

# EDUCATIONAL OUTREACH AND GENDER EQUITY IN PAKISTAN

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# Educational Outreach

Reach out to government girls schools/colleges to do **Optics** outreach activities: Active Learning in Optics (ALO)



Reach out undergraduate students-boys and girls in public sector universities to do **Optics** outreach activities: Active Learning in Optics



Reach out undergraduate /graduate students in **Physical Sciences** to help them virtually/ online using Pak-ICTP Alumni Society (PIAS)

Reach out transgender community and educate them about **decent options** to lead there respective lives...



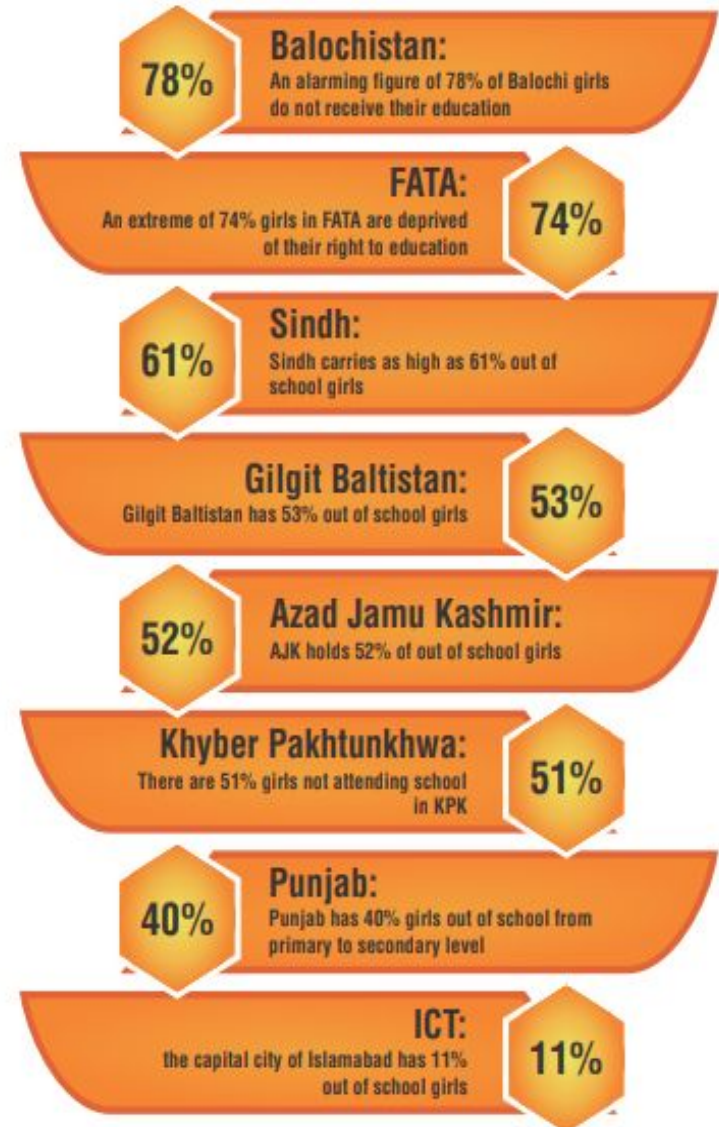
# Where Pakistan stands in education...

- The highest number of **out-of-school** children worldwide after Nigeria; Nearly 22.5 million
- Among the world's worst performing countries (Oslo Summit 2015)

“The State shall provide free and compulsory education to all children of the age of five to sixteen years in such manner as may be determined by law”

# What about Girls education...

- Female are about **49.2%** of total population
- Gender imbalance at all levels of education
- The out-of-school rate for primary age girls is **32%** compared to **21%** for boys.
- By grade six, **59%** of girls versus **49%** of boys are out of school
- By grade nine, merely **13%** of young women are still enrolled in school.



# What are the challenges...

**Poverty:** Fundamental barrier for girls education.

**Beliefs:** Girls should not be educated.

**Gender Discrimination:** Families prefer boys' education to ensure a better economic future for the family.

**Accessibility:**

Girls from remote rural areas of the country are unable to attend school because they cannot afford the cost of transportation

**Insecurities:** Girls from poor communities often face harassment

**Social Norms:** Attitudes vary significantly across different communities



# How and where to start...

- Reach out to help **government schools/colleges** for girls
- To provide **inquiry-based training** to High school and college teachers
- Help students to actively contribute to the learning process
- Foster science as a force that can **build up active citizens**
- To emphasize the relationship between **science skills** and **future employability**.



