Welcome to IU Physics Grad. Student Open House

David V. Baxter

Chair, Dept. of Physics

Low Energy Neutron Source
Center for Exploration of Energy and Matter (CEEM),
Quantum Science and Engineering Center
Indiana University

Thanks for your interest in what we are doing!

- We are a very collegial department of 35 faculty, some 90 graduate students (similar number of UG majors), in a beautiful major Midwest University (>40,000 students), in a small city (~80,000 residents) that is fabulous to live in.
- Major research thrusts in:
  - Nuclear Physics (perennially one of the top five groups in the country)
  - High-Energy Physics: ATLAS, neutrinos, fundamental symmetries, BSM physics, astrophysics
  - Condensed Matter: neutron scattering, correlated electron and topological materials, quantum fluids, soft matter
  - AMO: quantum simulation with ions and cold atoms
  - Biophysics: neuroscience, systems biology,

The research environment at IUB-Physics

- Research Centers:
  - **Center for Exploration of Energy and Matter (CEEM)**
    - Nuclear Physics (RHIC, slow neutrons, UCN, neutrinos, …)
    - Neutron Physics (Low-Energy Neutron Source)
    - Major facilities/large work areas facilitates significant participation in important international collaborations.
  - **IU Center for Spacetime Symmetries (IUCSS)**
    - World center for precision measurement approaches to studying fundamental symmetries (from AMO/nano scale approaches to satellites and astrophysical approaches).
  - **Quantum Science and Engineering Center (QSEc)**
    - Exploring the power of quantum entanglement through novel probes, quantum simulation, quantum certification, …

The research environment at IUB-Physics

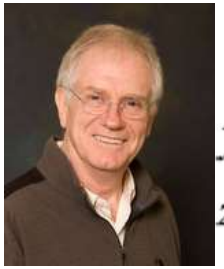
- Novel aspects of our Department/School:
  - **MANY faculty work across disciplinary boundaries, lots of students get to as well!**
  - **Many faculty (~30%) have major leadership roles in directing international-scale experiments and/or in defining the future of their fields.**
  - **Very strong ties to National/International labs**
  - **Astronomy is a separate department at IUB**
  - **IUB has only had an Engineering school for four years**
  - **One of the most beautiful campuses in the country.**
  - **IUB has one of the country's strongest Music Schools**
    - Over 1000 performances every year
  - **Great art-house movie series through IU Cinema**

CMP/AMO/QIS-X Faculty

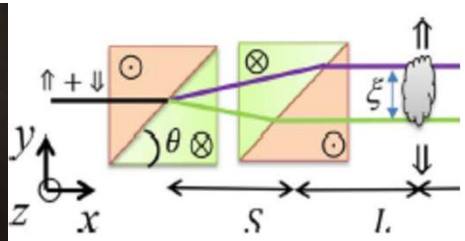
David Baxter
Neutron Scattering
Nanomaterials

John Carini
Low-T Transport
Energy Storage

Brian DeSalvo
AMO, Cold Atoms

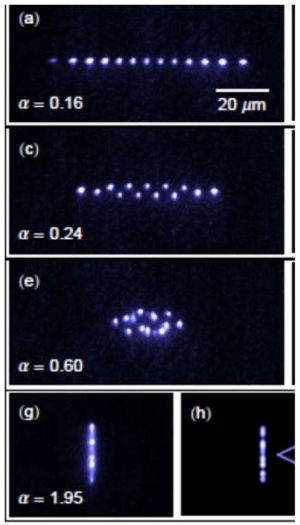


Roger Pynn*
Neutron Scattering, Soft
Materials, Magnetism



Entangled neutrons

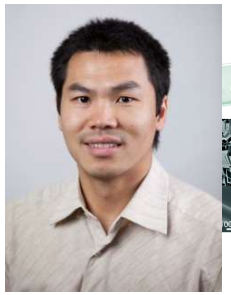
2D Paul trap



Phil Richerme*
Trapped Ions: Quantum
simulations/computing

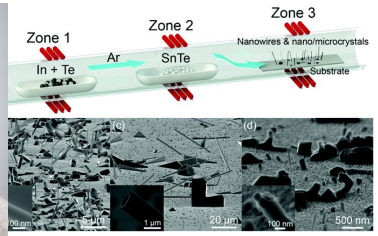
Paul Sokol
Neutron Scattering,
Quantum Liquids,
Nanomaterials,

