

Promoting Physics in Developing Countries

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ICTP

PWF Website www.ictp.it/physics-without-frontiers.aspx
PWF Facebook & Twitter [@ictpPWF](https://www.facebook.com/ictpPWF)

US
UNIVERSITY
OF SUSSEX



PHYSICS WITHOUT
FRONTIERS

Physics in developing nations

In many developing countries research into fundamental physics is lagging

-> **We are not exploiting potential scientific brain power**

- Universities often do **not have resources** or access to funding for research
- Scientists from developing countries suffer **isolation** (lack collaborators, access to funding), and are often **saturated by teaching**
- Students **lack exposure to research** and mentoring, and are not aware of **opportunities** in physics



Physics in developing nations



Gaza, Palestine: Islamic University Gaza

- Professors struggle to find collaborators, and do research with few resources
- Poor equipment demotivates students, little exposure research



Particular to GAZA - students and professors cannot travel easily, isolation is immense

Given the chance students excel!!

- **Abdelrahman Almeghari** CERN technical student
- looking for opportunity for PhD!!

Physics in developing nations

Need for scientific research



Sustainable Development:

The need to solve environmental and developmental problems requires scientists

In recent years many high income countries' governments have placed unprecedented emphasis on research as **a key motor for national development.**

Investment into educational, technological and research institutions play a key role in growing a **knowledge-based economy**

Research into basic science drives quality of science education throughout a nation

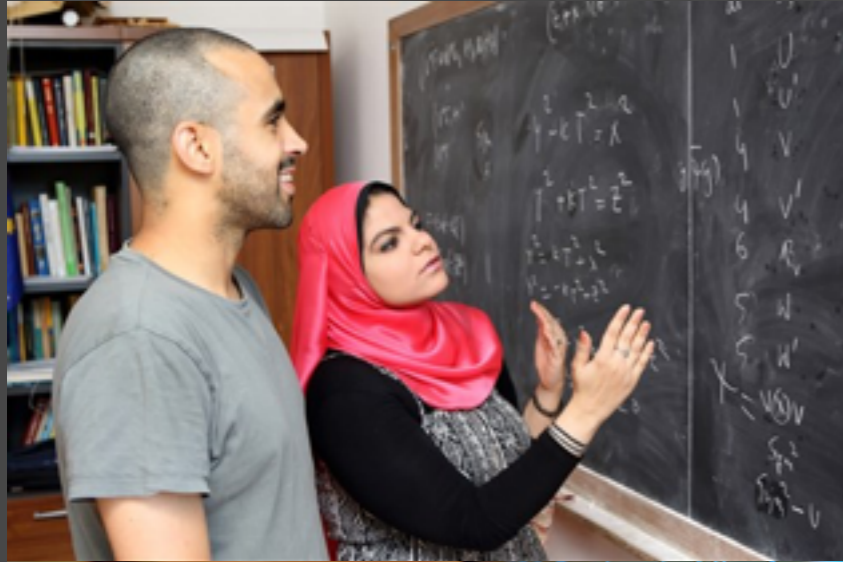
Advance of the knowledge-based society

*‘refers to **societies** that are well educated, and who therefore rely on the **knowledge** of their citizens to drive the innovation, entrepreneurship and dynamism of that **society's** economy.’*



- > Ground breaking developments due to improved communication and information technology
- > Can ignite technological progress, economic growth, societal well being, cultural enhancement
- > All countries have been obliged **to review and reorganise** their capacities for accessing and benefiting from the high level knowledge which shapes social change
- > Higher education, research and innovation fuel its progress