# When we started...

- Active learning in Optics ( ALO): Self funded group established in January 2016 under the umbrella of ICTP and QAU.
- With aims to bring physical sciences to under privileged Girls schools/ colleges/ universities:
- Provide an **enriching science experience in a friendly atmosphere.**
- Outreach activities organized to support and encourage girls students to **pursue careers in sciences.**



# Why hands on Optics..

- The United Nations designated 2015 as International year of light (IYL) and Light-based Technologies.
- International day of Light is celebrated on 16 May each year, the anniversary of the first successful operation of the laser in 1960 by physicist and engineer, Theodore Maiman

**Leads us to do something personal for IdL and Girls education**





# What we usually do...

- What is light?
- What is the role of light in our daily lives?
- Laser vs ordinary light
- Magic tricks based on optical illusions
- Laws of geometrical optics
- Diffraction with single and double slit
- Interference
- Polarization of light



# What we do for younger girls...

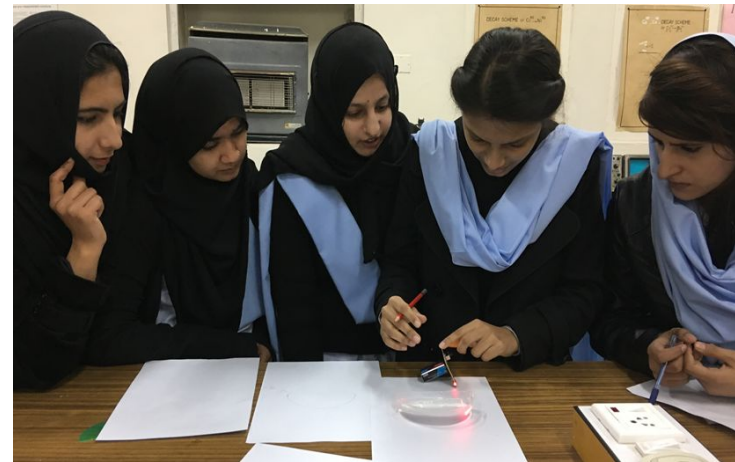
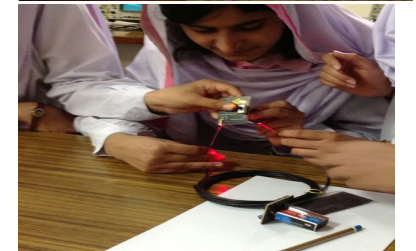
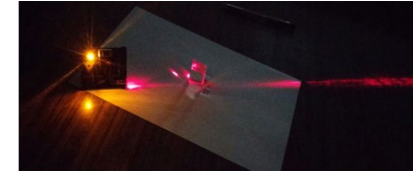
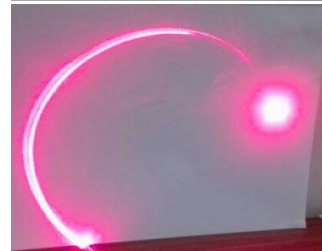
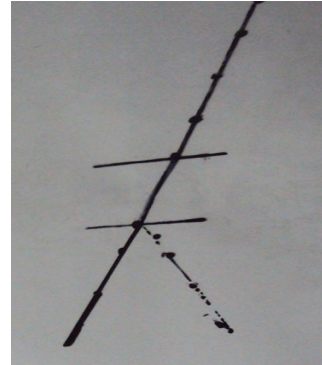
- Introduction to light sources
- Properties of light
- How to draw virtual image
- Concept of colors/filters
- Absorption of different colors of light
- Generation of White light
- Optical illusions



# What for senior girls...

## Geometrical Optics

- Law of Reflection
- Law of Refraction  
–Snell's law
- Finding critical angle
- Total internal reflection
- Working principle of fiber optics



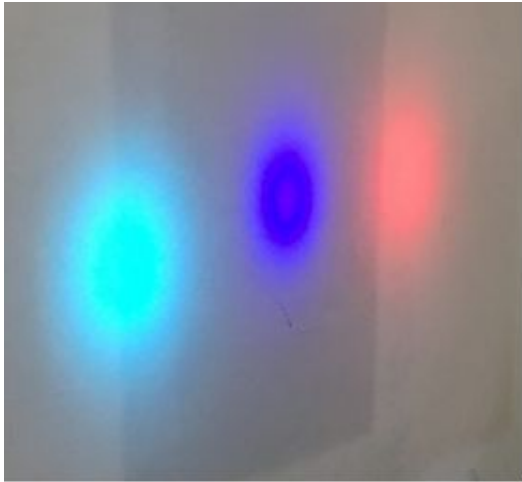
# What for senior girls...