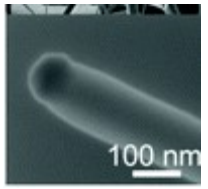
Garfield Warren
Complex Fluids



Shixiong Zhang*
Nano-material Synthesis
Nanoscale Characterization
Magnetism and Transport

Topological nanowires

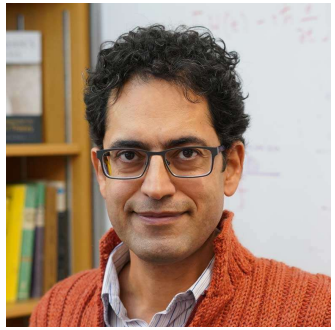




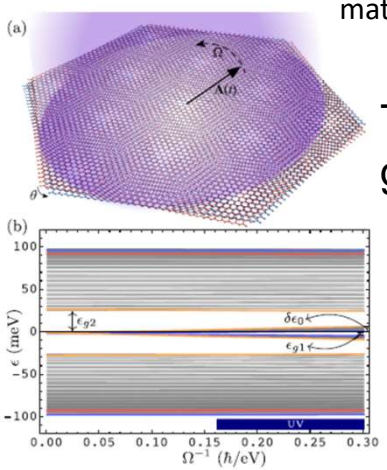
CMP/AMO/QIS-T Faculty

Herb Fertig*
Graphene, topological materials

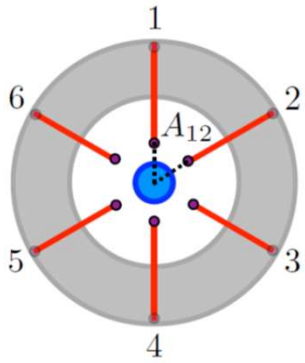
Gerardo Ortiz*
Many-body Physics, Quantum Information



