

Welcome to IU Physics
Grad. Student Open House
25 March, 2023

David V. Baxter

Chair, Dept. of Physics

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 32 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 (inter)national-scale experiments and/or in defining the future of their fields.**
 - **Very strong ties to National/International labs**
 - **Strong commitment to community and diversity**
 - **Astronomy is a separate department at IUB**
 - **IUB has only had an Engineering school for five 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**

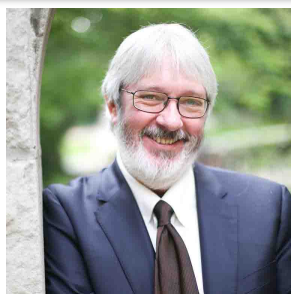


Neutrino Physics Faculty



Mark Messier*

Founding co-spokes. of NOvA
DUNE



Jim Musser (ret.)

NOvA, HELIX (Cosmic Ray
physics)

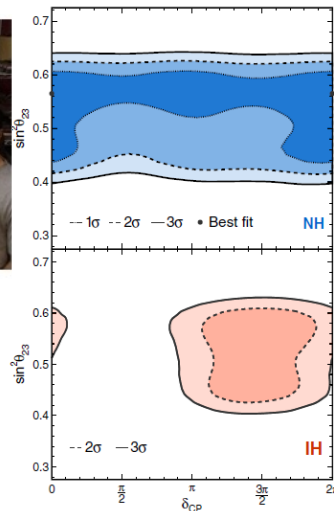


Jon Urheim*

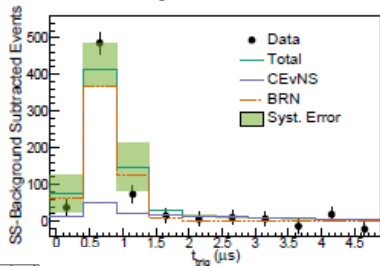
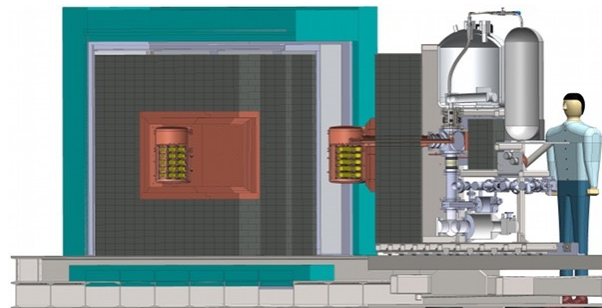
DUNE, NOvA



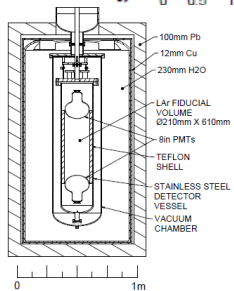
Normal
hierarchy
from NOvA



Majorana, ν -less
 $\beta\beta$ decay



**COHERENT ν
scattering on Ar**



Rex Taylor*

MiniBoone and COHERENT



Walter Pettus*

LEGEND, Majorana,
Project 8

High-Energy Physics Experimental Faculty-Collider



Rick van Kooten

Exec. Dean of the College



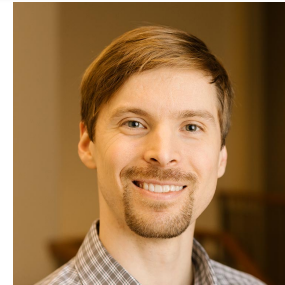
Hal Evans

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



Sabine Lammers*

ATLAS- gFEX trigger



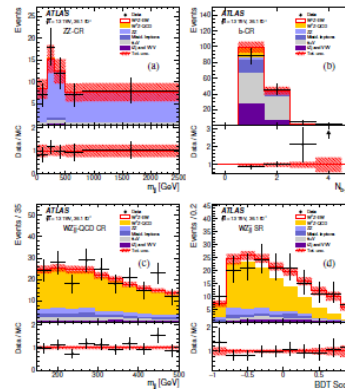
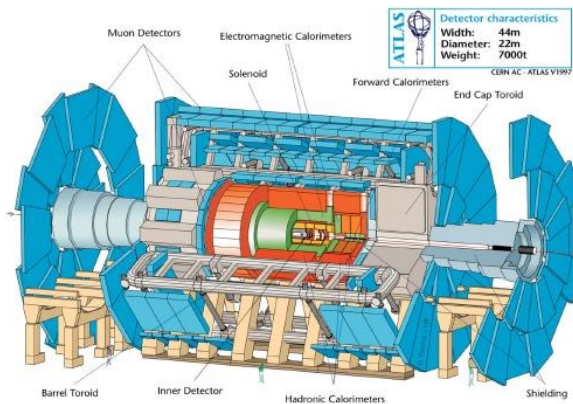
Chris Meyers

