

Physics INTERACTIONS

A NEWSLETTER HIGHLIGHTING THE DEPARTMENT OF PHYSICS AT PURDUE UNIVERSITY

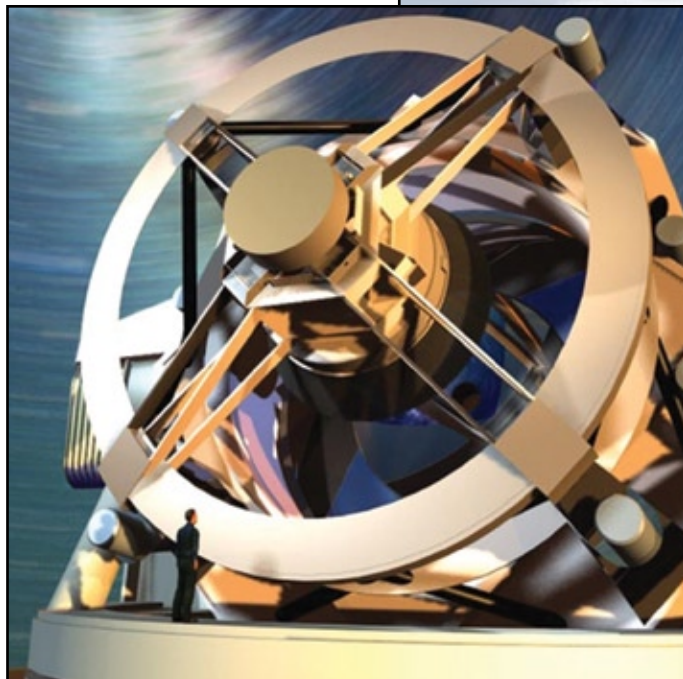
PURDUE
UNIVERSITY

2007



**The Department of
Physics Welcomes
Purdue University
President France
Córdoba as its
Newest Faculty
Member** (page 3)

**Purdue Joins Large
Synoptic Survey
Telescope Consortium
(LSST)** (page 8)



Inside

- 3** New Faculty
- 4** Milestones
- 5** Faculty Honors
- 6** Physics News
- 10** Student Awards
- 12** Alumni News



From the Head

Welcome to this new issue of *Physics Interactions*. As you scan through this newsletter, you'll see that there is news to report. The first piece of news I should mention is that Andrew Hirsch has stepped down from his position as Department Head, after serving in that role for nearly 10 years. We are all very grateful for everything he has contributed to the Department. I assumed the position of Department Head in July and I hope that I can meet the high standards set by Andy. I have been fortunate in recruiting two new Associate Department Heads, Marc Caffee and Hisao Nakanishi, who are off to a fast start in helping to keep the Department running smoothly.

Since becoming Head, I have gained a new appreciation of the Department. I have gotten to know many more of our outstanding undergraduate and graduate students. I have also had the pleasure of working closely with our young faculty. In the past several years, under Andy's leadership, we have added 18 new faculty, who bring a great deal of energy and many new ideas to the Department. (And I should also mention the newest Physics Professor on campus, our new President France Córdova – see next page). I thus look forward to a very bright future for the Department.

While I am very optimistic about the future, there are many challenges ahead. We are now in the midst of redesigning our undergraduate curriculum for physics majors. This is the first major review of the curriculum in several decades, and is needed to keep our program alive and current. Another challenge is to provide increased scholarship support, more research opportunities, and other resources for our students. Here many of the Department's friends are essential, in providing scholarships and other support for the Department's programs (see p. 10). A third challenge is to provide our new faculty with the mentoring and other resources (such as high quality research space) they need to reach their full potential.

Meeting these challenges will not be easy, but I am confident that with the support of the entire Department and its many friends, good times lie ahead.

-Nicholas J. Giordano ('73)

Hubert James Distinguished Professor of Physics and Department Head

Credits

This newsletter is published annually by the Department of Physics at Purdue University. Please address any questions to our department at the phone number below.

Department Head
Nicholas Giordano

Editors
Bill Fornes - Assistant to the Head
Mike Focosi - Webmaster
mfocosi@purdue.edu

Contact Information:
Department of Physics
525 Northwestern Avenue
West Lafayette, IN
47907-2036

www.physics.purdue.edu
Telephone: (765) 494-2970
Fax: (765) 494-0706

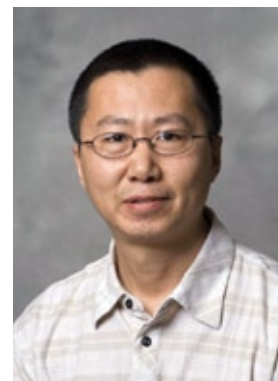
An electronic version of this publication is available for downloading at:
www.physics.purdue.edu/interactions

New Faculty

Yong P. Chen, Assistant Professor of Physics, uses quantum physics to manipulate electrons, atoms, spins and photons in various materials and artificial systems, with the aim to uncover novel quantum phenomena and new states of matter, and to explore applications in quantum devices (such as quantum information and quantum computation devices) and nanotechnology (such as nanoelectronics and nanosensors). Chen received a bachelor's degree from Xi'an Jiaotong University, an M.Sc. from the Massachusetts Institute of Technology and a Ph.D. from Princeton University.



Wei Xie, Assistant Professor of Physics, specializes in experimental high energy nuclear physics, studying the quark-gluon plasma believed to be created a few micro-seconds after the Big Bang. The experiments are being done at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Lab and at the Large Hadron Collider at CERN. Xie received a bachelor's and master's degree from Shanghai University and a Ph.D. from the Institute of High Energy Physics, Academia Sinica.



