

## Fall 2012 Newsletter

# From the Chair...

Dear Physics & Astronomy Alumni and Friends of the Department:

In reviewing the status of our department in the intervening time since our last newsletter update, I am pleased to report that we have continued to experience remarkable growth, and our faculty and students have received many honors and awards in recognition of their accomplishments, many of which you will read about in this newsletter. I am appreciative of the efforts and generosity of our alumni, which assist in the support of our department and our students.

Due to the efforts of our faculty, we continue to receive new grant money during challenging economic times. As of fall 2012, we have almost \$22.6 million in external grant funding. Worthy of particular notice is the participation of our department in the recent \$5.5 million grant to establish the Sidney Kimmel Institute for Nuclear Renaissance (SKINR) at MU, which will encourage collaboration from scientists in several disciplines, including physics, the MU Research Reactor (MURR), engineering, material science and chemistry. This grant was facilitated by Rob Duncan, our Vice Chancellor of Research, and also jointly appoint-

ed to our department.

We now have a total of 32 faculty in our department, including full- and part-time, plus joint appointments. Books by professors Sergei Ko-peikin, Carsten Ullrich, and Giovanni Vignale are now in print, which you can read about in this newsletter. Our distinguished alumnus Gerald Fishman, a recipient of the distinguished Shaw Prize in Astronomy, was recently made an Adjunct Professor to our department. Jerry was also the Lloyd B. Thomas Distinguished Lecturer for Arts and Science just prior to this Leader's meeting. Harland Tompkins, also alumnus of our department and recent seminar speaker and Saturday Morning Science speaker, was made an Adjunct Professor as well.

Our University's official 2011 fall enrollment was 33,805, and the 2012 first-day-of-class number was a record 34,255, with a record freshman class of 6,560 students. We continue to successfully meet the challenges of providing classes and labs to an ever-increasing number of students.

To help meet these challenges and in recognition of a role she was already fulfilling, I recently named Dr. Dorina Kosztin as the new (and first) Associate Chair of our Department of Physics and Astronomy.

An important initial step toward developing a long term strategic plan for our department was undertaken this spring by Paul Miceli and his Planning Committee as they conducted a survey of department resources and needs and then proposed an initial plan for optimizing the use of space in our department. We will follow up on their findings and recommendations in the upcoming year and then see what is left to accomplish as we work toward defining our longer-term goals.



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## New Training for Next Generation Neutron Scatterers at MU

By Hak Taub  
Professor, MU



MU has received its first award from the IGERT Program (Integrative Graduate Education and Research Traineeship Program) of the National Science Foundation for a proposal entitled "Neutron Scattering for the Science and Engineering of the 21st Century." The award provides \$3 M for the training of graduate students in neutron scattering research. Partners in this project are Indiana University, North Carolina State University, and Fisk University. The Project Director is, Haskell Taub, Professor and Director of Neutron Scattering, in MU's Department of Physics & Astronomy.

NSF funded approximately 18 IGERT awards in this competition out of 100 full proposals submitted. 412 proposals were reviewed in the preliminary proposal stage of the program competition for the Fiscal Year 2011.

**Background:** Fundamental research utilizing neutron scattering techniques has led to a host of technological advances in such diverse areas as drug design, the development of high-strength metals and cements, novel materials for electronic and magnetic devices, and hydrogen storage materials. Based on these achievements in science and engineering, recent progress in the design of neutron scattering in-

strumentation, and the potential for new discoveries, the United States has invested nearly \$2B in new facilities for neutron scattering over the past decade.

**Project Description:** Innovative methods of training the next generation of scientists and engineers are required to maximize the scientific impact of these new capabilities in neutron scattering research. To meet this challenge, the MU-led IGERT Program will implement a new paradigm for interdisciplinary training of Ph.D. students in the application of neutron scattering research within three major themes of science and engineering. These themes include: 1) biological macromolecules and biomaterials; 2) the structure and dynamics of strongly correlated electronic materials; and 3) design of artificial nanoscale materials. The proposed graduate curriculum will exploit a combined problem-based learning/writing intensive approach accessible to students from traditionally distinct disciplines. It will combine in-depth, hands-on training at our unique university-based neutron source MURR, the largest research reactor at a U.S. University, with innovative theoretical courses encompassing the three major research themes.

On-campus research and training will be enhanced by research experiences at Oak Ridge National Laboratory and the National Institute of Standards and Technology.

**Broader Impacts:** This project will enlarge the community of researchers capable of exploiting new neutron scattering facilities of un-

precedented power just as they are coming on line. The trainees will develop communication and organizational skills required for geographically dispersed teams to utilize these national facilities effectively.

