Notre Dame Science
Department of Physics

Physics Tracks

August 2012

Commencement 2012—*Good luck graduates!*

The Department of Physics honored 17 undergraduates and 15 doctorates at the May 2012 commencement ceremony. Special awards were also given.

UNDERGRADUATE AWARDS

Outstanding Senior Physics Major: **Julie A. Cass**

Outstanding Undergraduate Research: **Thomas A. Catanach**

Paul Chagnon Award for Service to the Department: **Santina Michelle Consiglio**

Dean's Award for Outstanding Research in the College of Science: **Nancy A. Paul**

Bachelor of Science Degrees

Adam J. Alongi
Mathew D. Anthony
Christopher T. Bell
Jeffrey M. Berryman
Julie A. Cass
Thomas A. Catanach
Santina Michelle Consiglio
Daniel J. Corey
Kathryn A. Gerbich
Mary Ellen Keneally
Alexander W. Kocurek
Corey M. Kownacki
Katherine E. O'Connor
Giuseppe Passucci
Nancy A. Paul
Michael T. Puza
John Riley

GRADUATE AWARDS

Department of Physics Research and Dissertation Award: **Alejandro de la Puente PhD** and **Ayan Paul PhD**

Larry O. Lamm Memorial Award Recognizing Outstanding Service and Dedication to the Nuclear Structure Laboratory: **Richard deBoer PhD**

Continued on page 3

Inside this issue:

Contact information

Phone: 574-631-6386
Fax: 574-631-5952
E-mail: physics@nd.edu

225 Nieuwland Science Hall
Notre Dame, IN 46556

Web site: physics.nd.edu

Alumni—let us know about your recent achievements and appointments. We look forward to hearing from you!

Mitchell Wayne, Department Chair
Kathie Newman, Director of Graduate Studies
Anthony Hyder, Director of Undergraduate Studies

Physics faculty promotions & reappointment

Michael Hildreth has been promoted to Professor of Physics. His primary research interest is in discovering and understanding the mechanism or mechanisms responsible for Electroweak Symmetry Breaking. He is a part of the CMS experiment at CERN and also involved in an accelerator instrumentation project at SLAC and the KEK laboratory in Tsukuba, Japan.

Nicolas Lehner has been promoted to Research Associate Professor. His research focuses on understanding the physical processes that drive and regulate the growth of galaxies.

Arielle Phillips has been reappointed to another three-year term as Research Assistant Professor. Her research interests include the missing baryon problem, the intergalactic medium in simulations, and the geometrical structure in simulations and surveys.

Faculty news & notes

Ani Aprahamian, the Frank M. Freimann Professor of Physics, is featured in a video commissioned by the National Research Council (NRC) in conjunction with its recently-published decadal review of the field of nuclear physics. Aprahamian is vice chair of the committee that produced the report. The video, called "Exploring the Heart of Matter" presents the scope of nuclear physics research, from the interior of the atom to the vast expanses of the universe, as well as its economic and social benefits, including diagnosis and treatment of cancer.

Professors Antonio Delgado and **Christopher Kolda**, and Postdoctoral Research Associate Jorge de Blas Mateo have received a grant from the Mexican government that will strengthen ties between the University of Notre Dame and universities in Mexico. The grant, supporting research in models of particle physics relevant for the Large Hadron Collider at CERN, involves Notre Dame, the University of Puebla and the University of Colima both in Mexico, and the University of Southampton in the United Kingdom. The renewable grant provides for travel by faculty and students between Notre Dame and the Mexican universities for collaborative work, at least once a semester in each direction.

Professor Umesh Garg was appointed to the Beam-time Program Advisory Committee (B-PAC) of the Cyclotron Facility of the Research Center for Nuclear Physics (RCNP) at Osaka University in Osaka, Japan. The committee advises the director on the scientific merit and feasibility of proposals for experiments using the RCNP AVF or AVF-Ring cyclotron accelerator facility, as well as providing scientific and technical advice to the director on problems during experiments.

Prof. John LoSecco will spend six months in France as a Fulbright Foreign Scholar starting this fall. The award will enable him to be on-site at a critical stage of the international Double Chooz experiment that has been under way for years. This experiment is aimed at better understanding fundamental properties of neutrinos. The effort involves a team of some 100 people from around the world.