## Refraction and Total internal reflection



# What for senior girls...

## Generation of white light



# What for senior girls...

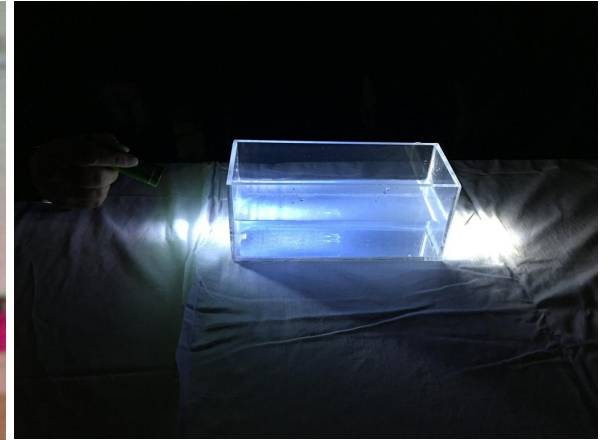
## Interference

- Constructive Interference
- Destructive Interference
- Finding position of maxima and minima for blue and red wavelengths
- Finding the position of green wavelength on intensity pattern



# What for senior girls...

## Scattering



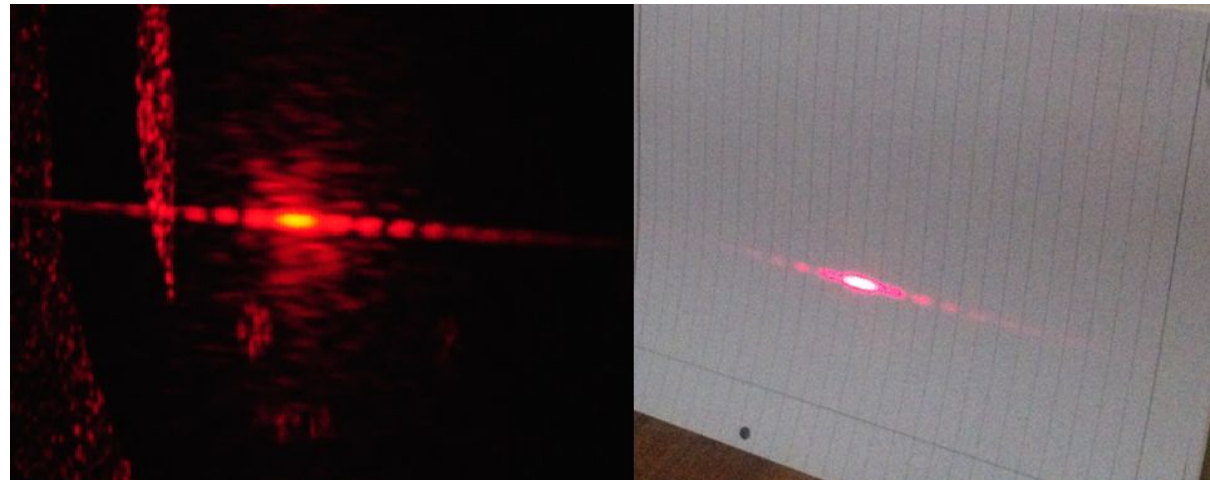
# What for senior girls...

