



INTERNATIONAL

MASTERCLASSES

hands on particle physics



Activities and Opportunities for Learning on the Energy Frontier

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U.S. DEPARTMENT OF
ENERGY

Office of
Science



 **Fermilab**

QuarkNet Centers in the national program



QuarkNet Centers within reach for Indiana



University of Notre Dame
Notre Dame/South Bend

Purdue University Northwest
Hammond

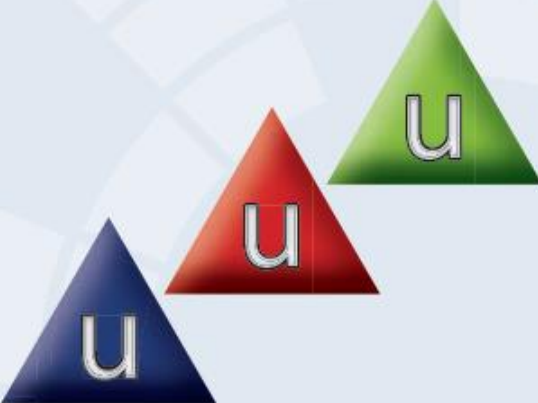
Purdue University (main campus)
West Lafayette

University of Cincinnati
Cincinnati OH

Activity

Particle Cards

UP QUARK
DISCOVERED: 1969



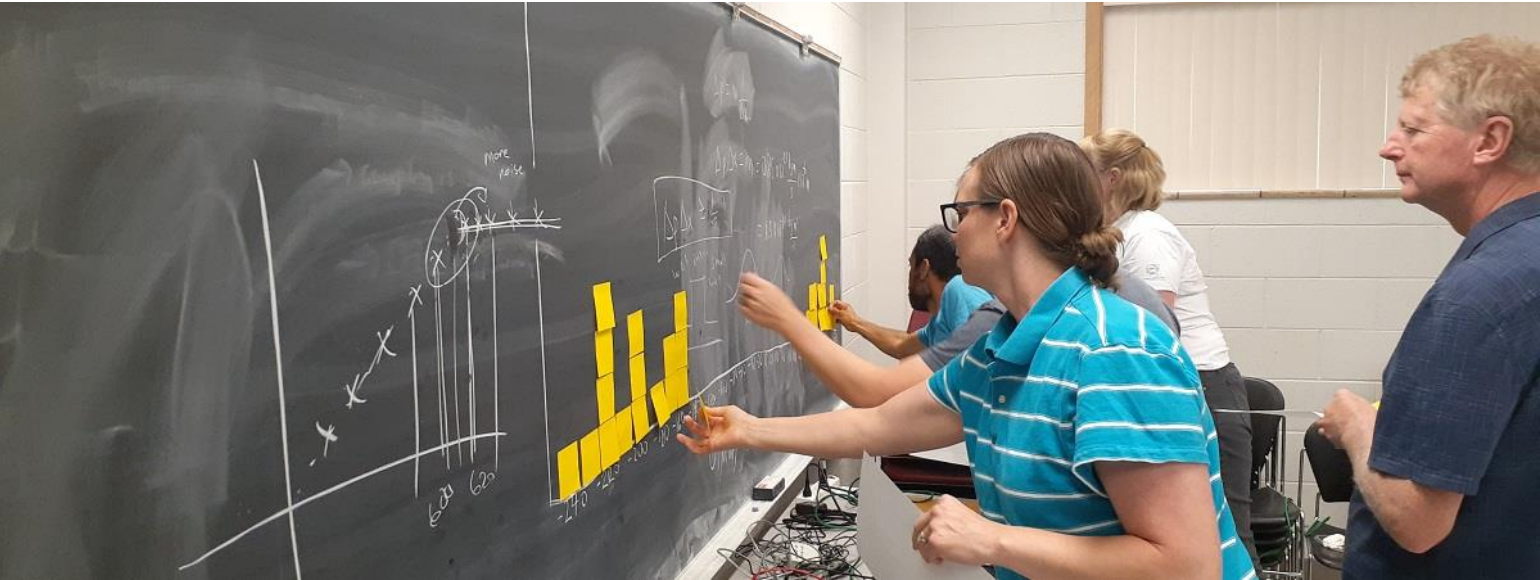
MATTER PARTICLE

Mass:	2 MeV/c ²
Electric Charge:	+ ² / ₃
Strong Charges:	blue, red, green
Weak Charge:	+ ¹ / ₂
Lifetime:	unlimited

Programs-Teacher Opportunities

- Cosmic ray Fellows
 - Cosmic Ray Detectors
 - Data collection and analysis
 - e-Labs
 - Cosmic Watch
 - Cosmic Day (November)
 - Muon Week (February)
- Teaching and Learning Fellows
 - Data Camp (summer)
 - Coding Camp (summer)
 - Step Up
- LHC Fellows
 - MasterClass CMS and ATLAS (March)
 - Big Analysis of Muons (May)
 - World-Wide Data Day (November)
- Neutrino Fellows
 - MasterClass MINERvA and NOVA (March)
 - Neutrino Classroom
- Data Activities
- Summer Workshops at Centers

Content



Pedagogy



<https://quarknet.org>

Masterclasses Be a Physicist for a day!