In addition to training leaders for future interdisciplinary university-based research, the project will provide a pool of potential users and employees of both national research facilities and highly competitive industries that depend on complex materials. The interdisciplinary curriculum is designed to attract future scientists from fields outside of physics and students from underrepresented groups.

In addition to training leaders for future interdisciplinary university-based research, the project will provide a pool of potential users and employees of both national research facilities and highly competitive industries that depend on complex materials. The interdisciplinary curriculum is designed to attract future scientists from fields outside of physics and students from underrepresented groups.

Co-PIs are:

Dr. Anna Waldron, University of Missouri,  
Prof. Arnold Burger, Fisk University  
Prof. Roger Pynn, Indiana University,  
Prof. Flora Meilleur, North Carolina State University.



MU's Research Reactor





*The following is a reproduction of an article written and released on 2/10/12 by Christian Basi of MU on a 5.5. million dollar grant to MU, facilitated in a large way by Rob Duncan, MU Associate Dean for Research, with a joint appointment in the Department of Physics and Astronomy.*

## MU Scientists Receive \$5.5 Million Gift from Kimmel Foundation to Search for the Next Big Thing in Alternative Energy

### Gift given by Sidney Kimmel Foundation, created by founder of The Jones Group

by Christian Basi  
MU News Bureau

COLUMBIA, Mo. — Sustainable practices and the search for safe, environmentally friendly energy has been a priority of scientists for years. With some success, researchers across the globe are continuing the hunt for an energy source that is clean and abundant. Now, scientists at the University of Missouri are the recipients of a five-year, \$5.5 million gift from the Sidney Kimmel Foundation that will help focus efforts in fundamental, physical sciences in the search for new alternative energy sources.

“We don’t know what the next big thing is because it probably hasn’t been invented yet,” said Rob Duncan, vice chancellor for research at MU. “This gift to MU’s scientists will give us the opportunity to explore new and empirical phenomena in the physical sciences, which may ultimately be transformative and could lead to a new form of alternative energy. Tomorrow’s solutions depend on scientific discoveries that are being made now, and hence, on innovations that have



Duncan

not yet occurred.”

The Sidney Kimmel Foundation is donating the large gift, believed to be one of the largest to study energy alternatives. The Foundation was created by Sidney Kimmel, the founder and chairman of The Jones Group, a leading designer and marketer of branded apparel and footwear. The Jones Group includes brands such as Jones New York, Anne Klein, Nine West, Gloria Vanderbilt, Bandolino and Rachel Roy. The company recently acquired footwear brands Stuart Weitzman and Kurt Geiger. Since 1993, the Sidney Kimmel Foundation and its subsidiary, the Sidney Kimmel Foundation for Cancer Research, have committed more than \$750 million to philanthropic causes, including \$550 million to cancer research. According to Business Week, Kimmel is one of four billionaires in the United States who have given over half their wealth to philanthropy.

The donation to MU will be used to create the Sidney Kimmel Institute for Nuclear Renaissance (SKINR), which will encourage collaboration from scientists in several disciplines, including physics, the MU Research Reactor (MURR), engineering, material science and chemistry. Seven major research groups within these disciplines

will participate in this comprehensive scientific effort. These scientists will be studying the fundamental physics of certain energy producing reactions of an unknown origin in their quest for alternative forms of energy.

“Very much like my commitments to cancer research, I believe in investing for America’s future generations,” Kimmel said. “I chose the University of Missouri for this important gift because it is a comprehensive university, experienced in using its deep scientific research capacity across many fields with its firm commitment to serve the public good. This may be futuristic, but when it comes to energy, our future is now.”

In previous studies, scientists from the Naval Research Laboratory; ENEA, which is the National Energy Laboratory of Italy; and other scientific teams around the globe have reported observing excess heat effects when hydrogen or deuterium has interacted with palladium, nickel or platinum under certain extreme conditions. However, the researchers do not know how the excess heat is being created, nor can they duplicate the same, exact results on a consistent basis in some of these systems.

“This phenomenon – excess heat being observed during the interaction of these elements – is intriguing, but we don’t understand where it is coming from,” said David Robertson, professor of chemistry and associate director of research at MURR. “The success rate is about 20 percent, so we know the conditions must be very specific. It’s a hit-or-miss reaction, which is the reason why we’re trying to understand

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it, and we're using every tool in the toolbox to find the answer. This gift to Mizzou will help us enhance our resources to find the answers to this phenomenon and potentially uncover the secrets of a new, clean alternative form of energy."

Robertson says the potential uses for this excess heat energy will depend on how much energy is extracted and how consistent the process is for generating the energy.



