Student Awards & Honors

Steven Henck (left) and Ian Goyette (right) received departmental awards during the College of Arts & Sciences’ Honors Day held May 2008 in Ira Allen Chapel. Ian was awarded the 2008 David W. Juenker Prize for outstanding scholarship in physics. Steven received the Albert D. Crowell Award for experimental physics on the basis of his honors thesis “Capillary Technology and Laser Light Scattering of Salt Solutions” supervised by Professor Yang.

2008 Sigma Pi Sigma inductees

Two undergraduates were inducted into the UVM chapter of Sigma Pi Sigma in May: Ian Christopher Goyette of Burlington, VT and Alex Gordon Libardoni of Brattleboro, VT.

Lan Zhou received one of six awards for her poster “Surface Roughness Evolution During Sputter Deposition of WSi₂ Amorphous Films” during the National Synchrotron Light Source Users’ meeting held in May at Brookhaven National Laboratory. Lan, a graduate student in the Materials Science program, is completing her Ph.D. thesis under the supervision of Professor Headrick.

Grants & Awards

Isabel Kloumann, a sophomore physics major, was awarded summer support under the College of Arts & Sciences’ APLE (Academic Programs for Learning and Engagement) program. Her project “Pulsar Nulling: Investigation of the Neutron Star Radio Frequency Emission Phenomenon” is supervised by Professor Joanna Rankin.

Lane Manning, a senior physics major, was a recipient of a URECA award. The URECA program pro-

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Faculty Notes

Professor Jun-ru Wu has returned to the faculty after ten years of service to the department as chair. Professor Clougherty will succeed Professor Wu as chair of physics.
Grants and Awards, continued from page 1

Professor Jun-ru Wu is a member of a NASA-EPS-CoR research team that was awarded $750,000 to study mechanisms of mitigating the effects of martian and lunar dust on human health and machine reliability during space exploration.

Professor Dennis Clougherty was awarded $240,000 by the National Science Foundation for theoretical studies of the interaction of ultracold atoms and molecules with surfaces.

Professor Joanna Rankin was awarded $206,000 by the National Science Foundation for her studies of the physics of pulsar core radiation and supernova “kicks.”

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<td><strong>Size Matters</strong> by Ken Picard (06.18.08)</td>
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When it comes to working with ultra-small objects, very few people delve into as tiny a realm as Dennis Clougherty. The denizens of his workaday world — solitons, polarons, superconducting fullerenes and colossal manganites — sound like characters out of Star Trek. Indeed, as a theoretical physicist, Clougherty boldly goes where few of us have gone before: namely, down to the quantum level, where the laws of Newtonian physics fly apart.

Clougherty chairs the physics department at the University of Vermont, where he specializes in condensed matter theory. In layman’s terms, his job is to try to understand and predict the properties of solids and liquids at the quantum scale, where particles are measured in nanometers, or billionths of a meter.

As a frame of reference, think of a nanometer as the distance a whisker grows in the time it takes to raise a razor to one’s face. Or, to use a structure from the field of quantum mechanics itself, imagine a soccer-ball-shaped molecule composed of 60 carbon atoms. This “buckyball,” as it’s called, measures 1 nanometer in diameter. To compare a buckyball with a soccer ball, Clougherty explains, is equivalent to comparing a real soccer ball with the planet Neptune.

Only at such an infinitesimal scale, Clougherty adds, do we encounter the “more correct truth” embodied in quantum mechanics. That is, the laws of nature we’re accustomed to using in the macroscopic world — such as gravity and electromagnetism — simply don’t apply there. As he puts it, “You have to put aside your classical intuition. It will mislead you.”

For example, “When you cool atoms to very low temperatures, they tend not to stick to other surfaces,” Clougherty continues. “This is classically counterintuitive. You’d suspect cold atoms are moving very slowly, so it would be very easy to get them to stick to surfaces. And yet, these cold atoms tend to be reflected from surfaces. Why is that?”

Admittedly, much of Clougherty’s research involves complex mathematics found only in the rarefied scientific communities of places like Harvard and MIT — two schools that Clougherty attended. However, there are also many everyday examples of nanostructures that are easily observable with the human eye.

For instance, think of the iridescent blue in the wings of a Morpho butterfly, or the water-repellence of kale leaves. Both, Clougherty points out, are natural examples of nanostructures. “We see the effects of quantum mechanics all around us,” he says. “We just don’t associate them as such.”

In the realm of human technology, Clougherty’s work has applications in the design of optical electronic devices, such as LCD screens and television sets. It could also come in handy in the future development of a “quantum computer,” which may one day perform highly complex functions that are simply unimaginable using today’s digital machines.

Clougherty devotes considerable time — and his vast scientific knowledge — to devising ways to get children interested in math and science. For instance, he’s done presentations at Burlington schools where he drops marshmallows into liquid nitrogen and shatters them against the wall like light bulbs.
“There are things that you can point to, like superconductivity and superfluidity, that really get kids excited,” he says. “When we levitate magnets, you should see them jump out of their seats.”

UVM’s Dennis Clougherty and David Hammond are giving a series of presentations on the weird and wondrous world of nanotechnology at the ECHO Lake Aquarium and Science Center on Burlington’s waterfront. On June 21, they’ll discuss “nanosurfaces”; on July 10, “liquid crystals”; and on August 14, “nanomaterials and you.” Recommended for ages 8 and older.

**Staff Kudos**

Our physics department administrative coordinator, Marilyn Eldred, received one of two awards for excellence in staff support from Dean Miller at the spring staff appreciation luncheon.

Nota Bene

We would enjoy hearing from all UVM physics alums and friends. Send your email to physics@uvm.edu.

**2008 Graduates**

*Bachelor of Science degree recipients*

- Julian Bouffard
- William Gergits
- Ian Goyette
- Steven Henck
- Jeremy Larson
- Thomas Pearo

*Master of Science degree*

- Jeffrey Herfindal

Congratulations graduates!
Alumni/ae Notes

The physics department relay team for the 2008 Vermont City Marathon featured several UVM physics alums: Kelly Miller (G ’04), Matt Mazlof (’00, G ’02), Professor Chu and Dave Hammond (’84).

Kelly Miller (G ’04) led a team of four advanced placement students from The Study School in Westmount, Quebec in an international physics competition held in Rehovot Israel in April 2008. Kelly and her team won the event, besting forty-four teams from around the world. Dave Hammond (’84) provided valuable technical assistance in the development of the project portion of the competition.