## Diffraction

- Diffraction with single slit
- Diffraction with double slit
- Diffraction from CD
- Diffraction from obstacles



- Pin hole
- Spring wire
- Human hair
- Curved obstacle





# What for senior girls...

## Polarization



# How many activities so far...

More than **60 Optics Outreach** activities for girls/female schools/colleges/universities

Around **10-15 Optics Outreach activities** for boys and girls together



# Middle/High School



# Undergraduate student



# Female universities



# We have reached so far...

## **Public sector Universities**

Fatima Jinnah University Rawalpindi -<https://www.fjwu.edu.pk/>)

Women university Swabi -<http://www.wus.edu.pk/>

Women University Mardan -<https://wumardan.edu.pk>

Rawalpindi Women University -<https://rwu.edu.pk/>

University of Wah -<http://uow.edu.pk/>

International Islamic University female campus  
-<https://www.iiu.edu.pk/>

Quaid-i-Azam University -<http://qau.edu.pk/>

# Public Sector schools/colleges

1. Islamabad Model College for Girls (IMCG) ( QAU Branch)
2. Islamabad Model College for Girls (IMCG) F-6/1 Branch
3. Islamabad Model School for Girls (IMSG) F- 7/2 Branch
4. Islamabad Model School for Girls (IMSG) G-8/4 Branch
5. Islamabad Model School for Girls (IMSG) I-9/4 Branch
6. Federal Government College for Women, College road
7. Sir Syed College Campus 2, Wah Cantt
8. Government Post Graduate College for Women 6<sup>th</sup> Road Rawalpindi
9. Viqar Un Nisa College for Girls, Rawalpindi
10. Viqar Un Nisa Noon School for Girls, Rawalpindi

# Private Schools

Headstart School (<https://headstart.edu.pk/>)

Lahore Grammar School Islamabad (<http://lgs.edu.pk/>)

Khaldunia High School (<https://www.facebook.com/khaldunia/>)

Becanhouse School (<https://www.beaconhouse.net/>)





## **International Workshop on Optics and Photonics(IWOP) (11-15<sup>th</sup> December 2017)**

# When COVID-19 Pandemic hit the globe...

- The COVID-19 pandemic has caused dramatic loss of human life across the globe - Impact is more severe for developing countries
- Closure of educational institutes impacted student learning
- Effected our outreach activities- leading to concept of In-Person and Online learning...
- Two Challenges- Online connection that works in remote areas  
National and international experts to deliver scientific talks

**Leads to foundation of Pak-ICTP Alumni Society**

# What Road we followed from ALO to PIAS

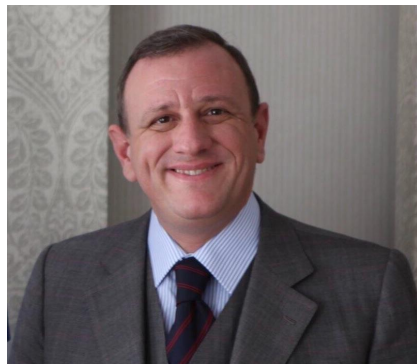
Pak-ICTP Alumni Society would like to extend the scope of the ALO activities from Optics to Physical sciences and to cover all areas of Pakistan and eventually making it a regional society in association with ICTP.



# What we wish to achieve...

Pak-ICTP Alumni (PIAS) society aims to further the mission of the Abdus Salam International Center of Physics and establish a vibrant STEM teaching and research community working in Pakistan.

PIAS can facilitate a mutual learning experience in Pakistan and at ICTP.



# Who are founding members

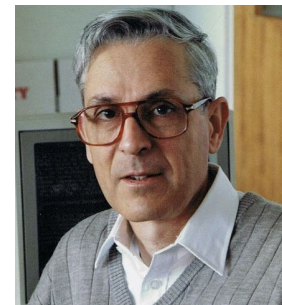
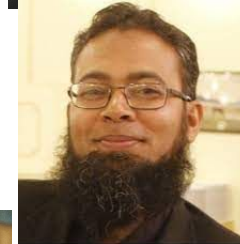
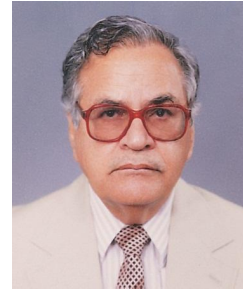
- Dr Imrana Ashraf (Senior Associate, ICTP)
- Prof Joseph Niemela (International Scientific Advisor, ICTP)
- Dr Raheel Ali (Quaid-i-Azam University, Islamabad)
- Dr Jehan Akbar (Hazara University, KPK)
- Dr Nigum Arshed (University of Education, Lahore)
- Dr Abdul Rahman (University of Szeged, Hungary)