## An Update on:

### A TIME for Physics First Leadership and Professional Development Program

by Sarah Hill, Physics First Program Coordinator, and Meera Chandrasekhar, Professor MU



Hill and Chandrasekhar

A TIME FOR PHYSICS FIRST is a partnership among the University of Missouri-Columbia (MU, lead institution), 37 core partner school districts and several supporting partners. The project is funded by the National Science Foundation grant entitled Academy for Teachers using Inquiry and Modeling Experiences for Freshman Physics in Missouri (A TIME for Freshman Physics in Missouri).

Several MU faculty and staff play pivotal roles in this project, including, from the Department of Physics and Astronomy PI Meera

Chandrasekhar, co-PI Dorina Kozstin, co-PI Deborah Hanuscin (joint appointment with College of Education), Project Director Sarah Hill and Professors Angela Speck, Paul Miceli and Karen King, Sunder Balasubramanian from Lincoln University and MU Department of Mathematics co-PI Dorina Mitrea.



Further support is provided by department students who work as Teaching Assistants.

The partnership aims to build leadership skills with research-based professional development (PD) that includes comprehensive physics content, pedagogy, research and evaluation. Participating 9<sup>th</sup> grade science teachers will become intellectual leaders as they learn to teach a yearlong freshman physics course. The impact of this sustainable institutional change will ultimately show an increase in students' future science coursework. The goals of the program are to:

- Create a cadre of teacher-leaders who will become advocates for excellence in physics content and research-based pedagogy.
- Strengthen high school freshman science teachers' and their students' understanding of physics.
- Enhance teachers' knowledge and ability to utilize reform-based pedagogies in teaching freshman physics

- Promote institutional change among core partner institutions.
- Increase students' interest in science coursework in higher grades.

The Summer Academy series, key to the professional development program, is an intensive residential experience that builds in content-level

each year over three years. The academies, held at the University of Missouri, focus on physics content integrated with pedagogy and

leadership training, team-taught by MU faculty and experienced peer teachers. Academies are four weeks long in Years 1 and 2, and two weeks in Year 3. Participants earn graduate credit plus receive a stipend, room, board, travel support and a kit of materials.

Physics First Fellows were recruited in two cohorts based on a delayed-entry design for purposes of related research. Cohort 1 started coursework in summer 2010, while Cohort 2 started in 2011. Both cohorts receive the same treatment, except for the mode of academic year mentoring support: Cohort 1 receives support from Coaches who visit their classrooms, while Cohort 2's Mentors support them online.

During the academic year Fellows implement the yearlong Physics First curriculum in their 9th grade classrooms. They participate in professional learning communities for small-group teamwork, follow-up sessions, support from trained coaches or mentors, online peer collaboration, an online science educa-

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tion leadership course, online access to content experts and a classroom kit lending program.

Planning is currently underway for the Summer 2012 Academy, scheduled during the month of June. Cohort 1 Fellows, who are in their third year of participation, will attend for two weeks, with a choice of two tracks – either a Praxis preparation course for higher teaching certification or independent work in which Fellows collaborate to create electronic resources like videos and animations, write curricular revisions for Special Ed students, create assessments and vignettes of lessons that illustrate the pedagogy of modeling. Cohort 2 Fellows will attend for four weeks, learning the content and pedagogy associated with the second half of the yearlong Physics First curriculum. This includes labs, Socratic dialogue, and inquiry-based discussions.

Along with physics content and pedagogy, Fellows receive leadership training to help them evolve into intellectual leaders. Math teachers and administrators from the Fellows' schools attend mini-academies to help support science teachers during the academic year. In total, up to 120 attendees are expected at this year's summer academy.

The project is in its third year of a five-year funding period. For more details, the Physics First website at [www.physicsfirstmo.org](http://www.physicsfirstmo.org) is a rich resource.



## Biophysics and Your Body.....New Team Emphasizes Interdisciplinary Science in the Middle School Classroom

*By Deborah Hanuscin, Associate Professor MU and Gavin King, Assistant Professor, MU*



Hanuscin



King

School science is usually divided into historic disciplines and taught separately, often with very little to no overlap. Concepts from physical science are taught one term, life sciences the next, and so on. Further, physics and the human body are usually thought of as unrelated—physicists like to break down systems to their barest essentials, while the human body is typically taught in a more holistic way, emphasizing the complex interactions of systems. Yet, at the forefront of scientific research, the barriers between these disciplines are fading. For example, when examined at the nanoscale, biological molecules become mechanistic objects that change shape, orientation or position in response to their interactions.

