

Perspectives on International Engagement in Optics

J. Niemela
UNESCO-ICTP
Trieste, Italy



A bit of background on ICTP and its origins:

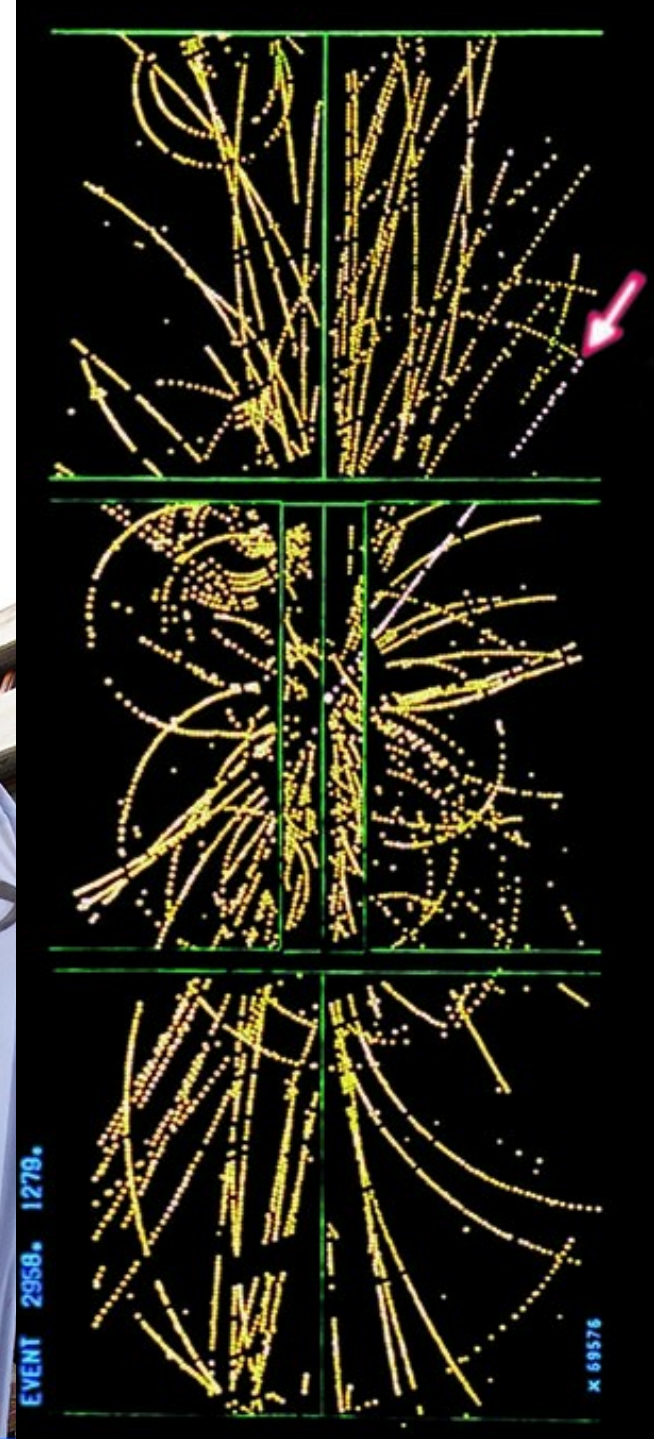
“Either I must leave my country or leave physics... and with great anguish I chose to leave my country.” -- *Abdus Salam* 1951

1962 Establishment of center approved by **IAEA**
General Conference

1964: ICTP opens in Trieste, Italy



ICTP Photo Archives



ICTP is operated today as a UNESCO Category 1 Center, under a tripartite agreement along with the IAEA and the government of Italy



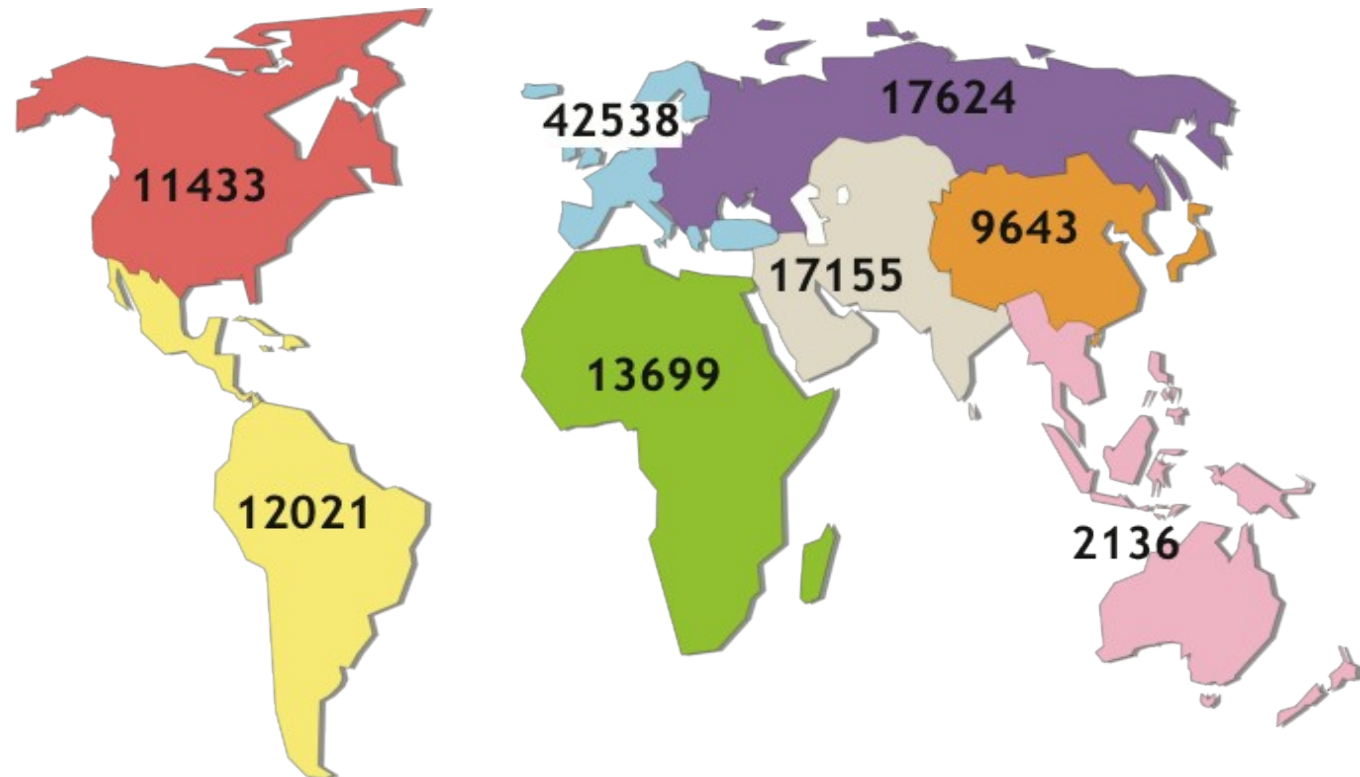
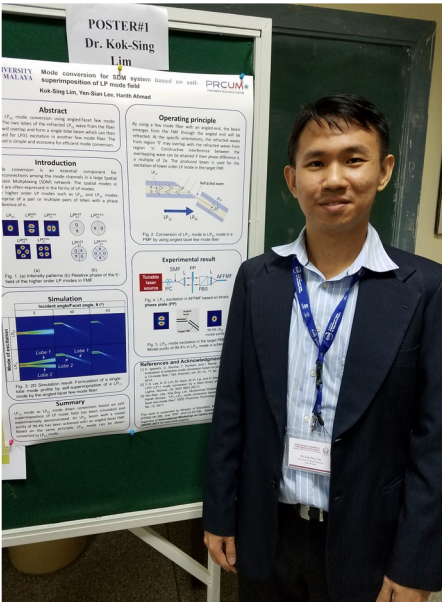
It's location in Trieste was the result of diplomatic and political negotiations, but also a fortunate encounter between Abdus Salam, Paolo Budinich and other scientists some years earlier



