

## Finding our way in the cosmos

In the spring semester the physics department hosted a three-part lecture series that explored the universe and our place in it.

The first event was Wednesday, February 15, when Father José Funes, SJ, Director of the Vatican Observatory presented a Nieuwland Lecture titled, "Why Science and Faith Matter to Each Other."



Father Funes participates in the unique work for the Catholic church in Rome: the Vatican Observatory. In this lecture, he spoke about this crossroads of science and faith and how important it is to promote dialogue between them.

The second event featured the recipient of the 2011 Nobel Prize in Physics. Dr. Brian Schmidt, of Australian National University, spoke Monday, February 27. His talk, "The Acceler-



Dr. Brian Schmidt lecture in Jordan Science Hall on February 27.

ating Universe," was part of the Lynch Lecture Series.

In 1998, two teams traced back the expansion of the universe over billions of years and discovered that it was accelerating, a startling discovery that suggests that more than 70% of the cosmos is contained in a previously unknown form of matter, called Dark Energy. His work was awarded the 2011

Nobel Prize in Physics, jointly with Adam Riess and Saul Perlmutter. Schmidt, who led the High-Redshift Supernova Search Team, described this discovery and explained how astronomers have used observations to trace our universe's history back more than 13 billion years, leading them to ponder the ultimate fate of the cosmos.

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

**Mitchell Wayne**,  
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## Physics faculty named AAAS fellows

Three Department of Physics faculty are among five University of Notre Dame faculty who have been named fellows of the American Association for the Advancement of Science (AAAS) in honor of their scientifically or socially distinguished efforts to advance science or its applications. AAAS, founded in 1848, is the world's largest scientific society and publisher of the prestigious journal *Science*.

The new Notre Dame AAAS fellows from physics are: **Mark Alber**, Vincent J. Duncan Family Professor of Applied Mathematics, concurrent professor of physics and computer science and engineering, director, [Interdisciplinary Center for the Study of Biocomplexity](#) and adjunct professor of medicine, Indiana University School of Medicine; **Margaret Dobrowolska**, the Rev. John Cardinal O'Hara,

C.S.C., Professor of Physics; and **Jacek Furdyna**, professor of physics, Aurora and Thomas Marquez Professor of Information Theory and Computer Technology.



## Faculty news & notes

**Ani Aprahamian**, the Frank M. Freimann Professor of Physics,



has been elected chair of the American Physical Society's Division of Nuclear Physics. The APS DNP is

composed of scientists and educators who study fundamental problems related to the nature of matter—the properties of nuclei and of their ultimate constituents, quarks and gluons.

**Margaret Dobrowolska**, professor of physics, has led a team



of collaborators from Notre Dame, the University of British Columbia, and Berkeley Lawrence National

Laboratory in an effort which has succeeded in identifying the mechanisms responsible for ferromagnetism in the semiconductor GaMnAs. This new understanding provides a handle for planning new strategies aimed at increasing its critical temperature, with an eye of making it ferromagnetic at and above room temperature, and thus opening the way toward realistic spintronic devices. This achievement is featured in the

February issue of [Nature Materials](#) in an article, “Controlling Curie temperature in (Ga,Mn)As through location of the Fermi level within the impurity band” by M. Dobrowolska, K. Tivakornasithorn, Y.-Y. Zhou, X. Liu, and J.K Furdyna (Notre Dame), M. Berciu (University of British Columbia, and K.M. Yu and W. Walukiewicz (Berkeley Lawrence National Laboratory).