In an effort to promote interdisciplinary education and scientific literacy, Prof. Deborah Hanuscin and Prof. Gavin King joined forces and spearheaded a new class in fall 2011 entitled “Biophysics Education Outreach”. Soon thereafter Prof. Peter Cornish (MU Biochemistry) joined the group, and the group became even more interdisciplinary. The class, which met once a week (over lunch, usually pizza!), provided an opportunity for doctoral students in physics and science education (including a middle school educa-

tion specialist) to collaborate on the design of a biophysics curriculum unit. The result was a collaboratively designed curriculum supplement focused on several aspects of the physics of the human body. Further, in an effort to sustain the group's efforts, students also gained experience writing grants, several of which were recently submitted.

The Physics of the human body topic is widely inclusive and provides ample opportunities to discuss quantitative physical science concepts in a context that is generally considered to be biological – and hence, provides a bridge toward building fundamental understandings in both fields. Given the stereotypical preferences of biology and physics for females and males, respectively, this curriculum also provides opportunities to address gender inequity in the science classroom. Specific topics in the curriculum supplement include force generation, vision, hearing, and energy. Molecular-scale descriptions of the biological phenomena were emphasized whenever possible.

Building on the momentum from this past fall semester, Prof. Hanuscin, Prof. King, and Prof. Cornish have teamed up with several convergence journalism students (lead by Prof. Mike McKean, MU Journalism School) to develop new multimedia content directly related to the curriculum supplement. The hope is to put the curriculum and associated media content through a pilot test this summer and fall 2012 so that it can be fine tuned before being disseminated to middle schools across the state in the future.



# A New Collaboration – University of the Western Cape

By Haojing Yan  
Assistant Professor,  
MU



On behalf of our department, Haojing Yan paid the first visit to the University of the Western Cape (UWC), South Africa, in January 20 - 26.

Our University and the UWC have had an enduring friendship since 1986, which has inspired a series of fruitful collaborations and ex-

November 2011, a number of astronomy faculties from both sides began to discuss possible collaborations. We at the MU side are interested in developing a partnership because our UWC colleagues have access to a number of telescopes, in particular the 10-m optical/IR South African Large Telescope (SALT). Currently South Africa is actively bidding for being the host of the Square Kilometer Array (SKA), which will be the largest, next generation radio telescope. It was agreed that we should start exchange of visits as soon as possible to bring out ideas.

The exchange began with Haojing's trip to the UWC in this January. His main objectives included: (1) gathering first-hand information on the UWC astronomy program; (2) exploring possible collaborations in astronomy,

both in research and in education; and (3) exploring possible interests in other aspects of physics. With the great help from Rodney Uphoff, Haojing's visit fulfilled all these objectives. During his 3-day stay in Cape Town, he had in-depth discussions with three UWC astronomy staff members, namely, Professors Catherine Cress and Roy Maartens, and Dr. Enrico Olivier. He also talked to five postdocs (out of seven total) and one PhD student. He also had lunch with the UWC Vice Chancellor Bharuthram, and briefly met with the UWC Rector Brian O'Connell. In addition, he also talk-

ed to a number of other physics faculties at the UWC, namely, Professors Reginaldt Madjoe (Department Chair), Christopher Arendse, Basil Julies, and Robert Lindsay.

We are now quite positive that we can move forward to build a relation and collaboration. As we knew at the very beginning, in order to make such a collaboration sustainable we need to think what we (MU) have to offer.

During the visit, a number of ideas were suggested to our UWC colleagues, including the collaborations at all levels (with the staffs, the postdocs and the students), and possible joint educational programs at both the graduate and the undergraduate levels. In addition to astrophysics, it also seems possible to collaborate in other fields of physics, such as alternative energy, microscopy, etc. To materialize these latter ideas will of course require further interactions of interested individuals of both sides.

Prof. Roy Maartens will be visiting us this September. We hope that these first visits will be the seed for a full-scale collaboration in the near future. In fact, Haojing has already started working with some of the UWC colleagues on one of his projects. A joint proposal, led by Dr. Russell Johnston, a postdoc at the UWC, was submitted on February 24 to request observing time at the SALT. The proposal was approved on April 4 and at least 2/5 of the observations are guaranteed time on the telescope. We are looking forward to even more productive collaborations very soon.

UWC website:

<http://www.uwc.ac.za>

UWC Astrophysics Group website:

<http://www.uwcaastro.org/>



University of the Western Cape

changes between the two institutions in many disciplines over the years.

This long-standing tie is now extending to our department and the Department of Physics at the UWC, in particular to the astronomy programs at both places.