France Córdova, Professor of Physics, is an astrophysicist. Her interests include observational and experimental astrophysics, multi-spectral research on x-ray and gamma ray sources, and space-borne instrumentation. Córdova received a bachelor's from Stanford University and Ph.D. from the California Institute of Technology. She is also Purdue University's 11th President.



Chen Yang, Assistant Professor of Chemistry and Physics, is an experimental condensed matter physicist. Her research areas include: 1) controlled synthesis of nanowires and nanowire heterostructures; 2) design and demonstration of novel device concepts for nanoelectronics and nanophotonics; 3) hierarchical organization of the nanoscale building blocks into integrated systems in two or three dimensions, using chemical or biological interactions. Yang received a bachelor's degree from the University of Science and Technology of China, a master's degree from Hong Kong University of Science and Technology, and a Ph.D. from Harvard University.



Birgit Kaufmann, Assistant Professor of Mathematics and Physics, is a theoretical condensed matter physicist. Her research includes condensed matter theory, correlated systems, non-equilibrium phenomena in quantum phase transitions, integrable models and scattering theories, Bethe Ansatz for quantum spin chains, and reaction-diffusion systems. Kaufmann received her B.S., M.S., and Ph.D. from the University of Bonn, Germany.



Milestones

College of Science Celebrates Centennial



Physics Building (1962)

It was 1907 when Stanley Coulter was appointed Purdue's first dean of Science, and 100 years later, science has transformed Purdue and our society. We celebrate the last hundred years and look forward to all the next century has to hold with a series of events during the 2007-08 academic year. The College of Science kicked off its Centennial celebrations with the Discovery Channel's *MythBusters* on October 28, 2007 and will host acclaimed primatologist Jane Goodall on March 29, 2008. Between these two special occasions, the College will host a series of distinguished lecturers in each of the science disciplines comprising the College. The lecturer for the Physics Department, Mildred Dresselhaus of the Massachusetts Institute of Technology, will visit Purdue on February 7, 2008.

The College of Science Centennial celebrations are a way to pay tribute to the men and women whose discoveries have changed and improved our quality of our lives. The celebrations are also designed to motivate students, particularly those in middle and high school, to study science, technology, engineering, and mathematics, and choose science as their number one career option.

- Jeffrey S. Vitter

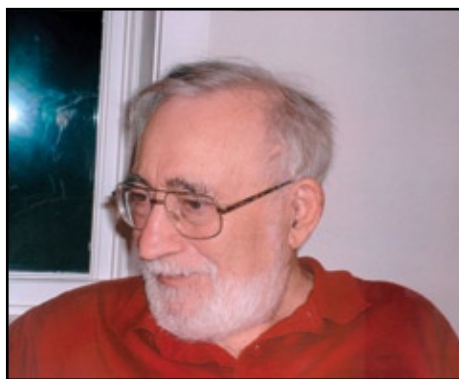
Frederick L. Hovde Dean of Science

For more information visit
www.science.purdue.edu/centennial/.

Symposium in Honor of Professor Ralph Bray

The Physics Department remembered the career of Professor Ralph Bray (1921-2006) at a memorial symposium on April 27, 2007. Following opening remarks by Department Head Andrew Hirsch and Ralph's wife Felice, Professor Esther Conwell from the University of Rochester, a classmate of Professor Bray's at Brooklyn College and a lifelong colleague, recalled their 60-plus year relationship. Professor Roberto Collela delivered a presentation on "X-ray Diffraction Studies of Acoustoelectrically Amplified Phonons: My Collaboration with Ralph Bray."

Physics alumnus Bill Robertson (Ph.D. 1988) gave the final talk about his experiences as a Bray student. Dr.



Ralph Bray (Photo provided by Felice Bray)

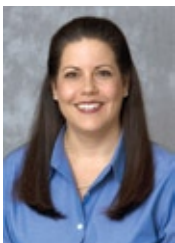
Bray was associated with the department as a graduate student and faculty member from 1942 through 1989. His research as a graduate student contributed to the development of the transistor.

Bray Ph.D. Students

Dale Brown, 1961
W.E.J. Pinson, 1964
Chander Sen Kumar, 1967
Philip Oscar Sliva, 1968
David Spears, 1969
Victor Dolat, 1971
Joseph Ross, 1972
Thomas Parker, 1973
George Celler, 1976
Satchidanand Mishra, 1977
Dennis Abramsom, 1981
Win-Chyi Chang, 1982
Kong-Thon, Tsen, 1983
Anthony Moretti, 1985
Kam Wan, 1985
William Robertson, 1988
John Parker, 1988

Faculty Honors

Professor Lynn Bryan has been elected to Board of Directors of NARST. The National Association for Research in Science Teaching is the leading international organization for science education research. (www.narst.org)



Professor Steve Durbin has been appointed to the Physics Policy Committee (PPC) of the American Physical Society (APS) for a 3-year term. This committee is charged with "...addressing those science policy issues that affect the development of physics, the health of the institutions in which physics is practiced, the resources available to physics, and the balanced use of these resources for the nation's scientific and technological needs. In practice, the PPC acts as the advisory committee to APS governmental and lobbying activities. Steve's term began on Jan. 1, 2007.



Professor Daniel S. Elliott has been nominated a Fellow of the American Physical Society for pioneering experimental demonstrations of coherent control in atomic systems.



