

# SPIRE program sends students overseas, forms three-way nanoscience partnership



When he had a break from research at the University of Hamburg, Wang explored Germany and its landmarks. He is pictured here near Hamburg on one of his weekend trips.

For Kangkang Wang, two continents just aren't enough to satisfy his interest in physics.

Three years ago, the graduate student left his home in China to study physics and astronomy at Ohio University. During Fall Quarter, Wang kicked up dust again — relocating to Hamburg, Germany, as part of an international nanoscience research program offered through NQPI and the office of education abroad.

Wang is the first graduate student from OU to participate in the Spin-Polarized Partnership for International Research and Education (SPIRE).

Funded by the National Science Foundation and designed by four NQPI faculty members, SPIRE sends OU undergraduate, graduate, post-doctoral and journalism students to universities in Germany and Argentina so they can interact with leading nanoscience specialists at these universities.

“Through SPIRE, we are trying not only to foster research on hot topics with social and technological relevance, but also are encouraging international collaboration,” said Assistant Professor of physics and astronomy Dr. Nancy Sandler, who wrote the grant proposal alongside Dr. Arthur Smith, Dr. Saw-Wai Hla and Dr. Sergio Ulloa.

The team chose to collaborate with the University of Hamburg, the University of Buenos Aires and the National Atomic Energy Commission in Argentina because the institutions share research interests with OU and have equipment not available at OU, Sandler said.

SPIRE is the first example of NQPI's 'NanoExchange' program, which promotes international student exchange, collaboration and communication.

For more on Kangkang's time in Germany, visit [www.ounqpi.org](http://www.ounqpi.org).

## NQPI director thanks retiring staff member for contributions

Ms. Cindy White, administrative assistant, has served NQPI for the past three years. In many ways she has helped the institute to progress. This has included making arrangements for NQPI to attend the past Ohio Nanotechnology Summits and other events, such as NQPI's recent annual retreats held at Burr Oak Resort and Conference Center.

Cindy has also been helpful in handling various budgetary issues, ordering items for members and providing financial accounting for the Institute's research incentive account. Cindy's experience in working with the university has been a great benefit to NQPI, and it's been a pleasure working with her. We wish her many happy, relaxing days as she moves into a well-deserved retirement.

— Dr. Arthur Smith, director

Design, layout & articles by Emily Hubbell.  
Editing by Dr. Eric Stinaff

Nanoscale & Quantum Phenomena Institute  
Ohio University  
Clippinger Labs 163, Athens, OH 45701  
Tel: (740) 593-1757 Fax: (740) 593-0433  
Email: [mala@helios.phy.ohiou.edu](mailto:mala@helios.phy.ohiou.edu)  
Web site: [www.ounqpi.org](http://www.ounqpi.org)

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## BY THE NUMBERS

7 DEPARTMENTS

26 MEMBERS

80 STUDENTS

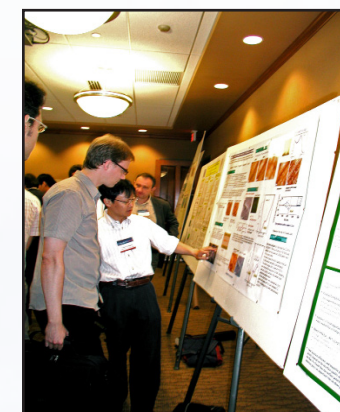
354 PUBLICATIONS IN FIRST FIVE YEARS

# 15,898,901

DOLLARS OF FUNDING SINCE INCEPTION



# International conference goes local



Above: The NNS5-SPSTM2 logo. Below: Graduate students discuss their research with nano experts during poster sessions.

Ohio University's NQPI was showcased on an international level over the summer when it hosted the joint NNS5-SPSTM2 conference.

More than one hundred experts and graduate students from fourteen countries traveled to the conference to discuss current nanoscience issues and to present research.

