

Summer 2009  
<http://www.phys.lsu.edu>

**CHAIR'S WELCOME . . . *Michael Cherry***

Despite the University's challenging budget situation, Physics & Astronomy continues to move forward. External research funding has grown to over \$8.7M per year; 28 new postdocs and Research Associates have been hired since January to strengthen the Department's research effort; 27 new graduate students will be entering in summer and fall 2009; and the Department added nine new faculty this year: Ray Chastain has provided an experienced and knowledgeable addition to the Department's instructor corps; and as part of the University's major materials science initiative and largely with the support of the University's focused Multidisciplinary Hiring Initiatives, Rongying Jin, Von Braun Nascimento, Ward Plummer, Shane Stadler, and Jiandi Zhang (experimental condensed matter/materials), John Sutherland (Director of the CAMD synchrotron), and Mark Jarrell and Juana Moreno (computational materials research) have also joined us. Luis Lehner is departing Baton Rouge, heading to the University of Guelph and the Perimeter Institute in Canada, and Lai Chan and Bill Gregg are retiring. We are sorry to see them go and we wish them all good luck.

Congratulations go to the Department's graduates! Since the last Newsletter, 12 students were awarded bachelor's degrees, 8 received Master's degrees, and 6 earned PhDs. They are listed individually below. Congratulations and good luck to all the graduates!

The department has been putting a good deal of emphasis on its instructional and outreach programs. In particular, the Physics Intensive Orientation for Students (PhIOS), a one-week intensive program specifically for incoming Physics, Astronomy, and Medical Physics

majors designed to prepare students for their college coursework and enhance their study skills, operated for the first time in August 2009 under the direction of Associate Chair Dana Browne. A sampling of the Department's outreach activities is also given below.

A delegation from LSU comprised of Dean Kevin Carman, Ward Plummer, Rongying Jin, and Jiandi Zhang traveled to China recently to sign an agreement with the Institute of Physics in Beijing (part of the Chinese Academy of Sciences) for a dual PhD program in materials science. The agreement creates what is believed to be the first dual PhD program between the US and China.

Articles about Jon Dowling, Ken Hogstrom, Ken Schafer, and graduate student Jen Andrews can be found in the College of Basic Sciences' most recent *Scientiae Fundamentales* newsletter (<http://science.lsu.edu/newspublications.cfm>). Additional news and information can be found at the Department's web site at <http://www.phys.lsu.edu>. Let us know your alumni news and we will gladly share it with the rest of our Physics and Astronomy community.

And finally, a big thank you goes to Scott and Susan Brodie, who have made a gift of \$200,000 to the LSU Foundation to establish the Scott and Susan Brodie Science Honors Scholar Awards and the Scott and Susan Brodie Professorship in Physics and Astronomy. Additional matching funds from the Louisiana Board of Regents raise the total value of their gift to \$260,000. The Department very much appreciates their generous support.



(l. to r.) Kevin Carman, dean of the LSU College of Basic Sciences, Dr. Mary Lou Applewhite, Forever LSU campaign cabinet member for the College of Basic Sciences, Susan Brodie, Scott Brodie, and Nancy Clark, dean of the LSU Honors College.



A gallery of Undergraduate Physics Major **James Champagne's** astrophotography images can be found on the department's web site or at <http://www.flickr.com/photos/23148441@N03/sets/72157603787621660/>.

At the left is a wide field view of the Rho Ophiuchi star-forming region of the Milky Way, with Antares the bright star near the center of the view. The images were taken between November 2007 and June 2009.

**NEWSLETTER STAFF**

**EDITORS**

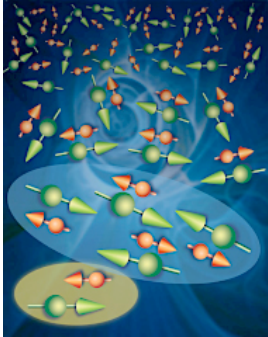
**GEOFFREY CLAYTON  
MICHAEL CHERRY, CHAIR**

**DESIGNER**

**SHEMEKA EZEFF**



## RESEARCH HIGHLIGHTS



• By replacing a few percent of the iron atoms with manganese atoms in the semiconductor ferrosilicon (FeSi), **John DiTusa, former student Ncholu Manyala, and colleagues** have demonstrated a possible method for systematically inducing non-Landau Fermi liquid behavior in doped semiconductors. ("Doping a semiconductor to create an unconventional metal", Nature 454, 976, 2008). See also the News and Views article "Materials Science: A metal left spinning", Nature 454, 951 (2008). The effect is apparently due to too few mobile electrons to compensate for the spins of unpaired electrons on the impurity atoms. The behavior can be turned on or off by applying a magnetic field at low temperature.

