



University of Cincinnati QuarkNet Summer 2021

“Intro to STEP UP” and “Quantum for ALL” Workshop Program

STEP UP is a national community of physics teachers, researchers, and professional societies. We design high school physics lessons to empower teachers, create cultural change, and inspire young women to pursue physics in college.

The *Quantum for All* projects, partially funded by the [National Science Foundation](#), are focused on providing quantum focused workshops, camps, institutes, resources, and support to educators and students.

(Virtual workshop on [ZOOM here](#))
9am – 4pm wednesday July 7th – Friday July 10th
Workshop [home page](#)
[sign in document](#)

AGENDA

Day 1: Wednesday, July 7th

Introduction To STEP UP

9:00-12:00

- Introductions & agenda
 - High school teachers
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 - UC faculty
 - [Dr. Mike Sokoloff](#) - Professor, UC Physics
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 - Quarknet visitors
 - [Ken Cecire](#) - QuarkNet staff teacher, Notre Dame University
 - [Adam LaMee](#) - Quarknet Fellow and Teacher-in-Residence, Univ. of Central Florida
- Registration
 - All teachers should register using this link: <https://forms.gle/4vzgoHCPJjtfdzkb6>.
 - Please indicate if you need an QuarkNet.org account or an e-Lab account.
 - Note that accounts are created daily; it may take up to 24 hours for accounts to be created. If you need an account sooner than that, please let Shane or Ken know.
- Update profile on quarknet.org
 - Update personal profiles on the website with this guide - by everyone. (Tiny URL - <http://tinyurl.com/qn15prfl>.)
- [Daily sign-in](#)
- Working together
 - Norms, [APS STEP UP poster](#) & [Fermilab norms poster](#)
 -

Lunch break

1:00-4:00

- (3:30-4:00) All Hands
 - (10 min) Move to different breakout rooms and share observations and thoughts from today
 - (10 min) Come back to the lobby and share closing comments
 - (10 min) [Daily feedback form](#)

Day 2: Thursday July 8

Quantum For ALL Day 1

9:00-12:00

Wave Particle Duality Part 1--Part 1 of 2 sessions designed to help students understand the dual nature of light. The first session compares classical particles and waves and then uses interactive activities to learn about the double slit experiment

Lunch break

1:00-4:00

Wave Particle Duality Part 2--Part 2 of 2 begins with a review of WPD and then uses the Mach Zehnder Interferometer to model interference patterns and analyze particle and wave models.

Day 3: Friday July 9

Quantum for ALL Day 2

9:00-12:00

Heisenberg= slit width, using diffraction to investigate light, photon momenta, intro to quantum (superposition, measurement), basis of uncertainty, energy and wavelength

Extra—in case teachers cant get enough!!

Malus Law = 3D movies, polarization (as photons), mutually exclusive states, quantum relevance

Lunch break

1:00-4:00

Power of Quantum Computing: Duetsch-Jozsa Algorithm--Session uses the concept of an interferometer to demonstrate this algorithm, showing the gain in efficiency from quantum computing due to superposition.

- (3:30-4:00) All Hands
 - Debrief & Wrap up Ken Cecire - QuarkNet
 - What's next for the UC Quarknet center?

Resources

After the workshop, all information and agenda will live on the Quarknet.org site [here](#).

