

Schrödinger's Otter

Otterbein Hosts "Operation Physics"

Two weeks over the past summer Otterbein hosted 30 fourth through ninth grade science teachers for the Operation Physics program. The teachers became students of physics in learning a variety of hands-on experiments and activities for use in their classroom. The class was taught by Brian Sell of the Physics department, Wendy Sherman Heckler from Education, as well as two experienced teachers, Dave Reber and Karen Richards.

The course covered topics in sounds, light, color and vision, electricity, magnetism, properties of matter, energy, measurement, forces and motion, simple machines, fluid dynamics and astronomy.

The teachers were enthusiastic students who all contributed to the discussions of improving science education, even though they came from such a diverse background of experiences. "I will be using most of the materials, demos and labs in my classroom," another teacher said in the course evaluation. "This course has excited me about science for the upcoming year."

OP2: Operation Physics is modeled after a suc-



Brian Sell is immobilized by co-teacher Dave Reber and a shop-vac with the help of relative air pressure.

cessful program developed by the National Science Foundation and is supported by the Ohio Board of Regents under its Improving Teacher Quality State Grants Program and by the interest and supplementary funds and services of local school administrators and Otterbein.

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Scheduled Events

Coffee Hour

Wednesdays, 3:30 p.m., Science Bldg. Room 205

Society of Physics Students

- LAN Party (Fall)
- Trip to OSU reactor (Winter Quarter)
- Trip to Fermilab (end of Spring quarter)

"Starry Mondays"

Astronomy Lecture Series

Mondays

October 4, 2010, 7:00pm
November 1, 2010, 7:00pm
February 7, 2011, 7:00pm
March 7, 2011, 7:00pm
April 4, 2011, 8:00pm
May 2, 2011, 8:00pm

PHYSICS CHALLENGE PROBLEM

An inclined plane with opening angle q is at rest on a frictionless horizontal surface. The plane is struck by an elastic ball which is moving horizontally just before impact. The ball bounces off the plane and then lands on it again at the same point as the first impact. Find the ratio of the masses of the ball and the inclined plane, in terms of θ .

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2010 Physics Nobel Prize

This year's Nobel prize was awarded to Andrei Geim and Konstantin Novoselov (both at U Manchester, UK) for their groundbreaking work on graphene. The novel material is a monatomic layer of carbon atoms, and thus truly two-dimensional stuff in a three-dimensional world.

Geim, born in Sochi, then Soviet Union, to German parents, became the first scientist to receive both the Nobel and the Ig-Nobel prize. The latter is, so to speak, the anti Nobel prize, awarded for especially bad or uninteresting science publications. Geim got it for his paper on levitating a frog with superconducting magnets. His unconventional research methods proved a real winner this time. During the Physics coffee hour at U Manchester, the group came up with the wacky idea to flake off layers of carbon atoms from a block of graphite (the stuff in pencils) and over the course of only two weeks produced a monatomic layer. Geim held steadfast to his so-called Lego doctrine,

whereby you have to work solely with the building blocks you have available.

On a personal note, one of us (Trittmann) continues to be inspired for his own research in a quite unrelated field, posting an APS News article on the idea on his wall months before the prize was awarded. Interestingly, it had been proven that a strict two-dimensional lattice of carbon atoms cannot exist (rolled-up nanotubes and spherical buckyballs are curved 2D lattices). Notwithstanding the proof, Geim and Novoselov produced just that, a two-dimensional, if slightly undulated, extremely strong material.

The physics department had discussed possible winners on the eve of the announcement, and was thrilled that young recipients and a mere six year delay proved all our guess work wrong. This sets a great signal for young researchers with original ideas that can be realized in tabletop experiments.

Science Lecture Series

The 2010-11 Science Lecture Series will take place April 15-16, 2011, and will feature Professor Andrea M. Ghez of the UCLA Department of Astronomy. Dr. Ghez is one of the world's leading experts in observational astrophysics, whose work sheds light on how our Milky Way Galaxy, our Sun, and our Earth came to be. Working in the field of high resolution imaging, Professor Ghez has used the Keck telescopes to demonstrate the existence of a supermassive black hole at the center of our galaxy, with a mass 4 million times that of our sun. She was named in Discover magazine's 20th anniversary issue (2000) as one of the top 20 scientists in the country under 40, and the work on the galactic center was selected by the journal Science as one of the top 10 science results for 2002.

Professor Ghez is the recipient of

numerous honor and awards including a MacArthur Fellowship, election to both the National Academy of Sciences and the American Academy of Arts & Sciences, the Aaronson Award from the University of Arizona, the Sackler Prize from Tel Aviv University, the American Physical Society's Maria Goeppert-Mayer Award, the American Astronomical Society's Newton Lacy Pierce, a Sloan Fellowship, a Packard Fellowship, and teaching awards from both Caltech and UCLA.

This year's SLS will be held in conjunction with the 120th annual meeting of the Ohio Academy of Science, hosted by Otterbein University. The Academy is the leading organization in Ohio to foster curiosity, discovery, and innovation and to unite all who value education, science, engineering, technology, or their applications for the



benefit of society. In addition to the annual meeting, the Academy conducts the state science days and publishes *The Ohio Journal of Science*, an international, multidisciplinary, scientific journal.

