged Murenzi and his team to further build on Trieste's scientific reputation and network, and to work closely with the Mayor's office in doing so.

> "Giving young minds the chance to evolve and confront with peers is the best contribution we may give to our future and to ourselves."

***Giorgio Parisi**, President of the Italian Accademia Nazionale dei Lincei and renowned Italian physicist.*

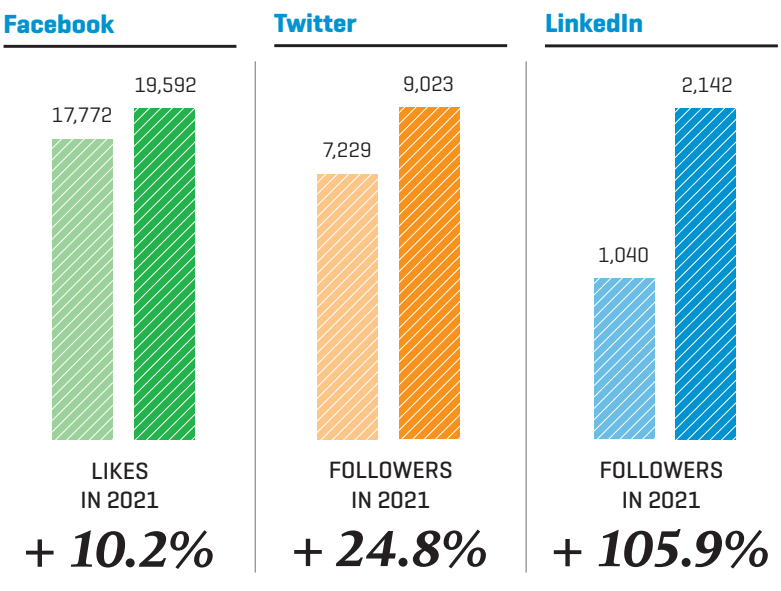
A STORY TO COMMUNICATE

To have an impact, TWAS must convey its work to an international audience that includes not just scientists, but policymakers, journalists, educators, students and the general public.

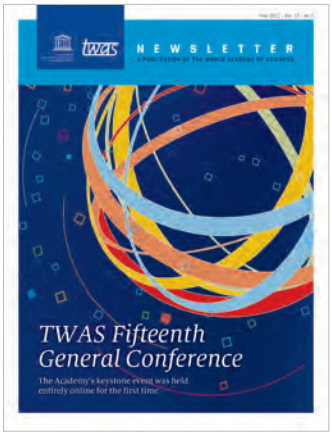
The Academy's communications strategy relies on several tools and activities: printed publications, such as TWAS Newsletters and Annual Report; TWAS website; social media (i.e., Twitter, Facebook, LinkedIn and YouTube), the electronic bulletin "TWAS Plus", and remote and in-presence events. All together, they support the Academy in the dissemination of its programmes, opportunities and initiatives among developing countries, nurture relations with established partners, and seek to create new partnerships.

In 2021, in line with the core principle of the United Nations 2030 Agenda for Sustainable Development of leaving no one behind, the Academy maximized its efforts towards least developed countries, enhancing outreach actions with particular emphasis on women empowerment, gender equality and climate action.

Starting from March, the editorial standards of all TWAS communications products were brought in line with UNESCO guidelines; new material was posted, regularly and more frequently, on TWAS website, followed by related social media posts; and dissemination through TWAS social media channels was coordinated in such a way to convey TWAS mission more coherently, thus enhancing a stronger branding identity. Not surprisingly, in 2021, TWAS achieved significant milestones



From 1 January to 31 December 2021.



▲ Above: A promotional graphic for the webinar of the first TWAS Awards Webinar Series.

Right: TWAS Newsletters from 2021 focusing on the themes of the TWAS Fifteenth General Conference and UNESCO Recommendation on Open Science.

in social media, and visits to twas.org started increasing again.

A pillar of TWAS traditional communications tools and a very relevant element for many TWAS Fellows, TWAS printed publications remained a core element of the Academy's outreach efforts.

In 2021, TWAS Public Information Office produced three **TWAS Newsletters** and the **2020 Annual Report**. In December, for the first time, TWAS Newsletter was issued in digital form only, thus reflecting TWAS commitment to implement environment-friendly policies, while maintaining the Newsletter usual visual appeal.

The 2021 issues of **TWAS Newsletter** focused on TWAS Fifteenth General Conference, and on UNESCO Recommendation on Open Science, respectively.

During the year, **TWAS website** saw an increase in all its major parameters, with 40 articles published, through which TWAS enhanced its visibility. The Public Information Office undertook also a more systematic effort to continue the steady growth of **TWAS social media** channels.