ATLAS: Inner tracker
Higgs sector



Fred Luehring

TRT software, MW Tier-2
Computing manager



WZ-double jet data

Nuclear/Particle Theory Faculty



Mike Berger (ret)
Quantum Field Theory



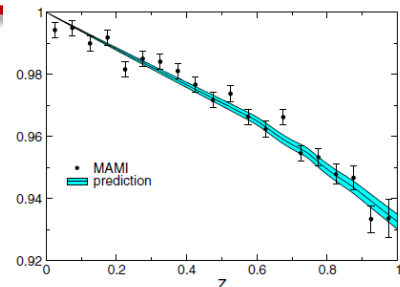
Radovan Dermisek
BSM at LHC and muon
colliders



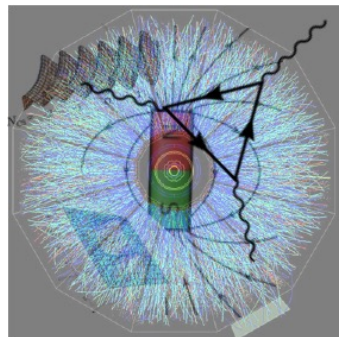
Alan Kostelecky
Lorentz/ CPT symmetry
SME



Enrico Lunghi
QFT, BSM



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



Quantum Chiral
magneto-
hydrodynamics in
the QGP



Chuck Horowitz (ret)
Astromaterials Science,
nucleosynthesis, gravity wave
sources



Jinfeng Liao*
Chiral effects in QGP
Quantum computing
applications



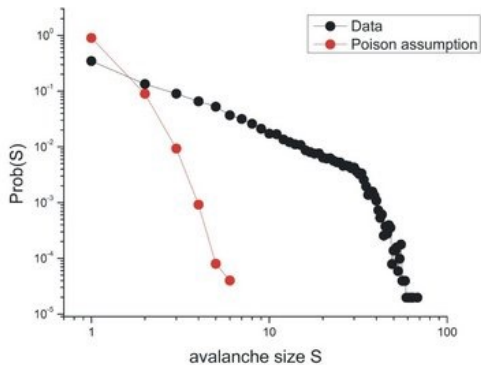
Emilie Passemar*
Chiral Perturb.
theory



Adam Szczepaniak
Director of JPAC
Hadron spectroscopy

Biological Physics Faculty

A



Frequency vs.
avalanche size



John Beggs*

If-organized criticality in
neural tissue



Rob de Ruyter

Information flow in visual
systems



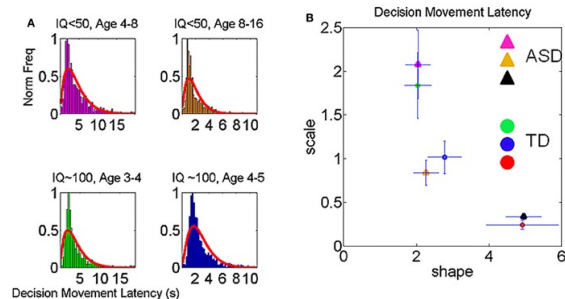
Jorge Jose*

Simple physical
biomarkers of disease

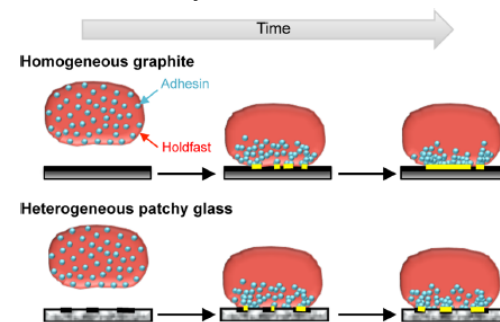


Sima Setayeshgar*

Quantitative biology,
networks

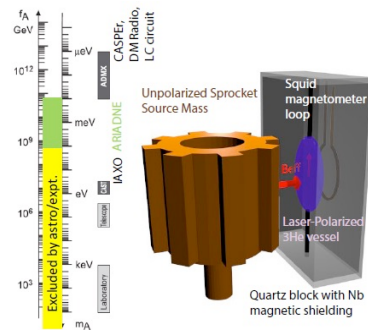


Autism spectra disorder
diagnosis from micro motion
analysis



Time evolution of
hold-fast strength

Nuclear Physics Experimental Faculty



Caryn Palatchi
CREX, Precision polarimetry



Walter Pettus
 ν -less $\beta\beta$ decay, ν mass



Mike Snow*
Slow neutron guru

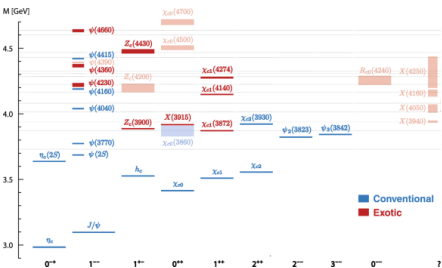


Rex Tayloe*
neutrinos



Scott Wissink (ret)
Proton structure

ARIADNE axion search



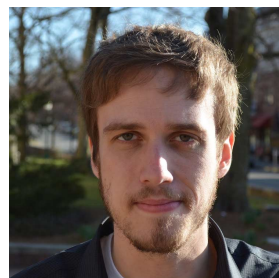
Hadron spectra



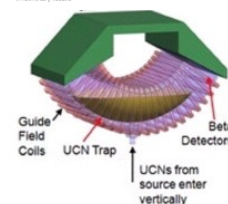
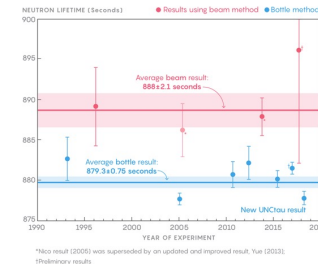
Matt Shepherd*
Spokesperson for GlueX