Initiated by Dr. James Scott (Director of UM International Center), Prof. Rodney Uphoff (Director of UM South Africa Education Program), Prof. Robert Duncan (UMC Vice Chancellor of Research) and Prof. Ramashwar Bharutharm (UWC Deputy Vice Chancellor) in





## TOP Teachers Program Will Help to Curb Teacher Shortage

By Laura Lindsey

Director of Communications, The College of Arts and Science  
University of Missouri

The United States faces a critical shortage of qualified physics and physical science teachers in high schools. More than one half of physics teachers do not have a physics degree, and the American Association for Employment in Education consistently lists high school physics as one of the fields with the most severe teacher shortages. Physics is the foundation for all other sciences, but in the past five years, MU has graduated only three new physics teachers.

Karen King, assistant teaching professor, and Professor Linda Godwin hope to increase those numbers thanks to funding they received from the Physics Teacher Education Coalition (PhysTEC) program. The title of King and Godwin's program is Tomorrow's Outstanding Physics Teachers (TOP Teachers.) PhysTEC is supported by the National Science Foundation (NSF) and the American Physical Society. Since 2001, PhysTEC's mission has been to improve and promote the education of future physics teachers. So far, the funded institutions have doubled their production of physics teachers and have developed mentor programs to help retain them.

A former high school teacher, King is the principal investigator for this project. She understands from first-hand experience the importance of recruiting quality physics teachers.



King

Beginning this fall, she and Godwin will recruit students for the program through high school visits, college classroom presentations, and partnering with the College of Education.

"It is never too early or too late to recruit a student into the teaching profession," says Godwin. "That is why we will target high school students, college students at all stages of their education, and recent graduates who are searching for a career."

Students can get their teaching certifications in several ways. The first is to earn a dual degree in education and physics ([www.t2d2.missouri.edu](http://www.t2d2.missouri.edu)). This option will better prepare students to teach advanced placement classes and opens the door for graduate school if college-level teaching is appealing. Students interested in this option should start early in their college careers, so, ideally, high school students and freshmen are the targets in that scenario. Another option is to earn a bachelor of science degree in education with an emphasis in physics. This option works best for those students who already have plans for an education degree and do not want to start over with a dual major. The last op-

tion is the Science and Mathematics Academy for the Recruitment and Retention of Teachers (SMAR<sup>2</sup>T), which targets seniors or recent graduates who are looking for jobs. This program offers an entry into teaching for graduates who have already earned a degree in physics or engineering. Additional education training with a mentor teacher and classroom teaching will be required.

"The hardest group to recruit is sophomores and juniors," says King. "We need to find ways to get them interested in teaching, even though they aren't majoring in education."

One of the initiatives King and Godwin will implement this year is the Learning Assistant (LA) Program. As an LA, students will have an opportunity to teach in a high school or college-level physics classroom.

"This is a great part of the program because the students will get an authentic teaching experience and will get excited about the possibility of teaching," says King.

Learning assistants will work with faculty to make courses student-centered and interactive. These programs will provide potential future teachers with support and a low-stress early teaching experience that will encourage them to pursue a teaching certification. Other institutions that have tried this program have found that it can increase the pool of students from which to recruit future physics teachers.

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"We want to grow students' interest in physics as a whole," says King. "We want to emphasize that you can do a lot with a physics degree—one does not just have to go to graduate school. Physics is a flexible and useful major."

Learning assistants will receive comparable compensation to a research assistant. The goal is to elevate teaching to the level of a researcher as a career choice.

Not all of their attention will center on current college students, however. One potential program will allow 11<sup>th</sup> and 12<sup>th</sup> graders to design mini lesson plans for 9<sup>th</sup>-grade students with the goal of discovering potential prospects.

The key to a successful teacher

preparation program is to have a teacher-in-residence (TIR) who applies classroom wisdom to the tasks of identifying, training, and supporting teachers of physics. Doug Steinhoff, a physics teacher at Jefferson Junior High School will take on this role at MU. His experience in the Columbia Public School system will be beneficial in building bridges with local schools and in creating professional development courses. Steinhoff will also serve an active role in recruiting future teachers, mentoring student teachers, and designing new courses aimed at preparing physics teachers.

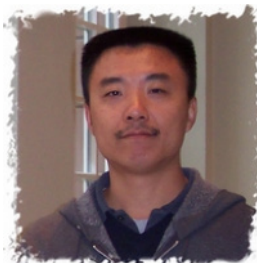
The TOP Teacher Program is funded through PhysTEC for three

years, with the College of Arts and Science and the Department of Physics agreeing to fund an additional three. Their goal is to have at least 10 students graduate from the program every three years.