In a recent paper published in [Physical Review Letters](#), Notre



Dame graduate student Pinaki Das and Associate Professor **Morten Eskildsen** re-

port results of their latest small-angle neutron scattering studies of the vortex lattice studies in the heavy fermion superconductor CeCoIn<sub>5</sub>. In particular they investigated the detailed interplay between superconductivity and magnetism in this material, which show very strong Pauli paramagnetic effects on the vortex cores. Studies of Pauli paramagnetic effects in superconductors were been pioneered by the Eskildsen group. The present results were obtained in collaboration with colleagues at University of Bir-

mingham (UK), the Paul Scherrer Institute (Switzerland), University of Montreal (Canada), Brookhaven National Laboratory and Los Alamos National Laboratory. (“Vortex Lattice Studies in CeCoIn<sub>5</sub> with H.LC”).

A new, state-of-the-art instrument, the AP-XPS (ambient pressure X-ray photoelectron spectrometer), was recently installed in the Radiation Laboratory. The project brought together faculty in the departments of physics and chemistry in a collaboration that included the Radiation Laboratory, the Department of Energy, the Office of the Vice President for

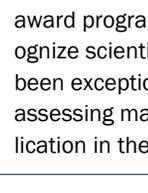


Research, and the College of Science. **Sylwia Ptasinska**, the first faculty member at

Notre Dame with a joint appointment in physics and the Radiation Lab, will use the instrument to study chemical changes in biomolecules such as proteins or DNA when they are irradiated. The AP-XPS will allow her to introduce water into the system to observe its effects during the radiation, rather than observing the DNA alone.

Professor **Jonathan Sapirstein**

has been named as an Outstanding Referee by the American Physical Society for 2012. The APS initiated the highly selective



award program in 2008 to recognize scientists who have been exceptionally helpful in assessing manuscripts for publication in the APS journals.



Nobel Laureate Dr. Brian Schmidt held informal discussions with the physics graduate students during his visit to Notre Dame in February.

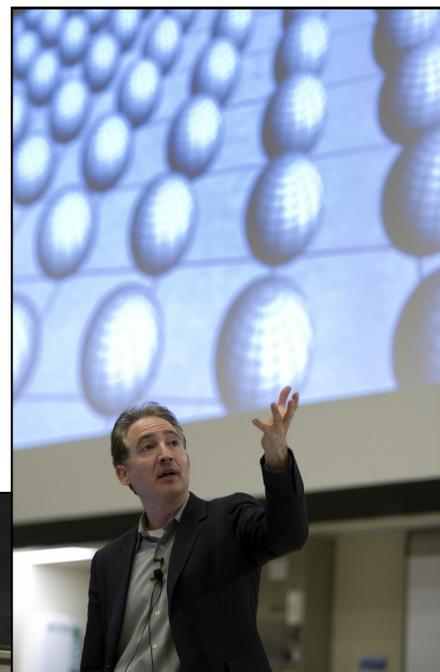
## Cosmos lecture series, continued

The third event featured Dr. Brian Greene of Columbia University and author of *The Elegant Universe* and *The Fabric of the Cosmos*. Dr. Greene presented “The Fabric of the Cosmos” on Tuesday, March 6, sponsored by the Building Bridges lecture series, the Niemand Lecture Series, and the Glynn Family Honors program. This public lecture was designed for a non-scientific audience. Greene also gave a physics department colloquia earlier that afternoon titled “The State of String Theory.”

Greene told a Notre Dame *Observer* writer “My goal is to make science accessible, exciting, and wondrous, because that’s what it is,” said Greene concerning his unique interest in conveying matters of physics to the general public.

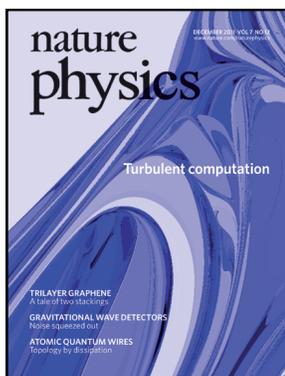
“To me it feels like the work that we’re doing is so vital that for it to be hidden behind the doors of the academy is tragic. People need to have an input, as opposed to shy away from joining the conversation because of a fear of science.”

Greene has worked diligently to reach the non-physics public through a number of books as well as two NOVA television series.