> "We have international laws, we have national laws [on preserving endangered species], and most of the time our problem is how to make people respect these laws."
>
> ***Etotépé Sogbohossou**, 2019 TWAS-Samira Omar Award Winner during TWAS Awards Webinar held on 10 June 2021*

In its seventh year of dissemination, the digital bulletin **TWAS Plus** continued to be a followed tool mainly focused on opportunities offered by the Academy.

The **coverage of TWAS Fifteenth General Conference** (1–4 November), both on TWAS website and on social media, was massive and was conceived as a crescendo: it started four weeks prior to the Conference, peaked during the Conference, and continued after it with the dissemination of information that had been embargoed until the Conference end, e.g., the publication of the Conference outcome document, the Jeddah Declaration, or the names of the new TWAS Fellows.

Leading up to the General Conference, in 2021, TWAS set forth on a new endeavour: **TWAS Awards Webinar Series**, consisting of five webinars taking place online between 10 June and 14 October, and featuring the winners of the 2019 and 2020 awards bestowed by TWAS (available on TWAS YouTube channel).

The webinars focused on the following subjects: agricultural sciences, social and economic sciences, chemistry and physics, engineering, mathematics and physics, and medical and biological sciences.

During the year, TWAS Public Information Office supported 37 calls for applications and nominations to TWAS programmes through TWAS Online Forms system, which reached its sixth year of activity. Four new form templates were created. Nearly 8,000 online forms were started in 2021, of which 2,263 were submitted.

For TWAS participation in the annual science festival **Trieste Next**, please, see p. 33.

FINANCIAL REPORT 2020-2021

Starting from the biennium 2020–2021, it was decided that the financial report for each odd-numbered year would cover two years, to bring it in line with UNESCO budget cycle.
From 2020 to 2021, TWAS received a total of $8,781,910.17 in funding, including $15,126.69 in individual contributions. TWAS was grateful for the generous contributions from its numerous, long-standing and more recent, supporters: their investments contributed to make TWAS critical work in the developing world possible.

2020-2021 FINANCIAL REPORT (IN USD)

INCOME[1] 2020-2021	
Balance brought forward 01.01.2020	827,598.40
1] Ministry of Foreign Affairs and International Cooperation, Italy	3,830,120.03
2] Swedish International Development Cooperation (Sida), Sweden	3,082,268.15
3] Lenovo Group Limited, China	228,248.00
4] SilverLining Inc., USA	210,000.00
5] Elsevier Foundation, Netherlands	100,000.00
6] Academia Sinica, Taiwan, China	100,000.00
7] Fondazione Ernesto Illy, Italy	89,285.60
8] Kuwait Foundation for the Advancement of Sciences, Kuwait	67,900.00
9] Ministry of Science, Technology and Innovation, Brazil	66,430.30
10] International Mathematical Union, Germany	24,600.00
11] Quarraisha Abdool Karim, South Africa	14,000.00
12] Siwei Cheng Foundation, University of Chinese Academy of Sciences, China	12,895.99
13] Searle, Pakistan	14,011.01
14] F.M.A. Al-Kharafi, Kuwait	12,000.00
15] Samira Omar Asem, Kuwait	12,000.00
16] C.N.R. Rao, India	7,010.00
17] American Association for the Advancement of Science, USA	5,751.25
18] Other miscellaneous income	14,984.34
19] Transfer from terminated project funded by Richard Lounsbery Foundation	3,598.89
20] Other Membership Fees	142.35
21] Interest income	58,859.00
22] Exchange difference	206.86
TOTAL INCOME	**8,781,910.17**