Advance of the knowledge based society



Fundamental Science



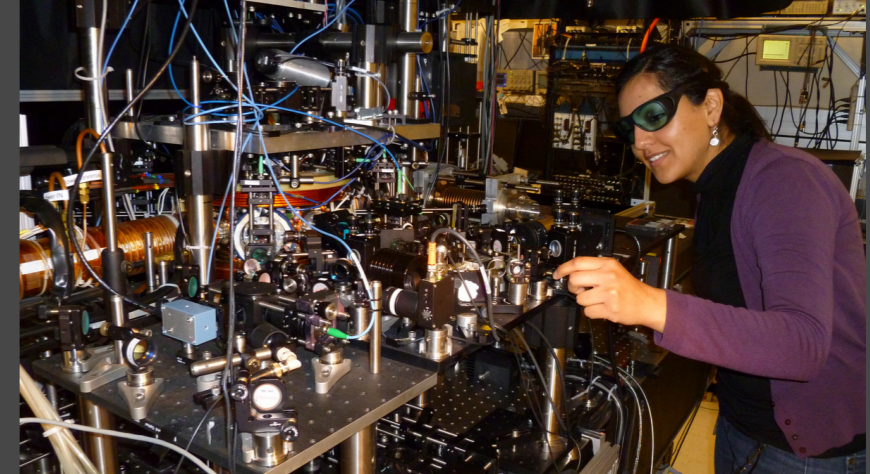
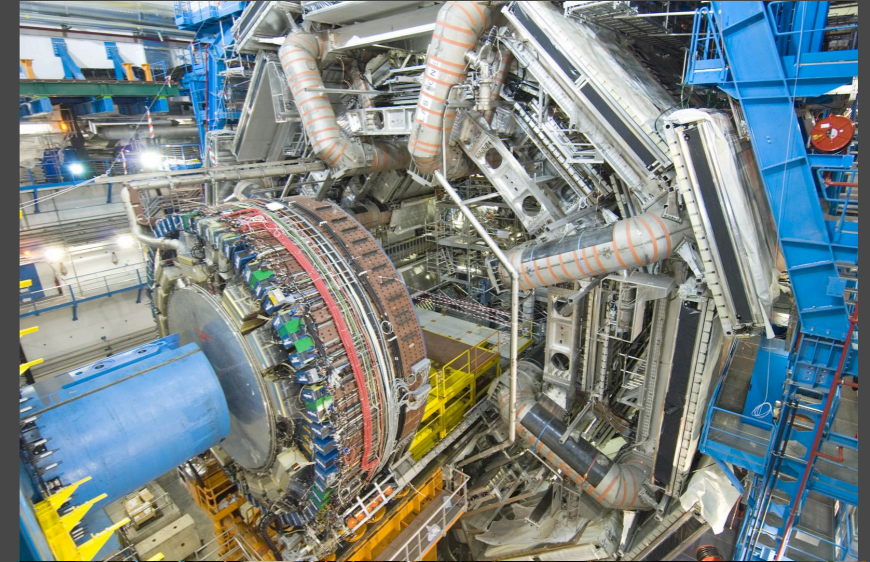
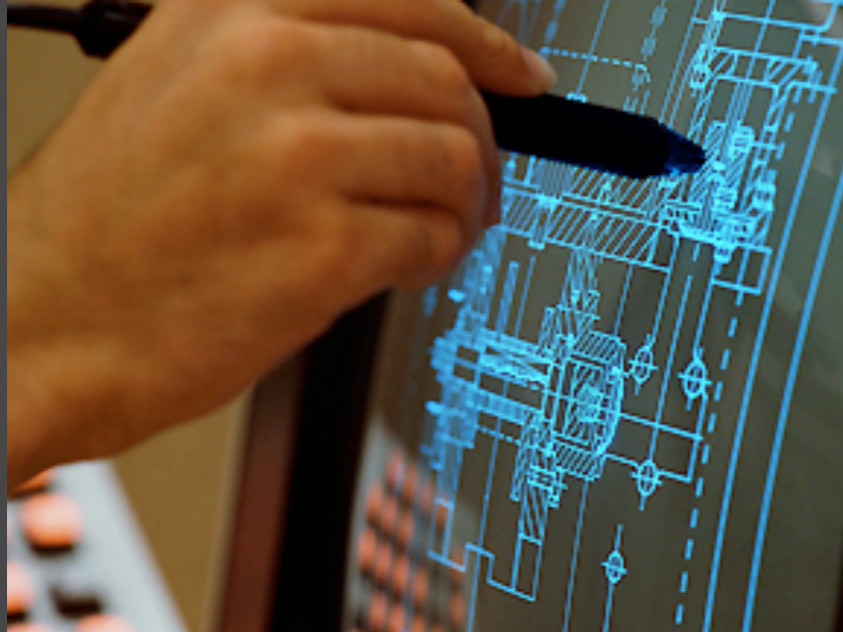
Applied Science