Nicholas Giordano, Hubert James Distinguished Professor of Physics, received the Ruth and Joel Spira Award for excellence in undergraduate teaching



Professor Gabriele Giuliani has been selected as a Fellow of the American Physical Society for his many contributions to the theory of the electron liquid and in particular to its modern formulation in terms of many-body local fields. This honor is limited to the top 0.5 percent of the organization's membership.



Professor Leonid Rohkinson was promoted to Associate Professor. Leonid's research is in electron transport in mesoscopic systems, spintronics, quantum information processing, molecular electronics, and nanofabrication.



Professor Ken Ritchie received the Ruth and Joel Spira Award for excellence in graduate teaching. Prof. Ritchie has developed a new graduate course in biological physics.



Professor Ian Shipsey was named the Julian Schwinger Distinguished Professor of Physics.

Prof. Shipsey was appointed to membership of the Program Advisory Committee at Fermi National Accelerator Laboratory.

Prof. Shipsey has also been appointed to serve on the U.S. Department of Energy Committee of Visitors. The Committee of Visitors is charged with reviewing the work of the Office of High Energy Physics of DoE.



Staff Honors

Julie Conlon, Physics Outreach Coordinator, has been appointed to the American Association of Physics Teachers (AAPT) Committee on Physics in Pre-High School Education. The appointment begins at the end of 2007 and concludes in 2010.



Particles of Information

Mechanical Strength of Multiwalled Carbon Nanotubes

Graduate Research Focus – Laura Biedermann*

The study of the mechanical properties of carbon nanotubes is a rapidly growing field of nanotechnology research, with wide-ranging applications in everyday objects such as bicycle frames and baseball bats as well as nanoscale devices such as scanning probe microscope probes, rotational actuators, and tunable electromechanical oscillators.

Carbon nanotubes are cylindrical tubes of carbon that come in two primary forms, single-walled carbon nanotubes (SWNTs) and multiwalled carbon nanotubes (MWNTs). A SWNT can be visualized as a hexagonal lattice of carbon atoms rolled up into a slender tube. A MWNT is a concentric arrangement of many SWNT shells with an interlayer spacing of 0.35 nm. A MWNT can consist of a few to hundreds of SWNT shells. Typical MWNTs have outer diameters, d_o , of 5–300 nm and inner diameters, d_i , of 2–100 nm.

Carbon nanotubes are uniquely suited for applications in nanomechanical systems in part due to their high strength and flexibility. The Young's modulus, E , of MWNTs varies from 10 GPa for high-defect carbon-vapor deposition (CVD) MWNTs to 1.8 TPa for pristine arc-grown MWNTs. CVD-grown MWNTs are mass-produced more economically than arc-grown MWNTs and can be grown to much longer lengths. Reliable techniques to accurately measure the elastic modulus of nanotubes are generally lacking.

A survey of the literature reveals that the Young's modulus of individual MWNTs has been measured by observing resonant frequencies in electron microscopes or by manipulating MWNTs with AFM microcantilevers. Neither of these methods is ideal; the former technique is moderately destructive while the latter is impractical for convenient analysis of samples.

To address this issue, graduate student Ryan Tung (Mechanical Engineering, advisor Prof. Arvind Raman) and I, have measured the oscillation frequency of individual CVD-grown MWNTs using a Polytec MSA-400 scanning vibrometer, a sophisticated laser interferometer.

If the length (L) and diameters (d_o, d_i) of a MWNT are measured using electron microscopy (see Fig. 1a) and if the resonant oscillation frequency of a MWNT can be accurately determined, then E can be inferred from a Euler-Bernoulli analysis of a pinned oscillating cantilever beam.

The resonant frequency is given by

$$f = \frac{1.8751^2}{8\pi L^2} \sqrt{\frac{E}{\rho} (d_o^2 - d_i^2)}, \text{ where } \rho = 2300 \text{ kg/m}^3, \text{ the density of graphite}$$

Due to the inherently small diameters involved, little light is reflected from a bare MWNT. To increase the intensity of reflected light, a small reflecting bead can be attached to the MWNT (see Fig. 1b). The resonant frequency is now given by

$$f_{\text{bending}} = \frac{1}{2\pi} \sqrt{\frac{3EI}{L^3 m_{\text{bead}}}}, \text{ where } I = \frac{\pi(d_o^4 - d_i^4)}{64}$$

For the MWNT depicted in Fig. 1(b), the measured thermal vibration spectrum is plotted in Fig 1(a). A clear resonance peak near 48 kHz corresponds to the first eigenmode (the diving board mode) of oscillation. From this resonance, E was calculated to be 29.2 GPa.

To date, E has been determined for seven MWNTs. Furthermore, the glass bead causes a strong torque on the MWNT. A resonance at higher frequencies (not shown) is attributed to the torsional mode of the MWNT. This resonance allows estimates for the torsional modulus of the MWNTs and may well lead to estimates for the number of carbon shells contributing to the torsional motion.

The technique developed is completely general and allows for studies of the elastic modulus of a wide variety of nanowires. Future work includes a systematic investigation of the variation in the elastic modulus of MWNTs caused by different growth conditions and a study of the degradation in the elastic properties of various nanowires caused by different forms of radiation.

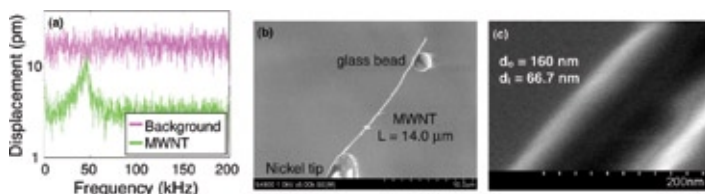


Fig. 1

Figure 1: Frequency spectra (a) of a MWNT show a peak at 45.5 kHz, which is due to the thermal oscillations of the MWNT. SEM micrographs show the (b) MWNT with glass bead affixed to the nickel tip and the (c) inner and outer diameter. The glass bead was added to increase laser signal return.