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

EXPENDITURES 2020-2021	App. Budget	Rev. Budget	Expenditure
1) Prizes			
1.1) TWAS Lenovo Science Award	112,150.00	112,150.00	112,147.59
1.1.1) Award cost	*100,000.00*	*100,000.00*	*100,000.00*
1.1.2) Other costs	*12,150.00*	*12,150.00*	*12,147.59*
1.2) TWAS Awards	102,000.00	102,000.00	97,523.88
1.2.1) Award cost	*90,000.00*	*90,000.00*	*90,000.00*
1.2.2) Other costs	*12,000.00*	*12,000.00*	*7,523.88*
1.3) Fellows Awards	93,080.00	86,540.00	86,492.30
1.3.1) Award costs	*71,000.00*	*66,000.00*	*66,000.00*
1.3.2) Other costs	*22,080.00*	*20,540.00*	*20,492.30*
1.4) TWAS - Siwei Cheng Award in Economic Sciences	24,298.00	12,149.00	11,807.25
1.5.1) Award costs	*20,000.00*	*10,000.00*	*10,000.00*
1.5.2) Other costs	*4,298.00*	*2,149.00*	*1,807.25*
Subtotal for (1)	***331,528.00***	***312,839.00***	***307,971.02***
2) Research Grants			
2.1) Grants to Individual Scientists	720,889.00	987,448.61	970,166.47
2.2) Grants to Research Units	911,093.00	964,129.00	954,502.29
2.3) Support for MSc Students	309,347.00	309,347.00	305,983.32
2.4) Research Grants Meeting	96,726.00		
2.5) Research Grants Network	3,840.00	1,888.00	1,887.81
2.6) Support for Inter Meeting	58,910.00	140,208.00	137,791.98
2.7) Support for Open Access	65,198.00	72,312.00	64,031.83
2.8) Regional Conference Young Scientists	193,306.00	1,308.00	1,307.92
2.9) Selection Committee	3,798.00	3,798.00	3,559.15
2.10) Science Diplomacy	120,529.00	22,901.00	21,578.70
2.11) Communications	36,684.00	36,684.00	1,680.95
2.12) Monitoring	81,070.82	62,070.82	41,903.56
2.13) Staff and office space	483,030.00	483,030.00	424,772.70
2.14) Sustainable Programme for Refugee and Displaced Scientists	182,826.00	182,826.00	174,321.09
2.15) Additional Research Grants	231,586.02	231,586.02	231,586.00
Subtotal for (2)	***3,498,832.84***	***3,499,536.45***	***3,335,073.77***
3) Fellowships, Associateships and Professorships			
3.1) Fellowship Programmes	484,891.00	484,891.00	220,292.74
3.2) Associateship, Professorship and Visiting Programmes	388,315.00	499,840.00	422,120.63
Subtotal for (3)	***873,206.00***	***984,731.00***	***642,413.37***
4) Meetings			
4.1) Council and General Meetings	350,000.00	35,000.00	10,722.83
4.2) Steering Committee and Other Official Meetings in Trieste	15,000.00	7,000.00	5,343.46
4.3) Trieste Next	5,000.00	5,000.00	1,814.24
4.4) Official visits to TWAS Executive Director in Trieste	10,000.00	5,000.00	288.55
Subtotal for (4)	***380,000.00***	***52,000.00***	***18,169.08***
5) Publications			
5.1) Publications	70,000.00	70,000.00	48,244.02
5.2) Other Costs	23,460.00	23,460.00	11,730.00
Subtotal for (5)	***93,460.00***	***93,460.00***	***59,974.02***

Continue next page

EXPENDITURES 2020-2021	App. Budget	Rev. Budget	Expenditure
6) Joint Projects			
6.1) TWAS Regional Partners	105,000.00	56,400.00	56,400.00
6.2) TWAS - Arab Regional Partner Activities	65,460.00	65,460.00	27,730.00
6.2.1) Regional Conference for Young Scientists	*25,000.00*	*25,000.00*	
6.2.2) Other activities	*33,000.00*	*33,000.00*	*24,000.00*
6.2.3) Other costs	*7,460.00*	*7,460.00*	*3,730.00*
6.3) Science Diplomacy Programme	11,875.00	5,305.00	5,073.69
6.4) Sustainability Orientated Activities	33,788.00	33,788.00	1,786.50
6.4.1) Symposium, Fellowships and South-North Exchange Programme	*31,488.00*	*31,488.00*	
6.4.2) Other costs	*2,300.00*	*2,300.00*	*1,786.50*
6.5) Solar Radiation Management Governance Initiative Activities	479,753.91	702,392.78	652,159.12
6.5.1) Meetings	*9,835.21*	*8,563.26*	*8,563.26*
6.5.2) Grants	*255,000.73*	*463,911.55*	*442,329.06*
6.5.3) Other Activities	*25,603.28*	*25,603.28*	*19,009.55*
6.5.4) Staff costs	*179,867.69*	*194,867.69*	*172,834.20*
6.5.5) Other costs	*9,447.00*	*9,447.00*	*9,423.05*
6.6) Focused Mathematics Activities	23,000.00	23,000.00	22,927.58
6.6.1) Fellowships	*19,600.00*	*19,600.00*	*19,600.00*
6.6.2) Other costs	*3,400.00*	*3,400.00*	*3,327.58*
6.7) Collaboration with activities of the Abdus Salam International Centre of Theoretical Physics (ICTP)	100,000.00	50,000.00	50,000.00
6.8) Young Affiliates Network	246,330.00	246,330.00	40,540.37
6.8.1) Activities	*213,570.00*	*213,570.00*	*11,289.80*
6.8.2) Other costs	*32,760.00*	*32,760.00*	*29,250.57*
6.9) Collaboration Activities with Local Authorities	67,000.00	67,000.00	64,980.64
6.10) Coffee Research Conference	103,836.00	3,138.57	3,138.57
6.11) Additional funds for Research Grants	50,000.00	50,000.00	25,198.58
Subtotal for (6)	***1,286,042.91***	***1,302,814.35***	***949,935.05***
7) Operational Expenses			
7.1) Staff Costs	2,600,000.00	2,650,000.00	2,542,790.37
7.2) ICTP Services	155,000.00	155,000.00	155,000.00
7.3) Communications	17,406.00	17,406.00	6,927.68
7.4) Strategic Communications	47,718.00	47,718.00	24,667.19
7.5) Travels	15,025.00	15,025.00	24.59
7.6) Fundraising Activities	7,500.00	7,500.00	
7.7) Library, office and other supplies	30,000.00	30,000.00	20,455.01
7.8) Other general operating expenses	33,512.00	33,512.00	14,713.01
Subtotal for (7)	***2,906,161.00***	***2,956,161.00***	***2,764,577.85***
Management costs	**410,928.00**	**399,141.00**	**332,012.85**
Total expenditure	**9,780,158.75**	**9,600,682.80**	**8,410,127.01**
Savings on prior years' obligations			356,303.57
Excess (shortfall) of income over expenditure			728,086.73
Reserve Fund[2]			
Amount available at the beginning of period			1,789,836.54
End of service entitlements			(8,397.34)
Reserve fund balance end of period			**1,781,439.20**