The conference — consisting of lectures, poster presentations and social activities — was held in Baker University Center over four days in July. Previous con-

ference hosts include Tokyo and Hamburg.

The conference included two parallel sessions. The NNS5 — Nanoscale Spectroscopy and Nanotechnology 5 — was chaired by Dr. Saw-Wai Hla, associate professor of physics and astronomy. The SPSTM2 — Spin-Polarized Scanning Tunneling Microscopy 2 — was chaired by Dr. Arthur Smith, professor of physics and astronomy.

In addition to the parallel contributed talks, national and international experts also delivered plenary lec-

tures, said Mala Braslavsky, conference coordinator and NQPI's special event and outreach coordinator.

She added that creating an open, scientific discussion between people from around the world was top priority for the group that planned the conference.

“It was really important for people at the conference to communicate with each other,” she said. “The conference brought the world here to Athens and to Ohio University.”

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## NSF grant funds colorful light absorption research

At a third-floor lab in Ohio University's Clippinger Laboratory, chemistry isn't black and white. It's purple, red, yellow, orange and — depending on the type of laser — even peach.

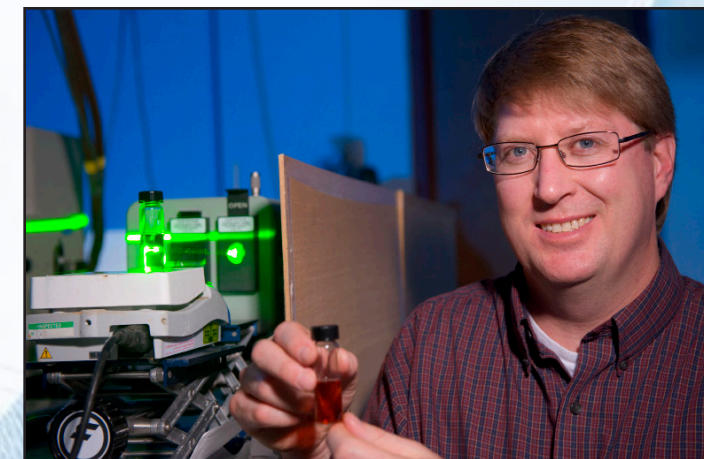
With the help of a \$315,000 grant from The National Science Foundation, an NQPI research team is studying the ability of certain molecules to absorb light and change color at heightened speeds.

“The idea is to design mol-

ecules and materials that respond to light in specific and predictable ways,” said Dr. Jeffrey Rack, associate professor of chemistry. To measure a molecule's ability to absorb light, Rack and chemistry graduate student Beth Anne McClure use laser spectroscopy.

After placing a sample in front of a lamp, the team excites the molecules by hitting

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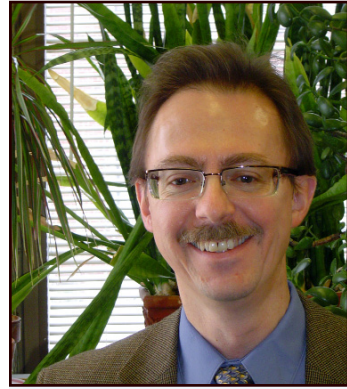
Photos by Rick Fatica, University Photographer.

Above: Dr. Rack takes a break from an experiment in his Clippinger laboratory.

Left: When hit with beams of light, chromophores like this one undergo color changes.

<p><b>DIRECTOR'S CORNER</b> Institute implements graduate education grant, pg 2</p>	<p><b>AN EDUCATION IN ETHICS</b> Professor discusses science conduct, pg 3</p>	<p><b>NANO ABROAD</b> Graduate student studies in Hamburg, pg 4</p>	<p><b>NQPI BY THE NUMBERS</b> Everything you want to know and more, pg 4</p>
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# Director's Corner NQPI implements GERB base funding



*Dear Colleague,*  
Beginning July 2008, Ohio University awarded NQPI with new initiative funding to help support ongoing nanoscience efforts on campus. This award was received after a competitive internal process run by OU's Graduate Education and Research Board (GERB).