- **D. Uskov and A. R. P. Rau:** "Geometric phases and Bloch-sphere constructions for SU(N) groups with a complete description of the SU(4) group", Phys. Rev. A 78, 022331 (2008), provides a geometrical view of two-spin quantum systems. The quantum system of a pair of spins (qubits) lies at the heart of quantum computing, quantum cryptography and related areas of current research. This paper develops a geometrical picture for the time evolution of such systems that closely parallels a similar picture, called the Bloch sphere, which has been very influential over the decades for the quantum mechanics of a single spin in magnetic fields. This latter picture of a unit vector rotating on a sphere provides both basic insight into magnetic resonance and guides its applications in chemistry, biology and medical magnetic resonance imaging. Extension to two (or more) spins provides analogous geometrical objects, albeit of higher dimension, including spheres of larger dimension. The quantum evolution is mapped into that of real vectors rotating on such geometrical manifolds.
- **Three papers by the theoretical and experimental gravity group have been highlighted** by the editorial board of the journal Classical and Quantum Gravity this year: [1] In "Rotating collapse of stellar iron cores in general relativity" (Class. Quantum Grav. 24, S139 2007), B. Zink, E. Schnetter, and colleagues present the results of simulations of the collapse of rotating stellar iron cores, focusing on the gravitational wave emission during the collapse, core bounce, and post-bounce phases. [2] In "Late-time tails in the Kerr spacetime" (Class. Quantum Grav. 25, 072001, 2008), Jorge Pullin and colleagues describe the decay with time of perturbation fields outside a black hole. [3] In "Search for gravitational-wave bursts in LIGO data from the fourth science run" (Class. Quantum Grav. 24, 5343, 2007), the LIGO Science Collaboration (including R. Amin, L. Blackburn, J. Giaime, G. Gonzalez, C. Hanna, W. Johnson, A. Rodriguez, J. Slutsky, and M. Sung at LSU) describe the results of the fourth science run with the LIGO and GEO 600 gravitational wave detectors. With significantly lower noise and greater sensitivity than previous runs, no positive signals from supernova or binary black hole merger events were detected. The theoretical gravity group has made the Classical and Quantum Gravity highlights list every year since the group started at LSU in 2001!
- **The binary pulsar system PSR J0737-3039A/B** consists of two closely spaced neutron stars in an edge-on configuration such that one pulsar eclipses the other once every 2.45 hr orbit. The spin of one compact rotating star couples with the orbital angular momentum and the spin of the other, analogous to spin-orbit and spin-spin coupling in an atomic system, providing a test of general relativity in the strong-field regime. The relativistic spin precession of pulsar B has now been measured to be about  $4.80^\circ/\text{year}$  (R. Breton et al., Science 321, 104, 2008) in agreement with the prediction of  $5.10^\circ/\text{yr}$  made by B. Barker and R.F. O'Connell, Phys. Rev. D12, 329 (1975), within an observational uncertainty of 13%. See also R.F. O'Connell, <http://arxiv.org/abs/0804.3806> (2008) which reviews both strong and weak-field tests. The terminology spin-orbit and spin-spin in the gravitational context was introduced by R.F. O'Connell, in Experimental Gravitation: Proceedings of Course 56 of the International School of Physics "Enrico Fermi," B. Bertotti, Ed. (Academic Press, New York, 1974), p. 496.