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

TWAS ENDOWMENT FUND 1994-2021[3] (IN USD)

ORGANIZATIONS	CONTRIBUTIONS RECEIVED
1] Ministry of Sciences and Technology, China	2,200,000
2] Ministry of Science and Technology, Brazil	1,933,107
3] Department of Science and Technology, India	1,000,000
4] Consejo Nacional de Ciencia y Tecnología, Mexico	739,155
5] Academia Sinica, Taiwan, China	608,915
6] Ministry of Science and Technology, Nigeria	586,779
7] Kuwait Foundation for the Advancement of Sciences (KFAS), Kuwait	500,000
8] Ministry of Research, Science and Technology, Islamic Republic of Iran	269,183
9] Mohammad Ahmad Hamdan, Jordan	171,000
10] Ministry of Science, Technology and Innovation, Malaysia	100,000
11] Ministry of Science and Technology, Pakistan	100,000
12] Secretariat of Science, Technology and Production Innovation, Argentina	55,000
13] Ministry of Modernization and Technology, Senegal	52,887
14] Administrative Department of Science, Technology and Innovation (COLCIENCIAS), Colombia	50,000
15] Ministry of Higher Education and Scientific Research, Egypt	50,000
16] Atomic Energy Commission of Syria, Syrian Arab Republic	50,000
17] Ministry of Finance and Economic Planning, Sudan	49,850
18] Vietnam Centre for Science and Technology Evaluation, Viet Nam	20,000
19] National Academy of Science and Technology, Philippines	11,957
20] Ministry of Science and Technology, Bangladesh	10,000
21] Ministry of Education, Science and Technology, United Republic of Tanzania	4,529
22] Shui-Chin Lee Foundation for Basic Science, Taiwan, China	4,000
23] Swedish Council for Higher Education, Sweden	1,302
24] Office of the Prime Minister, Jamaica	1,000
25] Instituto Venezolano de Investigaciones Científicas (IVIC), Venezuela	300
Subtotal	**8,568,964**
Plus other contributions[4]	192,479
Plus interest earned	6,992,926
Net Transfer to TWAS Fund (2011-2021)	-1,625,768
TOTAL	**14,128,601**

[3] The aim of establishing this endowment fund was to build a capital of $25 million to cover the secretariat costs and basic programmes.

[4] This amount comprises donations from TWAS Fellows, individuals and other organizations' contributions (see separate list, next page).