*Laura Biedermann is a graduate student with Professor Ron Reifenberger and was supported in this work by a Purdue Excellence in Science and Engineering Fellowship from Sandia National Laboratories.

Teacher Adds Science to Students' iPod Playlists

Elizabeth Gardner,
Purdue News Service

Students may add iPods to their school supplies list this year to take advantage of educational podcasts available through iTunes.

Matt Carlson, a science teacher in West Lafayette, IN., produced 30 podcast episodes, digital video files distributed on the Internet that can be played on portable media devices and personal computers. The videos are available free of charge at www.ScienceTheater.net and on iTunes, and each lasts about five minutes.

Carlson was one of two teachers selected in 2006 for Purdue University's annual Research Experience for Teachers program sponsored by the National Science Foundation. The program allows educators to be involved in research or to access university resources to expand their knowledge and improve educational tools, said Stephen Durbin, a professor of physics and principle investigator for the Research Experience for Teachers program. The teachers also are awarded a \$500 grant for equipment and a \$1,050-per-week stipend.

"We were impressed by Dr. Carlson's interest in using technology to reach students on their playing field," Durbin said. "The majority of students ages 12-17 have an iPod or some other portable music and video player. We think it is great that a teacher is tapping into this resource and taking a fresh approach to inspire and retain students in the sciences."

Carlson worked with the Department of Physics to create podcast episodes of "Dr. Carlson's Science Theater," a program he began in 2005 that explains various scientific principles and offers entertaining demonstrations. He used a teacher grant from the Lilly Foundation to create the first episodes, which aired on the Harrison High School student-produced televi-

sion program. Carlson was limited to short segments and quickly ran out of demonstrations to perform, he said.

Purdue's physics department allowed him full access to its catalog of hundreds of demonstrations and provided the equipment and space to perform and tape the podcasts.

"The quality of the demonstrations is the key to engaging students, and I



Matt Carlson performs a demonstration during an episode of "Dr. Carlson's Science Theater."

would not have been able to achieve the necessary quality without assistance from the department," Carlson said. "By creating podcasts of some of the most interesting and dramatic demonstrations, we can reach students at an earlier stage in their education."

Carlson aims to engage students before they reach high school and are able to choose whether or not to take science courses.

"Some of the most exciting areas of science are covered later in the education track, after many students have decided to stop pursuing science," he said. "We need to show students how cool science can be before they make that decision."

Podcasts reach students through the Internet, an arena where many spend a large portion of their time. By taking science outside the classroom and putting it into a familiar setting, it becomes more accessible and less intimidating to students, Carlson said.

"The education experience needs to evolve as generations become more technologically savvy, and educators need to keep up with their students in that respect," he said.

While personalities like Bill Nye the Science Guy target grade-school students, Carlson targets students in middle school.

"This is the age where most students decide if science is fun or not," he said. "It is a pivotal point. In addition, by targeting this age group I can reach the entire population. It won't be over anyone's head, regardless of if they have a background in science or not."

Carlson also created podcasts with Purdue faculty members to illustrate careers in scientific research.

"Students think of professors as giving lectures, but in reality that is only a small part of what they do," he said. "I wanted to show students the research going on and the interesting things professors of science do. There are many opportunities for careers involving science, and I want students to be aware of what is out there."

Carlson completed his Research Experience for Teachers program this summer but continues to make podcasts to enrich education and inspire future scientists. If the opportunity arose, Carlson would not be opposed to creating a television show to reach a larger audience, he said.

The podcasts also are available through Carlson's Science Theater Web site: ScienceTheater.net

More information about the Research Experience for Teachers program is available online at www.compadre.org/ptec/rets



The Large Synoptic Survey Telescope

By John R. Peterson
Assistant Professor of Physics

The Large Synoptic Survey Telescope (LSST) is a proposed 8.4 m optical survey telescope that will address a wide range of astrophysical topics. It is planned to be located on Cerro Pachon in Northern Chile, and it may begin its operations in 2013-2014. The LSST project involves of 21 universities, private corporations, and national laboratories. Last April, Purdue became the newest member of the consortium.

The ability of a telescope to survey large patches of the sky is given by its étendue.

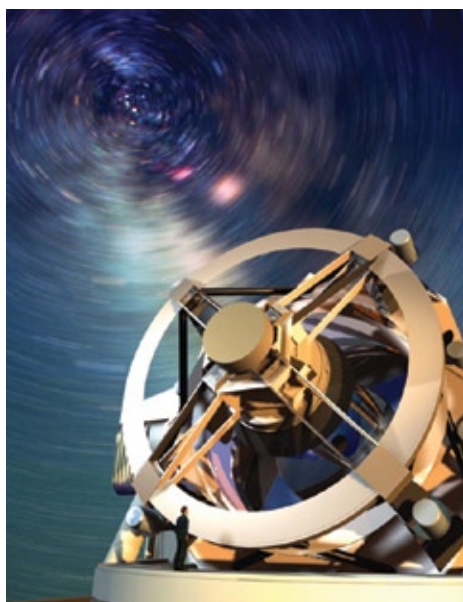
Étendue, the French word for extent, is defined mathematically as the product of the light collecting area and the field of view of the telescope. This quantity measures the

number of photons per unit frequency per unit time a telescope will accept. This number is particularly important in conducting a large astronomical survey. LSST uses a large primary mirror with an 8.4 m diameter to achieve a high collecting area. LSST also features a very large 10 sq. degree field of view by using a three mirror optical design. For comparison, the full moon has an angular diameter of about $\frac{1}{2}$ degree. Thus, LSST will have an effective étendue of $320 \text{ m}^2\text{deg}^2$. This exceeds previous survey telescopes by a factor of ~ 30 and proposed precursor surveys by a factor of ~ 7 , which will make LSST the largest survey ever conducted.