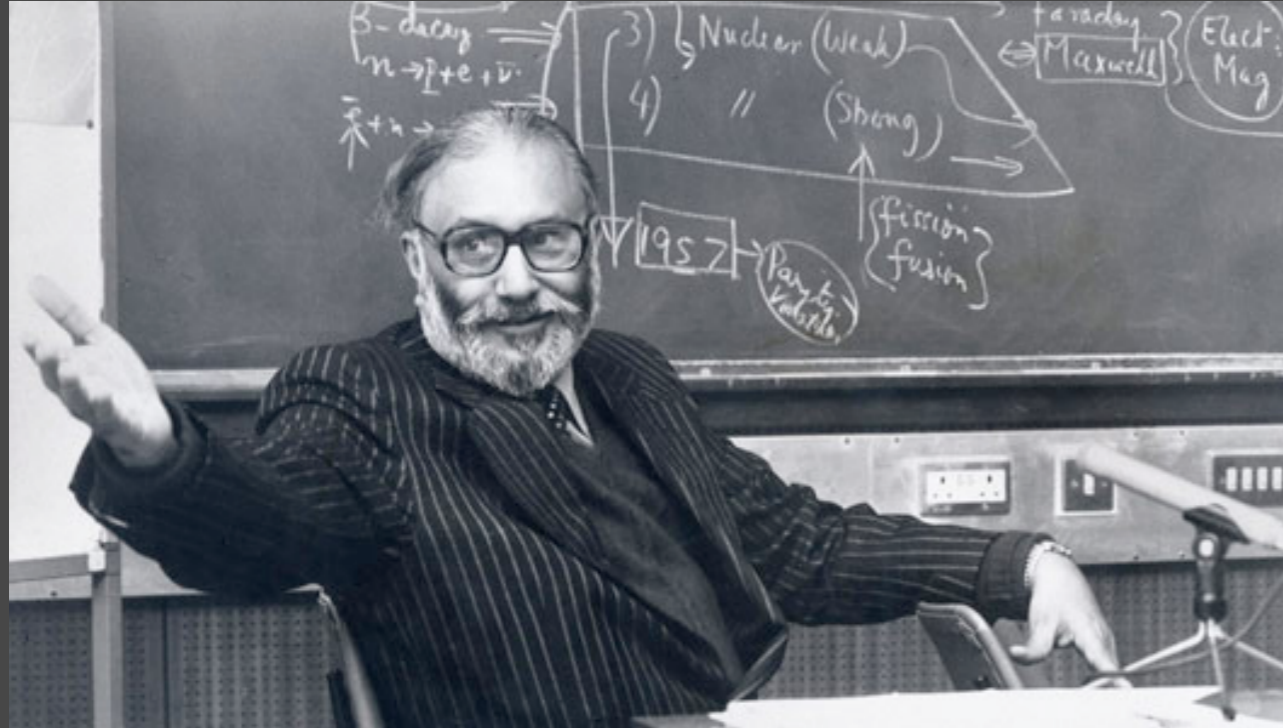
Technology and Innovation



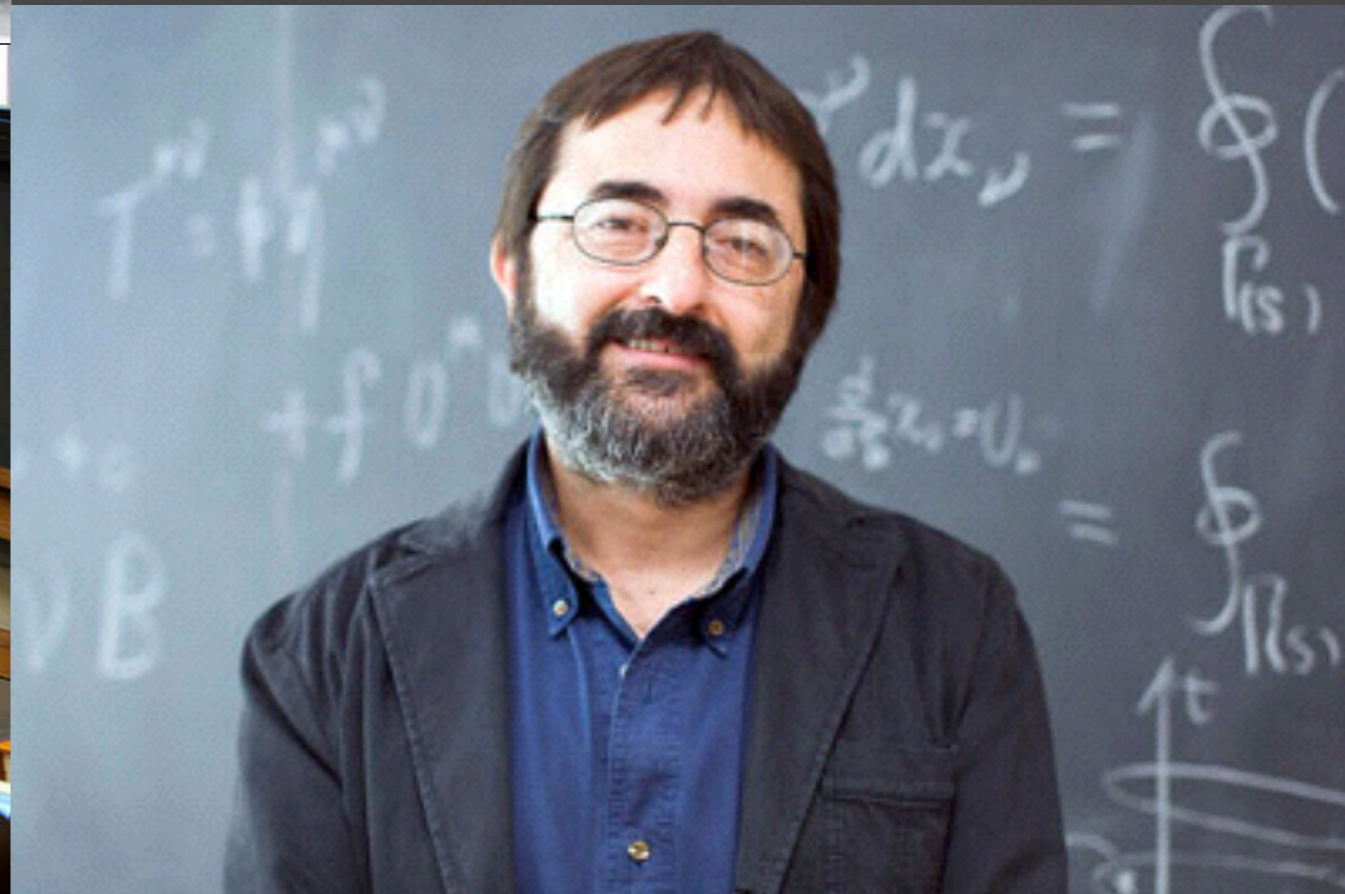
Sustainable Development



International Centre for Theoretical Physics (ICTP)



- Hub for high quality scientific research
- Provides conferences and workshops
- Associateship schemes
- Diploma and master programs
- ictp.it



TWAS

The World Academy of Sciences for the advancement of science in developing countries

-> Works to support sustainable prosperity through research, education, policy and diplomacy

-> Number of programs to support scientists in developing countries!



Fellowships

PhD and Postdoctoral Research fellowships are crucial for building scientific strength in developing countries.



Research Grants

Funding helps researchers in the developing world to purchase lab equipment and supplies.



Scientific Meetings

Grants support high-level international and regional scientific meetings in developing countries.



Prizes and Awards

TWAS honours are among the most prestigious given for research in the developing world.



Visiting Scientists

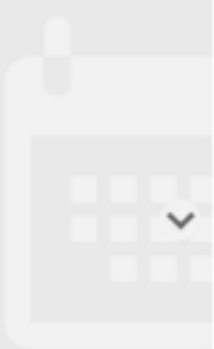
Share your projects and your expertise in developing nations as a visiting researcher or professor.

