## University of Kansas QuarkNet Center

Summer 2020 report

The University of Kansas (KU) QuarkNet center hosted a two-day workshop for high school physics teachers July 7 and 8, 2020. The workshop theme was "Modeling Random Processes," which was again on a computational theme following our 2019 "Computing in the Physics Classroom" workshop. KU professors Graham Wilson and Phil Baringer put together the workshop program with help from Jim Deane of Ottawa High School in Ottawa KS. Graham Wilson is taking on the role of co-mentor of the University of Kansas QuarkNet center, joining Phil Baringer who has led the center for many years.

Due to the pandemic the workshop was held entirely online and four teachers joined us on Zoom. On the first day of the workshop, Baringer gave introductory talks on the physics of particle decays (why do some particles have longer lifetimes than others?) and the math behind exponential decays and half-lives. Wilson next led a computational exercise in random numbers and exponential decays. As in the previous summer, Deane helped everyone with the use of Jupyter notebooks and the Anaconda tool.
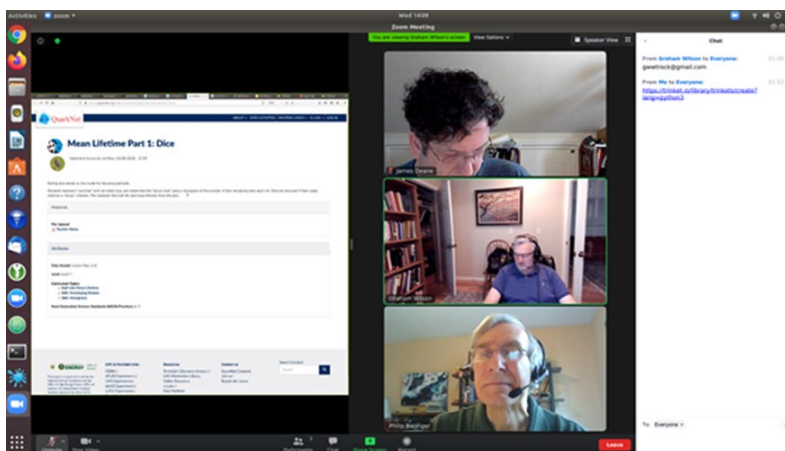
On the second day Wilson led another computational exercise on games of chance and the electoral college. (I'll leave it to the reader to decide how much connection there is between these two! We'll just say that random numbers were involved in both exercises.) The afternoon of the second day was spent on a share-athon about our experiences teaching online during the pandemic.

The schedule left time for teachers to work on exercises and presentations offline at home so as to limit the amount of time looking at a Zoom screen. The workshop schedule is attached below. (As in past summers, the allotted times on the schedule were not strictly adhered to.)

QuarkNet workshop 2020

Modeling random processes

Tuesday, July 7

Morning

9:15 – 9:30 AM: Zoom connection, registration and profile update

9:30 – 10:00 AM: The physics of particle decays (Phil Baringer)

10:00 – 10:30 AM: Math of exponential decay, radioactive half-life (Phil Baringer)

10:30 – 11:00 AM: Break for homework assignment

Homework: 1) How do you get the concept of half-life across in the classroom for different math levels? 2) Choose a particle and look up its lifetime. (see pdg.lbl.gov) What are the physics reasons for that lifetime?

11:00 AM – Noon: Discussion of homework and the morning's topic (All)

Afternoon

Noon – 1:00 PM: Lunch break

1:00 – 1:30 PM: Jupyter notebook setup (Jim Deane)

1:30 – 2:10 PM: Using random numbers to model physical processes (Graham Wilson)

2:10 – 3:00 PM: Simulation of exponential decay (Graham Wilson)

3:00 – 3:30 PM: Online office hours

Homework: Carbon dating exercise and prepare for tomorrow afternoon's Share-athon on online teaching

Wednesday, July 8

Morning

9:15 – 9:30 AM: Zoom connection

9:30 – 10:00 AM: Debrief on Day 1 (All)

10:00 – 10:45 AM: Modeling games of chance: basketball, pandemics, elections (Graham Wilson)

10:45 – 11:00 AM: Break

11:00 AM – Noon: Electoral College Simulator (Graham Wilson)

Afternoon

Noon – 1:00 PM: Lunch break

1:00 – 2:30 PM: Share-athon on online teaching (moderated by Jim Deane)

2:30 – 3:00 PM: Wrapup, survey (All)