CONTRIBUTIONS TO THE ENDOWMENT FUND FROM TWAS FELLOWS, INDIVIDUALS AND OTHERS (1994-2021)

Wook Hyun Kwon, Republic of Korea	30,000
Bai Chunli, China	21,770
M.H.A. Hassan, Sudan	13,104
J. Palis, Brazil	10,079
Science Initiative Group, USA	6,250
J.I. Vargas, Brazil	5,287
S.S. Katiyar, India	4,100
A.V. Rama Rao, India	3,000
A. Hamoui, Syrian Arab Republic	2,500
M. Peimbert, Mexico	2,500
Lu Yong Xiang, China	2,300
P. McGrath, UK	2,046
M. Iqbal Parker, South Africa	2,000
K. Namsrai, Mongolia	1,858
Phillip A. Griffiths, USA	1,750
Harald Fuchs, Germany	1,703
B.N. Upreti, Nepal	1,644
Fuchu He, China	1,620
R. Miledi, USA	1,320
L.N. Johnson, UK	1,281
A. Paulrai, USA	1,236
J. Garidkhuu, Mongolia	1,221
F. El-Baz, Egypt	1,200
C.N.R. Rao, India	1,131
E.W. Thulstrup, Denmark	1,062
A. Badran, Jordan	1,045
Jih Ru Hwu, Taiwan, China	1,030
Académie des Sciences et Techniques du Sénégal, Senegal	1,029
E.M. Essien, Nigeria	1,000
M. Klein, USA	1,000
A. Kornhauser, Slovenia	1,000
A.O. Kuku, Nigeria	1,000
G.S. Khush, Philippines	1,000
R. Murenzi, USA/Rwanda	1,000
Sang-Dai Park, Republic of Korea	1,000
G.T. Prance, UK	1,000
I. Serageldin, Egypt	1,000
Y. Sobouti, Islamic Republic of Iran	1,000
H.E. Varmus, USA	1,000
Y. Yuthavong, Thailand	1,000
J.L. Moran Lopez, Mexico	1,000
K.E. Mshigeni, United Republic of Tanzania	1,000
Wong Henry Nai Ching, China	1,000
Yam Vivian Wing-Wah, China	1,000
S.Q. Mehdi, Pakistan	1,000
Pei Gang, China	1,000
P. Littlewood, UK	1,000
I. Eltayeb, Oman	1,000
Lee Wu Yan-Hwa, Taiwan, China	1,000
Centre for the Aids Programme of Research in South Africa, South Africa	1,000
J. Huang, China	1,000
Nan Cewen, China	990
P. Ciarlet, France	985
Cheng, Hui-Ming, China	985
Lee Yuan T., Taiwan, China	977
Gaoqing (Max) Lu, UK	966
M. Zhu, China	966
Anil Jain, USA	958
E.K.A. Edee, Togo	900
Mei Hong, China	879
Jean-Marie Lehn, France	840
M. Clegg, USA	830
J. Döbereiner, Brazil	800
M. Munasinghe, Sri Lanka	750
L. de la Pena Auerbach, Mexico	742
M. Akhtar, Pakistan	700
B.L. Deekshatulu, India	700
Wu Yue-Liang, China	666
D. Balasubramanian, India	650
Un-Chul Paek, USA	634
Zhao Jincai, China	621
F.R.I. Kayanja, Uganda	600
L.F. Rodriguez, Mexico	600
Dong Shaojun, China	600
Wang Erkang, China	600
Long Yiming, China	589
J. Allende, Chile	500
E.H.S. Diop, Senegal	500
M.V. George, India	500
D.T. Lê, Viet Nam	500
Li Desheng, China	500
G. Thottappilly, India	500
C. Vieira, Brazil	500
Z.H. Zaidi, Pakistan	500
J. Jisnuson, Thailand	500
R. Crewe, South Africa	496
S. Ayupov, Uzbekistan	495
M. Limonta, Mexico	491
Girish Agrawal,USA	488
Mohammad Jamshidi, USA	488
S. Atluri, USA	483
E. Ayupov, Uzbekistan	483
P. Y. Kwok, Taiwan, China	483
Girish Agarwal, USA/India	475
Li Yiyi, China	465
I. Saavedra, Chile	443
A.H.O. Hajiyev, Azerbaijan	400
S. J. Jabbur, Lebanon	400
M. Tchuente, Cameroon	400
T. Obi, Nigeria	400
S.S. Hasnain, UK	400
N. Kumar, India	360
Mr and Mrs Andriambololona, Madagascar	352
M.P. Alpers, Australia	331
Mu Guoguang, China	330
H. Van Ginkel, Netherlands	327
A.C. Cerda, Chile	300
H. Chaimovich, Brazil	300
S. Datta, India	300
L. Davidovich, Brazil	300
Min Enze, China	300
M.M. Peixoto, Brazil	300
H. Ramkissoon, Trinidad and Tobago	300
Shi Changxu, China	300
Su Zhao-Bin, China	300
Yu Lu, China	300
R.P. Bambah, India	300
Zhao Zhongxian, China	300
Zhai Mingguo, China	300
B. Tsetseg, Mongolia	300
S. Sivaram, India	300
R. Garruto, USA	300
Sang Yup Lee, Republic of Korea	300
Li Jinghai, China	296
Mayor Zaragoza Federico, Spain	294
Chao-Jun Li, China	292
Luna Kamau, Kenya	290
M. O'Kane, Australia	288
J.S. Yadav, India	285
Zhang Ya-Ping, China	285
Wang Fosong, China	280
B.M. Abegaz, Ethiopia	272
A. Falodun, Nigeria	200
E. Igbinosa, Nigeria	200
S. I. Ola, Nigeria	200
E. Unuabonah, Nigeria	200
T. Durrani, UK	200
A.K. Sood, India	200
R. Ramaswamy, India	200
Chen Sai-Juan, China	200
Chen Zhu, China	200
Ding, Zhongli, China	193
Carlos F M Menck, Brazil	192
A.M. Cetto, Mexico	151
A. Bahri, Tunisia	143
H. Roesky, Germany	106
M. Jakovljevic, Serbia	106
U. Aswathanaray, India	100
S.M. Muhongo, South Africa	100
R. Zare, USA	100
M.A.J. Mariscotti, Argentina	100
H.K. Majumder, India	100
K. Basu, USA	100
U. Colombo, Italy	97
Soumitro Banerjee, India	96
Mohamed Mansour, Switzerland	95
A. Peeraly, Canada	86
Ingrid Daubechies, USA	48
Total	**192,479**