The GERB initiative supports both education and research components. The education portion includes the 'NanoExchange', 'NanoMentor' and 'NanoForum' activities. 'NanoExchange' involves sending students abroad for

international research experiences such as our SPIRE program (see related story on back page), while 'NanoMentor' supports co-mentorship of students working across disciplinary boundaries. The 'NanoForum' will be a discussion seminar to foster interdisciplinary collaboration.

To support the GERB research priorities, an important first step has been investing in a helium recycling and liquefaction facility.

The price and availability of liquid helium has been spiraling out of control for the last two to three years, putting an unreasonable load on grant dollars.

The new *He* liquefier, manufactured by *Linde Cryogenics*, will recover helium gas from users and re-liquefy it at a rate of up to 17 liters/hour, saving huge costs and the world's

precious helium resource. A second company — *Quantum Technology* — will supply the recovery system and other components. The capital purchase, to be paid off gradually over five years, is supported not only by the GERB but also by the PIRE grant, an OU Foundation grant and other internal funds.

**"An important first step has been investing in a helium recycling facility."**

— Dr. Arthur Smith, Director, NQPI

Additional GERB funds will be allocated annually to support the program priorities, particularly research efforts along with education, outreach, news/publications and event hosting (such as the conference held last summer). We plan that this newsletter will keep colleagues such as yourself informed of the happenings in nanoscience at OU.

— Dr. Arthur Smith, director

## NANOBYTES

— Dr. Marcia Kieliszewski has been promoted to full professor of chemistry and biochemistry.

— Dr. Arthur Smith has been promoted to full professor of physics and astronomy.

— Dr. Gang Chen has joined NQPI.

— Dr. Martin Kordesch has received a \$262,720 grant from Nanohmics, Inc. for "Optimization of Scan-date High Current Density Cathodes."

— Dr. Ido Braslavsky has received a \$315,000 grant from the National Science Foundation Division of Chemistry for "Experimental Study on the Interaction Between Antifreeze Proteins and Ice." The grant was co-funded by the MPS/CHE, the Molecular and Cellular Biosciences Divisions, the Office of International Science and Engineering and the Office of Polar Programs.

# Research team publishes zigzag graphene model

An NQPI research team recently published a model illustrating the effects of confinement, spin-orbit interaction and the Coulomb interaction on an electron's movement along a zigzag graphene ribbon — research that could have applications for future electronic devices.

The team — comprised of Assistant Professor of physics

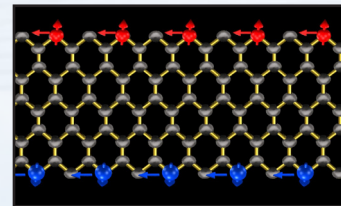
and astronomy Nancy Sandler and postdoctoral research assistants Mahdi Zarea and Carlos Busser, currently at Oakland University — published its findings in the paper, "Unscreened Coulomb Interactions and the Quantum Spin Hall Phase in Neutral Zigzag Graphene Ribbons." Phys. Rev. Lett 101, 196804 (2008). The paper was published in

November and was featured in the Virtual Journal of Nanoscale Science and Technology.

Graphene — a sheet of carbon that comprises graphite when layered — is considered a natural successor for silicon, the semiconductor used in 99 percent of all electronics today, Zarea said.

Graphene's rigidity and

high electron mobility make it well-suited for spintronics and a hot topic in nano research.



This model shows the movement of electrons in a zigzag graphene ribbon.

# Physics alumnus returns for speech on patenting, technology transfer

Ohio University alumnus Dr. Howard Lee Mosbacker returned to his alma mater in November to discuss ways for researchers to market their ideas and technology to businesses.

Mosbacker, who earned his bachelor of science in physics at OU, held a small discussion with NQPI members prior to giving a colloquium entitled "The Physics of Entrepreneurship."