Symposium on Elementary Particle Interactions, Miramare Castle, Trieste 22-26 June 1960

Welcoming scientists from around the world:

- More than 140,000 visits since 1970
- 190 countries represented (person-months heavily biased in favor of scientists from developing countries)
- Since 2018, more than 25% of ICTP visiting scientists are women.



Conferences, workshops and schools

- Providing training, knowledge sharing, and opportunities to network
- More than 60 activities each year
- Hosting an average of up to 6,000 scientists from 145 nations annually



2019 ICTP Winter College on Optics

Some scientific calendar activities are held *regionally* rather than in Trieste. This is one of them

A familiar-looking *student chapter-driven* optics conference in Yerevan was part of ICTP's annual scientific calendar in 2014.



2nd International Symposium on Optics and its Applications 1 – 5 September 2014 Yerevan-Ashtarak, Armenia

The Abdus Salam International Centre for Theoretical Physics (ICTP), in collaboration with the International Commission for Optics (ICO), the Russian-Armenian (Slavonic) University (RAU), the Institute for Physical Research of NAS (IPR of NAS), the LT-Pyrkal cjs, and the faculty of Physics of Yerevan State University (YSU) will organize the 2nd International Symposium on Optics & its Applications (OPTICS-2014), which will be held at Yerevan and Ashtarak, Armenia, from 1 to 5 September, 2014.

PURPOSE OF THE SYMPOSIUM

This scientific event will provide good opportunity for optics & photonics field scientists and industrial companies for information exchange. The objective of this symposium is to bring together leading specialists and young scientists working on various aspects of optics, to discuss the most recent developments in that area. OPTICS-2014 will combine invited plenary lectures, sectional reports, presentations of young scientists (there will be special awards from the SPIE Armenian Students Chapter for the best student's contributions), poster presentations, laboratory tours, exhibition and excursion.

DIRECTORS:

Gagik Buniatyan (LT-PYRKAL, Armenia)
María L. Calvo (Universidad Complutense de Madrid, Spain)
Narine Gevorgyan (RAU, Armenia / ICTP, Italy)
Angela Guzman (CREOL, USA)
Joseph Niemela (ICTP, Italy)
Aram Papoyan (IPR of NAS, Armenia)
Hayk Sarkisyan (RAU, Armenia / YSU, Armenia)

COORDINATOR:

Paytsar Mantashyan (IPR of NAS, Armenia)

TOPICS:

Optical properties of nanostructures
Quantum optics & information
Singular optics and its applications
Laser spectroscopy
Strong field optics
Nonlinear & ultrafast optics
Photonics & fiber optics
Optics of liquid crystals
Mathematical methods in optics

PARTICIPATION

Scientists and students from all countries that are members of the United Nations, UNESCO or IAEA may attend the Symposium. As this activity will be conducted in English, participants must have an adequate working knowledge of this language. Although the main purpose of ICTP is to help scientists from developing nations through a programme of training activities within a framework of international cooperation, applicants from developed countries who would equally benefit from the Symposium are also welcome to attend. As a rule, travel and subsistence expenses of the participants should be borne by their home institutions. However, limited funds will be available to support some participants, who are nationals of, and working in, a developing country and who are not more than 45 years old, to be selected by the Organizers. Every effort should be made by candidates to secure support for their fare from their home country. It is stressed that participants whose travel expenses are paid by ICTP are required to attend the entire course. There is no registration fee for attending the Symposium.

HOW TO APPLY FOR PARTICIPATION

Application forms for the Symposium and agenda can be found at the activity website on the Web server of ICTP at http://cdsagenda5.ctp.it/full_display.php?agenda_id=4358. Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit online the application form **not later than 1 May 2014**.

Telephone: +39-040-2240544
E-mail: mailto:osm263@ictp.it
ICTP Home Page: <http://www.ictp.it/>

January 2014

its applications



CO-ORGANIZING
STUDENT CHAPTERS:
the YSU & NAS SPIE Armenian
Student Chapter, and the BMSTU
SPIE & OSA Student Chapters

INVITED SPEAKERS:

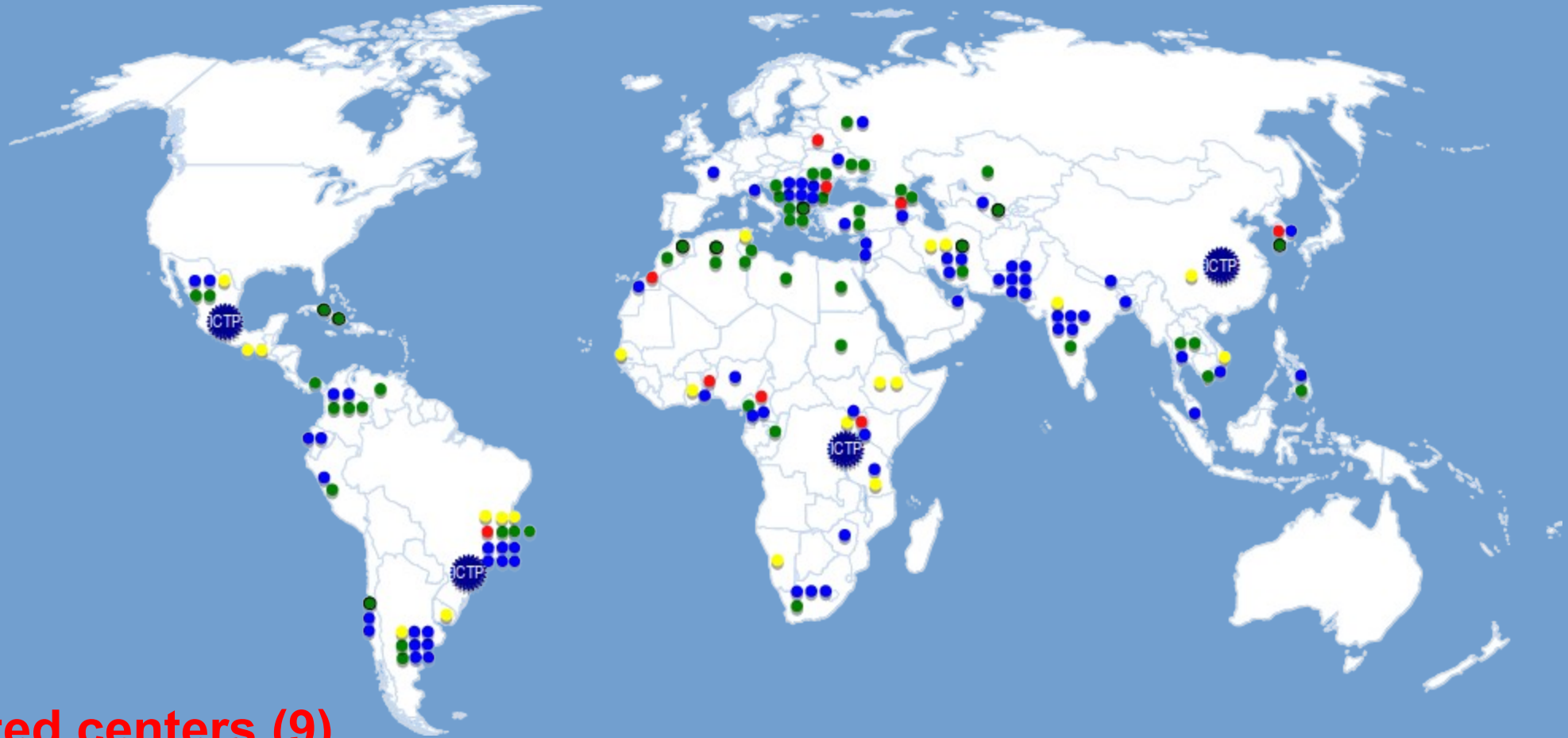
Alber Gernot, Germany
Baldotti Mario, Brazil
Bellucci Stefano, Italy
Bergou Janos, USA
Berry Michael, UK
Bhattacharjee Aranya, India
Blaschke David, Poland/Russia
Bliokh Konstantin,
Japan/Ukraine
Cabrera Humberto, Venezuela
Calvo Maria L., Spain
Cowan Thomas, Germany
Duque Carlos, Colombia
Ekers Aigars, Latvia
Guzman Angela, USA
Hatsagortsyan Karen, Germany
Kavokin Alexey, UK
Khvedelidze Arsen, Georgia
Machnikowski Pawel, Poland
Manko Vladimir, Russia
Niemela Joseph, Italy
Pandey Avinash, India
Petrosyan David, Greece
Ponce Luis, Mexico
Reinholz Fred, Germany
Reinholz Heidi, Germany
Rhodes William T., USA
Ruhl Hartmut, Germany
Schrinzi Armin, Germany
Shahbazyan Tigran, USA
Svanberg Katarina*, Sweden
Svanberg Sune*, Sweden
von Bally Gert, Germany
Zadoyan Ruben, USA

*to be confirmed

DEADLINE

1 MAY 2014

Other activities are supported through the Office of External Activities



- **Affiliated centers (9)**
- **Network centers (9)**
- **Scientific meetings (90)**



Partner institutes (4) in :
Brazil, Mexico, Rwanda, China

Scientific Career Development Programs: Enhancing Collaborations in **Optics** and other areas



- **Associate Program** (keeping good scientists at the leading edge through periodic research visits to the Centre)
- **TRIL: Training and research in Italian laboratories** (for experimentalists, many or most of them in **optics**)



- **Research at the Elettra synchrotron light laboratory** (User Program ICTP-ELETTRA, TRIL, Associates, ...)
- **ICTP Optics Laboratory** (relatively new, under coordination of Humberto Cabrera)

Awards recognize outstanding researchers and regional contributions: ICO-ICTP Gallieno Denardo Award

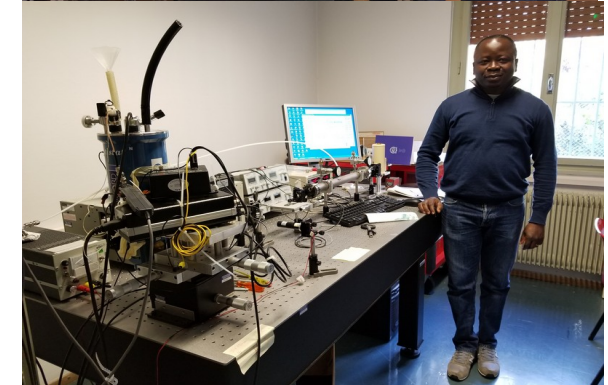
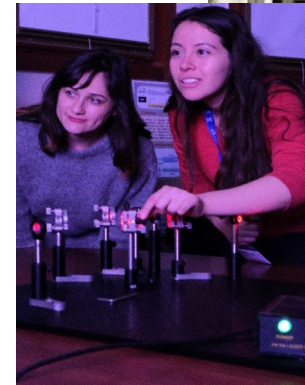
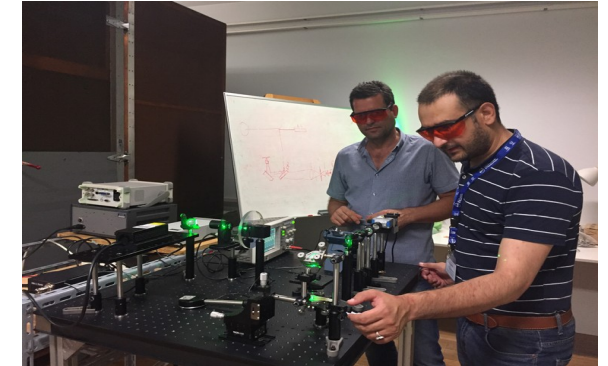
Outstanding under-40 researchers in optics working in a developing country

