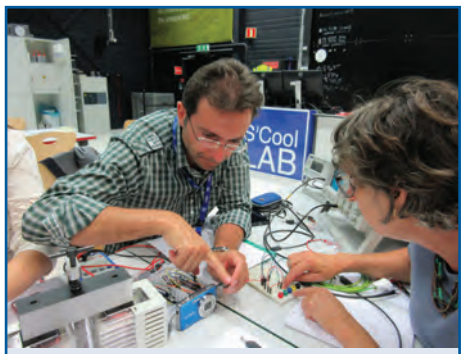
Report on 2016 CERN Teachers Workshop

by Jeff Goldie, Strathcona High School, Edmonton, AB

This past spring was a time of more than a little excitement in my life as I was honoured by the Canadian Association of Physicists with an Award for Excellence in Teaching High School/CEGEP Physics (Prairies and Northwest Territories) and subsequently chosen to attend the CERN High School Teachers Programme (HST) in Geneva, Switzerland[1]. The HST, offered each summer by CERN, brings teachers from around the world together for three intensive weeks of lectures, question and answer sessions, hands-on workshops, working group collaborations, and visits to as much of the CERN complex and the Large Hadron Collider (LHC) as is reasonable and safe. This year's HST involved 47 teachers from 38 countries.

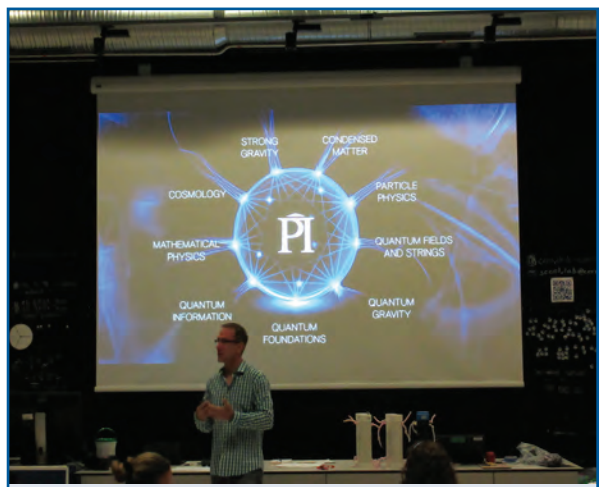


Guiseppe Augello (Italy) and Nathalie Sihol (France) working on Acoustic Levitation project

The teachers present at this year's HST arrived with varying familiarity with particle physics, especially at the high-energies that the LHC is operating at, consequently many of the sessions during the first week were directed toward the physics involved in how the LHC operates, and perhaps more importantly, why it is being done. One of the early presentations focussed on the medical applications related to accelerator and detector technology that CERN has been at the forefront of – information that is highly applicable to any high school physics classroom. I greatly appreciated the time and thoughtfulness that each of the presenters devoted to their sessions or tours, and even more to their willingness to entertain and answer questions. This alone was one of the most fulfilling aspects of the programme. I arrived with a notebook full of questions, left with another notebook full of answers, and more importantly to me, even more questions than I had before! Just in case it sounds like all we did was sit and listen there were of course also many breaks in the flow of information to visit key spot of the CERN complex especially S'Cool Lab. This working facility is focussed on delivering hands-on particle physics experiments to high school students from all across Europe and forms a key part of their public outreach program.

S'Cool Lab was also integral to many of the working group collaborations, groups of six teachers collaborating to create educational resources related to CERNs operational goals and projects. Each working group had a primary focus that ranged from working with the Open Data platform, constructing Muon detectors, planning activities using CERNs "Microcosm" display or S'Cool Lab, through to Gender Inclusive teaching. Each group was also tasked with presenting their results to the rest of the groups. It was an excellent opportunity to compare and contrast our varied teaching experiences, and to share ideas with our colleagues. I was constantly amazed at how similar our daily school experiences are regardless of language, culture or even age. I guess no matter where you go students will be students.

The final week of the HST was in some ways the most enjoyable and challenging for the teachers. It started off with a pleasant evening on the CERN patio at a "meet and greet" for fellow Canadians Greg Dick and Dave Fish from the Perimeter Institute (PI). The group was lulled into a false sense of security by the easy going charms of the pair. Little was the group to know that the next day their intellectual world would be shaken to the foundations as Greg and Dave turned on the physics!