EVENTS AND DEADLINES

31 MARCH 2018
TWAS-DFG Cooperation Visits Programme

31 MARCH 2018
CAS-TWAS President's PhD Fellowship Programme

3 APRIL 2018
TWAS Prizes



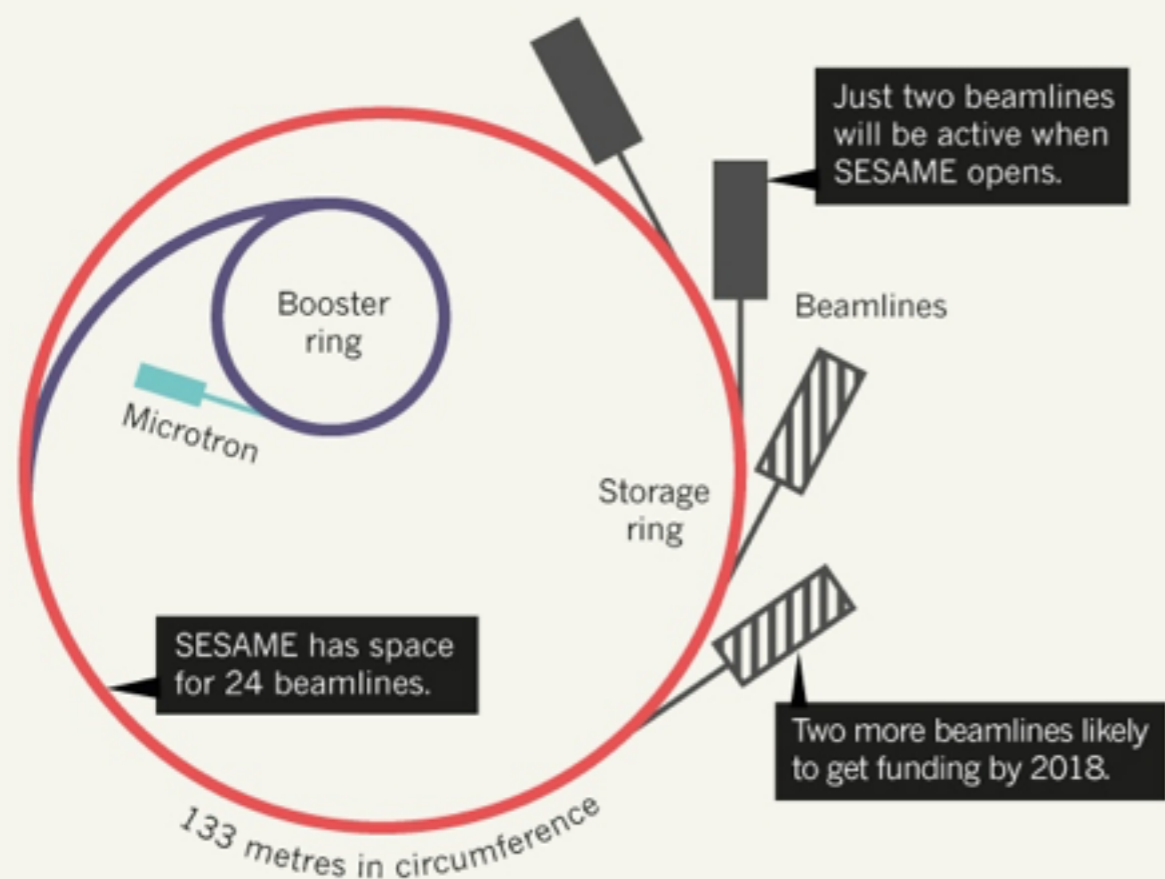
SESAME

Synchrotron-light for Experimental Science and Applications in the Middle East

Synchrotron-light source opened in Amman (Jordan) on 16 May 2017. It is the Middle East's first major international research centre.

OPEN SESAME

The SESAME synchrotron near Amman, Jordan, will start circulating beams in December. But it will initially use only a fraction of its potential capacity.



MICROTRON

Electrons accelerated to 22 megaelectronvolts.

BOOSTER RING

Electrons further accelerated to 800 megaelectronvolts.

STORAGE RING

Electrons circulate at 2.5 gigaelectronvolts, and start to emit light.

BEAMLINES

Optical instruments tailor the light and use it to investigate samples.

©nature



No	Beamline	Energy Range	Source Type
1	XAFS/XRF (X-ray Absorption Fine Structure/X-ray Fluorescence)	4.5-30 keV	Bending Magnet
2	IR (Infrared Spectromicroscopy)	0.001-3 eV	Bending Magnet
3	MS (Materials Science)	5-25 keV	2.1 Tesla MPW (SLS)
4	Macromolecular Crystallography (MX)	~4 ~14 keV	In Vacuum Undulator

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Schools and workshops

9TH CERN LATIN-AMERICAN SCHOOL OF HIGH-ENERGY PHYSICS

San Juan del Rio, Mexico, 8-21 March 2017
<http://cern.ch/physchool/LASHP9>

Scientific Programme



Heavy Ion Physics
A. Ayala (LANL, Mexico)

High Energy Physics
L. De Raet, CERN/CONICET/UBA, Argentina
C. Garcia-Casal, UNLP, Argentina
Special Lectures on Cosmological Neutrinos
S. Capozzi, Louisiana State U., USA
Particle Detectors
C. Malin, CERN, Spain
G. G. M. S. (CERN)

Physics Beyond the Standard Model
M. Mangano, LANL, Mexico
Flavor Physics and CP Violation
A. Pich, IFAE, Universitat de Valencia, Spain
Cosmology
S. Perlmutter, STUN/STP/STP-SMIVV, USA, Brazil
Neutrino Physics
R. Sanchez, IFAE/IBET, Spain
Particles in Latin America
A. Sanches, USP, Brazil
LHC Experiments and LHC Results
R. S. F. (CERN), ATLAS, LHC, CERN

Workshop Leaders
A. Ayala (LANL, Mexico)
L. De Raet (CERN/CONICET/UBA, Argentina)
C. Garcia-Casal (UNLP, Argentina)
S. Capozzi (Louisiana State U., USA)
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AEP SHEP 2018

12 - 25 SEPTEMBER 2018, QUT HONOLULU, HAWAII

Scientific Programme

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THE FIFTH BIENNIAL AFRICAN SCHOOL OF FUNDAMENTAL PHYSICS AND APPLICATIONS

University of Namibia, and
Namibia University of Science and Technology
Windhoek, Namibia
June 24 - July 14, 2018

APPLICATION
asp2018-registration@unam.na

DEADLINE
Open for application from November 1, 2017 to February 28, 2018. Bursaries & full support for selected students. Provide a CV, transcripts, letter of motivation & one recommendation letter with your online application.

CONTACT
ASP-IO@CERN.CH

WEBSITE
www.african-school-of-physics.org

The Scientific Program Includes:

- Workshop for High School Teachers
- Outreach to Secondary Schools
- Astro Physics
- Nuclear & Particle Physics
- Medical & Radiation Physics
- Monte Carlo Generator, Simulations & Data Analysis
- Solar Cells & Renewable Energies
- High Performance Computing

LOCAL ORGANIZING COMMITTEE (LOC):
E. Kasal (UNAM), M. Backes (UNAM), R. Steenkamp (UNAM), R. Tjenge (UNAM), D. Singh Jet (NUST), A. Zulu (NUST), E. Shiveru (MCT), J. Ndamba (ICRST), A. Pholander (ICKG), M. Shabangu (ICRS)