- 2000: Arbab Ali Khan (**Pakistan**)
- 2001: Arashmid Nahal (**Iran**) and Fernando Perez Quitian (**Argentina**).
- 2002: Alphan Sennaroglu (**Turkey**)
- 2003: Robert Szipöcs (**Hungary**)
- 2004: Imrana Ashraf Zahid (**Pakistan**) and Revati Nitin Kulkarni (**India**)
- 2005: Sarun Sumriddetchkajorn (**Thailand**)
- 2006: Hector Manuel Moya-Cessa (**Mexico**)
- 2007: Svetlana V. Boriskina (**Ukraine**)
- 2008: Mourad Zghal (**Tunisia**)
- 2009: Saifollah Rasouli (**Iran**)
- 2010: Cleber Mendonça (**Brazil**)
- 2011: Ivan Moreno (**Mexico**) and Ryan Balilli (**Philippines**)
- 2012: Selcuk Akturk (**Turkey**)
- 2013: Mohammad Dhafer Al-Amri (**Saudi Arabia**)
- 2014: Maria Florencia Pascual Winter (**Argentina**), John Fredy Barrera Ramirez (**Colombia**)
- 2015: Rim Cherif (**Tunisia**), Rajan Jha (**India**)
- 2016: Jehan Akbar (**Pakistan**), Mati Horprathum (**Thailand**)
- 2017: Goutam Kumar Samanta (**India**)
- 2018: Urbasi Sinha (**India**)
- 2019: Muhammad Faryad (**Pakistan**), Christian Tomas Schmiegelow (**Argentina**)
- 2020: Kok Sing Lim (**Malaysia**)
- 2021: David Hayrapetyan (**Armenia**)
- 2022: V.R. Supradeepa (**India**)



Individual International Collaborations: The ICTP Optics Lab

The *extraordinary* **Humberto Cabrera**: Cuba to Venezuela to Italy

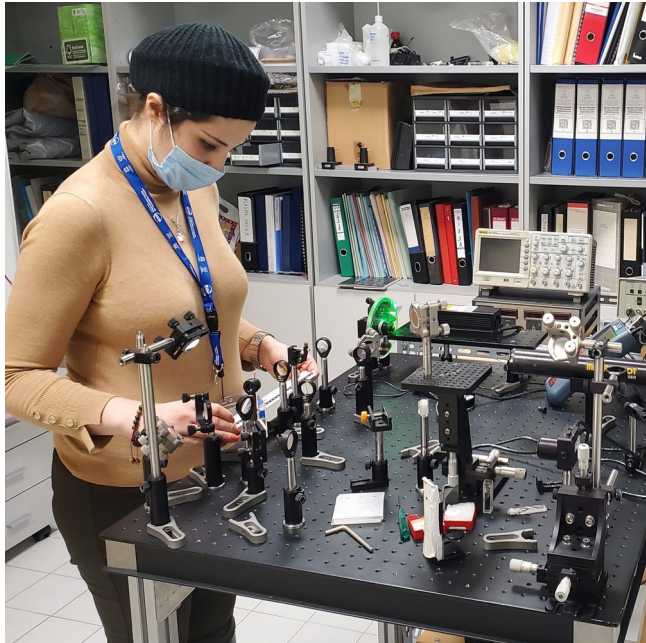


Top far right: Jehan Akbar, Hazara University, Khyber Pakhtunkhwa Region, Pakistan, Bottom far right: Komlan Gadedjisso-Tossou, University of Lome, Togo----Two success stories for sustainable actions

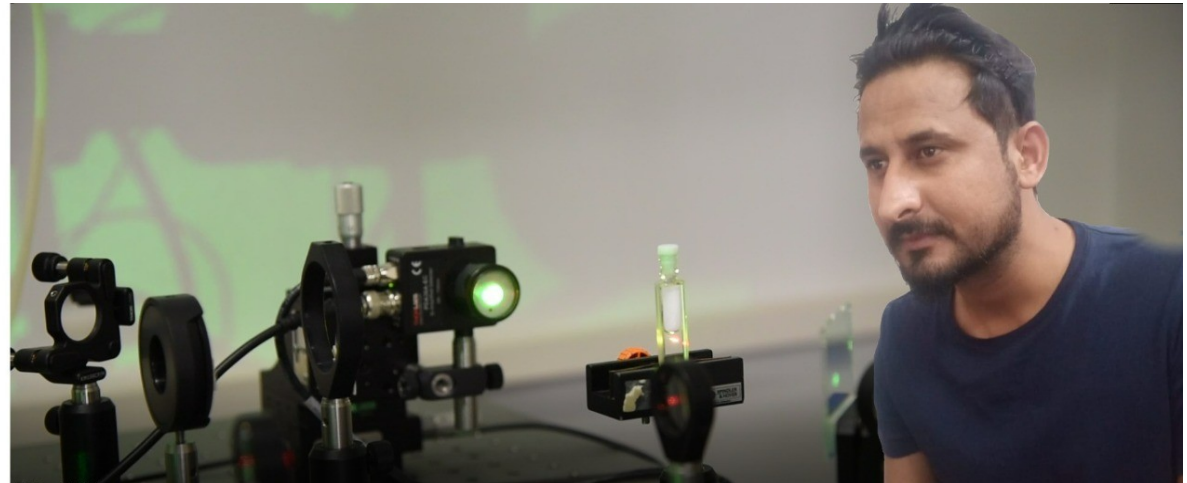
In research, Humberto has extraordinarily propelled the **careers** of many young scientists from the developed world with incredible energy, time commitment, and mentorship echoing words from UNESCO's first DG Julian Huxley on science in diplomacy:

"Practical demonstration is the best form of education"