LSST will take a series of exposures lasting 15 seconds and scan the sky rapidly during each night. The large étendue and short exposures al-

low the entire visible sky (about half of the entire sky) to be surveyed in about one week. Each exposure will be able to see objects as faint as 24th magnitude or about 30 million times more sensitive than the human eye. The LSST camera will be the largest camera ever constructed in astrophysics. It will have about 3 billion pixels in a set of CCD devices. Six different filters will be used periodically to collect light in the optical and near infrared bands.

There will be two kinds of studies that one can undertake with LSST: 1) analyses that will benefit from the extremely deep stacked image that will build up over time and 2) studies that search for objects in a differenced image that have changed or moved since the last time a piece of the sky was visited. LSST will find most of the asteroids in the solar system larger than 150 m (which could be very destructive if they hit the Earth). LSST will also map the structure of the Milky Way to high precision enabling studies of galaxy formation. Millions of new variable objects will be discovered with LSST, such as variable stars, supernovae, and potentially new unknown objects. About 3 billion gal-



Rendering of LSST (Image Credit: LSSTC)



LSST site in Northern Chile (Image Credit: V. Krabbendam and C. Claver, NOAO/LSSTC)

axies will be imaged and their three-dimensional positions will be mapped.

LSST also promises to make a series of complementary measurements, which use either the galaxies or supernovae, to study the mysterious phenomena called dark energy. Astrophysical evidence in the last decade has suggested an apparent acceleration in the expansion of the Universe in the last several billion years. This has been termed dark energy, although its nature is not at all understood and it could indicate new physics.

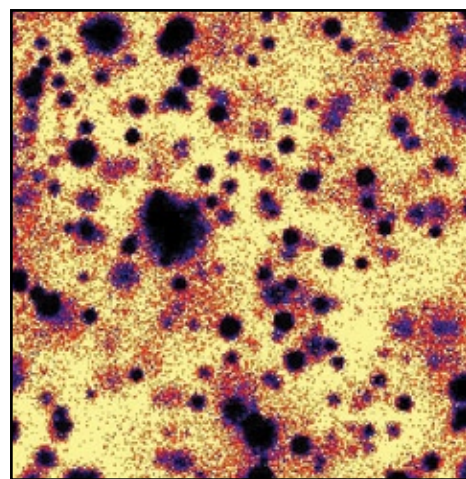
Theoretical models that explain dark energy range from a small vacuum energy density (equivalent to a cosmological constant that was first conceived by Einstein), a variable scalar field (often called quintessence), a breakdown of General Relativity on large scales, or even more exotic models. Potentially, the next generation of astrophysical measurements with LSST will distinguish between these models. One of these measurements involves measuring statistically the subtle distortion of shapes of galaxies, which occurs by the gravitational deflection of light and is often called gravitational lensing. This measurement maps the intervening dark matter (yet another astrophysical puzzle). The exact distribution of dark matter in cosmic time can produce an unprecedented set of constraints on models of dark energy.

The fact that the amount of light in 3 billion pixels in the LSST camera will be recorded every 15 seconds implies

an enormous quantity of data will be collected. About 30 Terabytes of data will be collected every night and tens of Petabytes of data will be collected over the lifetime of LSST. All of that data is potentially useful. This is by far the largest data set ever obtained in any astrophysics project, and comparable to modern particle physics experiments. In addition, LSST is committed to making the data public within about 1 minute of when it is recorded. This will enable rapid follow-up of the variable sources with other telescopes. This enormous data volume poses some interesting challenges for computer scientists.

A large group of researchers at Purdue are involved with the development of LSST, which includes astrophysicists and particle physicists in the physics department as well as computer scientists in the computer science department, Rosen Center for Advanced Computing at Purdue, and the Purdue Cyber Center in Discovery Park. A growing number of faculty, senior researchers and engineers, and graduate and undergraduate students have started to work on LSST in these departments. Purdue will be involved with simulating the enormous images before LSST begins taking data, designing algorithms to analyze the LSST dataset, the construction of the cyber-infrastructure to handle the enormous data rates, and assistance in the construction and testing of the camera. We expect that Purdue will play a key role in the many challeng-

ing aspects of LSST, and it promises to answer a number of unsolved questions in physics.



Atmospheric and instrument physics simulations of LSST done at Purdue. The top image is composed of stars and galaxies covering about $\frac{1}{2}$ of the LSST focal plane and the bottom image is an extremely blown-up version with size about equal to one pixel on the previous image. (Image Credit: A. Meert and J. Peterson, Purdue).

