Quarknet Masterclass Agenda: Punahou School March 14, 2020

10:30am **Cornuelle** Arrival/Registration
Welcome students to Masterclass, sign in sheet, nametags, etc

10:50am **M104** Hands-On Activities (C. Corti)
Student Investigation with Rolling with Rutherford Activity
Students will roll balls to an unseen target and consider how Rutherford came to his conclusions about the nucleus. Mentors mingle with groups to listen and answer questions. This will be a time to encourage them to ask questions and think about what particle physics is and what is going on.

M103 Hands-On Activities (A. Kuhlman, C.Freeman)
Student Discussion with Quark Puzzle Activity
Students will play with the Quark Puzzle pieces and learn how quarks can combine. Mentors mingle with groups to listen and answer questions.

M102 Hands-On Activities (T. Coke)
Student Discovery of the Top Quark Mass
Students will use images from ATLAS to find the missing mass from a collision and then add up all the momenta to find the particle that was created. Again, mentors mingle with students.

11:10am **M102/M103/M104** Switching activities
Students will move to another room to complete a different activity.

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12pm **M102/M103/M104** Introductions (T.Coke with introductions of others)
Introductions of physicist speakers.

12:05pm **M102/M103/M104** Lunch with a physicist (C. Corti, X.Tata, V.Bindi)
Students will spread out to the different classrooms, each with a different physicist. Questions from students are encouraged.

12:15pm **M103** Tour of Punahou Cosmic Ray Detector (J. Adams)
Someone will lead students in small groups in a 5 minute tour of the cosmic ray detector throughout lunch.

12:45pm **Cornuelle** Welcome (T.Coke introduces S. Wood)
Linking the morning activities to particle physics, introducing the ideas behind the speakers talks.

1pm **Cornuelle** Dr. Xerxes Tata
The Very Large and the Very Small, 5-10 minutes for questions

1:30pm **Cornuelle** Dr. Veronica Bindi
The AMS experiment and indirect detection of dark matter, 5-10 minutes for questions

2pm **Cornuelle** Panel Discussion with X.Tata, V.Bindi
Student questions for about 30 minutes

2:30pm **Cornuelle** Analysis preparation with Guided Practice (T.Coke)
(T.Coke, all physicists, grad students, physics teachers)
Review of the presentation describing the data they will see. Describe I-Spy and CIMA.
Lead the students through as they open their laptops and get to the website.
Other teachers, professors will troubleshoot if needed if there are issues getting/reading data
Students bring their computers and move to classrooms after guided practice.

2:45pm **M102/M103/M104** Data Analysis (student centered)
Physicists walk around students in classrooms, listening and answering questions
Mentors will listen to student discussions with each other and ask leading questions if the students seem to be veering off track.

4pm **Cornuelle** Pre-conference Discussion of Results
(S.Wood, T.Coke, C.Corti, V.Bindi with input from others)
Students and mentors discuss meaning of analysis results and questions for other institutes.
I will lead the introduction so the students are aware of what we need to accomplish, Claudio, Shawn and Veronica and will lead them through an understanding of the physics behind their data results. Did they get the masses they expected, the ratios they expected? Why were those ratios expected? If they did not get the expected results, any ideas as to why not?

4:30pm **Cornuelle** Videoconference with Fermilab + other student groups
Students will discuss their results with students from other schools in other locations around the world with guidance from scientists at Fermilab

5pm **Cornuelle** Conclusions and Evaluation (T.Coke)
Students need to be prepared for their videoconference with a summary of the day's events.
Students fill out evaluation of the workshop.

5:15pm **Conclude**