Professor Zoltán Toroczkai and Postdoctoral Research Associate Mária Ercsey-Ravasz of the Interdisciplinary Center for Network Science and Applications, in collaboration with food science experts, have recently published a rigorous analysis of the international food-trade network that shows the network's vulnerability to the fast spread of contaminants as well as the correlation between known food poisoning outbreaks and the centrality of countries on the network. The paper was titled "Complexity of the International Agro-Food Trade Network and Its Impact on Food Safety."

As the world's population climbs past 7 billion, the sustainable production and distribution of food is balanced against the need to ensure its chemical and microbiological safety. The new paper maps the international agro-food trade network (IFTN)—a highly complex and heterogeneous system formed around a core group of seven countries, each trading with more than 77 percent of the world's nations. Since any two countries in the IFTN have only two degrees of separation on the network, the IFTN is capable of spreading a foodborne contaminant very efficiently. It also tends to mask the contaminant's origins once the system is compromised, since so many network paths run through the central nodes.

Notre Dame's Research Experience for Undergraduates (REU) program in Physics celebrated its 26th year this summer. The participants spent ten weeks working closely with physics faculty—and also had some fun. The program advisor is Prof. Umesh Garg, and it is funded by the National Science Foundation.

New faculty welcomed

The department is pleased to welcome two new faculty members this fall. **Justin R. Crepp** and **Kenjiro K. Gomes** have each been appointed as Freimann Assistant Professors of Physics.

Crepp comes to Notre Dame from the California Institute of Technology. He completed his PhD in 2008 at the University of Florida. His research involves using new high-contrast imaging technology and observational techniques to directly detect and study extrasolar planets that orbit nearby stars.

Gomes was at Stanford University. He completed his PhD in 2008 at the University of Illinois Urbana-Champaign. The goal of his research project is to use scanning tunneling microscopy and atomic manipulation to assemble—one atom at a time—artificially engineered electronic systems.

Look for more information about our new faculty in future newsletters.

Commencement 2012, *continued*

Doctoral Degree Recipients (and Faculty Advisor)

August 2011 Graduates

Hyunju Kim
(Prof. Zoltán Toroczkai)

Aniruddha Konar
(Prof. Malgorzata Dobrowolska-Furdyna and Prof. Debdeep Jena)

January 2012 Graduates

Sergio Almaraz-Calderon
(Prof. Ani Aprahamian)

Andreas Best
(Prof. Michael Wiescher)

Richard deBoer
(Prof. Michael Wiescher)

Laura Kinnaman
(Prof. Kathie Newman)

Ted Kolberg
(Prof. Colin Jessop)

Joseph Ribaudo
(Prof. Jay Christopher Howk and Prof. Nicolas Lehner)

Xue Rui
(Prof. Bruce Bunker)

Nan Sun
(Prof. Steven Ruggiero)

May 2012 Graduates

Matthew Becker
(Prof. Bruce Bunker and Prof. Prashant Kamat)

Alejandro de la Puente
(Prof. Antonio Delgado)

Antonios Kontos
(Prof. Michael Wiescher)

Ayan Paul
(Prof. Ikaros Bigi)

Zhen Song
(Prof. Bruce Bunker)

PhD alumni in the news

Marianna Safronova, who earned a PhD in Physics at Notre Dame in 2001 and now serves as an associate professor at the University of Delaware, has been named the Woman Physicist of the Month for August 2012 by the American Physical Society's Committee on the Status of Women in Physics. Each woman so recognized is nominated by a peer whose life or career she has influenced.

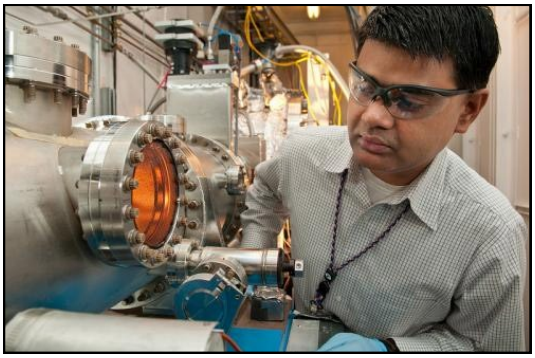
Safronova has become a leader in the theory of atomic structure, bringing new excitement to this venerable field with her pioneering calculations and her precise, versatile thought. She has been sought out by experimentalists in a vast array of fields: the next generation of atomic clocks, dynamics of ultracold atoms, quantum information processing, tests of fundamental symmetries, physics beyond the Standard Model, and searches for time variation of the fundamental constants.

