Physics Without Borders

Abha Eli
Phalen

Humanitarian Foresight and Futures Co-Creation Workshop

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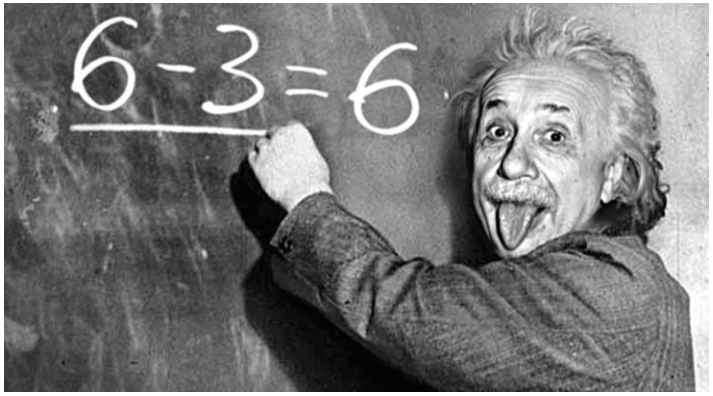
Physics as a tool for the next generation



Einstein was a genius. He was also poor, a German Jew, a refugee and an immigrant.

His understanding of the laws of nature changed the world he lived in and 100 years later, continues to impact our lives.

Laser pointer, came up with the idea in **1901** with his paper on photoelectric effect. Applied by Charles Hard Townes, Gordon Gould and others. **1961**, the first medical laser treatment was done to remove retinal tumor. **1974**, a pack of Wrigley's Chewing gum was the first product to be read by a bar code scanner in a grocery store. Since then, we have superefficient incandescent lightbulbs and …

- What is everything made up of?
- How nature and the world around us works, discovering the underlying principles of how various phenomena in nature are interconnected.

Physics is a fundamental foundation of modern science on which our lives depend

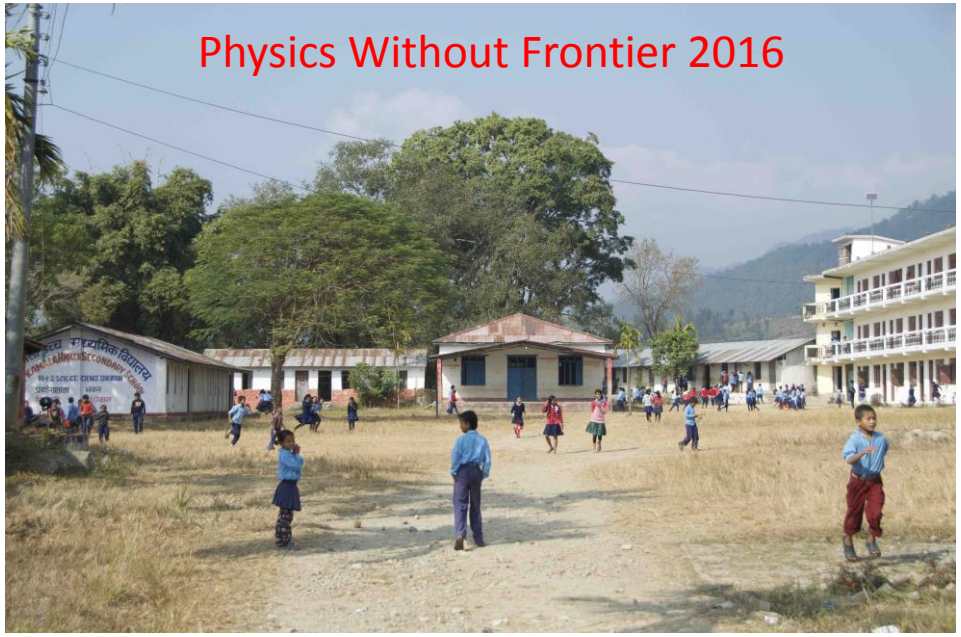
ICTP Physics Without Frontiers Winter School, 2-6 Jan 2018

Partners: Tribhuvan University, Kathmandu University, CMS Experiment, Government of Nepal

- CERN is interested in partnership with South Asia and the regional benefits can be enormous
- A South Asian High Energy Physics Instrumentation workshop dedicated such a collaboration was held at KU, in partnership with CERN with 70+ invitees from SAARC states and experts from CERN on 20-21 June
- The idea was to survey and understand the needs and desires of the regional scientists, and to seek common areas in terms of scientific pursuit and research goals

- 2013 – pilot project at Kathmandu University (KU)
- 2014 – PWF Masterclass at KU with students from other universities, and later video connection to India
- 2015 – PWF Masterclass at TU with students from other universities

Kamala High School (Sindhuli)



- Compared to what it had back then, it's now "ultra-modern"

- The town now has electricity and a highway runs through it
- The school now runs science classes all the way up to B.Sc. with affiliation to Tribhuvan University – the oldest and largest in the country
- Infrastructure is still a bit … primitive?

