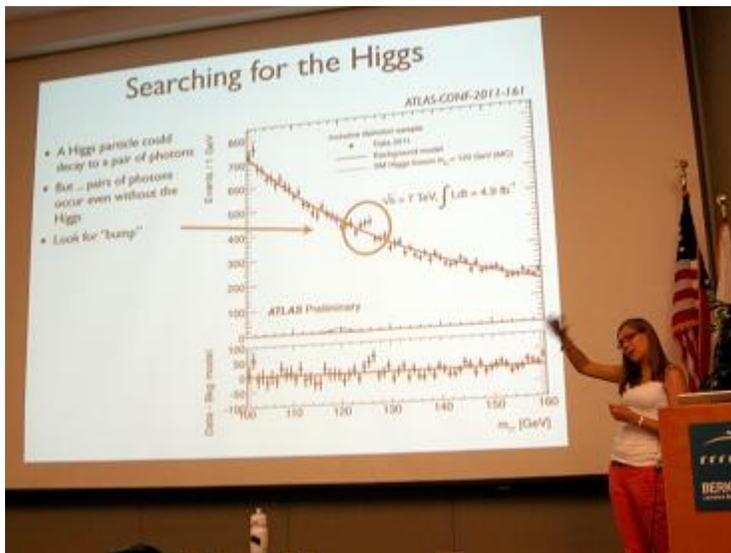


Lawrence Berkeley National Laboratory

Annual Report 2012

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The LBNL Physics Division and the Berkeley Center for Cosmological Physics hosted its sixth “Physics In and Through Cosmology” workshop for QuarkNet Leadership teachers and high school students. The five day workshop, June 25 to June 29, was held at the Berkeley Lab. Eleven high school teachers participated & one retired physics teacher. Five of the teachers have been active members of QuarkNet for five or more years. Six new teachers joined the group this year. The QuarkNet Teachers represented public and private high schools in the greater San Francisco Bay Area. Also participating were 36 high school students and three UC Berkeley undergraduate students supported through the Cal Teach (teacher preparation) program.



Adding to the excitement of the workshop was the fact that it was the week before the Higgs announcement. As one teacher put it: “This workshop was the perfect storm: just prior to the big Higgs announcement at LHC, meeting George Smoot, being with students and teacher colleagues as feverish as me about the ultimate question about the universe—how good does it get?!”

The daily format consisted of a hands-on warm-up activity, followed by a presentation. After the presentations, groups worked on hands-on experiments (e.g. use of parallax to determine distance), discussed the lecture, toured research facilities such as the ALS & 88” cyclotron, and designed & carried out experiments with Cosmic Ray Detectors. Students were divided into eight breakout groups of four to five students each. Breakout groups were paired under one returning QuarkNet teacher and one or two new teachers. After lunch there was another presentation and group work.

The first day focused on getting all participants familiar with concepts & terms in particle physics & cosmology. This was accomplished through “mini” lectures given by returning Quarknet teachers & CalTec students as well as through activities.

Formal presentations included:

Ina Reichel - Basics of particles & accelerators / standard model

Nao Suzuki - Tour of the Universe

Natalie Roe – Welcome to the Lab / Physics Department

Bryan Marten - Origin of Elements and the Life Cycle of Stars

Kris Whelan – Quarknet

Glen Melnik - Relativity

Jeff Silverman - Super Novae

Spencer Klein – ICE CUBE

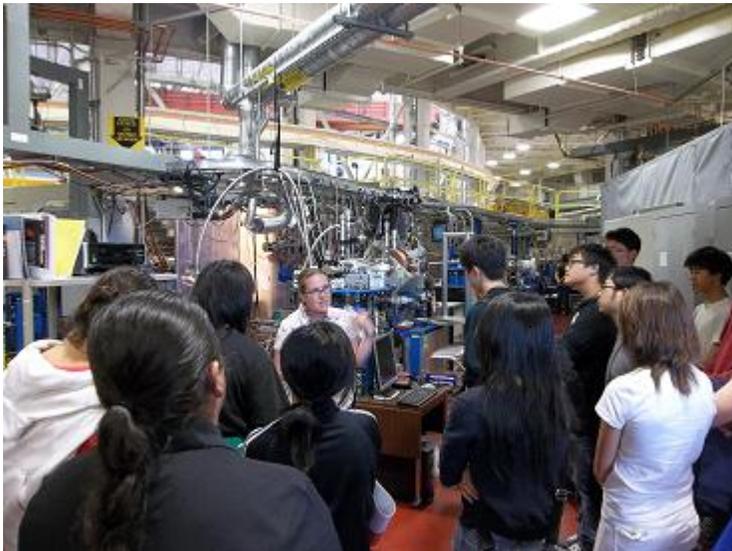
Casey Stark – Large Scale Cosmology

Hee-Jong Seo - Dark Energy & BAO

Tony LaTorre – Dark Matter

Louise Skinnari - ATLAS

George Smoot - CMB



Students evaluated their understanding of the High School Science Concepts at the start and the completion of the workshop on a scale of 1 to 5. The statistical inference (a 1-sample t-test) showed that the averaged difference between the pre- and post-test is statistically significant. There was an average increase over the week of .609 points. Certificates were given at a graduation pizza party. Students also evaluated the workshop and here are some of their comments:

- great program, awesome brain-fryer
- this was a fabulous experience and helped me determine my future a little more (maybe medicinal physics or computational physics)
- expanded my knowledge beyond high school level Newtonian physics
- it was awesome to be around crazy machines like the ALS, cyclotron, and around so many smart people from CERN, LBL, etc.
- fundamental particles make much more sense

- I learned so much about particle physics, cosmology, and cutting-edge discoveries and methods involving the study of the universe. Most important, I would not have been able to learn any of this in my high school because cosmology and astronomy are not taught at my school. I also loved being able to learn about what the different speakers do/research in their job and the purposes behind the research. Science and potentially physics is definitely the field I want to go into and it was great to have exposure to what physics is like in the real world/why it is useful and purposeful.

Here are some teacher comments:

- This is my first time participating in the workshop. I am impressed with the wealth of cutting edge information that we were given. I learned more information about neutrinos and new projects throughout the world. I will definitely share this information with my students.
- I intend to bring more of what I learned about ALS and particle accelerators to the classroom

For more information about these workshops please visit: <http://bccp.berkeley.edu/gta.html>