Ryan Mitchell
BES III



Dan Salvat*
UCN and neutrinos



N-lifetime problem

CMP/AMO/QIS-X Faculty



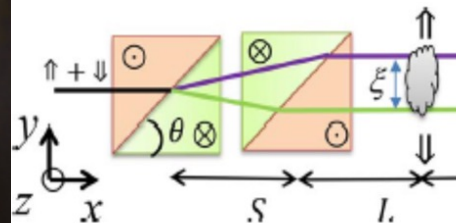
David Baxter
Neutron Scattering
Nanomaterials



John Carini
Low-T Transport
Energy Storage

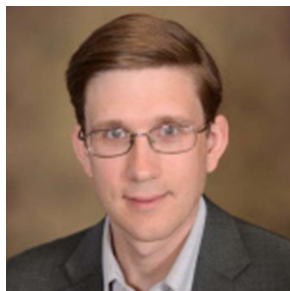
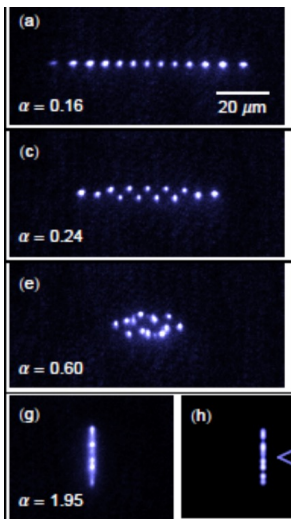
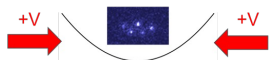


Roger Pynn*
Neutron Scattering, Soft
Materials, Magnetism



Entangled neutrons

2D Paul trap



Phil Richerme*
Trapped Ions: Quantum
simulations/computing



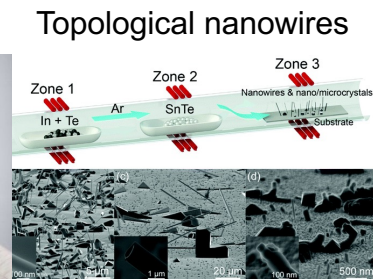
Paul Sokol
Neutron Scattering,
Quantum Liquids,
Nanomaterials,



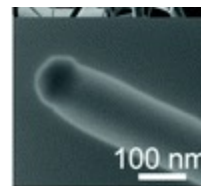
Garfield Warren
Complex Fluids



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



Topological nanowires



CMP/AMO/QIS-T Faculty



Herb Fertig*

Graphene, topological materials



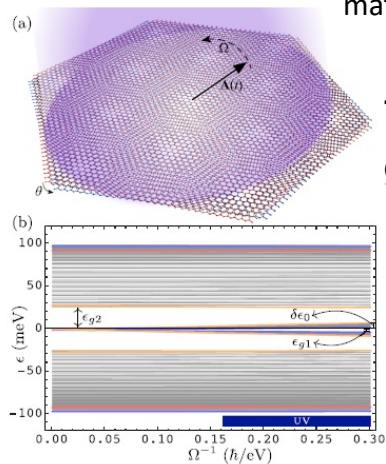
Gerardo Ortiz*

Many-body Physics,
Quantum Information

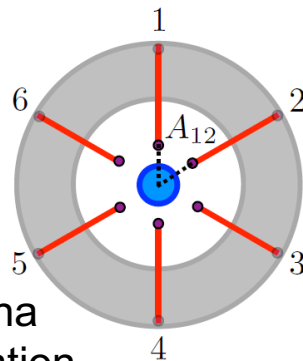


Babak Seradjeh*

Dynamical Quantum
Systems, Topological
systems

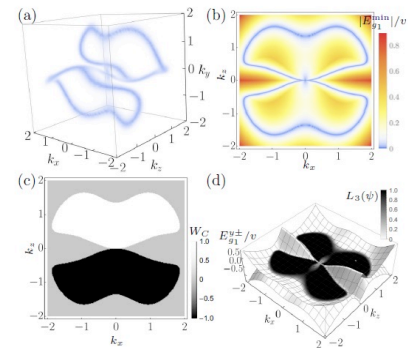


Twisted-layer
graphene



Majorana
certification

Looking for LV in
Weyl semimetals



AMO labs in Simon Hall