## RESEARCH HIGHLIGHTS cont.

- **The Auger Collaboration** (including Jim Matthews, Alexei Dorofeev, Javier Gonzalez at LSU, and Megan McEwan, Roger McNeil, and Rishi Meyhanden formerly in the department) has published evidence for a cutoff at the high end of the cosmic ray spectrum. Auger previously showed that the arrival directions of cosmic rays at energies above  $6 \times 10^{19}$  eV were correlated with the directions of Active Galactic Nuclei -- i.e., that the highest energy cosmic rays are extragalactic in origin. Now, at the same energy, Auger has demonstrated the presence of the predicted GZK cutoff due to the interaction of extragalactic protons with the cosmic microwave background. The scientific article appears in *Physical Review Letters* 101, 061101 (2008). A commentary by Mike Cherry appears on the APS Physics Viewpoint web site.
- **The LIGO collaboration** (including the LSU group led by Professors Joe Giaime, Gabriela Gonzalez, Bill Hamilton, and Warren Johnson), has presented upper limits on gravitational wave emission from the Crab pulsar, giving an upper limit on gravitational wave emission that beats indirect limits inferred from the spin-down and braking index of the pulsar and the energetics of the nebula. The scientific paper can be found at <http://xxx.lanl.gov/abs/0805.4758>.
- **LSU and Florida State University (FSU) are collaborating to develop the Array for Nuclear Astrophysics Studies with Exotic Nuclei (ANASEN).** ANASEN combines three different types of detectors to achieve an efficient and selective instrument for studies of nuclear reactions induced by low intensity beams of exotic nuclei. Solid-state and gaseous detector technologies are being developed with state-of-the-art electronics systems to provide accurate measurements of the energies and trajectories of charged ions over a large angular range. Students at LSU and FSU will develop and test detector elements that will be combined into a completed array and used in experiments with beams of exotic nuclei at the Fox Superconducting Accelerator Laboratory at FSU. ANASEN will allow new direct measurements of nuclear reaction cross sections that are important for understanding stellar explosions like X-ray bursts and the structure of short-lived nuclei. ANASEN will also be a portable instrument that will be moved to the National Superconducting Cyclotron Laboratory at Michigan State University and potentially to other laboratories. LSU and FSU students will have a unique opportunity to conduct leading research in nuclear physics and nuclear astrophysics with ANASEN at major national accelerator facilities. Students will also gain invaluable hands-on experience in forefront instrumentation and techniques that are important for various fields from health care to national security. ANASEN is funded by the by the National Science Foundation's Major Research Instrumentation Program and by LSU and FSU, and led at LSU by Jeff Blackmon.
- **An article on the value of preserving, digitizing, and studying archival astronomical plates** in the April 24 issue of *Science* features Geoff Clayton and his research group. Separately, a podcast interview from last fall's meeting of the American Association of Variable Star Observers (AAVSO) on the subject of R Coronae Borealis stars can be seen at <http://www.slackerastronomy.org/wordpress/2008/10/new-podcast-interview>.

Information on all of our department's research activities can be found on our web page @

<http://www.phys.lsu.edu>

## OUTREACH AND DIVERSITY PROGRAMS :

- Ravi Rau runs the Saturday Science public lectures for high school students that attract audiences of up to 300 students to campus for monthly research presentations by LSU faculty.
- Dana Browne, Mike Cherry, Ray Chastain, and Juana Moreno together with Steve Watkins (Chemistry) have been working with Jim Madden (Math) in running a summer in-service program for local science teachers as part of LSU's Masters in Natural Science program. The MNS program has recently received NSF funding to continue for another five years.
- The Louisiana site of the Laser Interferometer Gravitational wave Observatory (LIGO) in nearby Livingston, directed by Joe Giaime, operates a very successful Science Education Center (SEC) which capitalizes on the excitement of astrophysics to provide a unique educational and outreach facility for southern Louisiana. The SEC has attracted a large number of student and teacher groups, hosted numerous tours of LSU students, and set up an active science education program for teachers. In conjunction with LIGO and with funding from the Louisiana Board of Regents, Physics & Astronomy faculty have designed a curriculum for a multi-year program of teacher workshops and hands-on research experiences for teachers and students with an emphasis on minority-serving schools in the Baton Rouge area.
- The Highland Road Park Observatory continues to provide important educational opportunities to the community with weekly programs designed and managed by Physics faculty and staff including Greg Guzik, Brad Schaefer, Rob Hynes, Jim Giammanco and Geoff Clayton.
- The Physics & Astronomy Department together with the Cain Center have purchased a portable planetarium which will be used together with the recently acquired Mobile Astronomy van to conduct visits to local schools.
- Greg Guzik and John Wefel operated the third year of their PACER balloon program for students from Historically Black Colleges and Universities (HBCUs). This year, students from Central State University in Ohio, Albany State University in Georgia, and Interamerican University of Puerto Rico came to LSU for the summer, designed and constructed their own experiments, and launched their experiments on high altitude balloons from NASA's Scientific Balloon Launch Facility near Dallas in August.
- The Louisiana Space Consortium (LaSPACE) program directed by John Wefel operates several minority/diversity programs: the MoonBuggy Team at Southern University, the Minority Research Scholars program for undergraduates, the Research Initiation Grants with a minority focus, the FIRST Robotics awards to predominantly African American high schools and Choctaw tribal high schools, and a summer intern program aimed at students from HBCUs.
- Finally, Tabbetha Dobbins, Assistant Professor at Grambling State University and Louisiana Tech, spent the Spring 2009 semester in the Physics & Astronomy Department as an HBCU Visiting Faculty Member. She taught an upper level undergraduate course in synchrotron physics and conducted research at CAMD.