# Which fields we wish to cover...

- Laser/Quantum Optics**
- Condensed Matter Physics**
- Plasma Physics**
- Biomedical/Biochemistry**
- Materials Science/Mathematics**
- High Energy Physics**
- Environmental Sciences**
- Quantum Information and Quantum Computation**

# Remembering Salam

- Prof. Fayyazuddin
- Prof. Pervez Hoodbhoy
- Prof. Babar A. Qureshi
- Dr. Mansoor Ur Rehman
- Prof. Ahmed Ali
- Prof. Robert Delbourgo



# Within two years of PIAS?

Atish Dabholkar

Joseph Niemela

Vanderlei Salvador Bagnato

Sandro Scandolo

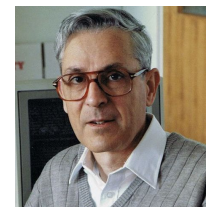
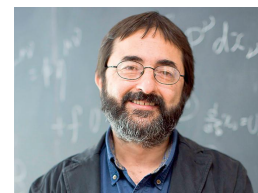
Fernando Quevedo

Fred Kucharski

Cedric Yu

Vahid Karimipour

Robert Delbourgo





# Speakers from Pakistan

Muhammad Faryad

Moetasim Ashfaq

Muhammad Sheeraz Ahmad

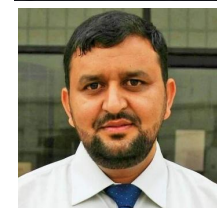
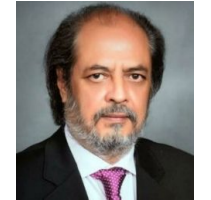
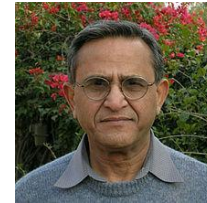
Babar A. Qureshi