Babak Seradjeh*
Dynamical Quantum Systems, Topological systems

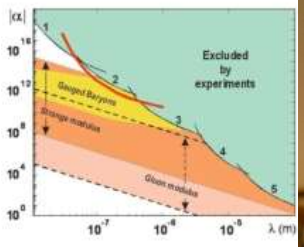


Twisted-layer graphene



Majorana certification

Subatomic Physics Experimental Faculty



Force limits vs. length scale

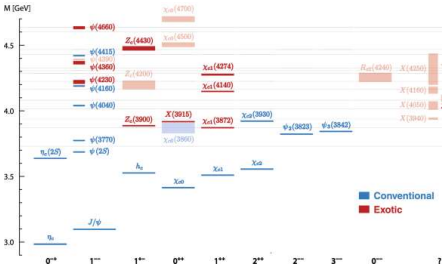
Josh Long*
Exotic Forces

Chen-Yu Liu*
UCN approaches to n-lifetime, EDM

Mike Snow
Slow neutron guru

Rex Tayloe
neutrinos

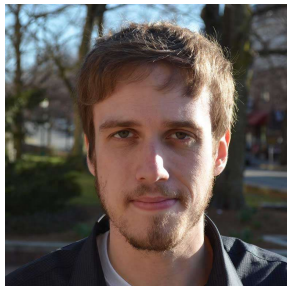
Scott Wissink
Proton structure



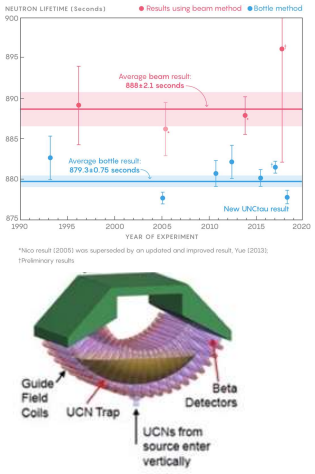
Hadron spectra

Matt Shepherd*
Spokesperson for GlueX

Ryan Mitchell
BES III



Dan Salvat*
UCN and neutrinos



N-lifetime problem

Subatomic Physics Experimental Faculty-Collider

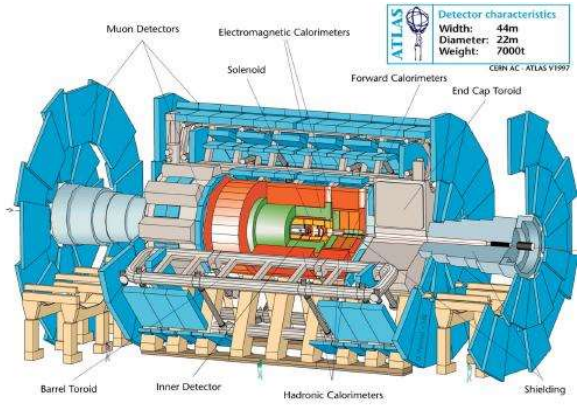
Rick van Kooten
Exec. Dean of the College

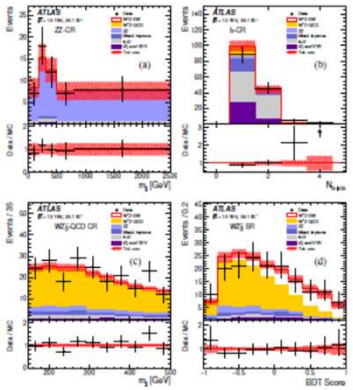
Hal Evans
ATLAS- L0 Trigger coord.
TDAQ Dep. Upgrade lead.

Sabine Lammers*
ATLAS– gFEX trigger

Chris Meyers
ATLAS: Inner tracker
Higgs sector

Fred Luehring
TRT software, MW Tier-2
Computing manager





WZ-double jet data

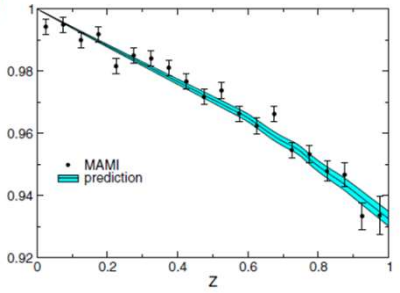
Subatomic Theory Faculty

Mike Berger
Quantum Field Theory

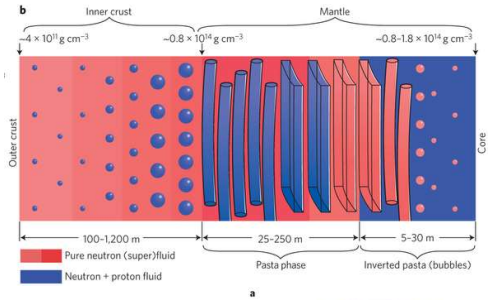
Radovan Dermisek
BSM

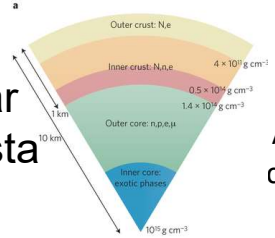
Alan Kostelecky
Lorentz/ CPT symmetry
SME

Enrico Lunghi
QFT, BSM



$\eta-3\pi$ analysis gives
Q=22.0(7)
Quark mass diff. ratio





Neutron star nuclear pasta

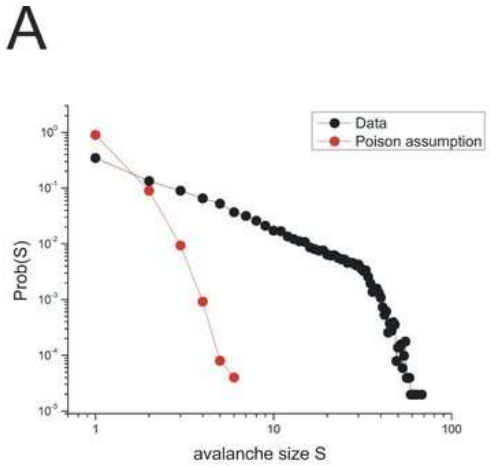
Chuck Horowitz*
Astromaterials Science, cleosynthesis, gravity wave sources