VOLUNTARY CONTRIBUTIONS RECEIVED FROM TWAS FELLOWS, YOUNG AFFILIATES AND OTHER INDIVIDUALS (2021 ONLY)

Individual donations[1] to the programme budget were received from:

Zhu Meifang, China
Girish Saran Agarwal, USA/India
Ghillean T. Prance, UK
Arogyaswami Joseph Paulraj, USA
Mohammad Mo Jamshidi, USA
Zhao Jincai, China
Li Chao-Jun, USA/Canada
Marilia Oliveira Fonseca Goulart, Brazil
Márcia Walquíria De Carvalho Dezotti, Brazil
David Justin Bakibinga, Uganda
and from anonymous donors.

Individual donations[1] to the Endowment Fund were received from:

Huang Jikun, China
Nan Ce-Wen, China
Zhu Meifang, China
Jisnuson Svasti, Thailand
Anil Kumar Jain, USA
Satya N. Atluri, USA
Shavkat Abdullaevich Ayupov, Uzbekistan
Kwok Pui-Yan, Taiwan, China
Long Yiming, China
Kumar V.G. Das, Malaysia
Michael Tran Clegg, USA
Luis de la Peña Auerbach, Mexico
Ana María Cetto Kramis, Mexico
Carlos Frederico Martins Menck, Brazil
Mihajlo (Michael) Jakovljevic, Serbia

[1] Names are listed in the order of amount donated, from most to least, in each category.

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**

NEW TWAS FELLOWS AND YOUNG AFFILIATES

TWAS FELLOWS ELECTED IN 2021

Agricultural Sciences
- EGAMBERDIEVA, Dilfuza (Uzbekistan)
- EMAM-DJOMEH, Zahra (Islamic Republic of Iran)
- ISLAM, Md Tofazzal (Bangladesh)

Structural, Cell and Molecular Biology
- GUILLÉN, Gerardo (Cuba)
- PANDA, Dulal (India)
- SAAD, Bashar (State of Palestine)
- TEIXEIRA, Santuza (Brazil)

Biological Systems and Organisms
- DUBE, Anuradha (India)
- HILDEBRAND, John G. (USA)
- JHA, Pramod Kumar (Nepal)
- MBACHAM, Wilfred Fon (Cameroon)
- MEKONNEN, Yalemtsehay (Ethiopia)
- ORYAN, Ahmad (Islamic Republic of Iran)
- RADA TARIFA, Ana (Bolivia)
- SADUNISHVILI, Tinatin (Georgia)
- VAL, Adalberto Luis (Brazil)

Medical and Health Sciences, including Neurosciences
- CHATTERJEE, Mitali (India)
- CHEN, Zi-Jiang (China)
- CROMBET-RAMOS, Tania (Cuba)
- GAYE, Oumar (Senegal)
- GLUCKMAN, Peter David (New Zealand)
- HUNGRIA DA CUNHA, Mariângela (Brazil)
- JAYE, Assan (Gambia)
- KWOK, Pui-Yan (Taiwan, China)
- NG, Kwan Hoong (Malaysia)
- NTOUMI, Francine (Republic of the Congo)
- ZUMLA, Alimuddin (UK)