Student Awards

Undergraduate

College of Science Outstanding Student Award

2006-2007 John Wright
Joseph Clampitt
Kevin O'Brien
Cameron McKinney

Richard W. King Award

2006-2007 John Schaibley
Daniel Hugenberg

College of Science Shapiro Award

2006-2007 Emily Grace
Evan Witkoske

Spira Summer Research Award

2006-2007 Zachary Blackwood
John Neylon

Undergraduate Research and Poster Symposium

2006-2007 Joseph Clampitt

Lijuan Wang Award Undergraduate Research

2006-2007 Tasneem Mohsinall

David G. Seiler Physics Scholarship

2007-2008 Emily Grace

Kenneth S. and Paula D. Krane Physics Scholarship

2006-2007 Emily Grace

2007-2008 Zachary Blackwood
Joseph Clampitt
John Neylon
Robert Troup

Shalim and Paul Sargis Memorial Scholarship

2006-2007 Greg Kemp
Desiree Skaggs

2007-2008 Rachelle Klinger
Joshua Phillip

College of Science Leadership in Physics Awards

2006-2007 Zohar Aliya
Alec Biccum
Shakeel Dalal
Tamanaco Francisco

cisquez

Jon Jasinski
Jeremiah Kemp
Joseph Krueger
John Schaibley

AAPT Outstanding Teaching Assistant Award

2006-2007 Samarth Agarwal
Peter Dudley
Brandon Hogan
Andrew Irrgang
Deepak Pandey

Graduate Teaching Certificate

2006-2007 Jacob Hale
Valeriia Starovoitova

Lark-Horovitz Award

2006-2007 Stefano Chesi
Kwan Jeong

Dr. Warner Black Award

2006-2007 Seth McConchie

Mandler-Akeley Award

2006-2007 Joshua Mattes

Tautfest Award

2006-2007 Viktor Veszpremi

Bilsland Dissertation Fellowship

2006-2007 Gang Chen

Fan Award

2006-2007 Gang Chen
Xiangshun Lu

Lijuan Wang Award

2006-2007 Roya Lahiji (teaching)
Chun Lan (research)

Honorable Mention: Sigma Xi Graduate Poster Competition

2006-2007 Dongmyung Oh

Graduate

Grodzins Summer Research Award

2006 Stefano Chesi
Gabor Pszota

Leadership in Physics Awards

2006-2007 Alyssa Garrelts
Kari Frank
Jacob Hale
John Millis
Cristina Moody
Suzanne Nichols

Celebration of Graduate Student Teaching

2006-2007 Glynn Bricker
Joshua Mattes

2007 Honorary Degree

Dr. Jacek K. Furdyna has distinguished himself as one of the most creative scientists in the world of semiconductors.

He has a 22-year history in the physics department at Purdue and is now professor of physics at the University of Notre Dame. His very impressive and pioneering research on some of the fascinating properties of elemental and compound semiconductors addressed a range of electromagnetic and optical phenomena: Faraday effect, Alfvén and helicon wave propagation, and plasmas in solids.

These early studies, carried out with microwave techniques, established him as a young physicist with great promise when Purdue succeeded in attracting him to West Lafayette in the spring of 1966 as associate professor.

Born in Poland, he was deported to the Soviet Union at the outbreak of World War II at the age of six. He spent much of his childhood in Kazakhstan and Uzbekistan, and after release from the USSR, in Iran, Iraq, Palestine, and in the United Kingdom, before immigrating to the United States.

Dr. Furdyna earned his bachelor's degree at Loyola University in Chicago, and his doctorate at Northwestern University (in 1960), where he stayed on as a postdoctoral fellow for an additional two years. From 1962 to 1966 he was on the research staff of the Francis Bitter National Magnet Lab at the Massachusetts Institute of Technology.

At Purdue, Dr. Furdyna established an exciting new program in magnetic semiconductors, which thrives to this day. He established an international reputation through imaginative re-

search on diverse topics in this area, bringing him and his Purdue colleagues much visibility and recognition on the world scale. Throughout his career Dr. Furdyna projected the image of an extraordinarily creative scientist, with a special talent for identifying fascinating new problems and new directions.

Dr. Furdyna's research continues to prosper, particularly in the field that he started at Purdue, as measured by his seminal publications and international collaborations. His large number of publications (over 600) and literature citations (over 10,000) bear testimony to his remarkable productivity and creativity.



Jacek K. Furdyna
Doctor Of Science

Positions Held

1. Research Associate, Department of Electrical Engineering, Northwestern University (1960-1962).
2. Staff Member, Francis Bitter National Magnet Laboratory, M.I.T. (1962-1966).
3. Associate Professor, Department of Physics, Purdue University (1966-1972).
4. Professor, Department of Physics, Purdue University (1972-1986).
5. Chairman, Materials Sciences Council, Purdue University (1982-1984).
6. Director, Materials Research Laboratory, Purdue University (1984-1985).
7. Professor, Marquez Chair of Information Theory and Computer Technology, Department of Physics, University of Notre Dame (1987-present).

Alumni News

2007 Distinguished Science Alumni Award



J. Trent Anderson

BS 1961,
Physics, Purdue University

LLB 1964,
University of Virginia
School of Law

J. Trent Anderson is a partner with Mayer, Brown, Rowe & Maw LLP, one of the world's largest law firms. He practices in corporate and finance law. His client list includes corporations, banks, and healthcare organizations, among others. He served on the firm's world-wide management committee from 1991-1997 and presently serves as co-chair of the firm's pro bono committee.

Trent has also lectured at the Practising Law Institute and at Illinois Continuing Legal Education seminars, speaking about corporate, finance, and related topics. He was a teaching assistant at the Boalt Hall School of Law, University of California at Berkeley, in 1964-1965 and holds an adjunct faculty appointment at the Loyola University of Chicago School of Law. He was admitted to the Illinois and Indiana bars in 1965.

Trent's professional affiliations include his recent election as president of the Indiana Society of Chicago. He also served on the College of Science Dean's Leadership Council, from 2002–2005.

Trent and his wife Judy live in Wilmette, Illinois.