Greg Dick introducing the Perimeter Institute workshop

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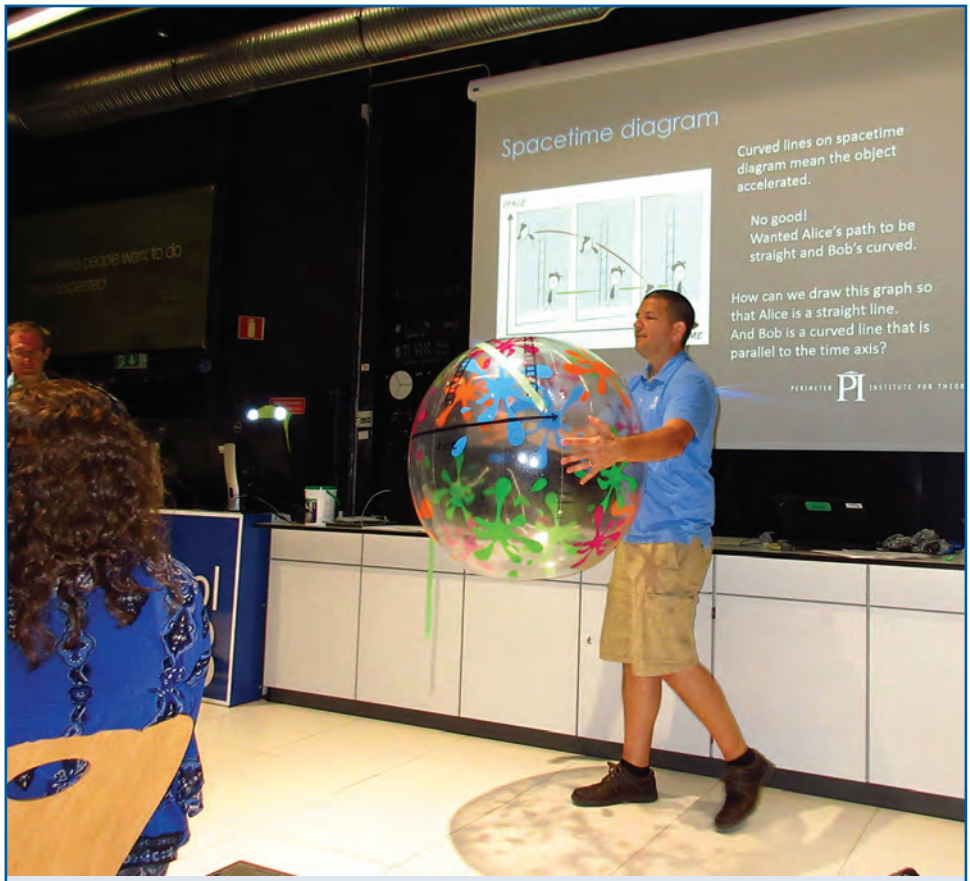
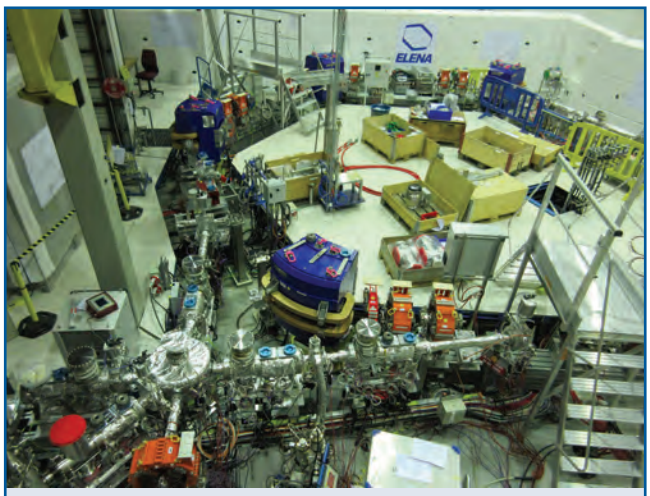
1. Participation in this Workshop is made possible through the Perimeter Physics Education Scholarship and the additional support provided by the Institute for Particle Physics and the CAP HS/Cegep Teachers Award.