Chemical Sciences
- BADSHAH, Amin (Pakistan)
- BHARGAVA, Suresh Kumar (Australia)
- CHERGUI, Majed (Switzerland)
- FONSECA GOULART, Marília Oliveira (Brazil)
- WU, Li-Zhu (China)

Engineering Sciences
- ALOUINI, Mohamed-Slim (Saudi Arabia)
- DAUD, Wan Ramli Wan (Malaysia)
- DEZOTTI, Márcia Walquíria de Carvalho (Brazil)
- LUO, Jianbin (China)
- MITRA, Sushmita (India)
- SOBOYEJO, Winston Oluwole (USA)
- TAO, Dacheng (Australia)

Astronomy, Space and Earth Sciences
- AHMED, Shakeel (India)
- OCHIENG OLAGO, Daniel (Kenya)
- SOKONA, Youba (Mali)
- YU, Gui-Rui (China)

Mathematical Sciences
- ATANGANA, Abdon (South Africa)
- MUKHAMEDOV, Farrukh (United Arab Emirates)
- OMIROV, Bakhrom (Uzbekistan)
- OUHABAZ, El Maati (France)
- WANG, Xiaoyun (China)

Physics
- ALTSHULER, Ernesto (Cuba)
- DABHOLKAR, Atish (Italy)
- JORIO DE VASCONCELOS, Ado (Brazil)
- LI, Ruxin (China)
- MAHADEVAN, Priya (India)
- NAQIB, Saleh Hasan (Bangladesh)

Social and Economic Sciences
- JAKOVLJEVIC, Mihajlo "Michael" (Serbia)
- LIMA, Nísia Trindade (Brazil)
- SETATI-PHAKENG, Mamokgethi (South Africa)
- VON BRAUN, Joachim (Germany)

TWAS YOUNG AFFILIATES SELECTED IN 2021

Sub-Saharan Africa
- AKUFFO, Kwadwo Owusu (Ghana)
- BITALO, Daphne (Uganda)
- DJOMO NANA, Eric (Cameroon)
- RAKOTONARIVO, Onjamirindra Sarobidy (Madagascar)
- RIANASOAMBOLANORO, Rakotosaona (Madagascar)

Arab Region
- AL-MOHAMMEDAWI, Maysaa Chasib Hatem (Iraq)
- AL-NAQEB, Ghanya Naji Mohammed (Yemen)
- AL-QADHI, Gamilah Abdulhak Abduakdaim (Yemen)
- AL-YAMANI, Hafsa Mohammed Mohammed (Yemen)
- ALSALIM, Rana (Syrian Arab Republic)
- FAEL, Hanan (Syrian Arab Republic)
- FARDON, Manal (Lebanon)
- FERHATI, Hichem (Algeria)
- ISMAIL, Shirin (Syrian Arab Republic)
- KARIM ZADA, Sedighe (Afghanistan)
- MAANAN, Mehdi (Morocco)
- SAID, Lobna (Egypt)
- SUNOQROT, Suhair (Jordan)

AWARDS CONFERRED IN 2021

Latin America and Caribbean
- BIRBRAIR, Alexander (Brazil)
- BLAIR ESPINOZA, Reina Maricela (Honduras)
- CUBILLOS RIFFO, Francisco Alberto (Chile)
- PAREDES VILLANUEVA, Kathelyn (Bolivia)
- SOLORZANO ORTIZ, Elizabeth (Guatemala)

East and South-East Asia and Pacific
- DAI, Qing (China)
- PRABOWO, Briliant Adhi (Indonesia)
- SOE, Thi Thi Soe (Myanmar)

Central and South Asia
- ARFATAHERY, Noushin (Islamic Republic of Iran)
- ELIAS, Sabrina Moriom (Bangladesh)
- SHARMA, Mahak (India)
- SHEKOUHY, Mohsen (Islamic Republic of Iran)
- SALEEM, Rabia (Pakistan)
- RAHMATULLAEV, Muhammadjanovich Muzaffar (Uzbekistan)

TWAS Medals
- DIAB, Roseanne (South Africa)
- SINDI, Hayat (Saudi Arabia)
- SRINIVASAN, Mandyam (Australia)

TWAS-CAS Young Scientist Award for Frontier Science in Physical Sciences
- PÉREZ, Laura (Chile)

TWAS-Atta-ur-Rahman Award in Chemistry
- HASAN, Zubair (Bangladesh)

TWAS-Fayzah M. Al-Kharafi Award
- BASALEEM, Huda Omer Salem (Yemen)

