

OSU QuarkNet Workshop, July 18-21

(Physical Sciences 147)

Objectives for 18-19 July

Participating teachers will:

- Apply physics principles to reduce or explain the observations in data investigations.
 - Examine simulated and experimental data. Identify patterns within the data and consider the causes of those patterns.
 - Create, organize and interpret data plots; make claims based on evidence and provide explanations; identify data limitations.
 - Develop a plan for taking students from their current level of data use to subsequent levels using activities and/or ideas from the workshop.
-

QuarkNET Agenda TinyURL: <https://tinyurl.com/OSUQN2022>

Monday, July 18th - Morning Session

9:00 Opening & Registration

- Welcome & introductions
- Registration (<https://forms.gle/VeuyjybWkgMvCUji6>) and create/login to Google account
- Update QuarkNet account (<https://quarknet.org/document/update-your-profile-quarknet-site>)

9:30 Working together

- Norms: [APS STEP UP poster](#) & [Fermilab norms poster](#)
- Video: Pair programming how-to ([YouTube](#)) ([Amara w/Sp subtitles](#))
- Video: [What Most Schools Don't Teach](#)
- A look at the [Data Activities Portfolio](#)

10:00 Coding activities ([GitHub](#)) ([Colab Survival Guide](#)) ([MikeP's Sample Code Blocks](#))

- [Introduction to Jupyter](#)
 - Skills: run, edit, & save a notebook
- [Probability](#)
 - Task: Simulate flipping a coin and make a histogram of the number of heads for each trial.
 - Skills: generate random numbers, create and format a histogram
- [Position graphs](#)
 - Task: analyze Position graphs
 - Skills: modify a loop, define a function, format a plot

11:45 All Hands Meeting

- Share observations, challenges
- How do you think your students would handle these tasks?

12:00 Break

- Lunch
- Create/update your Quarknet.org account

Monday, July 18th - Afternoon Session

13:15 Special Topic - collecting data from the [Smartphone](#)

[With G accel data set](#)

[WithOut G accel data set](#)

[James & Joe Cool Plot](#)

13:45 Try another coding activity

- [Velocity graphs](#)
 - Task: Analyze Velocity graphs
 - Skills: modify a loop, define a function, format a plot
- [Projectile in Air](#)
 - Task: Model the motion of a projectile in air
 - Skills: modify a loop, define a function, format a plot
 - [James & Joe - Cool Look at Tesla in the Air](#)
- [Quakes](#)
 - Task: Identify patterns in global seismic activity
 - Skills: read in a large data set from the web, visualize complex data
- [Global Temperature](#)
 - Task: Describe the differences between land and water on temperature
 - Skills: read in a large data set from the web, visualize complex data
- [Tides](#)
 - Task: Identify patterns in tidal height over time
 - Skills: read in a large data set from the web, visualize complex data, manipulate time series data

Chris's [Stars Notebook](#)

[Motion of a pendulum](#)

Charlie's [Gravitational and Electric Fields Program](#)

[Here](#) is the source of a pennies mass lab

Python in [Biology](#)

[Github](#) in Biology

[Getting Data](#) from Google Sheets - the penny lab is near the bottom

[This site](#) from CERN has a great notebook view of analyzing CERN data

[Datasaurus Dozen](#) resource code, etc

14:30 Special Topic: Lab Data Analysis Using Python Notebooks

[Slides](#)

[Notebook: Lab Data Linearization Analysis in Python](#)

[Google Drive Folder: "Dry Lab" Spreadsheet & Python Linearization Activity](#)

[Notebook: Comparison of 2 Mean Values from 2 Measurement Sets](#)

15:00 Introduction to Muon Mass Notebook

- Short introduction to Muon Mass notebook
- [Muon mass](#)
 - Task: measure the invariant mass of a muon
 - Skills: calculate invariant mass given its 4-vector (energy and x/y/z-momentum), make a mass plot

15:45 All hands meeting

- Share observations, challenges
- How do you think your students would handle these tasks?

16:00 End of day

Tuesday, July 19th - Morning Session

9:00 Welcome back

- Recap from yesterday
- What stood out? Any new thoughts?

9:15 Change from student hat → teacher hat!