Adnan Bashir

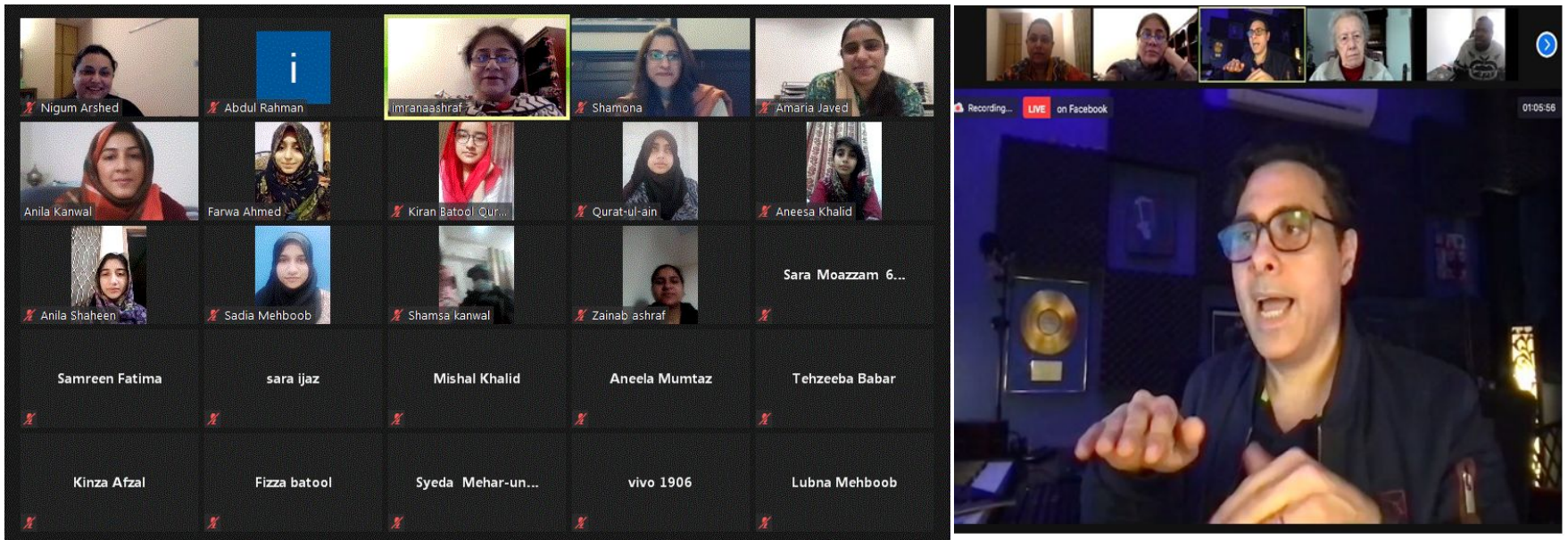
Jamil Aslam

Pervez Hoodbhoy

Abdul Hameed Nayyar



# What PIAS did for female education...



ALO and PIAS organized a unique event to celebrate IDL 2021 and also highlight importance of female education. Aaron Haroon Rashid has produced Pakistan's first full length 3D animated series "Burka Avenger", to emphasize the importance of girls' education.

# Educational Outreach from Under-privileged to Unfortunates

No one in our society has been taught what to do with a child that's neither a boy nor a girl. The Urdu language is such a rich language, but it only has words for 'son' and 'daughter.' Even the language cannot tell me what I am to my parents." Dr. Sarah Gill



# Educational Outreach from Under-privileged to Unfortunates

The Khwaja Sira were given the right to vote and identify their gender on the national identity cards by the supreme court of **Pakistan** in 2012



The Transgender Persons (Protection of Rights) Act of 2018 guarantees citizens their right to self-identify as male, female or a blend of both genders, and to have their identity registered on all official documents.



# Educational Outreach from Under-privileged to Unfortunates



# Educational Outreach from Under-privileged to Unfortunates

## Our plans

To guide them towards a respectable life through education;

Invite them with other female students to attend our open science sessions

Let them realize that they can be a part of our scientific society



# What we have learnt ...

- The activities should be according to the age of students.
- Topics should be selected according to the theoretical background of students.
- Start with introductory session explaining aims of hands-on activities
- Student should be encouraged to make predictions/ ask questions
- Emphasis on conceptual understanding through observation

# What I experienced ...

## Being a woman

- being a daughter and later a daughter-in law
  - being a wife
  - being a mother of young girl
- 
- Especially Asian culture where having an uneducated male heir is a greater source of pride to a mother than a daughter with an advanced degree.
  - Knowing how female children have been treated in remote areas of my beautiful country makes me **want to do so much more for girls...**



# What I feel...

Pakistani girls really do embody light

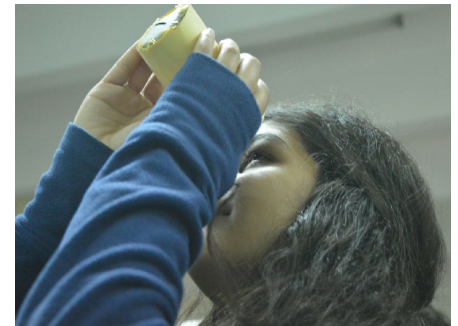
Their faces transmit a positive energy that says clearly:

- We are your future -take care of us and we will take care of you
- As good citizens
- As mothers
- As teachers
- As productive members of an enlightened society

**where culture and traditions do not have to be in conflict with the realization of the potential of young girls.**

# What I believe...

If you educate a man-  
you educate an  
individual but if you  
educate a woman  
you educate a family



# What about Future moves...

- The ALO group is planning to establish a regular calendar of outreach- hands on activities in Optics.
- To extend the limit of these activities to remote area of Pakistan and eventually make it a regional activity.
- From PIAS forum we are already reaching regions around Pakistan and central Europe. We hope to organizes in person activities

To take ALO (active learning in optics) to ALPS (active learning in physical sciences)