Dr. Brian Greene presented a standing-room only physics colloquium on March 6 in Jordan Hall of Science.

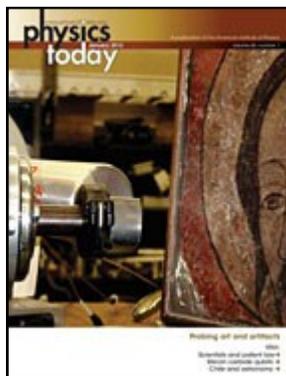
## Faculty research featured on two journal covers



The research work of [Prof. Zoltán Toroczkai](#) and former Notre Dame postdoc Mária Ercesey-Ravasz was featured on the cover of the 2011 December issue of [Nature Physics](#).

“Optimization hardness as transient chaos in an analog approach to constraint satisfaction,” is the title of the article.

Constraint-satisfaction problems are among the computationally hardest tasks: solutions are efficiently checkable, but no efficient algorithms are known to compute those solutions. Fresh insight might come from physics. A study mapping optimization hardness onto the phenomena of turbulence and chaos suggests that constraint-satisfaction problems can be tackled using analog devices.



Professors [Philippe Collon](#) and [Michael Wiescher](#) are using accelerated ion beams to pinpoint the age and origin of material used in pottery, painting, metalwork and other art. The results of their tests can serve as powerful forensic tools to

reveal counterfeit art work, without the destruction of any sample as required in some chemical analysis.

Their research is featured on the front cover of the January 2012 issue of [Physics Today](#) in an article titled, “Accelerated ion beams for art forensics.” Wiescher and Collon say, “Art experts play an important role in identifying the style, history, and context of a painting, but a solid scientific basis for the proper identification and classification of a piece of art must rely on information from other sources.”

## Alumnus launches video series of scientists



César Hidalgo, who earned a Ph.D. in Physics at Notre Dame in 2008, has started an online video series of scientists, “Cambridge Nights: Conversations About a Life in Science.” The series is produced at the M.I.T. Media Lab that he joined last year. Hidalgo is the ABC Career Development Professor at The Media Lab and a faculty associate at the Center for International Development at Harvard University.

Hidalgo’s first guest last October was Albert-László Barabási, his advisor at Notre Dame who is now at Northeastern University, on the science of networks.

Others were Juan Pérez Mercaader of Harvard on the origins of life and astrobiology; Marshall Van Alstyne of Boston University on information markets; Luis Bettencourt of the Santa Fe Institute on the science of cities and on scientific productivity; Ricardo Hausmann on what differentiates nations at different levels of development and on economic “black matter”; Marc Vidal of Harvard on systems biology; and Geoffrey West of the Santa Fe Institute on the fractal nature of the metabolism and the scaling laws of life.

Two filmmakers at the lab assist with the low-budget project, with most guests from Harvard University a taxi drive away or visitors in town for research collaborations. The academics in the first season were friends of Hidalgo. Marta Gonzalez, Rosalind Picard, Steven Pinker, Nicholas Christakis and Joe Loscalzo are already scheduled for the second season. The site has received more than 15,000 visitors, including some from the United Kingdom, Canada, Chile, Spain, and other countries.

The site is: [cambridgenights.media.mit.edu](http://cambridgenights.media.mit.edu)

## NDeRC holds Forum V

On Saturday, February 25 the [Notre Dame extended Research Community](#) (NDeRC) gathered education and research professionals for the fifth annual Collaborating for Education and Research Forum in the Jordan Hall of Science.

The event fosters interaction among K-12 teachers and administrators; university faculty, graduate students and staff; and local industry specialists in science, technology, engineering and mathematics.

Presenters included representatives from NDeRC, the Institute for Educational Initiatives, the Center for Sustainable Energy at Notre Dame, ETHOS (Encouraging Technology & Hands On Science), Riverbend Community Math Center, and others.