TWAS-Samira Omar Innovation for Sustainability Award
- ASFAW, Nigist (Ethiopia)

TWAS-Abdool Karim Award in Biological Sciences
- DABITAO, Djeneba (Mali)

TWAS Regional Awards in Public Understanding and Popularization of Science
- PARGA, Julia Tagüeña (Mexico)
- SHARMA, Sujata (India)
- ISMAIL, Adel (Egypt)
- SEGALO, Puleng (South Africa)
- LI, Huang (China)

OWSD-Elsevier Foundation Awards for Early-Career Women Scientists in the Developing World
- CABRERA CATALÁN, Maria Eugenia (Guatemala)
- DORJGOTOV, Khongorzul (Mongolia)
- DUSHAQ, Ghada (State of Palestine)
- MUNAWEERA, Imalka (Sri Lanka)
- NKANSAH, Marian Asantewah (Ghana)

TWAS SECRETARIAT

Executive Director's Office
Executive Director: Romain Murenzi
Special Adviser: Giusto Sciarabba

Senior Assistant: Sandra Ravalico

Giorgia Danelon
Vanessa Varnier

Programmes and Activities
Programme Coordinator: Massimo Paoli
Cristina Ballaben Simoes
Marco Beltramini [Until February]
Sara Dalafi
Francesca Gaglia [From September]
Sena Galazzi
Memoth Kanniakonil [From March]
Mathilde Labregère
Antonella Mastrolia
Francesca Menozzi [From March]
Fabrizia Niscio
Payal Patel
Manuela Schipizza [Until February]

Public Information Office
Public Information Officer: Raffaella De Lia [From March]
Francesca Pettoello
Cristina Serra
Sean Treacy

Finance and Administration
Administrative Officer: Ulrich Singe
Chiara Cesareo
Antonino Coppola
Patricia Presiren
Paola Vespa
Ezio Vuck

OWSD - Organization for Women in Science for the Developing World
Coordinator: Tonya Blowers
Tanja Bole
Lucia Fanicchi
Erika Hrvatic
Erin Johnson
Marina Juricev
Evgenia Markvardt [Until August]
Zabeeh Ullah Sahil

GenderInSITE
Director: Roseanne Diab
Peter McGrath

InterAcademy Partnership (IAP)
Coordinator: Peter McGrath
Sabina Caris
Muthoni Kareithi
Giovanni Ortolani

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

TWAS ANNUAL REPORT 2021

TWAS Executive Director
Romain Murenzi

Public Information Officer
Raffaella De Lia

Coordinator
Sean Treacy

Contributors
Cristina Ballaben Simoes
Tonya Blowers
Tanja Bole
Sara Dalafi
Raffaella De Lia
Lucia Fanicchi
Sena Galazzi
Erin Johnson
Marina Juricev
Memoth Kanniakonil
Muthoni Kareithi
Mathilde Labregère
Antonella Mastrolia
Peter McGrath
Francesca Menozzi
Fabrizia Niscio
Giovanni Ortolani
Massimo Paoli
Payal Patel
Francesca Pettoello
Sandra Ravalico
Zabeeh Ullah Sahil
Cristina Serra
Vanessa Varnier
Paola Vespa

Graphic Design
Rado Jagodic
Studio Link, Trieste, Italy

Printing
Grafica Goriziana
Gorizia, Italy

Printed on Fedrigoni Arena Extra White Smooth, a paper made with environment-friendly ECF pure cellulose.

ELEMENTAL CHLORINE FREE GUARANTEED · ACID FREE · HEAVY METAL ABSENCE CE 94/62

TWAS gratefully acknowledges financial support
for its 2021 activities provided by the following institutional partners:

Ministry of Foreign Affairs and International Cooperation, Italy
Swedish International Development Cooperation Agency, Sweden
Lenovo Group Ltd., China
SilverLining Inc., USA
Elsevier Foundation, Netherlands
Academia Sinica, Taiwan, China
Fondazione Ernesto Illy, Italy
Kuwait Foundation for the Advancement of Sciences, Kuwait
Ministry of Science, Technology and Innovation, Brazil
International Mathematical Union, Germany
Siwei Cheng Foundation, China
Searle, Pakistan
The American Association for the Advancement of Science, USA

United Nations
Educational, Scientific and
Cultural Organization

twas

THE WORLD ACADEMY OF SCIENCES
for the advancement of science in developing countries
ICTP Campus, Strada Costiera 11 • 34151 Trieste, Italy
Tel.: +39 040 2240 327 • Email: info@twas.org • Website: www.twas.org