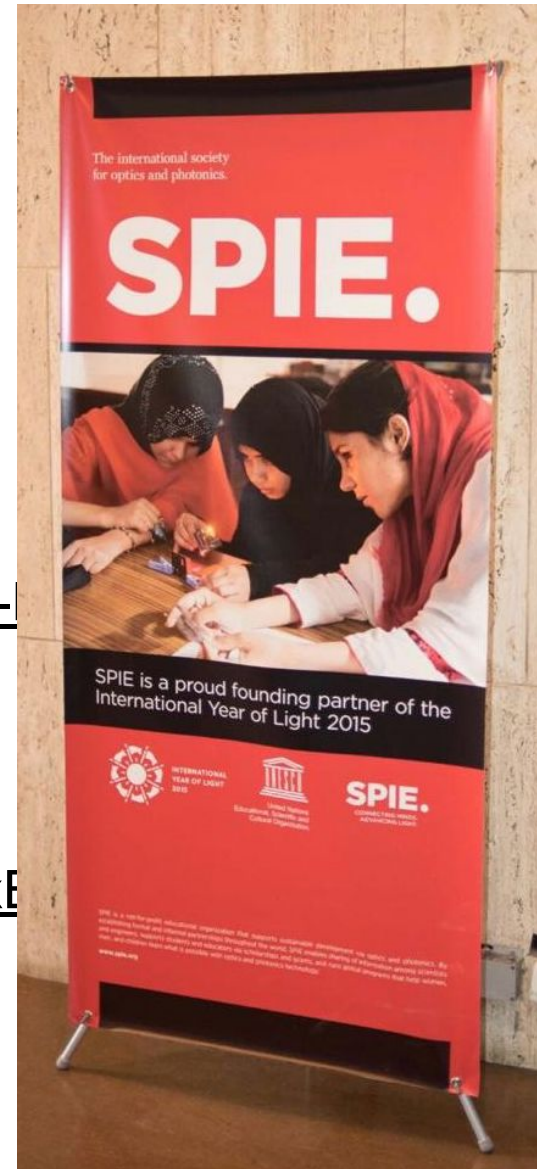
# How you can reach us...

<https://www.facebook.com/opticsworkshops>

<https://www.facebook.com/PakICTPALumni>

<https://www.facebook.com/ICO-Territorial-Committee-of-4732000592>

<https://www.dropbox.com/sh/r5k51z5fusga1mr/AAAlsdxEaQj0Ba?dl=0>



# International News Letters

- 1. Lecture on “Outreach education and Gender equity” at ICTP
- <https://indico.ictp.it/event/9790/other-view?view=ictp timetable>
- ICTP YouTube page
- [https://www.youtube.com/channel/UCEnzzp6hyw4q\\_qk8ba6E6XA](https://www.youtube.com/channel/UCEnzzp6hyw4q_qk8ba6E6XA)
- 2. Article entitled” Researcher, Teacher, Mentor “ ICTP recognition Url:
- <https://www.ictp.it/about-ictp/media-centre/news/2017/3/imrana.aspx>
- 3. Article entitled “Bringing the Joy of Scientific Inquiry to Girls in Pakistan” in APS news (june 2017) Url:
- <https://www.aps.org/publications/apsnews/201707/international.cfm>
- 4. Article entitled “There is always Light around the corner”, in ICO Newsletter (July 2019) Url:
- [https://www.ptf.net.pl/media/cms\\_page\\_media/1484/ICO\\_news\\_jul\\_19.pdf](https://www.ptf.net.pl/media/cms_page_media/1484/ICO_news_jul_19.pdf)

# International News Letters

- 5. International day of light
  - <https://www.lightday.org/high-speed-connectivity>
- 6. Article entitled "New ICTP Alumni Network"
  - <https://www.ictp.it/about-ictp/media-centre/news/2021/3/pias.aspx>
- 7. Article entitled "Let the Light be Always On"
  - [https://www.e-ico.org/sites/default/files/pdfs/ICO\\_news\\_apr\\_21.pdf](https://www.e-ico.org/sites/default/files/pdfs/ICO_news_apr_21.pdf)
- 8. Article entitled "Optics Outreach Blooms Again in Pakistan"
  - [https://www.e-ico.org/blog/wp-content/uploads/2023/01/ICO\\_news\\_jan\\_23-3.pdf](https://www.e-ico.org/blog/wp-content/uploads/2023/01/ICO_news_jan_23-3.pdf)
- 9. Supporting education at all levels in Pakistan.
  - [https://mailchi.mp/833a8f523be4/idl2023-newsletter-january-2023/?fbclid=IwAR1Gsvd1SM8KjU6nQ1LSj7xvqEg7SgxLUN-ReUsjSnHsSXB\\_9zBNzpUw0IE](https://mailchi.mp/833a8f523be4/idl2023-newsletter-january-2023/?fbclid=IwAR1Gsvd1SM8KjU6nQ1LSj7xvqEg7SgxLUN-ReUsjSnHsSXB_9zBNzpUw0IE)

**Thank you**