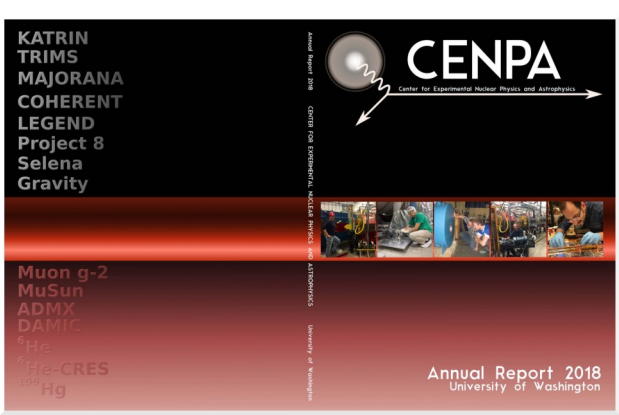
CENTER FOR EXPERIMENTAL NUCLEAR PHYSICS AND ASTROPHYSICS

November 2018 Newsletter

At a Glance 2018

In this issue:

The Center for Experimental Nuclear Physics and Astrophysics, CENPA, was established in 1998 at the University of Washington as the institutional home for a broad program of research in nuclear physics and related fields. Research activities — with an emphasis on fundamental symmetries and neutrinos — are conducted locally and at remote sites. In neutrino physics, CENPA is the lead US institution in the KATRIN tritium β-decay experiment, the site for experimental work on Project 8, and a collaborating institution in the MAJORANA and LEGEND ^{76}Ge $0\nu\beta\beta$ experiment. The Muon Physics group has developed the MuSun experiment to measure muon capture in deuterium at the Paul Scherrer Institute in Switzerland. The group has a leadership role in the new project to measure the anomalous magnetic moment of the muon at Fermilab to even higher precision than it is presently known from the collaboration's previous work at Brookhaven. The fundamental symmetries program also includes "in-house" research on the search for a static electric dipole moment in ^{199}Hg, and an experiment using the local tandem Van de Graaff accelerator to measure the electron-neutrino correlation and Fierz interference in ^{6}He decay.



CENPA 2018 Annual Report
(download PDF or buy printed copy)
https://www.npl.washington.edu/cenpa/reports/

The DOE Office of Nuclear Physics has awarded CENPA a new three-year continuation of the program, which is supporting the bulk of the research efforts.

In addition to the research directly supported by DOE's Office of Nuclear Physics through the CENPA core grant, other important programs are located at CENPA, forming a broader intellectual center with valuable synergies. The Eöt-Wash group - with both DOE and NSF support - studies the weak and strong Equivalence Principles, as well as searches for non-Newtonian forces such as those predicted by theories with extra dimensions. In addition, they participate in LIGO. The DOE Office of High Energy Physics supports the unique ADMX axion search experiment performing world-leading search for axion dark matter.

CENPA 2018 Group Photo

CENPA is home to a large number of faculty, research faculty, post-doctoral researchers, graduate, and undergraduate students. The core professional engineering and technical staff provide diverse capabilities and skills such as state-of-the-art detector, development, fabrication of custom electronics, large-scale computing, and design engineering. New advancements, capabilities, and ideas are regularly shared at seminars by CENPA members and visitors alike.

Please consider donating to Friends of CENPA —Thank you!
https://www.npl.washington.edu/cenpa/support

ADMX in the NEWS!

The Axion Dark Matter Experiment here at CENPA – led by Leslie Rosenberg and Gray Rybka – has the physics community excited. This past year, ADMX has published their first measurements demonstrating unprecedented sensitivity to an axion solution to the Dark Matter puzzle. ADMX is special because it can test the best theoretically-motivated coupling models of the axion. While their first scan over a small axion mass range had a null result, the quest has only just begun as the experiment retools programmatically to move through a wide search range. Just a few fun links include articles in National Geographic, Scientific American, Wired, and Gizmodo. Have a look and have fun.

Image credit: *Timothy Archibald*

New CENPA Seminar Series Initiated!

Research Assistant Professor Martin Fertl developed a magnificent program, which by now has featured 33 speakers, 50% of whom are international visitors to our campus. The series runs biweekly and includes lab visits for the visitor, lunch with graduate students, and a general gathering of everyone for coffee and cookies prior to the presentation. The series has been very popular. The lunch, coffee and cookies, are provided for by our (limited) discretionary funds, but we are prioritizing this educational component to our overall mission. **Seminars are open to all: https://www.npl.washington.edu/cenpa/seminar**

Muon g-2 has its first physics data!

