The Nuclear Physics Graduate Program at Ohio University

Overview
Fall 2016
Ohio University: “Riverfront research school”

*Oldest university in the Northwest Territory
Physics & Astronomy Department at OU

The Cosmos  Nanoscience  INPP
Probing Life  Nuclei & Particles  EAL  CMSS

~30 faculty, ~80 graduate students, ~70 undergrad majors

(Fall 2016)
How were the elements made?

How do the building-blocks of matter behave?

Temperature $T$ [MeV]

- Early universe
- Deconfinement and chiral transition
- Neutron stars
- Color Superconductor?

Net Baryon Density

- Hadrons
- Quarks and Gluons

D. Spergel
Science 2015

Wm. F. Sheehan Ref. Chem. 1976

GSI-FAIR Tech. Report 2009
Institute of Nuclear & Particle Physics

**Experiment:** Structure, Reactions, Astrophysics, & Applied Theory: Reactions, Nucleon Structure, & Nuclear Astrophysics

*Research profiles available on the INPP webpage: [http://inpp.ohiou.edu/faculty.html](http://inpp.ohiou.edu/faculty.html)*
Nuclear Graduate Program at a Glance

~20 students (~2/3 international, ~25% women, ~½ Low-Energy Nuc.)

Most on Research Assistantships after 1st or 2nd year (Fall 2016)
Nuclear Graduate Training at a Glance


• Required:
  • *Particles & Nuclei*
  • *Computer Simulation Methods in Physics*
  • *Nuclear & Particle Lab*
  • *Nuclear Lunch*

• Special Topics*:
  • *Applied Nuclear Physics*
  • *Contemporary Nuc. Theory*
  • *Teaching College Physics*
  • *Nuclear Astrophysics*

*Vary in availability

*For the full list of courses, see the P&A Grad Curriculum page: https://www.ohio.edu/cas/physastro/grad/phd/courses.cfm
Theoretical Research Program

Effective Field Theory

Properties of Matter at Extreme Density

Reaction Theory

*For an overview of the INPP theory program, see: [http://inpp.ohiou.edu/theory.html](http://inpp.ohiou.edu/theory.html)
Theory Supercomputing Resources

For an overview of the INPP theory program, see: http://inpp.ohiou.edu/theory.html
Experimental Research Facilities

PHENIX @ RHIC

QWEAK, G0, DVCS @ JLAB

Edwards Accelerator Lab on OU campus

*For an overview of the INPP experimental program, see: [http://inpp.ohiou.edu/experiment.html](http://inpp.ohiou.edu/experiment.html)
Edwards Accelerator Lab

Keck Thin Films Analysis Lab
RBS chamber

Charged particle time-of-flight chamber

4.5MV tandem Pelletron
Cs sputter & duoplasmatron ion sources

Beam swinger

Neutron time-of-flight tunnel

2 target rooms
6 beam-lines
2 full-time staff

*See a laboratory description, the lab history, and current schedule: http://inpp.ohiou.edu/~oual
4.5MV T-type tandem Pelletron

- H, He, D, Li, C, ... beams
- ~μA beam intensities
- Solid & gaseous stripper
- Bunching (ns-resolution)
- Feeds 6 beamlines

*See a laboratory description, the lab history, and current schedule: [http://inpp.ohiou.edu/~oual](http://inpp.ohiou.edu/~oual)*
Beam Swinger + n-ToF tunnel

- Swinger range: $-4^\circ \leq \theta_{\text{lab}} \leq 158^\circ$
- 30m neutron flight-path
- Polyethylene collimation & lead shielding for tunnel entrance
- Solid & gaseous targets (*including tritium*)

*See a laboratory description, the lab history, and current schedule: [http://inpp.ohiou.edu/~oual](http://inpp.ohiou.edu/~oual)
Charged-particle ToF set-up

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Norwegians invade Athens

A. Voinov et al. PRC ‘07
W.M. Keck thin films facility

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Developed energy-dependent optical potentials, essential for interpreting \((d,p)\) as \((n,\gamma)\) surrogate.
Substantially reduced uncertainty of one of the most important reactions for massive star He-burning
First Determination of the Weak Charge of the Proton
(PRL 111 141803 (2013))

Rakitha Beminiwattha
PhD ‘13
(Louisiana Tech, Asst. Prof.)
Graduate Student Accolades

Graduate Student Research Award 2015

“Spectroscopy of Neutron-rich Mg Isotopes in and around the Island of Inversion”

Andrea Richard
Current PhD Student

(Fall 2016)
Sponsors
Visit us on the web: http://inpp.ohiou.edu
Contact the INPP Director: phillid1@ohio.edu
Contact the Edwards Lab Director: brune@ohio.edu

(Fall 2016)