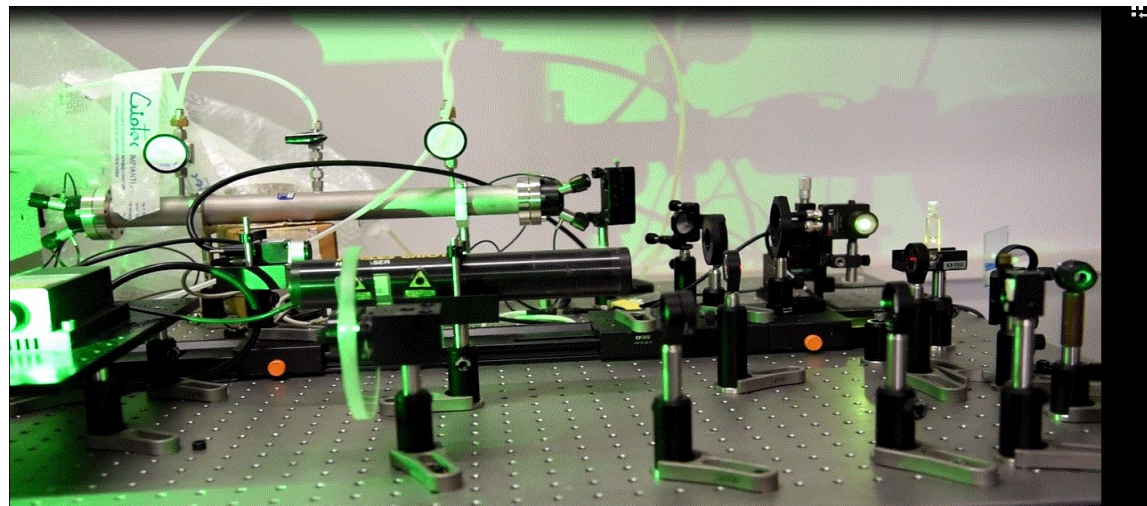
Some of the recent visitors to the optics lab



Early career scientist Behnaz Abbasgholi (Iran) brought a chemistry perspective to the optics lab. Currently a long-term visiting scientist in the NanoInnovation Lab at the Elettra Synchrotron Facility, a premier laboratory in Europe



Abdul Rahman a talented student from Pakistan completed his PhD thesis experimental component with Humberto in just 2 months, including two much-needed publications (in high impact journals) required for graduating.



Alexis Jaramillo Osorio from Colombia completed experimental research for his PhD dissertation publishing a paper in Journal of Optics (IOP) together with Humberto and his advisor **John Fredy Barrera-Ramírez** (ICO-ICTP Award 2014). He developed a novel approach to *optical encryption at ICTP*

Subhash Utadiya started as a “sandwich” PhD student with Humberto as his 2nd advisor, in the general area of laser-based *bio-physics*. Subhash’s home advisor was able to come along for the first visit through a complementary program



Focus on Careers at the ICTP Optics Lab: Publications so far in 2022

1. Abdul Rahman, et al. "[A modified mode-mismatched thermal lens spectrometry Z-scan model: An exact general approach](https://doi.org/10.1016/j.jleo.2022.169399)", *Optik* **265(2)**, 169399 (2022). DOI: [10.1016/j.jleo.2022.169399](https://doi.org/10.1016/j.jleo.2022.169399)
2. Sareh Kabi, et al., "Microsphere-Assisted Digital Holographic Microscopy Integrated with On-Line Thermal Lens Spectrometry for 3d Imaging and Enhanced Photothermal Detection", *SSRN Electronic Journal*, DOI: [10.2139/ssrn.4216567](https://doi.org/10.2139/ssrn.4216567) (2022).
3. John Alexis Jaramillo Osorio, et al. , "Optical encryption using phase modulation generated by thermal lens effect", *Journal of Optics* **24(2)**, 025702 (2022). DOI: [10.1088/2040-8986/ac4412](https://doi.org/10.1088/2040-8986/ac4412)
4. Shaimaa Elyamny, et al, "Thermal transport properties for unveiling the mechanism of BiSbTe alloys in thermoelectric generation: A glance from synchrotron radiation Bi L 3 –XAFS", *Journal of Materials Research and Technology*, **18** 2261-2272 (2022). DOI: [10.1016/j.jmrt.2022.03.101](https://doi.org/10.1016/j.jmrt.2022.03.101)
5. Behnaz Abbasgholi-Na, et al. "[Thermal Diffusivity and Conductivity of Polyolefins by Thermal Lens Technique](https://doi.org/10.3390/polym14132707)", *Polymers*, **14(13)**, 2707 (2022). DOI: [10.3390/polym14132707](https://doi.org/10.3390/polym14132707)
6. Behnaz Abbasgholi-NA, et al. "[On the Absorption and Photoluminescence Properties of Pure ZnSe and Co-Doped ZnSe:Eu³⁺/Yb³⁺ Crystals](https://doi.org/10.3390/app12094248)", *Applied Sciences* **12(9)**, 4248 (2022). DOI: [org/10.3390/app12094248](https://doi.org/10.3390/app12094248)
7. Adina Stegarescu, et al. Synthesis and Characterization of MWCNT-COOH/Fe₃O₄ and CNT-COOH/Fe₃O₄/NiO Nanocomposites. Assessment of Adsorption and Photocatalytic Performance", *Nanomaterials* **12(17)**, 3008 (2022). DOI: [10.3390/nano12173008](https://doi.org/10.3390/nano12173008)
8. Subhash Utadiya, et al. "Digital holographic imaging of thermal signatures and its use in inhomogeneity identification", *Optics and Laser in Engineering* **160**, 107227 (2022). DOI: [10.1016/j.optlaseng.2022.107227](https://doi.org/10.1016/j.optlaseng.2022.107227)

Setting up laboratories: The World Academy of Sciences (TWAS) provides research fellowships



TWAS offers grants* for research projects in biology, chemistry, mathematics and physics to individual young researchers or research groups to purchase the research facilities they need to improve their productivity.



*Open to 66 S&T lagging countries

New Collaborative Programs: Expanded focus on **early career scientists**



What: Laboratory visits to European or North American laboratories.