Jinfeng Liao
Chiral effects in QGP
Quantum computing applications

Emilie Passemar*
Chiral Perturb. theory

Adam Szczepaniak
Director of JPAC
Hadron spectroscopy

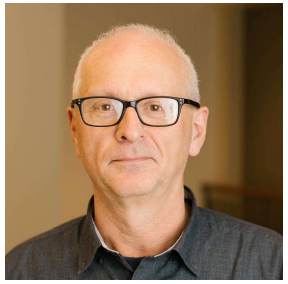
Biological Physics Faculty



Frequency vs. avalanche size

John Beggs*

lf-organized criticality in neural tissue

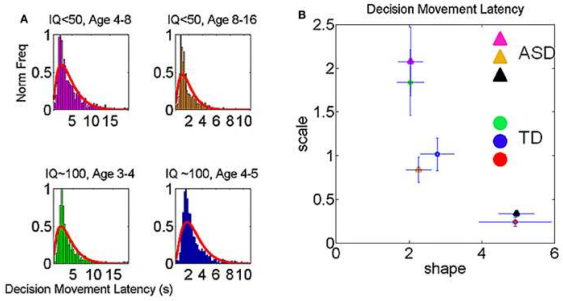


Rob de Ruyter

Information flow in visual systems

Jorge Jose*

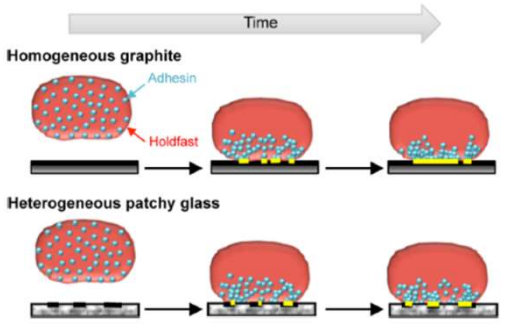
Simple physical biomarkers of disease



Autism spectra disorder diagnosis from micro motion analysis

Sima Setayeshgar*

Quantitative biology, networks



Time evolution of hold-fast strength

Neutrino Physics Faculty

Mark Messier*

Founding co-spokes. of NOvA DUNE

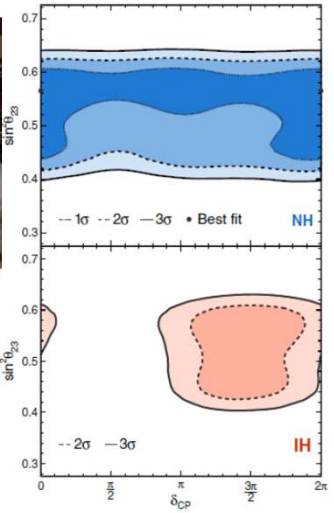
Jim Musser

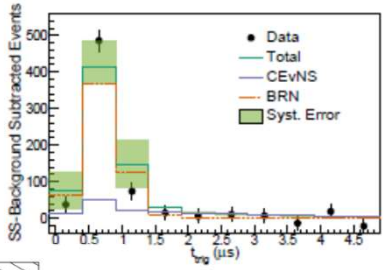
NOvA, HELIX (Cosmic Ray physics)

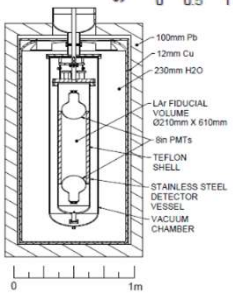
Jon Urheim*

DUNE, NOvA

Normal hierarchy from NOvA







COHERENT ν scattering on Ar

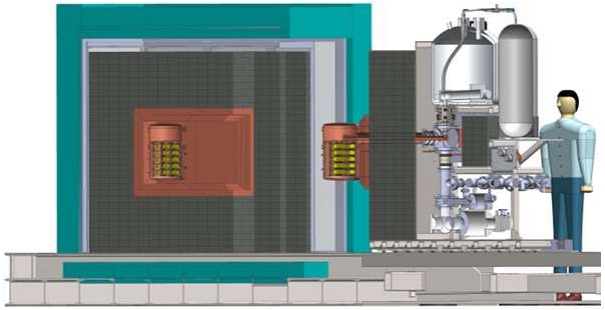
Rex Tayloe*

MiniBoone and COHERENT

Walter Pettus*

LEGEND, Majorana, Project 8

Majorana, ν-less ββ decay



AMO labs in Simon Hall