

Spring 2014

www.otterbein.edu/physics

Otterbein University

 Department of Physics

Schrödinger's Otter

Systems Engineering Program Announced



Professor Reinhard and President Krendl at press conference announcing the new major in systems engineering

On February 6, Otterbein officially announced a new major in systems engineering, to launch in fall 2015. Systems engineering represents a broad-based engineering education which focuses on the principles of mechanical, industrial, and electrical engineering as well as physics and math. We have received very positive feedback on our curriculum from local industry partners such as Xigent Automation Systems, Worthington Industries, Mettler Toledo, and Emerson Network Power. Therefore, we are confident that our future graduates will be in high demand.

Professors Dave Robertson and Aaron Reinhard of the Physics Department were leaders in the development of this curriculum, and Reinhard was appointed interim director of the program in January 2015. In May, Otterbein hired Dr. Gary Maul to be the full-time director of the program. Dr. Maul had a

long and distinguished career as a member of the Industrial and Systems Engineering department at Ohio State, and has recently started a new engineering program at OSU Marion.

The 3+2 Cooperative Engineering program run by the Physics Department will continue, allowing students the opportunity to pursue areas of engineering other than systems.

For more information visit, our website: <http://www.otterbein.edu/systemsengineering>

The Physics Blog has been launched! Check it out for up-to date news at <http://physicsblog.otterbein.edu/>. Here is one of Dr. Tagg's posts: **MicroBooNE – Neutrino physics with liquid argon**

The neutrino group at Otterbein (that is, myself and one or two students) are busy working on a new experiment called [MicroBooNE](#) at the [Fermi National Accelerator Lab](#). This experiment measures the rates of different kinds of neutrino interactions with nuclei by looking at the ionized particle tracks left in a huge tank of liquid argon. An electric field "drifts" the ionization electrons to a set of wires for easy readout.

I'm busy working on several parts of this experiment: namely the event viewer. You can see some simulated data with my [Argo Event Viewer](#). I'm also working on the DAQ (Data Acquisition) group, providing them tools for doing online monitoring of the data. This will allow us to keep an eye on the health of the detector as we set it up and run it.



The wire cage that surrounds the detection volume is about 3m x 3m x 10m. This gets put into a huge tank (the cryostat) which holds 170 tons of liquid argon. (Continued on page 2)

SCHEDULED EVENTS

Physics Coffee Hour

Mondays, 3:30pm, Science Center Room 205

Physics Problem Solving Nights

Come and have all your questions answered!

Tuesdays 5-7pm in SCI 204.

Starry Mondays Astronomy Lecture Series

October 7, 2013	7:00 - 8:00 pm
November 4, 2013	7:00 - 8:00 pm
December 3, 2013	7:00 - 8:00 pm
February 3, 2014	7:00 - 8:00 pm
March 4, 2014	7:00 - 8:00 pm
April 7, 2014	8:00 - 9:00 pm
May 5, 2014	8:00 - 9:00 pm

Everyone is welcome.

Otterbein Chapter of the Society of Physics Students

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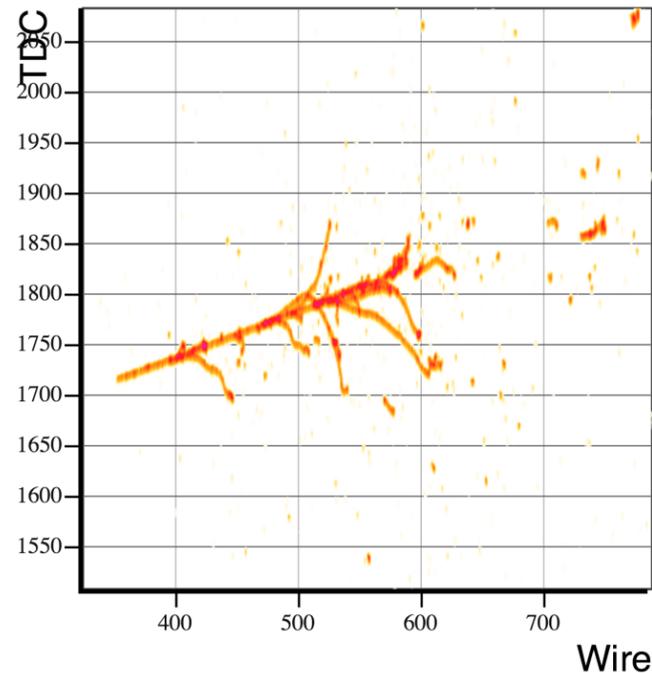
Philip Kellogg will be working with me this summer trying to identify Michel electrons (electrons resulting from the beta-decay of stopped cosmic-ray muons) and using them to try to measure the energy response of the detector. With a little luck, this will make a great senior thesis. I'll also be looking for one other lucky student to work on this project.