For further information see <http://www.otterbein.edu/sciencelectureseries>, or contact Diane Nance at 614-823-1846 or DNance@Otterbein.edu.

Semester Conversion is Here

This is the last year on quarters for Otterbein University. The new academic year will be beginning in August with the Fall Semester.

The Physics Department seized the opportunity to revamp its curriculum and came up with some exciting changes that will strengthen the offerings and enhance the students' learning experience.

The biggest change may be the addition of a third semester of introductory physics, dedicated to modern physics, i.e. relativity and quantum mechanics. This frees up time in the first two semesters to present the students with a well-rounded tour of classical physics. It should be noted that these changes only pertain to the calculus-based sequence; algebra-based introductory physics remains a one-year deal. This in turn means that the two strands are out of sync, which triggered a second major change,

namely the separation of the introductory laboratories that used to be taught together. This enables the instructors to cater more specifically to the needs of the two groups of students which naturally come to class with different expectations and preparations.

The remainder of the semester changes are a streamlining of the advanced physics courses, where, among other changes, electrodynamics was upgraded to a whole year.

Otterbein has put rules in place to make sure that all students will be able to graduate in four years, irrespective of how many years they spend "on quarters".



LIBERAL-ARTS MAJORS MAY BE ANNOYING SOMETIMES, BUT THERE'S NOTHING MORE OBNOXIOUS THAN A PHYSICIST FIRST ENCOUNTERING A NEW SUBJECT.

(xkcd.com, permission granted)

Undergraduate Summer Research

Two physics students worked at Otterbein the summer of 2010 on a major particle physics experiment based in Fermilab. Molly Clairemont and Jack Brangham joined Dr. Tagg's research group to work on the MINERvA experiment.

MINERvA (<http://minerva.fnal.gov>) is designed to measure what happens when neutrinos interact in matter. The experiment consists of a 'small' (1 ton) fine-grained detector that will detect the by-products when the nearly massless, charge-less neutrinos from the Fermilab NuMI neutrino beam interact in iron, plastic, and other materials. The particle by-products form tracks seen by detecting a few photons of light created by glowing plastic scintillator.

A focal point of Dr. Tagg's work at Otterbein has been to provide a data visualization tool for use by the scientists. (You can play with this tool yourself, following the links at <http://neutrino.otterbein.edu>.) Molly worked to help adapt this tool and the documentation for use by a wider audience: high school students. Stu-

dents will be able to look at real particle physics events to explore the details of particle decay and momentum conservation on a subatomic scale. Help was given to the group by photography student, Erin Cochran, who lent her artistic eye to develop the aesthetics of the system.

Jack worked to develop a test stand to measure the fundamental properties of the plastic scintillator that MINERvA uses, including numerical simulation of the material for comparison.

Both Jack and Molly also contributed directly, visiting the experimental site and either consulting scientists there or taking shifts late into the night to monitor the detector and the neutrino beam.

Dr. Tagg will continue using students for undergraduate research this summer and in future, funded by an NSF grant for Research at Undergraduate Institutions. Please contact him if you are interested in spending a summer working with him.

OSAPS Meetings

Two meetings of the Ohio-Region Section of the American Physical Society (OSAPS) are scheduled for this year. The autumn conference will be at Marietta College in Marietta, Ohio on "**Physics of Large and Small Surfaces.**" It is a joint meeting of the APS Ohio Section and the AAPT Appalachian and Southern Ohio Sections. The conference dates are October 8-9, 2010.

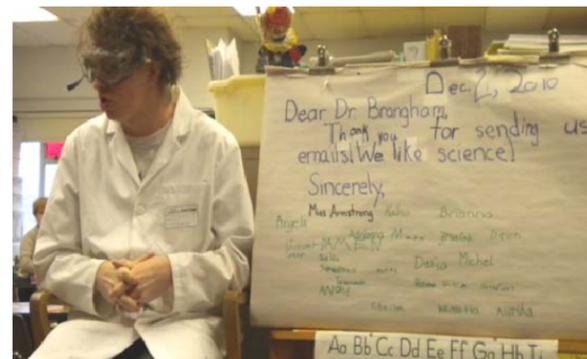
The OSAPS spring meeting will be held at John Carroll University in Cleveland on April 15-16, 2011. The meeting's title is "**Novel materials for our Energy Future**" and the plenary talks will be on thermoelectrics, photovoltaics, energy storage, and energy efficiency.

Both conferences are Friday afternoon/Saturday morning events, and

free for students. Although there is a set of plenary talks on the main theme of the meetings, many short talks with topics from all areas of physics are scheduled in the parallel sessions.

These conferences are a great opportunity for undergrads to attend a first professional conference.

Physics Student Plays Scientist for 1st Graders



Otterbein student Jack Brangham played "Dr. Brangham" for a class of first graders. After the production of a video showing him as a "Mad Scientist" from Otterbein University in search for teacher's assistants for his research on force, motion and energy, he solicited help from the students. He (or the teacher in his name) would send emails to the students with tasks and remarks about their previous work. In the end, he got a nice big letter (see photo) thanking "Dr. Brangham" for his work with the class - which came to "like science".