INTERNATIONAL ORGANIZING COMMITTEE (IOC):
B. Acharya (ICTP and King's College London), K. Assamagan (BNL), A. Delrowski (CERN), C. Darve (ECS), J. Ellis (King's College London), S. Muenza (CNRS-IN2P3), R. Voss (CERN)

INTERNATIONAL ADVISORY COMMITTEE (IAC):
H. Bachacou (CEA-IRFU), U. Bassler (CNRS-IN2P3), M. Campanelli (UCL), S. Connel (University of Johannesburg), T. Ekouf (University of Lorraine), L. Elouadrhiri (UNAM), E. G. Ferreira (USC), J. Gray (AGPS), H. Gordon (BNL), J. Gowarths (UCL), B. Heinemann (DESY), N. Holtkamp (SLAC), J. Huston (ISIS), O. Ka (ICRS), S. Karim (BNL), Y. K. Kim (University of Chicago), D. Kobor (URSI), S. C. Lee (Academia Sinica), H. Montgomery (UNAM), M. de Naulois (Ecole Polytechnique), M. Nunez (INFN), F. Quevedo (ICTP), L. Rivkin (PSI & EPFL), J. Senola (IIT), P. Skands (Monash University), R. D. Tahir (Simon Fraser University), E. Tsionelis (CERN), T. Vicky (University of Sheffield), Z. Viskazzi (University of the Witwatersrand), H. B. White Jr. (Fermilab)




Case Study: Nepal



Case Study: Nepal



Kathmandu University



Tribhuvan University



<https://www.nature.com/news/developing-world-far-flung-physics-1.16361>

Case Study: Nepal



Suyog Shrestha (ATLAS)



Outreach program Schools



Particle Physics Winter School 2018

Physics Without Frontiers

*The ICTP Physics Without Frontiers program works to **inspire**, **train** and **motivate** physics and mathematics university students in developing countries to help **build the next generation of scientists**.*

*Each project is **unique**, developed with the country's specific needs in mind.*

Our target is undergraduate & master students.

A poster for the Physics Without Frontiers program. The background is a dark space with a starry sky and two globes of Earth. The text is centered and reads: 'JOIN PHYSICS WITHOUT FRONTIERS'. Below this, it says 'WORLDWIDE PHYSICS OUTREACH TO INSPIRE, TRAIN & MOTIVATE PHYSICS & MATHEMATICS STUDENTS IN DEVELOPING COUNTRIES' and 'HELPING BUILD THE NEXT GENERATION OF SCIENTISTS'. At the bottom, it says 'REQUEST A UNIVERSITY COURSE - RUN AN OUTREACH ROADSHOW - GET INVOLVED' and 'WWW.ICTP.IT/PHYSICS-WITHOUT-FRONTIERS'. In the top left corner, there is the ICTP logo and the text 'The Abdus Salam International Centre for Theoretical Physics'. In the top right corner, there are logos for the University of Trieste and IAEA.

ICTP The Abdus Salam International Centre for Theoretical Physics

UNIVERSITY OF TRIESTE IAEA

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Physics Without Frontiers

Specifically target countries / universities with less developed science - no PhD programs, little research.



AIMS:

- Help create next generation of physicists
- Support physics departments to with their needs in teaching and research

Physics Without Frontiers



Send scientists to visit countries that need support!

- **Run sustained programs to motivate, train and educate**
- **Support the department and the faculty members**
- **Provide sustained mentoring**

Our success is when we are not needed anymore!

Physics Without Frontiers: Our Programmes

Inspire and Motivate

Train and Educate



**Public
Outreach**

Secondary Schools
& the Public

**Masterclass
Roadshows**

Undergraduate &
Master students

**Schools and
Workshops**

Undergraduate &
Master students

**University
Courses**

Undergraduate &
Master students

**Network and Collaborate
Sustained Mentoring**

Our Teams, Role Models & Mentors!



Physics Without Frontiers: Networking



We work with the physics departments to understand their individual needs:

- Collaborations for research
- Infrastructure projects
- Plans to support with resources

Communicate the importance of physics research

Is basic science an unnecessary luxury?

Should not developing nations invest only in applied research to address immediate needs?

Fundamental scientific research is central to the development of a **capacity** to adapt and adopt technologies

Basic and applied research are **inter-dependant**, innovation requires a strong collaboration between them, and highly skilled scientists in both disciplines



Communicate the importance of physics research

All countries need to draw upon international research findings

High income countries can do this because of their vital domestic research community, their expertise in both basic and applied sciences