Other contributors to the grant include: Troy Sadler, professor of science education and director of MU Science Education Center; Deborah Hanuscin, associate professor of physics and education; Dorina Kosztin, associate teaching professor of physics; Carlos Wexler, associate professor of physics; and Patricia Friedrichsen, associate professor of biological sciences and education.



## Two Professors Join the Department for the Fall Semester of 2011



Dr. Haojing Yan comes to MU from Ohio State University.

Haojing is an observational astronomer

who has a broad interest in galaxy formation and evolution, and is an active user of a variety of ground-based and space-based telescopes and their archives. Currently he is largely focused on searching for and understanding galaxies in the early universe when it was only less than ~ 1 billion years after the Big Bang (or in other words, ~ 13 billion years ago), and on investigating the mass assembly history of galaxies over cosmic time. He has been leading a large program, "Hubble Infrared Pure Parallel Imaging Extragalactic Survey" (HIPPIES), using the data obtained by the Hubble Space

Telescope. He has been deeply involved in a number of other space-based survey programs, such as the "Great Observatories Origins Deep Survey" (GOODS) and the "Spitzer Extended Deep Survey" (SEDS), and most recently the "Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey" (CANDELS).

Dr. Linda Godwin returned to the department following a 30-year career at the NASA Johnson Space Center in Houston, TX. Her career there included participating in four shuttle missions. A veteran of four space flights, she has logged over 38 days in space, was part of the crew that



deployed the Gamma Ray Observatory in 1991, and has participated in two spacewalks and conducted robotic arm operations. Her missions also included Earth science (with a synthetic aperture radar), other laboratory research, and visits to the Russian space station MIR and the International Space Station. Prior to NASA, Linda was a graduate student in this department working in low temperature condensed matter physics under Dr. Henry White.

She will teach introduction to astronomy and will also be involved with doing outreach in the Columbia community, plans to integrate her experiences at NASA into undergraduate teaching to show the application of physics to space-related scenarios and develop new curricula based on space applications.





# Our Students

## Recent Undergraduate Degrees:

### BS in Physics - 2011

Diana Katherine Bolser  
Nelson De Queiroz E Souza  
Corinne L. Fletcher  
Lorien Hayden  
Alex Hoban  
Alexander Ispa-Cowan  
Harrison Lewis Knoll  
Nicholas David Kullman  
Lindsey L Sinovic  
Richard L Sieightholm  
Kyle Gregory Williams

### BA in Physics 2011

Matthew Elisha Taylor

### BS in Physics 2012

Andrew Alferman  
Andrew Austin  
Andrew Barton  
Daniel Blake  
Alexander Buffard  
Anoff Cobblah  
Justin Grayer  
Jared Grice  
Harrison Knoll  
Michael Kramps  
Lucas Miller  
Anthony Pace  
Lee Seow  
Jordan Wheeler

### BA in Physics 2012

Amanda Stevenson-Grund

## Recent Master's and PhD degrees:

### Fall 2010:

#### MS in Physics

Ajay Mishra

#### PhD in Physics

Jhuma Das

### Spring 2011:

#### MS in Physics

Monika Golebiowska  
Dhanashree Moghe  
Raina Olsen

#### PhD in Physics

Jagat Lamsal  
Raina Olsen

### Summer 2011:

#### MS in Physics

David Arrant  
David Stalla  
Mitali Madhusmita

### Fall 2011:

#### MS in Physics

Brandon Hester  
Jagath Gunasekera

#### PhD in Physics:

Gengsheng Chen  
John Gaddy  
Michal Gramlich  
Menzi Mchunu

### Spring 2012:

#### MS in Physics

Matthew McCune  
Kevin Tarwater  
Jiong Zhang

#### Ph.D in Physics

Matthew Beckner  
Jimmy Romanos



New graduate students, Fall 2011,  
From left to right  
Back row: Andrew Gillespie,  
Grant Knotts, Sean Baldridge,  
Jacob Brown, Nelson de Souza,  
Alex Miller  
Front row: Tina Rezaie Matin,  
Marat Musin, Fengfei Wang,  
Chengfei Yan

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In the Fall 2011 our department admitted 10 new graduate students: Sean Baldrige, Jacob Brown, Nelson DeSouza, Andrew Gillespie, Grant Knotts, Alex Miller, Muarat Musin, Tina Rezaie Matin, and Fengfeng Wang.

Two new graduate students joined our department in the Spring of 2012: Gregory Kissinger and James Runge.