## FACULTY RECOGNITION



- **Jorge Pullin** has been selected as a Fellow of the American Association for the Advancement of Science (AAAS). He has been elected to the General

Council of the American Physical Society (APS) and also was recently named interim Co-Director of the Center for Computation and Technology (CCT).

- **Richard Kurtz** has been appointed Associate Dean for Research in the College of Basic Sciences and Interim Director of CAMD.



- **Arlo U. Landolt** is a member of the National Research Council's Space Studies Board Committee on Science Opportunities Enabled by NASA's Constellation Systems,

NASA's new launch systems being designed to implement the lunar exploration component of the Vision for Space Exploration and the NASA Authorization Act of 2005.

- **Ed Seidel** (Floating Point Chair of Physics/Director of CCT) was named the head of the National Science Foundation's Office of Cyber Infrastructure in September. He was interviewed in the *Chronicle of Higher Education* in July. It was recently announced that he will serve as interim assistant director for the National Science Foundation's Mathematical and Physical Sciences, or MPS, Directorate.



- **Mette Gaarde** has been elected to the Executive Committee of the APS Topical Group on Few-Body Systems.

- **Kenneth Schafer** has been elected as a Fellow of the Optical Society of America. He also has been awarded a Hedersdoktor degree, an honorary doctorate at Lund University in Sweden in recognition of his work.



- **Ward Plummer** has been elected Fellow of the American Association for the Advancement of Science (AAAS).

- **Jonathan P. Dowling** has been elected a Fellow of the American Physical Society (APS) by the Division of Atomic, Molecular, and Optical Physics (DAMOP) in recognition of his "major contributions to quantum optics as it pertains to the development of the theory of atomic emission rates and nonlinear switching in photonic crystals, as well as seminal contributions to quantum metrology and imaging, especially the invention of quantum lithography."



## HONORS & AWARDS

### Enhancement, Research Competitiveness, and Graduate Fellows awards recently announced by the Louisiana Board of Regents:

- \* P. Adams, J. DiTusa, D. Young, "Upgrade of the LSU Helium Liquefier Facility"
- \* J. Blackmon, "Development of a Novel Prototype Detector of Low Energy Neutrinos"
- \* D. Browne, M. Cherry, G. Gonzalez, B. Schaefer, "Graduate Fellows in Physics and Astronomy"
- \* S. Guo (Mech. Eng.), D. Young et al., "A Quantum-Design Physical Property Measurement System (PPMS) for Novel Thermoelectric Material Studies"
- \* R. Kurtz, P. Sprunger et al., "Acquisition of a Variable-Temperature SPM for Multidisciplinary Materials Research and Education"
- \* J. Madden (Math), M. Cherry et al., "Professional Master's Degree Programs for K-12 STEM Teachers"
- \* D. Sheehy, "Superfluidity and Strong Correlations in Ultracold Atomic Gases"
- \* M. Cherry, T.G. Guzik, J.G. Stacy et al., "Science Teacher Training Using Astrophysics Research".

## JOURNAL RECOGNITION

- \* Kenneth Schafer's attosecond stroboscope work, "**Coherent Electron Scattering Captured By an Attosecond Quantum Stroboscope,**" J. Mauritsson, P. Johnsson, E. Mansten, M. Swoboda, T. Ruchon, A. L'Huillier, and K. J. Schafer, Phys. Rev. Lett. 100, 073003, was chosen as one of Discover Magazine's top 100 stories of 2008.
- \* The **ATIC** (Greg Guzik and John Wefel) and **Auger** (Jim Matthews) cosmic ray experiments were both included on the American Institute of Physics' list of the Top Ten Physics Stories of 2008.
- \* The department's **Medical and Health Physics Program** has been highlighted in the Chronicle of Higher Education.