Who: Outstanding early-career researchers, especially young scientists returning to the laboratories from which they obtained their PhD

Why: Develop lasting collaborations and professional development that can sustain or advance careers and in turn strengthen the host institution

UN Agenda 2030 and its Sustainable Development Goals: Reducing poverty and improving the quality of life requires growth strategies that protect the environment:



These are areas for innovation and photonics can help

Light-based technology and the UN sustainable development goals



Remote sensing & imaging/lighting for indoor farms
Spectroscopy for monitoring



Diagnostics for imaging/Photodynamic Therapy/POC

Sterilization and water purification



Affordable lights in remote communities

Communications infrastructure



Solar power

Energy efficient and smart lighting

Winter College on Applications of Optics and Photonics in Food Science



11-22 February 2019
Trieste, Italy

Further information:
<http://indico.ictp.it/event/8643/sessions/2728/ictp.it>

The aim of the Winter College is to offer Ph.D. students and other emerging researchers broad training in the innovative applications of optics and photonics in food and agriculture. Deriving impact through research, development and entrepreneurship in this sector will be explored.

Directors:

S. SUMRIDDETCHKAJORN (NECTEC, Thailand)
A.G. MIGNANI (IFAC-CNR, Italy)
C. SIMPSON (University of Auckland, New Zealand)

Wednesday, 13 February 2019

09:00 - 19:00

Location: Leonardo Building - Budinich Lecture Hall

09:00 **Examples of food analyses by means of spectroscopy (part 3) 1h0'**

Speaker: Anna Grazia Mignani (CNR-Institute of Applied Physics 'Nello Carrara', Italy)

Material: Slides

10:00 **Remote Sensing and Optical Imaging -- Introduction -- 1h0'**

Speaker: Sarun Sumriddetchkajorn (National Electronics and Computer Technology Center (NECTEC), Thailand)

Material: Slides

11:00 **Coffee break 30'**

11:30 **Remote Sensing and Optical Imaging -- Applications on Rice -- 1h0'**

Speaker: Sarun Sumriddetchkajorn (National Electronics and Computer Technology Center (NECTEC), Thailand)

Material: Slides

12:30 **Lunch break 1h30'** (Leonardo Building - Cafeteria)

14:00 **LAMP talks (3-min poster presentations) - part 1 2h0'**

16:00 **Laboratory session 2h0'**

Speaker: Andy Wang (The University of Auckland, New Zealand)

Material: Slides

18:00 **Optional sessions: HPLC with thermal lens detection of Carotenoids in food samples & Raman Spectrometer 1h0'** (ICTP Optics Lab - Galileo Guest House)

Speaker: Humberto Cabrera, Zelnab Ebrahimpour, Fatima Matroodi, Hanna Budasheva, Jehan Akbar, Komlan Segbeya Gadedjisso-Tossou (Istituto Nazionale di Fisica Nucleare INFN; Research Institute for Applied Physics and Astronomy (RIAPA), University of Tabriz, Iran; Shahid Chamran University of Ahvaz, Iran; University of Nova Gorica, Slovenia; Hazara University Mansehra, Pakistan; Universite de Lome, Togo)





The Abdus Salam
International Centre for Theoretical Physics



WINTER COLLEGE on OPTICS and ENERGY

8 - 19 February 2010
Miramare - Trieste, Italy

The Abdus Salam International Centre for Theoretical Physics (ICTP), in collaboration with the International Commission for Optics (ICO), the Optical Society of America (OSA), the International Society for Optics and Photonics (SPIE), the European Optical Society (EOS), the Società Italiana di Ottica e Fotonica (SIOF), the US National Academy of Science (NAS), the Photonics Society (IEEE) and the Central European Initiative (CEI) will organize a **Winter College on Optics and Energy**, which will be held at ICTP, Trieste, Italy, from **8 to 19 February, 2010**.

DIRECTORS: **V. Lakshminarayanan** (University of Waterloo, Ontario)
G. Lanzani (Politecnico di Milano, Italy)
R. Winston (University of California, Merced)

LOCAL ORGANIZERS: **M. Danailov** (Elettra, Trieste)
J. Niemela (ICTP, Italy)

The Winter College will expose the participants to a broad range of topics related to the applications of optics and photonics for energy production and saving. Important physics aspects involved in solar energy conversion, like optical properties of materials and structures for light harvesting will be addressed, followed by more applied issues of optical devices design and technology. The scientific programme consists of lectures by international experts, internal seminars and group discussions, some laboratory demonstrations. The aim of the Winter College is to provide the background needed to follow the most advanced literature.

MAIN TOPICS:

- Radiation-Matter interaction
- Charge photogeneration
- Transport in semiconductors
- Light confinement and nano-photonics
- Photonic crystals
- Optical properties of photovoltaic systems
- Optical modeling and measurements for solar energy systems

WITH APPLICATIONS TO:

- Light harvesting
- Solar energy conversion
- Luminescent solar collectors
- Photovoltaic cells, modules, components and systems

An ICTP **PREPARATORY SCHOOL** will be organized the week before the College (from **1 to 5 February 2010**) for a limited number of selected participants. The purpose is to recollect some basic scientific elements that are relevant to the contents of the College lectures. The School sessions will have a tutorial structure, i.e. will include lectures and exercises.

The **LAMP** (Laser, Atomic and Molecular Physics) programme will include group discussions and internal seminars by participants. All participants are encouraged to present their own research, either in poster form or as an oral presentation, which will be determined sufficiently prior to the College.

PARTICIPATION

Scientists and students from all countries that are members of the United Nations, UNESCO or IAEA may attend the Workshop. As it will be conducted in English, participants should have an adequate working knowledge of this language. Although the main purpose of the Centre is to help research workers from developing countries, through a programme of training activities within a framework of international cooperation, a limited number of students and post-doctoral scientists from developed countries are also welcome to attend. As a rule, travel and subsistence expenses of the participants should be borne by the home institution. Every effort should be made by candidates to secure support for their fare (or at least half-fare). However, limited funds are available for some participants, who are nationals of, and working in, a developing country. Such support is available only for those who attend the entire activity. There is no registration fee.

HOW TO APPLY

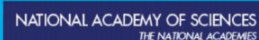
The application form can be accessed at the activity website: <http://agenda.ictp.it/smr.php?2132>. Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form.