Career Highlights

1972–present Partner; Mayer, Brown, Rowe & Maw, LLP

1965–1972 Associate; Mayer, Brown, Rowe & Maw, LLP

2007 Distinguished Science Alumni Award



Dan Fleetwood

BS 1980

Honors Physics and
Applied Mathematics,
Purdue University

MS 1981

Physics, Purdue University

PhD 1984

Physics, Purdue University

Dan Fleetwood joined Sandia National Laboratories, Albuquerque, New Mexico, after completing his PhD at Purdue. He left in 1999 when he accepted a position at Vanderbilt University. He is the author of more than 280 publications on radiation effects in microelectronics and low frequency noise, ten of which have been recognized with Outstanding Paper Awards.

In 1997, he received R&D 100 and Industry Week magazine awards for co-inventing a new type of computer memory chip based on mobile protons. The chip was recognized as Discover magazine's 1998 Invention of the Year in computer hardware and electronics. In 2000 he was named one of the top 250 most highly cited researchers in Engineering by the Institute for Scientific Information.

Dan is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and The American Physical Society (APS), and a member of the Phi Beta Kappa, Sigma Pi Sigma, and Phi Kappa Phi honorary societies. He has earned the Senior International Correspondence Chess Master title, recently finished eighth in the World Correspondence Chess Championship, and now represents the US in the 15th Correspondence Chess Olympics.

Originally from Surprise, Indiana, Dan is a 1976 graduate of Seymour (Indiana) High School, and the son of Louis and Dorothy Fleetwood. Dan, his wife Betsy, and their three sons live in Brentwood, Tennessee.

Career Highlights

- | | |
|--------------|--|
| 1999–Present | Professor of Electrical Engineering, Professor of Physics;
Vanderbilt University |
| 2003–present | Chair, Electrical Engineering and Computer Science
Department; Vanderbilt University |
| 2001–2003 | Associate Dean for Research; Vanderbilt School of Engineering |
| 1984–1999 | Senior/Distinguished (1990) Member of Technical Staff,
Radiation Technology & Assurance Department;
Sandia National Laboratories |
| 1998 | Invention of the Year award from Discover magazine |

Physics Outstanding Alumni Award 2007

The Physics Department hosted its Outstanding Alumni for 2007 on October 4, 2007.

Mario Paniccia, William Morse, J. Thomas Gruenwald, and Celeste Bottorff were honored for their contributions and leadership within their professions.

Mario Paniccia

(MS 1990, PhD 1994)

Dr. Mario Paniccia is an Intel Fellow and director of the Photonics Technology Lab. Joining Intel in 1995, Paniccia was a lead researcher for the development of a novel optical testing technology for probing transistor timing in microprocessors that is today's industry standard. Scientific American named Paniccia one of 2004's top 50 researchers for his work in the area of silicon photonics. Dr. Paniccia's advisor at Purdue University was Professor Ron Reifenberger.

William Morse

(MS 1971, PhD 1975)

Dr. William Morse was recently named an American Physical Society Fellow for his accomplishments in the field and his leadership role Brookhaven National Laboratory, especially for his role as resident spokesman for the BNL muon anomalous magnetic moment experiment from 1991 to 2004. The experiment's findings challenged the Standard Model of



From left: Celeste Bottorff, Dr. William Morse, Dr. Mario Paniccia, Dr. J. Thomas (Tom) Gruenwald

particle physics that describes the fundamental structure of matter. Professor Virgil Barnes acted as Dr. Morse's graduate advisor.

J. Thomas (Tom) Gruenwald

(MS 1972, PhD 1976)

Dr. Thomas Gruenwald is executive vice-president of corporate strategy and chief technology officer at Tellabs where he is responsible for Tellabs' technology strategy, business development and network evolution. Prior to his position at Tellabs, Dr. Gruenwald held a number of positions at Bell Laboratories and was a professor of physics at the University of Portland. His graduate advisor was Professor Ephraim Fishbach.

Celeste Bottorff

(BS 1975)

Celeste Bottorff is currently works for the Coca Cola Company where she is a Marketing Group Director in the Food Service and Hospitality Division. Prior to this position, Ms. Bottorff worked as a marketing consultant for McKinsey & Co., and as an engineer for General Electric and American Air Filter. She also holds an MBA from the University of Virginia, Darden School of Business.

Physics Department Head, Nick Giordano, presented the Physics Outstanding Alumni with engraved awards at a formal reception and presentation ceremony for the four honorees.

Alumni News

Pat Ridgely, MD (BS 1976, MS 1978) has joined the board of directors of SciMathMN, a public-private partnership focusing on development of state-level policy for K-12 science and math education in Minnesota. Pat is senior manager of clinician education for the cardiac-arrhythmia division of Medtronic, Inc. in Minneapolis.

Achille Giacometti (PhD '93) is an associate professor at Dipartimento di Chimica Fisica, Università Ca' Foscari, in Venice, Italy.

Arturo Morales-Acevedo (MS '82) is a professor of electrical engineering at CINVESTAV del IPN in Mexico

Mark E. Michalski (BS '05) writes, "It's been a busy year and a half since graduation. In that time I have been working for Abbott Laboratories for one year, I married Mary Stoudt (now Michalski) in June of 2006 and we bought a townhouse in Round Lake, IL. I have also since been awarded membership to the Chicago Mensa group."

Have news to share? Send it to us! Have a question?

Contact Tony Vidmar, Director of Development, at 765-494-0669 or tvidmar@purdue.edu.

Bruce Schechter (BS '80, Physics and Mathematics) finished his master's in computer science from Stanford University in December 2006. He says, "It was quite an invigorating experience, given that most of my classmates were less than half my age!"