## LSU's Material Science Program Expansion

As part of a major expansion of LSU's materials science program, eight new faculty have joined the department in the area of condensed matter and materials science: **Associate Professor Shane Stadler** (experimental condensed matter, with a joint appointment at CAMD) and **Assistant Professor Juana Moreno** (theoretical and computational material science, with a joint appointment at CCT) joined the department in August 2008. Both are the recipients of NSF CAREER grants. In January 2009, we were joined by **Professor Mark Jarrell**, also working in computational material science with a joint appointment at CCT. Professor Jarrell is a Fellow of the American Physical Society and will act as head of the Materials World Focus Area at CCT. His appointment is also associated with the LONI Institute and the Materials Science Multidisciplinary Hiring Initiative. **Professor Ward Plummer**, who also joined the department in January, is a member of the US National Academy of Sciences and formerly Distinguished Professor of Physics and Director of the Tennessee Advanced Materials Laboratory at the University of Tennessee, and Distinguished Scientist at the Department of Energy's Oak Ridge National Laboratory. He is the holder of numerous honors including Fellow of the American Physical Society and the American Vacuum Society. He has been awarded the Davisson-Germer Prize of the American Physical Society and the Medard W. Welch Award of the American Vacuum Society. Also joining the department in January and working with Professor Plummer in experimental materials science were **Professor Jiandi Zhang** and **Associate Professor Rongying Jin**, and **Assistant Professor-Research Von Braun Nascimento**. Professor Jin has been awarded the Excellent Young Scientist Award from the Chinese Academy of Science and the IBM Corporation Rising Star of Technology Award, and Professor Zhang is the recipient of an NSF CAREER award. **Professor John Sutherland**, formerly at Brookhaven National Lab and East Carolina University, joined the Department in Summer 2009 as Professor and Director of CAMD. The expansion of the Material Science program was featured in the Winter 2008 issue of the LSU Alumni Magazine (<http://www.lsualumni.org/magazine/archive.php>).

## LSU, Mary Bird Perkins team up on cancer treatment

LSU and Mary Bird Perkins Cancer Center announced plans recently to develop a proton therapy program for cancer patients, and intend to open a treatment and research center by 2012 at Our Lady of the Lake Regional Medical Center, LSU says. Proton therapy allows doctors to deliver higher doses of radiation while sparing the surrounding healthy tissues and organs. "Improving outcomes for cancer patients while advancing medical research and cancer treatment leverages the academic power of the university and the private resources of Mary Bird Perkins," LSU System President John Lombardi says. Historically, proton therapy has only benefited a small segment of cancer victims, mostly those with isolated solid tumors found on the brain, spine, head, neck or eye, but researchers believe the technology can benefit a wider range of patients. **Dr. Kenneth Hogstrom**, chief of physics at Mary Bird Perkins and chair of medical physics at LSU, leads the partnership. There are five proton therapy facilities in the United States, all affiliated with universities, and six more programs are under development, LSU says, not counting the new local program.



## DOE to Establish \$12.5 Million Energy Frontier Research Center at LSU

Ashley Berthelot, LSU Media Relations, LSU NEWS

LSU will be home to one of 46 new multi-million-dollar Energy Frontier Research Centers, or EFRCs, announced by the White House in conjunction with a speech delivered by President Barack Obama at the annual meeting of the National Academy of Sciences.

The EFRCs, which will pursue advanced scientific research on energy, are being established by the U.S. Department of Energy Office of Science at universities, national laboratories and nonprofit organizations across the nation.

The DOE plans to fund LSU's EFRC, headed by Jerry Spivey, McLaurin Shivers Professor of Chemical Engineering, at a level of \$12.5 million, payable over five years. The Board of Regents is also supporting the EFRC with approximately \$940,000 in additional funds.

The 46 EFRCs, to be funded at \$2-5 million per year each for a planned initial five-year period, were selected from a pool of some 260 applications received in response to a solicitation issued by the U.S. Department of Energy Office of Science in 2008. Selection was based on a rigorous merit review process utilizing outside panels composed of scientific experts.