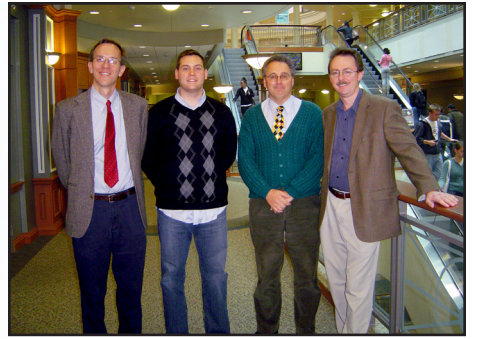
Creating a business plan and finding a niche market are important steps

in marketing an idea, Mosbacker said.

Securing a patent is crucial because once a researcher goes outside a university with an idea, it is unprotected, he added.

Mosbacker started Traycer Diagnostic Systems — a Columbus-based company that specializes in the use of microwave and tetrahertz imaging for medical applications — in 2008.

After finishing his undergrad at OU, Mosbacker completed graduate work



Department Chair Dr. Joe Shields, Dr. Howard Lee Mosbacker, Dr. David Ingram and Dr. Arthur Smith pause for a photo following their discussion.

at Ohio State University. He developed the idea for Traycer Diagnostic Systems while working there.

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the sample with a laser beam. The result of the photochemical reaction is a different compound with a different color, Rack said.

"The notion of initiating substantial changes in molecules with light is very compelling," Rack said. "Plus, things that change color are cool."

The research focuses on a certain family of chromophores that Rack said could improve the effectiveness of a fashion accessory seen widely around campus— sunglasses.

Currently, the photochromic material in sunglasses is also thermochromic, meaning it reacts to heat. This causes sunglasses to 'fatigue,' or to stay dark.

"The problem with the thermochromic effect is that if you're sitting in a very hot room, the sunglasses would start to change color regardless of how much light is there. This would be very annoying to the person wearing them," Rack said.

The team is studying a molecule that gets lighter colored in darker environments and is also not thermochromic. It could potentially be used as a next generation photochromic material, he said, adding that it also has industrial and military applications.

## SUMMER, from pg 1

Graduate students discussed their research with the experts through oral presentations and poster sessions.

Swati Ramanathan, an OU physics and astronomy graduate student who participated in the poster session, said the experience allowed her to showcase her research to a wide audience without having to pay for international travel.

"If the conference weren't in Athens, I would've had to travel far to present my research to an international audience," Ramanathan said. She added that a highlight of the conference was meeting a scientist from her hometown, Bangalore, India.

**"The conference brought the world here to Athens."**

— Mala Braslavsky, Conference coordinator

al audience," Ramanathan said. She added that a highlight of the conference was meeting a scientist from her hometown, Bangalore, India.

Kangkang Wang, an OU physics and astronomy graduate student, said that the international conference was one of the best he has attended, partly because it was conveniently held within walking distance of his home.

Nightly dinners and group outings provided additional ways for attendees to interact during the conference, Braslavsky said.

# Professor talks nanoscience ethics

Ethical issues have always been a part of science, but emerging fields like nanoscience provide unique opportunities for scientists to incorporate ethics into their classrooms and their labs, said Dr. Arthur Zucker at the 5th International Congress of Nano-Bio & Clean Tech.

"It's not just nanoscience. It's taking advantage of something new that people are looking at and changing the way scientists are taught to see science," said Zucker, chair and associate professor of philosophy and an NQPI member.

Professionals should think about the

social and ethical implications of science before conducting research, Zucker said. He added that an important aspect of ethics is to consider the public's perception of the science and the problems the public may have with it.

Many professionals in nano are already doing a good job focusing on ethics. But there is still more room for ethics in science curriculum, which should be taught by scientists and not separate ethicists, he said.

"The goal is to think about these issues before problems arise," he said.

## The life of NQPI

Since its formation in 2001, NQPI and its members have reached many milestones, recapped on this timeline.