- CMS
- ATLAS
- Minerva
- Nova



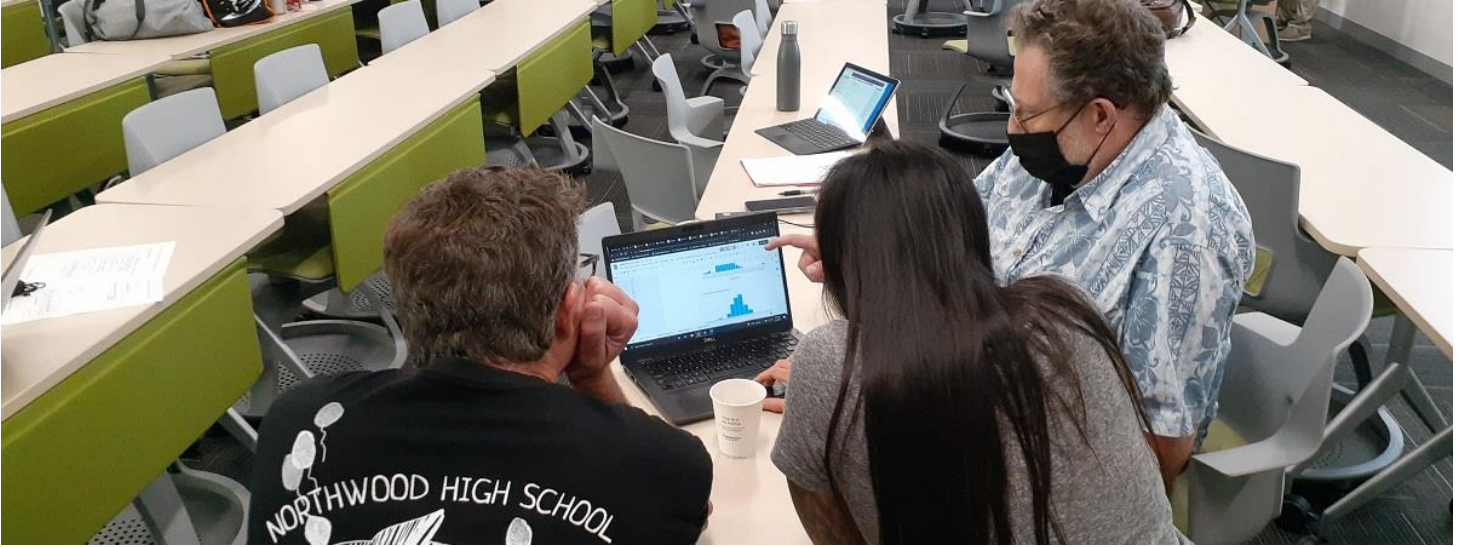
Big Data. Big Ideas. Be a part of it.

physicsmasterclasses.org



Cosmic rays

Coding





Thank you!

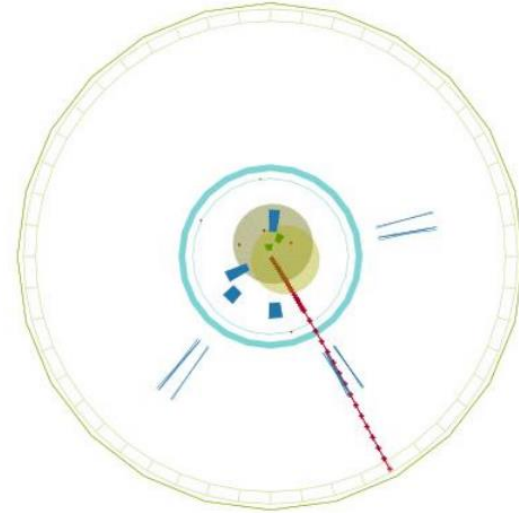
Questions?

Contact us!

- Marla Glover, mjglover@purdue.edu
- Ken Cecire, kcecire@nd.edu



Bonus Activity!



CMS Data Express from
QuarkNet Data Activities Portfolio at <https://quarknet.org>

Enter results at <https://cern.ch/hasti24>