LSU's EFRC is titled "Computational Catalysis and Atomic-Level Synthesis of Materials: Building Effective Catalysts from First Principles." It will be housed in LSU's Cain Department of Chemical Engineering and will rely heavily on LSU's own synchrotron radiation facility, the Center for Advanced Microstructures and Devices, or CAMD, for synthesis and characterization of novel nanostructured catalysts.

"This project brings together 21 investigators from nine institutions," said Spivey. "Our goal is to advance the emerging field of computational catalysis with experimental and spectroscopic methods, like those available at LSU's CAMD synchrotron facility, to develop new materials that can help provide clean energy."

Spivey also points out that researchers involved with this project will come from around the world to

collaborate with LSU researchers and utilize CAMD for research applications. "Simply put, I don't believe we would have received this funding without having a resource like CAMD in our backyard," he said.

EFRC researchers at other centers throughout the United States will take advantage of new capabilities in nanotechnology, high-intensity light sources, neutron scattering sources, supercomputing and other advanced instrumentation, much of it developed with DOE Office of Science support over the past decade, in an effort to lay the scientific groundwork for fundamental advances in solar energy, biofuels, transportation, energy efficiency, electricity storage and transmission, clean coal and carbon capture and sequestration and nuclear energy.

"This is a resounding endorsement of the type of world class research being performed at LSU. The fact that LSU has cutting edge research facilities like CAMD and the Center for Computation and Technology, and outstanding research faculty like Professor Spivey and his colleagues, makes us competitive with some of the country's leading research universities and laboratories," said Vice Chancellor of Research and Economic Development Brooks Keel. "It is also a clear statement that our students are receiving first-rate education and training opportunities from nationally recognized experts and in fields of science and engineering of global importance."

Other members of the LSU team include: Kerry Dooley, BASF Professor of Chemical Engineering, John Flake, Associate and Cain Professor of Chemical Engineering, Gregory Griffin, George H. Nusloch II Professor of Chemical Engineering, Challa Kumar, Director of Nanofabrication & Nanomaterials at CAMD, **Richard Kurtz**, Professor of Physics & Astronomy, **Ward Plummer**, Professor of Physics & Astronomy and **Phillip Sprunger**, Associate Professor of Physics & Astronomy.

## LSU Department of Physics & Astronomy Partners with Beijing University Develops Dual Ph.D Program with Institute of Physics in China

Ashley Berthelot, LSU Media Relations, LSU NEWS

LSU's Department of Physics & Astronomy and the Institute of Physics, or IoP, in Beijing, China, recently signed an agreement creating a unique dual-doctorate program between the universities – one of the only such programs currently in existence.

In July, Dean of LSU's College of Basic Sciences Kevin Carman, along with Professors Ward Plummer and Rongying Jin of the Department of Physics & Astronomy, traveled to China to secure the partnership with the IoP, which is a part of the Chinese Academy of Sciences. The resulting dual Ph.D. program will provide participating students with a doctorate from both institutions and give them exposure to experts at both institutions.

"This is a truly unique program focused on creating and training a globally engaged scientific community in the field of materials science," said Carman. "We hope that this partnership between LSU and the IoP will serve as an international model for the benefits of educational exchange."

The primary focus of this agreement is materials science, which is the emphasis of one of LSU's Multidisciplinary Hiring Initiatives, or MHIs. Plummer, who was hired through the Materials Science MHI and is a member of the National Academy of Sciences, will serve as LSU's program coordinator. Jin and Professor Jiandi Zhang, both of whom came to LSU through the MHI, also played key roles in negotiating the agreement and will be instrumental in its implementation.

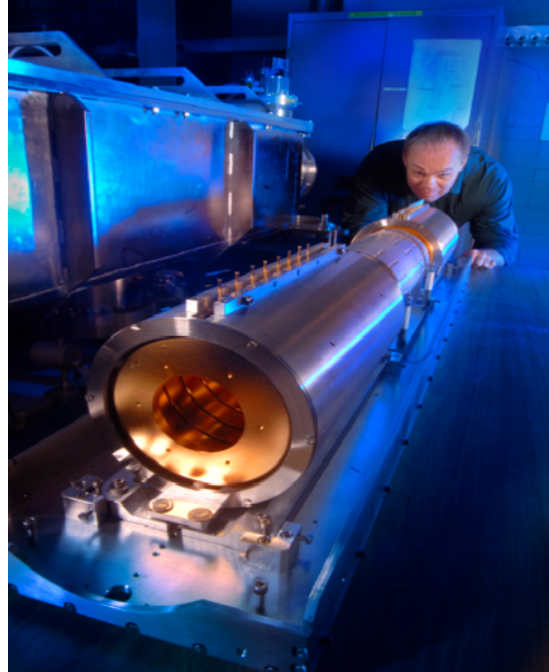
LSU's materials science focuses on "advanced materials to assure a secure energy future," and its recent investment in this interdisciplinary field is beginning to pay out significant dividends. One recent success is the DOE-funded Energy Frontier Research Center on LSU's campus, led by James Spivey, McLaurin Shivers Professor of Chemical Engineering. This center involves faculty across the Colleges of Basic Sciences and Engineering and places the university in a strong position to play a major role in developing solutions for our future energy needs.