MicroBooNE is being built now; first data will probably start coming out around the time we start classes after the summer of 2014... but we get to have fun putting the whole thing together very soon.

You can 'like' MicroBooNE on their [facebook page!](#)

– Nathniel

A simulated electron neutrino as will be seen by the MicroBooNE liquid argon time projection chamber.



Physics Nobel Prize 2013

The Physics Nobel Prize this year was awarded jointly to Francois Englert (Brussels) and Peter Higgs (Edinburgh) "for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider" (photos from the Nobel Foundation website)



Day. See also the article in the 2013 Newsletter, where we explained that "[t]he idea of the 'Higgs mechanism,' the theoretical structure that leads to the Higgs particle, was suggested first in 1962 by Philip Anderson. In the context of particle physics it was developed further in 1964 by three independent groups: Robert Brout and Francois Englert; Peter Higgs; and Gerald Guralnik, C. R. Hagen, and Tom Kibble." Brout died in 2011, and the Nobel committee decided to award the prize to the first two group of researchers.

This is a fast response to the discovery of the particle, announced the previous year on Independence

Gravitational Waves Detected

On St. Patrick's Day, researchers announced that the BICEP2 detector in Antarctica has detected tell-tale signs of long-sought gravitational waves. The waves were predicted by Einstein a century ago, and are created as ripples in the space-time by moving gravitating objects, such as two orbiting black holes. They have never been observed due to their incredibly small amplitudes. The signs - swirling patterns of polarization of the electromagnetic radiation left over from the Big Bang, the so-called cosmic microwave background (CMB), are thought to have been created in the very early universe, and could mean evidence for the theory of cosmic inflation. The latter stipulates that the universe increased its size very shortly after the big bang many trillions of trillions of times, which explains the flatness of the universe and the incredible homogeneity of the CMB (to 1 part in 100,000). The discovery is extraordinary, and will require extraordinary scrutiny.



This academic year's meetings of the Ohio-Region Section of the American Physical Society are held at the University of Cincinnati in fall (October 4&5, 2013), and at Youngstown State University in the spring (April 4&5, 2014). The theme of the fall meeting is "Dark Matter, Dark energy" and the main topic of the plenary talks at the spring meeting is "The Many Faces of Materials: Emergent Phenomena, Ideas, and Uses".

The meetings are starting Friday just after noon, and will end Saturday at noon. They are a great way for students to visit a first physics conference with a supportive atmosphere and free admission!

OP2: Operation Physics is on again for 2014-15

The Ohio Board of Regents has approved funding for a fifth year of OP2: Operation Physics for Middle Grades Science Teachers. This program brings to Otterbein a group of 30 (mainly) middle school physical science teachers for an intensive course in basic physics principles with lots of hands-on activities. This will be the fifth year of OP2 at Otterbein.



OP2ers fire golf ball trebuchets at the Science Center windows. Prof. Robertson directs fire.

Snow Rollers in Westerville

A strange and rare winter weather marvel appeared overnight in Eastern states blasted by blustery winds —snow sculpted into fanciful shapes such as doughnuts and hollow tubes.

Known as snow rollers, the delicate formations are as light as meringues and may crumble when touched, but others are icy enough for play. They were a social media phenomenon in late January sweeping Twitter and Facebook as people from Ohio, Illinois and Pennsylvania posted images of their yards dotted with strange snowballs.

According to the National Weather Service, snow rollers need just the right combination of light,



sticky snow, strong (but not too strong) winds and cold temperatures to form. It's been about 10 years since snow rollers were reported in western Pennsylvania, but snow rollers appeared in near Spokane, Wash., in 2009.

Like a snowball spinning downhill in a cartoon, picking up size, snow rollers grow layer by layer as they're rolled along by the wind. Sometimes they do roll downhill, but in this case, wind created the mysterious, hollow snow tubes. Pictures posted online show tracks in the snow left behind as the snow rollers swept across snowy yards and golf courses.

The snow rollers are the latest in a string of strange winter weather events this month. After the polar vortex dropped temperatures in early January, Lake Michigan birthed its annual crop of giant ice balls. The ice balls form as freezing lake water is tumbled by waves, forming spheres. The coastline of Lake Superior froze as well, allowing hikers to head out to icy sea caves near Wisconsin's Apostle Islands. And the New Year started with a bang in Canada when frost quakes were reported throughout Ontario. When the polar vortex swept through, the cold air rapidly froze water in the ground, causing ice to expand and crack in frost quakes.

(Original Article on LiveScience)