Recognizing Our Donors

We recognize and thank our donors who made gifts to the department between October 1, 2006 and September 30, 2007.

James Adley
Roshan Aggarwal
David Alexander
Roger Alig
Virginia Ayres
Virgil Barnes
Robert Baum
William Becker
Emil Benko
Richard Betuker
Robert Beyer
Gregory Boebinger
Lydia Bottorff
David Brown
Joseph Brown
Julius Budos
Warren Bulman
Louis Caplan
Thelma Capps
Bartley Cardon
Erica Carlson
Philip Cole
Roberto Colella
Gabor Csathy
Braden D'Andrea
Matthew Davies
Robert Davis
William DeGraf
Jeffrey Derr
Stephen Durbin
Jimmie Eller
David Elmore
Hung Fan
John Finley
Ephraim Fischbach
Daniel Fleetwood

Mark Flohr
Harold Fuquay
Owen Gailar
Luis Gainza
Arthur Garfinkel
Solomon Gartenhaus
Gordon Gerbick
Nicholas Giordano
James Goff
George Goldsmith
John Gotwals
Lee Grodzins
Laszlo Gutay
Douglas Harke
Mark Haugan
Dennis Henry
John Hill
Andrew Hirsch
Craig Hoffman
Jiangping Hu
Michael Huebschman
Dale Human
William Humer
Timothy Jones
Marvin Kemple
Sergei Khlebnikov
Yeong Kim
Everett Klontz
Michael Klucher
David Koltick
Kenneth Krane
Nicholas Lanier
William Larson
Yung-Rai Lee
Clovis Linkous
Matthew Lister

Frank Liu
Andrew Livingston
Sherwin Love
Paul Luehrmann
Kirby McCord
John Mennel
David Miller
Denes Molnar
Donald Morningstar
Antone Morone
Steven Moss
Samuel Mudrak
Norbert Neumeister
David Nisius
Joseph Olson
Piu Ong
Aare Onton
Clarence Oyer
Richard Pastore
Norman Pearlman
John Peterson
Wallace Phelan
Stephen Popik
Margaret Poyatt
Joseph Priest
Earl Prohofskey
Laura Pyrak-Nolte
Bo Qiu
Anant Ramdas
J. Rhode
Patrick Ridgely
Barrett Robinson
David Rohlfing
Leonid Rokhinson
Ahmad Saleh
James Sargis

Sergei Savikhin
John Schaibley
Rolf Scharenberg
David Seiler
John Seiler
Edward Shibata
Ian Shipsey
Ceber Simpson
Richard Soendlin
Joel Spira
David St. Onge
William Stadlander
Steven Stendahl
William Struzinski
Neal Sullivan
John Sutter
Daniel Sutton
Donald Szenina
Manley Tate
Joseph Tesmer
Srinivasa Venugopalan
Robert Vickers
Jennielea Vidrich
William Wallenmeyer
Elizabeth Waltman
Fuqiang Wang
Lowell Wenger
Roland West
David White
Charles Wiley
Donald Wilke
Henry Zandberg
Robert Zeman

Corporate Gifts

Scientific-Atlanta
Foundation, Inc.
Chevron Phillips
Chemical Company
Spanion
Fidelity Charitable Gift
Fund
IBM International
Foundation
Boeing Gift Matching
Program
Lutron Foundation
McGraw-Hill Company
Coca-Cola Foundation
MGP
Exxon Mobil
Corporation
ExxonMobil Upstream
Research Co.
Research Corporation

Memorial Gifts

Dr. and Mrs. Jimmie L.
Eller in memory of Prof.
Ralph W. Lefler

Mr. and Mrs. Gordon I.
Gerbick in memory of
Mr. Kenneth J. Gerbick
(BS '74)

Physics Degrees

May 2007

BS Degrees

Arrfalt, Karlene
Carpenter, Steven
Choi, Go
Foley, Joseph
Graber, Jeramiah
Heidenreich, Joseph
Heim, Jordan
Jelinek, Jake
Kemp, G. Elijah
Krueger, Joe
Manalang, Justin
McKinney, Cameron
Mellott, Nicholas
Merrill, Jeffrey
Merritt, Samantha
Mohsinally, Tasneem
Nalley, Derek
Puetz, Brett

Schaibley, John
Stewart, Margaret
Urbanski, Greg
Vargo, Nicholas
Wilkie, John
Wilkins, Daniel
Miller, Christopher

M.S. Degrees

Angelo Bove
Andrew Irrgang
Heather Moor
Wontaek Yoo

Ph.D. Degrees

Stefano Chesi
Hanyoup Kim
Hogyoung Kim
Seth McConchie

August 2007

BS Degrees

Archambault, Brian
Brown, Stephen
Nolan, James

M.S. Degrees

Haiwei Gu
Jing Ouyang
Anuradha Madhavan

Ph.D. Degrees

Trinanjana Datta
Md Fhokrul Islam
Kwan Jeong
Yexian Qin
Valeriia Starovoitova
Viktor Veszpremi
Ahmet Yanik

Your Donation Can Make a Difference!

If you are interested in supporting the Department of Physics remember that donations are tax deductible. Even small amounts are helpful and add up when combined with gifts from others. Gifts to the department's Discretionary Fund provides the greatest flexibility, allowing the department to allocate the funds where it is needed most. For further information contact Tony Vidmar, Director of Development.

PURDUE
UNIVERSITY

Purdue Physics
525 Northwestern Avenue
West Lafayette, IN 47907
www.physics.purdue.edu

Nonprofit
Organization
U.S. Postage
PAID
Purdue University