This new dual Ph.D. program will allow students to have advisors at each university. First, students will complete a course of study at either LSU or IoP. Once complete, American students will travel to Beijing, where they will spend a minimum of one year conducting research. Chinese students will come to LSU to spend a research year upon completion of their IoP studies. At the end of the process, all degrees from both institutions and has already enrolled its first student, with more applicants expected in the coming months.



## LSU's Focus on Faculty, Students, & Staff

Ed Zganjar, and his UNIRIB colleagues, were recently awarded \$1.78 million to complete the **construction of a new type of mass separator** and place it on-line to the radioactive ion-beam accelerator at the Holifield Radioactive Ion Beam Facility at the Oak Ridge National Laboratory. Construction on this mass-separator was begun in 2003 on a "shoe-string" using regular DOE funds from Zganjar's LSU grant and \$25-50K pieces from UNIRIB's operating budget. Most of the initial construction was done in the LSU machine and electronics shops with Andreas Piechaczek (LSU postdoc) leading the effort. The initial objective was to have a separator capable of physically separating nuclear isobars (same  $A$  different  $N$  and  $Z$ ) by achieving a mass resolution of  $M/dM$  of 40,000. Such a device was deemed absolutely necessary to do nuclear spectroscopy on very neutron-rich isotopes (now reachable with the new radioactive ion beams) and, in particular, those approaching the astrophysical  $r$ -process path.



This device represents a new concept for an isobar separator based upon the time-of-flight principle. As the development progressed, it became clear that it would be a successful device and additional funds from DOE and ORAU were added to the mix. Because the device is based upon electrostatics with 14 separate lenses (all constructed at LSU), an ion-optics expert was hired to help define the optimal parameters. Because of the precision of construction, and the optimization of the parameters, a predicted mass resolution  $M/dM$  of 400,000 is to be achieved. This impressive resolving power makes the device capable of not only separating nuclear isobars, but also nuclear isomers (same nucleus but in a longer-lived excited state). Consequently, the group has named the device ORISS for Oak Ridge Isomer Spectrometer and Separator.



### Celestial celebration

Christopher Kersey, manager of the Highland Road Park Observatory, and Brad Schaefer, director of the LSU Landolt Observatory, are pictured with one of the telescopes at Highland Road Park Observatory. Both observatories are hosting programs to celebrate 2009 International Year of Astronomy. Read the story at: <http://www.2theadvocate.com/entertainment/42347212.html>

LSU's Focus on Faculty, Students, & Staff cont.

The ATIC Collaboration has discovered an excess of electrons in the cosmic rays at 300-



800 GeV. This may be the first observation of a nearby source of particle acceleration from an as yet unidentified astrophysical

object or it could be a signature of the annihilation of a Kaluza-Klein dark matter particle of mass about 620 GeV. The finding is reported in "An Excess of Cosmic Ray Electrons at Energies of 300-800 GeV" by John Wefel, Greg Guzik, Joachim Isbert et al. in Nature 456, 362 (2008) and is featured in Nature News & Views p. 329 as well as being the subject of a NASA press release and in The Advocate. ATIC was largely constructed at LSU and the excess in the spectrum was discovered in data collected

during ATIC's first two Antarctic balloon flights. Their findings were featured on the front page of the New York Times' Science Times on November 25, 2008. You can read the article at <http://www.nytimes.com/2008/11/25/science/25dark.html?emc=eta1>.

A recent article about **archival astronomical research** using photographic plates featured a picture of LSU Physics & Astronomy grad student Ashley Pagnotta (seen at right). Check out the article: Stars in Dusty Filing Cabinets by Yudhijit Bhattacharjee (Science 24 April 2009: Vol. 324, no. 5926, pp. 460 – 461) <http://www.sciencemag.org/cgi/content/full/324/5926/460>.