For the Fall, 2012 semester, our department welcomed 9 students to our graduate studies: Zachary Buck, Justin Grayer, Hannah Groom, Shahrzad Karimi, Harrison Knoll, Zhiyuan Ma, Bradley Mills, Alexander St. John, Mohammad Mahdi Valizadeh, bringing our number of full-time graduate students to 56.



*New graduate students, Fall 2012, from left to right: Zhiyuan Ma, Justin Grayer, Mohammad Mahdi Valizadeh, Alex St. John, Shahrzad Karimi, Zack Buck, Hannah Groom, Harrison Knoll, and Bradley Mills*

## PAGSA: A Year in Retrospect

*By Christopher Owens and Matt McCune  
2012 PAGSA Executive Board  
Members and Graduate Students,  
MU*

The Physics and Astronomy Graduate Student Association ([PAGSA](#)) has completed another successful year helping to enrich the lives of graduate students in the department. The organization is a place for members to voice concerns, practice presentations in Journal Club, and produce a feeling of camaraderie among graduate stu-

dents in the department.

To honor our alumni and promote the department, PAGSA has chosen to construct an enhanced [Alumni Directory](#). PAGSA's hope is that potential graduate students will use the directory as recent examples of the various careers and achievements that can be attained with an advanced degree in physics from Mizzou. Also, some of the more senior alumni have been included on a [Select Alumni](#) page which

demonstrates their leadership in their field.

The PAGSA website now features a detailed [calendar](#) with many events including departmental seminars and colloquia, PAGSA General Assembly and Journal Club meetings, outreach and social events, training activities, non-departmental events at Mizzou, as well as regional and national APS, AAS and Biophysical Society meetings.



*PAGSA Members at NSTA Science Matters Night at Lange Middle School*

The Teaching Excellence Committee, headed by Jesse Kremenak, has made a huge push for mid semester evaluations to improve the quality of graduate student instructors. First a survey by [MoCAT](#), but more recently the survey was implemented on blackboard to ensure greater student participation. These mid-semester evaluations give TAs an opportunity to find ways they can improve as educators before the semester ends and improve their final evaluations. This is particularly helpful for first semester teachers to get some early feedback on their teaching skills.

In Jan 2012, PAGSA created a new Public Outreach Committee, headed by Matt McCune, which has organized the outreach capabilities of the organization, more than doubling the service performed in previous years. PAGSA members have par-

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ticipated in the Missouri Science Olympiad, NSTA's Science Matters Night at Lange Middle School, and a summer program entitled "The Physics of Superheroes", among many others. Currently, the committee is working with Sigma Pi Sigma to unite our outreach efforts with the department's undergradu-



A&S Fall Welcome

ate students.

2012 Missouri Science Olympiad State Tournament Volunteers (from left to right): Dhanashree Moghe, Jiong Zhang, Jesse Kremenak, Deepika Menon, Grant Knotts, Matt McCune, Lindsey Ortiz, Jagath Gunasekera, and Andrew Miskowiec (not shown: Kevin Tarwater, Keshab Paudel, Matt Mower, and Prof. Yun Zhang)



## Awards and Recognition Congratulations to...

....**Kattesh Katti** on his *induction in to the Academy of Science*, St. Louis, for his pioneering research in green nanotechnology.

Dr. Katti was inducted as a Fellow of the Academy on November 9, 2011 in a commemorative ceremony held in St. Louis, MO.

....**Gabor Forgacs** on the *St. Louis Science Center's inauguration of the exhibit*, "Organ Printing--Building Tissues and Body Parts in the Future" (funded by the NSF), with a special lecture of his (Star Trek Lecture), on Thursday, Jan. 12, 2012.

.... **Hak Taub** on his *election as Fellow of the Neutron Scattering Society of America* (NSSA). Fellowship in the NSSA is limited to less than 1% of the membership, every two years, and recognizes outstanding

contributions to neutron scattering in North America. The award will be presented at the American Conference on Neutron Scattering (ACNS), June 24 - 28, 2012, in Washington, DC

....**Debi Hanuscin** for *winning one of the five Kemper Awards for Teaching Excellence*.

.... **Gavin King** on his *NSF CAREER Award*, "Structure and Dynamical Mechanisms of Membrane Transport Proteins: New Vistas Via Ultra-stable Force Microscopy"

.... **Xiaoqin Zou** on her *NSF CAREER Award*, "A computational approach to template-based structure selection for protein-protein interactions."

## Department Hosted Distinguished Alumni:

The Department of Physics and Astronomy hosted Dr. William Brinkman, Director, Office of Science, U.S. Department of Energy, for the Vice Chancellor for Research Seminar lecture, "Science for Energy," on February 18, 2011. Dr. Brinkman is an alumnus of the Department and received the 2011 College of Arts & Science Distinguished Alumni Award (2011 Arts & Science Week).