Secretariat: e-mail: smr2132@ictp.it; phone: +39-040-2240-9932; fax: +39-040-2240-7932

College's web page: <http://agenda.ictp.it/smr.php?2132> ICTP Home Page: www.ictp.it



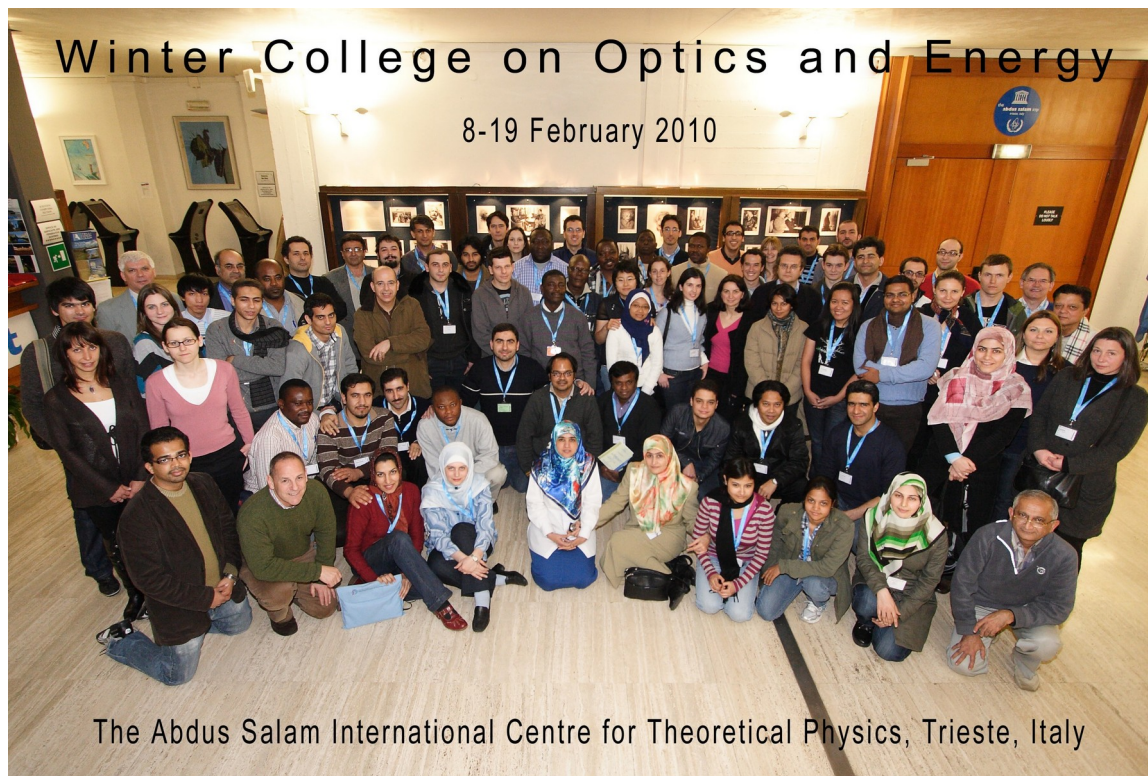
Co-Sponsored by:



**DEADLINE
for Requesting Funds**

16 October 2009

September 2009



Winter College on Optics and Energy

8-19 February 2010

The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

10:00 - 11:00

Photophysics for photovoltaics

10:00 **Photophysics for photovoltaics 1h0'**

Speaker: G. Lanzani (Politecnico di Milano, Italy)

Material: lecture notes

11:00 - 11:30

Coffee break

11:00 **Coffee break 30'**

11:30 - 12:30

Physics of solar cells I

11:30 **Physics of solar cells I 1h0'**

Speaker: J. Nelson (Imperial College of Science and Technology, U.K.)

Material: lecture notes

12:30 - 14:30

Lunch

12:30 **Lunch 2h0'**

14:30 - 15:30

Physics of solar cells II

14:30 **Physics of solar cells II 1h0'**

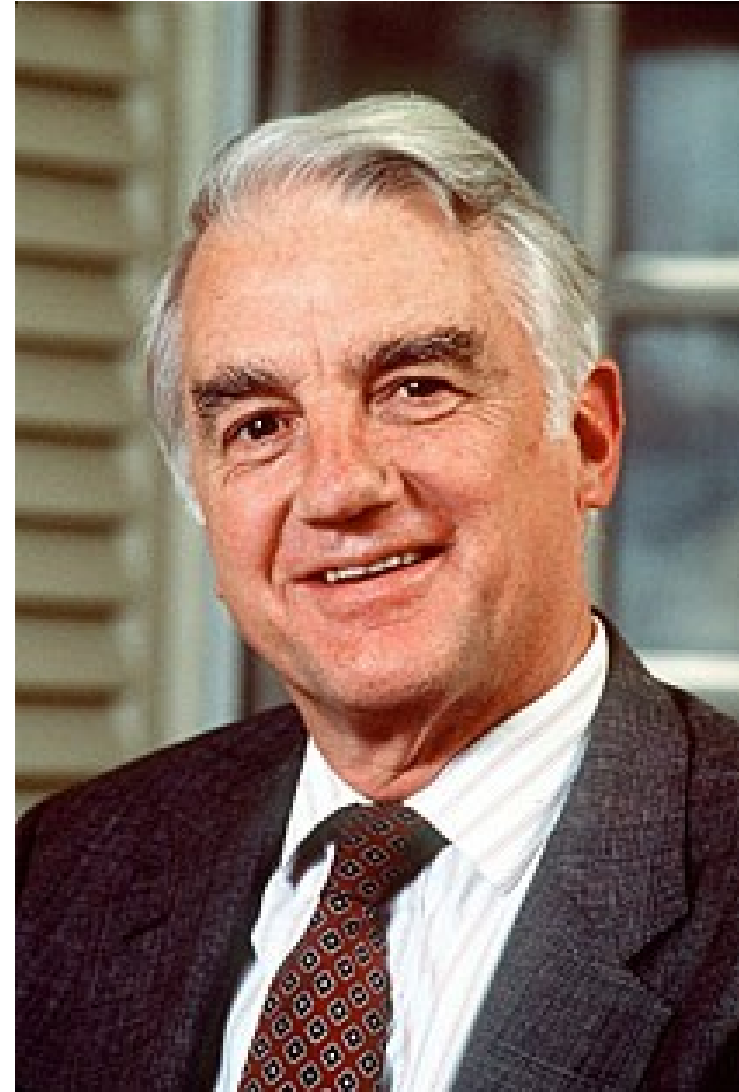
Speaker: J. Nelson (Imperial College of Science and Technology, U.K.)