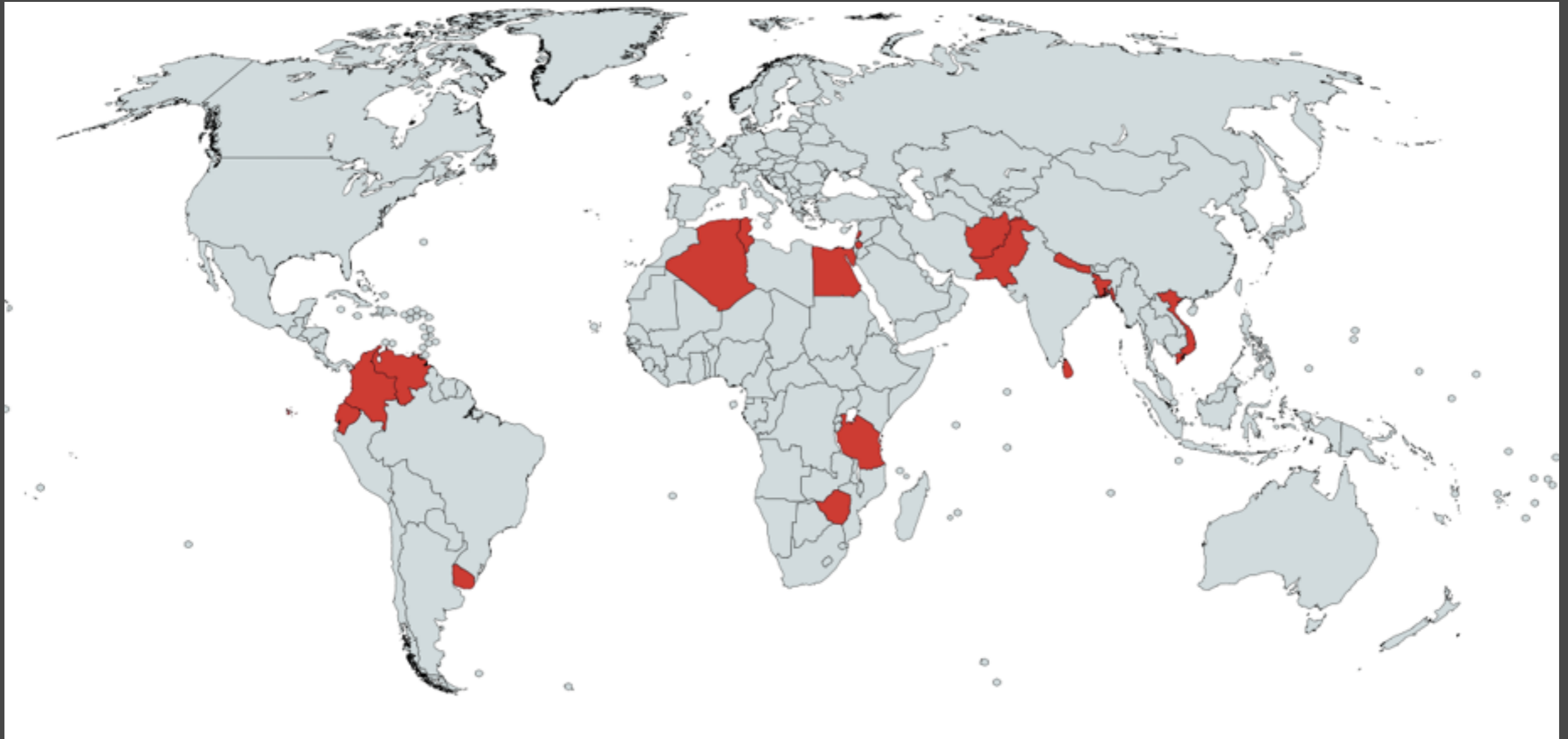
Countries with a weak national research community, have fewer opportunities to identify, adapt and make use of the new knowledge



The move towards a global knowledge economy is accelerating, and the necessity of having a thriving scientific community to generate new knowledge and exploit it is vital!

Report on the UNESCO forum on Higher Education, Research and Knowledge:

Physics Without Frontiers: Projects to date / upcoming



We support programs in any developing country

We have some focus on countries that are **least scientifically developed**

Physics Without Frontiers: Upcoming program

INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS



PHYSICS WITHOUT FRONTIERS AFGHANISTAN

HIGH ENERGY PHYSICS WORKSHOP

KABUL UNIVERSITY

SATURDAY 31 MARCH - SUNDAY 1 APRIL 2018

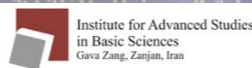
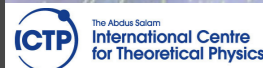
PHYSICS FACULTY, LECTURE ROOM 1

PWF is organising a workshop in high-energy physics at Kabul University, Afghanistan. The program is designed for 3rd and 4th year undergraduate physics students throughout the region, to introduce the field and research topics with a focus on cosmology and particle physics.