Kamala High School (Sindhuli)

- The reason we went to this school was the science teacher (and principal) of the school – Kamlesh Chaudhary
- He came to CERN for Science Teacher Training Program in 2015, returned to Nepal and invited us to do a program there

- Some 120 students and 30 teachers/staff/townsfolk
- Students were enthusiastic, asked brilliant questions
- We had a lot of fun interacting with the students and the management there!
- But Kamlesh isn't the only teacher from Nepal who has attended the Science Teacher Training Program

Adarsha School (Syangja)

- From ~200 KM southwest of Kathmandu, another high school science teacher, Bishnu Lamsal, attended the CERN High School Teacher Training program in 2014
- Co-led HST group for teachers from developing countries

- We went there in December 2014 and had a wonderful outreach session
- The students were again very enthusiastic and quite brilliant!

(Small voice in me: Students in Nepal tend to be enthusiastic and brilliant in general! ☺)

Select Students who attended the Outreach Programs

- In addition to the two high school teachers, students have also found opportunities through the outreach programs
- One student from the PWF 2014 (Santosh Parajuli) came to CERN Summer Program in 2015 and another student (Yadav Kandel) went to ICTP for Summer 2015 (and briefly came for CERN tour)

- In 2016, yet another student (Mahesh Thakuri) came to CERN Summer Program
- Currently, they are all pursuing PhD programs in the US . Santosh was the first student to defend his thesis on a Higgs boson analysis on ATLAS from a Nepali university!

The Public

Q&A after the movie

- We were lucky, to be honest, that by the time we started, many people knew about CERN and its mission
- Our reaching out to public included
  - A few articles in the magazines/newspapers
  - A short episode on particle physics and CERN programs on national television
  - Screening of Particle Fever was a HUGE hit with a waiting list of 250 people!

So what?

- So far the programs have been carried out on a loose framework of cooperation between individuals, supported by institutes (CERN, ICTP, KU, TU etc.)

- Talent, enthusiasm, and diligence among students demand that we make the frontiers of research and its associated tools available for them

- Institutionalized framework that allows us to do so is in order, and currently we are pursuing such frameworks in complementary directions

Reaching out to Government

Ministry of Science organizes a virtual visit to ATLAS on National Science Day

Visitors from the Mission in Geneva

Minister of Health Visits CERN with the Ambassador in Geneva

- With help of Mission in Geneva, have established contacts in the government
- The govt is interested in strengthening ties with CERN and recently the cabinet signed the International Cooperation Agreement with CERN
- Such an agreement will provide a legal framework any future program – training of personnel, knowledge transfer, facility development

2. Training Students/Educators

- ICTP's Physics Without Frontiers program invites scientists to lecture and mentor students in developing countries
  - Short term courses have been done so far, but 2-week to 8-week programs are in development phase
- In addition to students/teachers who come to CERN or ICTP for the summer, possibility of "sandwich" M.Sc. or PhD program
  - Degree granted by the university in local university while the research is carried out at CERN or ICTP
  - Santosh's M.Sc. thesis is a pioneering example

Why am I doing this?

- Personal prejudice – Because it is fun! ☺ I enjoy doing it, I assume so will everyone else.

- Practically speaking, because there is a lot of interest among the young in Nepal
  - Don't ask me why.
  - I have several theories but none is falsifiable.

- Optimistically, someday this will lead to highly skilled manpower which will contribute to the development of the region

Big Thanks!

- Many thanks to the organizers!
- Many thanks also to :
  - ICTP Physics Without Frontiers
  - CERN
  - ATLAS Outreach & Communications
  - CMS Outreach & Communications
  - And many others who have helped us, in many ways
- Without the hard work by Kate, Joerg, Suyog, Ajeeta, Sean and Mario none of this would have been possible