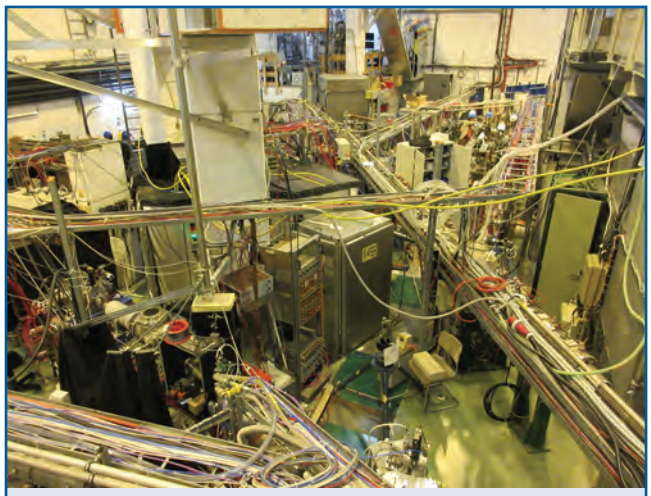
Dave Fish guiding HST group through Curved Spacetime activity

Although many teachers in Canada are familiar with the fantastic learning resources that PI has developed this was the first time that most of the HST group had experienced it. More critically, this was also the first time that they had experienced two experts modelling the type of learning environment that those resources lend themselves to. The phenomenal job that Greg and Dave did in introducing the pedagogy of how to use the PI materials was worth any expense those teachers incurred in getting to CERN. At supper that evening one of the participants offered the wistful observation that Greg and Dave had just made her question everything that she thought was true. The smile that illuminated her face as she also noted that this was going to force her to completely revamp her entire practice reminded me of exactly what a good professional development is intended to do.

From a personal point of view it was also illuminating to hear firsthand about a number of opportunities for teachers and students here in Canada to become involved with researchers and specialists currently active in the field of particle physics. The "BeamLine for Schools" (BL4S) competition presents teams of high school students from around the world with the opportunity to propose and carry out an experiment using the LHC beamline at CERN. Students might spend up to 50 hours learning about particle physics and creating their proposal but the chance for two winning teams (and their coaches) to be onsite at CERN while the experiment is being run is a huge incentive. One neat aspect is that teams do not have to be from a single school and collaborations are most welcome. For more information access <beamline-for-schools.web.cern.ch> or simply type Beamline for Schools into any search engine. A second opportunity is through the International Particle Physics Outreach Group (IPPOG) which offers International Master Classes (http://www.physicsmasterclasses.org). These classes enable high school students, partnered with a local university, to spend an entire day in the month of March exploring the wonders of particle physics. The morning sessions are an introduction to modern particle physics, the afternoon sees the students analyzing actual data from the ATLAS detector searching for a Higgs particle event, and the day culminates with a video conference with participants from around the world so that students can collaborate and share their findings. The IPPOG website (ippog.web.cern.ch) offers a wealth of classroom material, everything from informational posters and brochures through to presentations via their searchable resource list. Either of the BL4S or



Inside the Antimatter Factory



Inside ISOLDE – Radioactive Ion Beam Facility

Master Classes would be an excellent opportunity for physics teachers, and Canadian institutions to get our students excited about fundamental physics research. A third, intriguing opportunity, proposes a test of gravity using antimatter and more information can be accessed by typing projectantimatter.org into any search engine however it seems less likely to be something for the average physics classroom.

One of the last lectures we were privileged to hear was about the possibilities regarding where CERN is headed dependent on advances in technology, and the will of the public to continue to fund such a large scale venture. Reports from previous participants have noted the difficulty related to trying to convey the sheer scale of the network of people, data, and technology that is CERN. It is hard for many people to see the spin-off benefits associated with developing the technologies and infrastructure involved in the LHC, the ATLAS detector, the Compact Muon Solenoid, or the Antimatter factory. It is true that words really don't do these marvels the justice that they deserve. But as educators we can only try. As participants we were encouraged to return to our respective countries and classrooms and strive to instill in our students the knowledge, skills and attitudes about particle physics that make it the grand endeavour that it has been, and will continue to be. For those despairing of the herculean task that this seems to entail I can only offer the observation "The world changes one person at a time" or in our classes, one student at a time!