- Work Time Outline (Today, this morning and Tomorrow Morning)
- Where might these (or your own) coding activities fit into your course?
- Develop a coding activity and integrate it into your course plan.
 - See [CODINGinK12.org](https://codingink12.org) site and the [UCI Machine Learning repository](#) for data sets
 - Coding Fellows [Colab Survival Guide](#)
 - Mike P's [Sample Code Blocks Document](#)
 - embedding an image from your Google Drive ([source](#)):
 - In a text cell, embed an image with: `![alt text label](URL-to-image)`
 - Original URL:
<https://drive.google.com/file/d/0B6wwyazyzml-OGQ3VUo0Z2thdmc/view>
 - Edit the URL to look like this:
<https://drive.google.com/uc?export=view&id=0B6wwyazyzml-OGQ3VUo0Z2thdmc>
 - [Opening a Google Sheet in Colab](#)
 - Superscript example: In a text cell:
 - word `^{exponent}` will display as word ^{exponent}
 - This site can be used to create equations in Markdown: <https://latexeditor.lagrida.com/>
 - [Here](#) is a project I wrote a couple of years ago with a statement about project expectations.
- Create an implementation plan.
 - The format should be whatever is useful to you. How do you sketch out your lessons? Do you use a form from your school or district?

11:30 All Hands Check In

12:00 Break

- Lunch

Tuesday, July 19th - Afternoon Session

13:30 Continue working on implementation plan

- Get help on coding issues
- Finish your coding activity and drafting an implementation plan

14:30 Share out

- Teachers take turns (5 min each) sharing your ideas for how coding might make it into your classroom. If your Colab notebook is ready for others to try out,
 - Click the Share” button in the top right of the Colab notebook.
 - Copy the link to give others **view-only** access.
 - Send that link to michael.plucinski@gmail.com and we'll post in on the agenda
- The Sharing!
 - [James M - Friction](#)
 - [Ashley A - Pie Charts - Teacher Version](#)
 - [Ashley A - Pie Charts - Student Version](#)
 - [Kevin - Data Analysis with the Dry Lab](#)

15:30 All hands meeting

- Share observations, challenges
- Closing thoughts? Where to next?
- Complete QuarkNET [Survey Update](#) or [Full Survey](#)

16:00 End of day

Wednesday, July 20th - Morning Session

Objectives for 20 July

Participating teachers will:

- Explain the origin of the Higgs Boson, how it was discovered, and what we have yet to learn.
- Create and use a mass histogram to analyze data from ATLAS or CMS
- Explain different particle decay processes that give rise to a four-lepton signal

09:00 Check-in, re-start

09:15 Data Activity: [Shuffling the Particle Deck](#) ([online cards](#))

Alternative: [Quark Workbench](#) ([full info](#))

09:45 Tutorial: [Where's Higgs](#) ([responses](#))

10:30 Break

10:45 Presentation: What We Have Learned, What We Seek about Higgs

(Prof. Dorival Gonçalves)

11:45 Reflection and discussion

12:00 Break

- Lunch

Wednesday, July 20th - Afternoon Session

13:30 Introduction to CMS (Stupak)

14:00 Search for Higgs in CMS Data

- Take breaks as needed
- [Intro slides](#)
- [Z-mass activity](#) ([calculator](#)) ([data](#)) ([online protractor for Chrome](#))
- [MassCalc spreadsheet](#)
- [iSpy for Higgs@10](#) ([results form](#)) ([output](#))
- [Mike Plucinski's Higgs@10 Notebook](#)

16:00 End of day

- Group photo!

Thursday, July 21st - Morning Session

Objectives for 21 July

Participating teachers will:

- Discuss and develop plans for implementing activities into their classrooms
- See some active research labs
- Brainstorming with
- Feedback and brainstorming for future workshops

09:00 Welcome to the last day

09:05 Opportunities for Students from Underrepresented Groups

- Discussion with Dean Freeman, Senior Inclusion Officer

09:30 Share-a-thon, reflection, implementation planning

- Veteran QN teachers share their expertises: activities they already do, what works, what doesn't
- Reflect on the new activities from this workshop
- Discuss how to implement activities in your classroom

10:20 Break

10:30 Rosenberger Photonics Lab Tour

(Physical Sciences 551)

11:00 Meyers Materials Growth and Characterization Lab

11:30 Benton Radiation Physics Lab

(Drive/Carpool to to Venture 1 Building, 1110 South Innovation Way Drive)

12:00 Break

- Lunch

Thursday, July 21st - Afternoon Session

13:30 How can OSU help in your classroom?

(Zoom: <https://zoom.us/j/2763137742>)

- Brainstorming with the Physics Dept. Outreach and Recruitment Committee
- Set up guest lectures, demo days, other activities
- Notes: [📄 Notes from QuarkNet meeting with OaRC](#)

14:30 Break

14:45 Closeout

- Feedback on the 2022 workshop
- Ideas and plans for the future
- Complete QuarkNET [Survey Update](#) or [Full Survey](#)

15:30 End of Workshop