**REGISTER AT: <http://bit.ly/2tHjim3>
DEADLINE 22 MARCH 2018**

ORGANISED BY ICTP PWF, WITH:

BAKTASH AMINI (KABUL UNIVERSITY, ICTP PWF AFGHANISTAN COORDINATOR)
KATE SHAW (ICTP PWF COORDINATOR, UNIVERSITY SUSSEX, ATLAS EXPERIMENT AT CERN)
ENCIEH ERFANI (INSTITUTE FOR ADVANCED STUDIES IN BASIC SCIENCES)



Supporting physics can support women!

Around the world in many countries there is still a social problem for women to be educated!

When women however are at university, this gives them the opportunity for **empowerment**

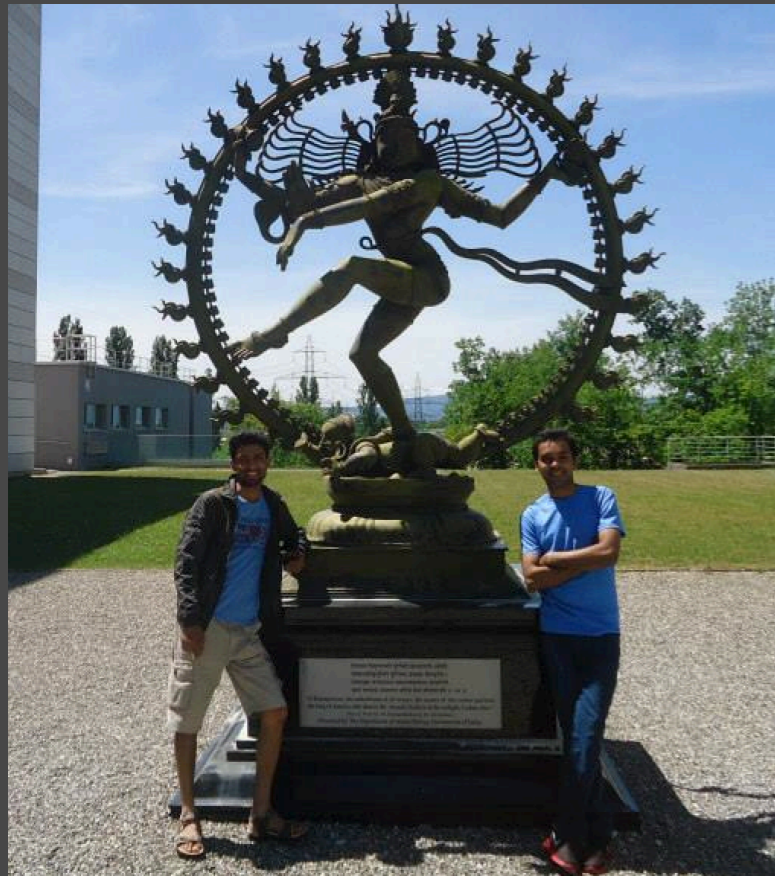
-> can drive the need for education for the **next generation** and become role models!

In many Arab countries - more women study physics than men (they don't have the social barriers we have about physics)



But they need opportunity, support, mentoring and empowering to reach their potential!

Worldwide network of students we work with

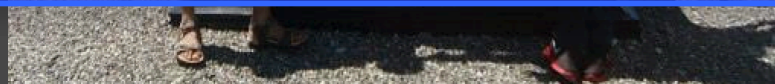


Worldwide network of students we work with



**They are looking for opportunities!!!
Many top students end up in the US,
France, Germany and elsewhere.**

**As lectures back in their home
countries they need collaboration!!**

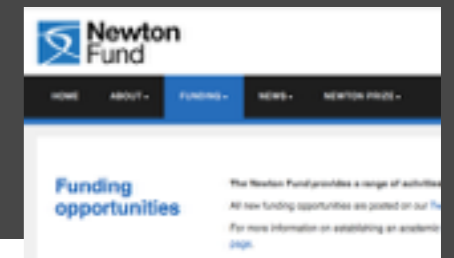


How can we support physicists and students worldwide?

Support Students:

- Masters/PhD opportunities
 - Universities have **opportunities** for students from overseas/ particular countries - PHYSICS should take advantage!
 - **DIFID Commonwealth opportunities / British Council / Royal Society**

- Newton fund



The Newton Fund aims to promote the economic development and social welfare of either the partner countries or, through working with the partner country, to address the well being of communities. It will do so through strengthening partner country science and innovation capacity and unlocking further funding to support this work. It is part of the UK's [official development assistance \(ODA\)](#).

- You can visit universities in developing countries or/and **join PWF** to teach, run a workshop/course/roadshow
- Join conferences and workshops to show support for their efforts!

Conclusion

Pool of well educated and motivated men and women from developing countries who need opportunities for study and collaboration

Scientific opportunity must be based on merit, not on ones country of birth or economic background

There is a huge untapped potential of scientists throughout the world, we and our institutes must reach out and collaborate!



PWF Website www.ictp.it/physics-without-frontiers.aspx

PWF Facebook & Twitter @ictpPWF

Get in touch to take part!

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