QuarkNet Oregon 2019

The Center for High-Energy Physics at the University of Oregon (UOCHEP) hosted the 2019 QuarkNet workshop June 20-21 on the UO campus. This was our 18th summer workshop. A printed version of the workshop web page is given on the next page and the URL (including live links) is here:

https://quarknet.org/content/2019-atlas-data-workshop-u-oregon

The focus for the workshop this year was on Atlas and Shane Wood came to Eugene to host the Atlas Data Workshop. In addition, we provided updates on gravitational wave astrophysics and LIGO. The UOCHEP faculty participation was Ray Frey (lead mentor and co-PI), Eric Torrence, Laura Jeanty and Jim Brau. However, Shane was the central figure for this year's workshop. The faculty talks were very well received and, following usual practice, the presentation files are linked on the web page above, where they are available to teachers. Nine high school science teachers joined us this year, as well as a few high school students and undergraduates. Funds from the UO Center for High Energy Physics were used to cover local expenses (catering, parking, dorm rooms, misc equipment).

The agenda included the traditional item in which teachers share interesting projects they undertook in the previous year and discuss possibilities for the coming year. This sharing of ideas, successes, and failures is very popular with the teachers.

Shane Wood did a great job organizing and leading the Atlas Data Workshop. The teachers indicated that they got a lot out of it, much of which they will share with their own students in one form for another.

Thursday, 20 June

09:00 Welcome and introductions

09:15 **LIGO and gravitational wave astrophysics (20 MB pdf) (https://pages.uoregon.edu/rayfrey/QuarkNet/QNet-2019.pdf)** (Ray Frey)

10:30 Break

10:45 **Introduction to LHC/Atlas (60 MB pdf) (https://pages.uoregon.edu/torrence/qnet/LHC_June19.pdf)** (Eric Torrence)

12:15 Shane arrives

- **QuarkNet accounts (https://quarknet.org/sites/default/files/qn_accounts_2018.pdf)** (you need 2 kinds)
- **Registration (https://docs.google.com/forms/d/e/1FAIpQLSd32XpY3me2VrIMqDoKp1VhWkFegwbrV2QHIygTc3HntHoUww/viewform)** (for those who need account)
- **Update account (/document/update-your-profile-quarknet-site)**

12:30 Lunch

13:30 Workshop Objectives/Overview/**Data Porfolio (/data-portfolio)**
CERN in 3 (really 4) minutes (https://www.youtube.com/watch?v=PHP13tTjidA) video

13:45 Level 1 Data Portfolio Activities:

- **Rolling with Rutherford (/data-portfolio/activity/rolling-rutherford)**
- **Quark Workbench (/data-portfolio/activity/quark-workbench)** or Particle Cards

14:30 Break

14:45 Data Portfolio Activitiy:

- **Z Mass (/data-portfolio/activity/calculate-z-mass)**
- Spreadsheet?
- Histogram maker (**Shodor (http://www.shodor.org/interactivate/activities/Histogram/)**)

15:30 Activity:

- **ATLAS W2D2 (https://quarknet.org/content/lhc-world-wide-data-day-2018)** (World Wide Data Day)
- **Spreadsheet (https://docs.google.com/spreadsheets/d/1Bl_ncKl9Uld6ZnDXCA75fPfsnpK6uztFlZry8QWhZe8/edit?usp=sharing)**

16:30 Search for Supersymmetry (Laura Jeanty)

17:15 End of Day Reflections, Discussion, Q&A

Friday, 21 June

09:00 **ATLAS Virtual Visit (https://indico.cern.ch/event/829904/)** - Steven Goldfarb

09:30 Recap of Yesterday/Plan for Today
Demo: **cloud chamber (https://www.youtube.com/watch?v=SnKvtazt5So)**

09:45 Higgs Factories (Jim Brau)

11:00 Break

11:15 Data Portfolio Activity: **Mass of US Pennies (https://quarknet.org/data-portfolio/activity/mass-us-pennies)**
Spreadsheet (https://docs.google.com/spreadsheets/d/1ptO8UKZ05pmi51GsqYxBgZQebz5fjvzg4ZSvOsRp5Go/edit?usp=sharing)

11:30 Level 2 Data Portfolio Activity:
ATLAS Masterclass Measurement (https://quarknet.org/content/atlas-z-path-measurement-2018)

Shift training:

- **Data analysis slides (https://quarknet.org/sites/default/files/atlasanalysis2017_v0.pdf)**
- ATLAS events **cheat sheet (http://cernmasterclass.uio.no/material/Zpath-SignalEvents.pdf)** 1
  ATLAS events **cheat sheet 2 (https://quarknet.org/sites/default/files/atlas_cheat_z_v0.pdf)**
- Demo event display

12:15 Lunch

13:15 **ATLAS Masterclass Measurement (https://quarknet.org/content/atlas-z-path-measurement-2018)**, cont.

Data Analysis:

- Access **Group 1 Data (http://cernmasterclass.uio.no/datasets/allSets/dir01/)** - Hypatia
- **OPIoT (http://cernmasterclass.uio.no/OPIoT-US/)**
- Discuss Results
- ATLAS Dimuon results

15:00 Break

15:15 Introduce CMS e-Lab

15:45 Implementation discussion

16:00 **QuarkNet Survey (https://www.surveymonkey.com/r/DHP9N8R)**

16:30 Discussion, Q&A, including teacher discussion of class projects.

17:15 End of Day

Resources

- **The Particle Adventure (http://www.particleadventure.org/)**
- **ATLAS (http://atlas.cern/)** Detector
- **ATLAS detector animation (http://atlas.physicsmasterclasses.org/en/zpath_playwithatlas.htm)**
- **LHC in 3 (4, really) minutes - 2016 version (https://www.youtube.com/watch?v=PHP13tTjidA)**
- **Symmetry Magazine Standard Model article (https://www.symmetrymagazine.org/article/the-deconstructed-standard-model-equation)**
- **Standard Model of Particle Physics (https://quarknet.org/sites/default/files/Standard_model.png)**

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