**Ham radio signals reach around U.S.** Jim Giammanco (pictured at Highland Road Park Observatory) was featured in The Advocate on June 28, 2009 while trying to communicate with astronauts on the International Space Station. Read the story at: <http://www.theadvocate.com/news/49351307.html>

### **Student Honors and Awards**

- Ph.D. student Jennifer Andrews was awarded a NASA Graduate Student Researchers Program (GSRP) Fellowship for her thesis research on "A Multi-Wavelength Study of Dust Production in Type II Supernovae."
- Graduate student Brent Budden was recently awarded a Dr. Charles E. Coates Research Award.
- Graduate student Sarah Caudill was elected as Chair of the APS Forum on Graduate Student Affairs.
- Undergraduate student Dana Lewis was awarded a 2008-2009 American Physical Society Scholarship for Undergraduate Physics Majors.
- Undergraduate student Christopher Granier received the 2008-2009 Dr. R. Greg Hussey Scholarship for Excellence in Physics.
- Undergraduate student Jessica Brinson received the 2009 Keen-Morris Prize for Outstanding Achievement in Physics.
- Undergraduate student James Champagne received the 2009 Outstanding Senior Project Award.
- Undergraduate student Joey Chatelain received the 2009 Outstanding Undergraduate Research Award.
- Undergraduate student James Hostetter received the 2009-2010 Dr. R. Greg Hussey Scholarship for Excellence in Physics.

WELCOME NEW MEMBERS TO OUR DEPARTMENT!

• **FACULTY** •

Raymond Chastain, Instructor  
Mark Jarrell, Professor  
Rongying Jin, Associate Professor  
Juana Moreno, Assistant Professor  
Von Braun Nascimento, Assistant Professor-Research  
Ward Plummer, Professor  
Shane Stadler, Associate Professor  
John Sutherland, Professor  
Jiandi Zhang, Professor

• **POSTDOCTORAL RESEARCHERS** •

Petr Anisimov (Dowling)  
Cesar Costa (González)  
Tomas Dytrych (Draayer)  
Dimitrios Galanakis (Moreno)  
Joseph Gallagher (Clayton)  
Xiaobo He (Plummer)  
Nagesh Kulkarni (Kutter)  
Valerie Mikles (Hynes)  
Jun Miyamoto (Kutter)  
Brian Moazen (Blackmon)  
Kelly Patton (Sheehy)  
Valery Rousseau (Moreno)  
Cengiz Sen (Jarrell)  
Kangjun Seo (Vekhter)  
Shiquan Su (Moreno)  
Jennifer Tate (Gaarde)  
Victor Taveras (Pullin)  
Jing Teng (Zhang)  
Zhaoxin Xu (Jarrell)  
Ying Yang (Jin)  
Unjong Yu (Moreno)

• **RESEARCH ASSOCIATES** •

Matthew Anderson (Tohline)  
Jun Geng (Sajo)  
Ehsan Khatami (Jarrell)  
Gregory McCandless (Jin)  
Karlis Mikelsons (Jarrell)  
Gretchen Raterman (Dowling)

• STAFF •

Stephanie Crews, Coordinator  
Debbie Norman, Coordinator (Moreno)

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**FALL 2008 GRADUATES**

Ph.D.

Tomas Dytrych  
Serge Aristide Ouedraogo  
Shyang Wen

B.S.

Tasha Lee Brown  
James Anthony Champagne

M.S.

Jason Edward Matney  
Christopher Erik Welch  
Robert Douglas Collyer  
David Jaquet Perrin

**SPRING 2009 GRADUATES**

Ph.D.

Ryan Glasser  
Sean Huver

B.S.

Benjamin Thomas Bourque  
Christopher John Champagne  
Joseph Paul Chatelain  
William Allen Hake  
Joseph C. Prestigiacomio  
Jennifer Nicole Roland  
Richard Thomas Russo II  
John James Schnake  
Charles Algeo Wilson IV  
Travis Wade Zalman

M.S.

Jennifer Andrews  
Ricky Hesston  
Shima Ito  
Jeffrey Kissel

**SUMMER 2009 GRADUATES**

Ph.D.

Charles Bradley

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