After many years of design and construction, the Muon g-2 experiment at Fermilab was commissioned and acquired its first physics data in spring 2018. The experiment aims to determine the anomalous magnetic moment of the muon to a precision of 140 ppb, a four-fold improvement compared to the previous experiment at Brookhaven. The BNL result stands ~3.5 standard deviations from the Standard Model prediction, representing a tantalizing finding of possible physics beyond the Standard Model. However, the threshold for an acknowledged “discovery” is 5σ, motivating a next-generation experiment. The good news is that the Run -1 data already exceeds the total from BNL, and the data-taking has barely begun.

CENPA has played a huge role in the experiment. Our staff, students, and faculty designed and built most of the precision magnetic field measuring equipment, the electromagnetic calorimeters and their electronics, and a novel suite of imaging detectors to monitor the incoming beam. CENPA group members have served as Co-Spokesperson Run Coordinator, Field Coordinator, and Analysis Coordinator. Two Ph.D. theses have been earned already at UW for work on g-2, and the group includes six more who are in various stages of their research. We expect to announce the results from the Run-1 analysis in mid-2019, as we and our many collaboration colleagues are vigorously analyzing the data. Will the new result confirm the hint of New Physics or will it reveal that the previous measurement was only a frustrating fluctuation? Stay tuned and watch this space.

TRANSITIONS & HIGHLIGHTS

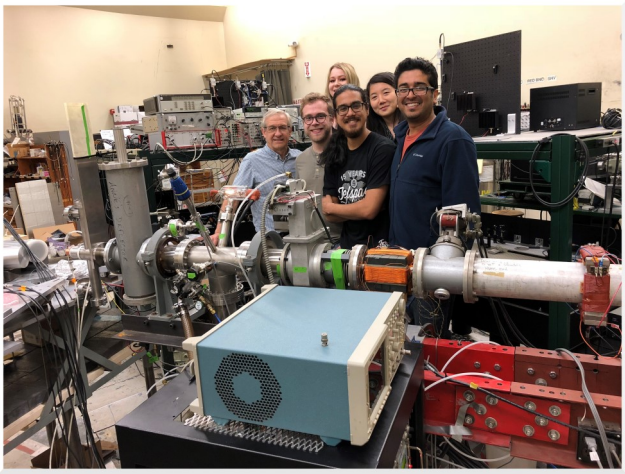
Alvaro Chavarria

Alvaro Chavarria joined the University of Washington faculty in January, 2018 as a new Assistant Professor and member of the CENPA faculty. Prof. Chavarria is the Analysis Coordinator of the DAMIC dark matter experiment and he is the conceptual lead for the new Selena neutrinoless 0νββ experiment. He has begun his laboratory work in a repurposed CENPA clean room located in the main Physics building.

Jason Detwiler

Jason Detwiler was promoted to Associate Professor of Physics with tenure, starting in autumn 2018. Jason Detwiler was named Co-Spokesperson for the MAJORANA DEMONSTRATOR.

- Martin Fertl and Jarek Kaspar were both appointed to be Research Assistant Professors.
- Peter Doe was named UW Spokesperson for KATRIN, succeeding Hamish Robertson.
- Postdoc Brent Graner, who completed his thesis on the Hg-199 EDM experiment, joined the He-6 beta decay experimental group.
- Elise Novitski – our first Robertson Postdoctoral Associate – joined CENPA and is working on Project 8 first tritium experiment.
- Megan Ivory began as a postdoc working 50% on the Hg-199 EDM experiment.
- Clint Wiseman is a new postdoc on the LEGEND and MAJORANA collaborations.
- Menglei Sun is a new postdoc on the KATRIN team.
- Daniel Salvat (postdoc) accepted a position to Indiana University.
- ADMX welcomes back Nicole Crisosto as a new postdoc to the team.
- ADMX postdoc Rakshya Khatiwada accepted a research position at Fermilab.
- Seven graduate students received their Ph.D.'s in the last 12 months. They include: Erik Lentz (University of Goettingen), Nathan Froemming (Postdoc at Northern Illinois University), Julieta Gruszko (MIT Pappalardo Fellowship), Matthias Smith (INFN Fellowship, Pisa), Brent Graner (CENPA Postdoc), Matt Turner (Microsoft Quantum Computing), and Eric Martin (seeking a Postdoc).
- David Hyde retired in August, 2017. Still learning how to properly retire, David Hyde was rehired as the student-shop manager on an hourly basis.
- Brittney Dodson has been hired to a new Research Engineer 1 position at CENPA.



Smarajit Triambak and Bhivek Singh (University of the Western Cape, Republic of South Africa) working on ^{21}Ne project with Prof. Garcia, Joben Pedersen, Brittney Dodson and MinJung Sung.

2018 Holiday Party

Come one come all to the CENPA 2018 holiday party.

December 12, 2018
3PM

Please RSVP to cenpaadm@uw.edu

** Thanks to University of Washington, Physics Dept., DOE, NSF, DOE-HEP, and DOE-NP for continued support. **