Material: lecture notes

*“If you think education is expensive, try **ignorance**.”*

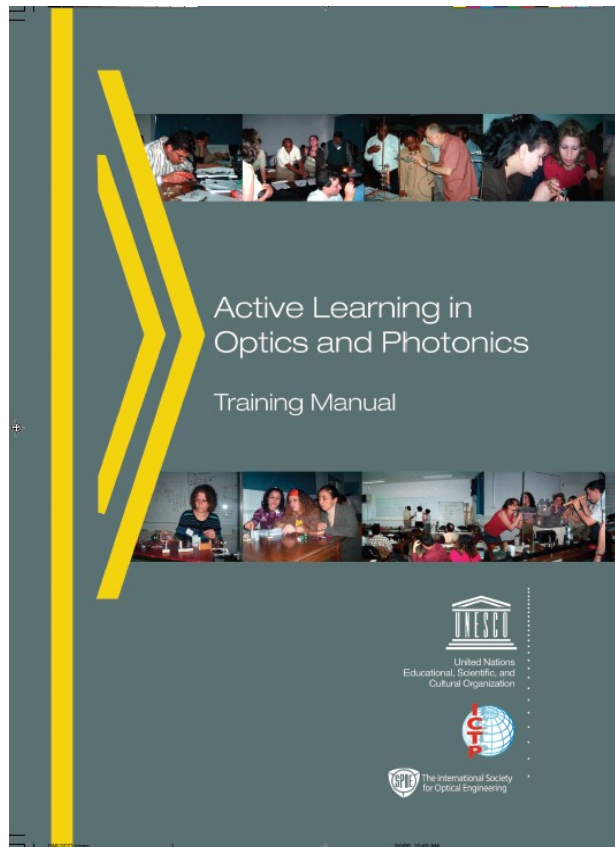
Derek Bok

Former president, Harvard University



UNESCO-ICTP Active Learning in Optics and Photonics (ALOP)

Over **1000** teachers trained from **60+** countries....



Philippines
Ghana
Tunisia (2)
Morocco
Mexico (2)
Brazil
Chile
Algeria
Tanzania
Colombia
Cameroon
Zambia
India (2)
Nepal (2)

Rwanda
Armenia
Thailand
Ethiopia
Indonesia (3)
Mauritius
South Africa
Bolivia
Pakistan
Panama
Nigeria
Namibia
Ukraine

Zimbabwe
Ecuador
Peru
Vietnam*
Jamaica*



Major program support from SPIE
with contributions from OSA, EPS, NAS, TWAS, Essilor, ICO...

* In preparation for 2020 2021 2022 2023....

Partnership with OAS, Lima
Peru (2019)



ALOP in pictures



Kigali Rwanda (2012)

Islamabad (2015)



Delhi (2006)

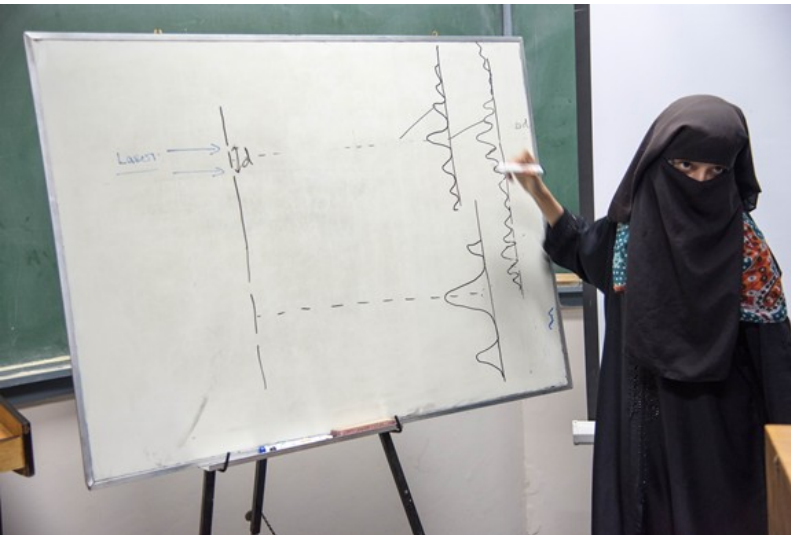


Kyiv
(2017)

Outreach in Universities

Undergraduate students, Quaid-i-Azam University, Islamabad.

The idea was mostly to make an enjoyable (voluntary) experience with “hands-on” optics



Creating an enduring legacy to the International Year of Light
and Light-based Technologies 2015

International Day of Light: May 16 every year



International Steering Committee Chairs
John Dudley and JN

The International Day of Light is a global observance

The key objective of The International Day of Light is to raise awareness of the importance of light-based technology for society.

Events since 2018 have reached millions of people in more than 100 countries and even on the International Space Station!



Highlights – Activities around the world in 2022 since 2018: 2250 activities in 103 countries plus global (virtual)



The International Day of Light encourages activities that would not take place otherwise, helping to promote science education for all

Highlights - Trust Science campaign against misinformation

TRUST SCIENCE



International
Day of Light



5000 international science leaders including Nobel, UNESCO L'Oréal, Breakthrough prize winners, and supporters from 95 countries

16 May 2021 message from the UNESCO Director-General



Ms. Audrey Azouley

“....Trust remains a fundamental condition for science to serve the public interest. This is also the reason why this edition of the International Day of Light is focused on this crucial theme....scientists from around the world, including Nobel Prize laureates have committed to shoring up trust in science through a major campaign which is being launched this International Day of Light.

This year, may this day, marked once again by the pandemic and its consequences, be an opportunity to celebrate not only science, but also all those who, by making it accessible, by discussing it and by questioning its limits, help to ensure that it is genuinely a common good for all humanity.”

16 May 2022 Message from the Director-General of UNESCO

**“ Without light,
our planet would be but a cold and barren place.
Indeed, where there is light,
there is often an abundance of life.
Yet light represents even more for humanity.
Light goes hand in hand with knowledge;
It is a lens through which to see and understand the world. ”**

Ms Audrey Azoulay | Director-General of UNESCO
On the occasion of the International Day of Light 16 May 2022



United Nations
Educational, Scientific and
Cultural Organization



International
Day of Light

Proposed for 2025!



INTERNATIONAL YEAR OF
**Quantum Science
and Technology**

The initiative is being led by the American Physical Society and the German Physical Society together with a broad and growing consortium of dozens of national, regional and international academies, societies, and organizations from Africa, Asia, Europe, the Middle East, North and South America, and Oceania.

It has received the endorsement of the International Union of Pure and Applied Physics (IUPAP) at its 30th General Assembly and will amplify the message of IYBSSD and other international scientific years, specifically on the role of quantum science and technology in addressing society's most critical challenges in all parts of the globe and help meet the UN SDGs

A Resolution to the UNESCO Executive Board is being sponsored by Mexico, Argentina, South Africa and Jordan

THANKS!