Prof. Safronova was advised by **Prof. Walter Johnson** at the University of Notre Dame.

Bhoopesh Mishra is a 2006 PhD graduate from the Department of Physics, who was advised by **Prof. Bruce Bunker**. The following is excerpted from the phys.org:

(Phys.org) -- If Bhoopesh Mishra had to pick a favorite food it would be seafood. Any type of seafood. Anytime. So when as a postdoctoral scholar he had a choice to pick a research topic, his taste buds had their say.

"There was a natural connection to studying mercury contamination," said Mishra, a guest scientist at the U.S. Dept. of Energy's (DOE) Argonne National Laboratory and a faculty researcher at the Illinois Institute of Technology. "Mercury contamination is a global problem, and when it finds its way into the water, it very, very rapidly makes its way up the food chain from small fish to large fish to our dinner tables."



Details of how to use bacterium to prevent mercury from becoming airborne were published in the *Journal of Environmental Science and Technology.*

Graduate student honors

Chad Meyer received the 2012 Center for Research Computing Award for Computational Sciences and Visualization. Meyer studies computational astrophysics, simulating star formation. He models the complex fluid dynamics within molecular clouds, which ultimately lead to the gravitational collapse of the first protostellar cores. To facilitate this, he also works in the area of algorithm development, building new numerical methods to improve the computational efficiency of simulations. His advisor is **Prof. Dinshaw Balsara**.

Nancy Paul was selected to receive a 2012 National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Fellowship. Paul earned her Bachelor of Science in Physics with a concentration in Advanced Physics in May from the University of Notre Dame, and has enrolled in the physics graduate program at ND. Her research focuses on low-energy nuclear structure and its impact on astrophysical processes, such as heavy-element nucleosynthesis.

Catherine Rastovski attended the 62nd annual Lindau Nobel Laureate Meeting, an opportunity for young researchers and Nobel laureates to inform and inspire each other. Rastovski is a member of **Prof. Morten Eskildsen**'s condensed matter physics group, where her research examines the superconducting state of unconventional superconductors using Small Angle Neutron Scattering.

Sabrina Strauss was named fellow of the Krell Institute. Recognizing an ever-increasing demand for scientists highly trained in areas of interest to stewardship science, the Department of Energy National Nuclear Security Administration founded the Stewardship Science Graduate Fellowship (DOE NNSA SSGF) in 2006. Strauss was one of five new fellows being welcomed into the program in 2012. She completed her undergraduate studies in May at Rutgers, The State University of New Jersey, and is a first-year graduate student at Notre Dame.

Anna Woodard received a three-year Graduate Research Fellowship from the National Science Foundation. Woodard, who is doing research in high energy physics, collaborates with other Notre Dame students and faculty on the Compact Muon Spectrometer (CMS) team at CERN's Large Hadron Collider, a particle accelerator in Switzerland. For her dissertation, Woodard plans to study the mechanism by which a Higgs boson is produced in association with a pair of even heavier particles called top quarks. Her advisor is **Prof. Kevin Lannon**.

The Kaneb Center Graduate Student Program at the University of Notre Dame named **Brendan Benapfl**, **Danielle McDermott**, and **Bryan Ostdiek** as outstanding graduate student teaching assistants in spring 2012. This program recognizes graduate students who have demonstrated excellence in the classroom, laboratory, or in another significant instructional capacity.

Find us on Facebook

Transit of Venus celebrated

On Tuesday, June 5, members of the Notre Dame and South Bend communities came to the Jordan Hall of Science to witness the Transit of Venus, a rare astronomical event in which the Earth, Venus and the Sun align. Over one thousand visitors gathered to watch Venus transit the sun for the last time this century.

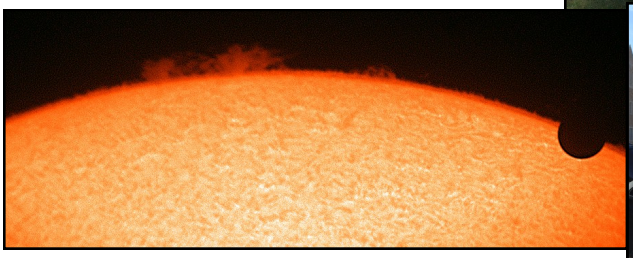


Image of the Venus transit taken at the Jordan Hall observatory. At the right, Venus is just starting its transit while a large Solar prominence is seen at the center.
Photo credit: Colin Littlefield.