On March 19-10, 2012, the department hosted Dr. Gerald Fishman, NASA astrophysicist and the winner of the 2012 prestigious Shaw award in Astronomy. Dr. Fishman presented both the O. M. Stewart Colloquium on "Gamma-Ray Bursts" and the Astrophysics & Relativity Seminar on "Terrestrial Gamma-Ray Flashes Above Thunderstorms"

.... **Angela Speck** on her *election as Councilor of the American Astronomical Society* (AAS). Her term in office will begin at the end of the annual business meeting in May 2011, in Boston, and end at the conclusion of the annual business meeting in 2014

.... **Dorina Kostin** on receiving the *MU Excellence in Advising Award*, which recognizes outstanding advising services to the students of the University of Missouri. Both Prof. Angela Speck and Prof. Dorina Kosztin were nominated for this award. Prof. Dorina Kosztin is also the recipient of the *MU Excellence in Education Award*, that recognizes



faculty members, advisers and academic administrators who have made significant contributions to the out-of-class learning experiences of MU students and who have demonstrated a long-standing commitment to student learning and personal development.



MU Excellence in Advising Award.  
Peter Pfeiffer, Lucas Miller, Dorina Kosztin, Paul Miceli, Angela Speck, Meera Chandrasekhar, Ioan Kosztin, Giovanni Vignale

## Physics Leaders Meeting - October 21-22, 2011

The Physics Leaders gathered on October 21st at MU to meet with the faculty and students of the department. Dr. Peter Pfeiffer, Chair, updated the leaders on the latest faculty statistics and research, Dr. Carsten Ullrich summarized the current graduate program, and Dr. Dorina Kostin discussed undergraduates and undergraduate recruitment. Graduate students Kevin Tarwater and Matt McCune described the activities of the Physics and Astronomy Graduate Student Association (PAGSA).

Several of the faculty made presentations:

Dr. Hak Taub, Director of Neutron Scattering: "IGERT at MU: Neutron Scattering for Science and Engineering of the 21st Century"

Dr. Haojing Yan (new faculty): "Galaxy Formation in the Early Universe"

Dr. Ioan Kosztin: "Multi-Scale Modeling of Biomolecular Systems"

Dr. Dorina Kosztin: "On-Line Teaching"

Undergraduate and graduate students made excellent presentations,

after which the leaders had a difficult decision to award first and second place to both undergraduate and graduate students:

Justin Grayer (UGR): "Precision Optical Techniques in Biology: Progress towards Optimization of an Ultrastable Force Microscope"

Luke Andrea (UGR): "Large Scale Fabrication of Active Hybrid Plasmonic Nanosensors"

Tyler Rash (GRAD): "Industrial Scale Hydrogen Storage on Activated Carbon at MU"

Andrew Miskowiec (GRAD): "Study of Water Diffusion on Single-Supported Bilayer Lipid Membranes by Quasielastic Neutron Scattering"

Danish Adil (GRAD): "Studying Organic Field Effect Transistors: Towards Building More Reliable Plastic Electronics"

Ashkan Shafiee (GRAD): "The Power of Printers: From Printed Electronics to Organ Printing"

Matt Connolly (GRAD), "Pore Structure of Activated Carbon"

Nelson DeSouza (GRAD): "FIRST Robotics Competition: Opportunity

for Recruiting Science and Engineering Majors"

First Place, Undergraduate: Justin Grayer

Second Place, Undergraduate: Luke Andrea

First Place, Graduate: Andrew Miskowiec

Second Place, Graduate: Danish Adil

Following lunch in the Physics Library, Physics Leader Dr. Homam-mad Salehpour, University of Texas M.D. Anderson Cancer Center in Houston, gave an interesting presentation on "What is Actually Medical Physics?", including his own path to this career, as well as some early historical links between our department and medical physics.

The leaders voted to approve Philip Chumbley as the new Chair of Physics Leaders, as the prior Chair, Linda Godwin, has joined the MU Department of Physics and Astronomy.

Dr. Peter Pfeiffer and his wife Therese hosted the Friday night dinner at the Upper Crust. Faculty and student awards were presented, and Philip Chumbley provided humorous reminiscences from his graduate student days.

The next Physics Leader's meeting will take place on September 28-29, 2012.





# Student Awards and Scholarships

## Graduate Students:

**Matt Mower:** GSA Outstanding Graduate Student Award (Graduate Student Association; 3/8/12) and 2012 winner of the TA Choice Award presented by MSA/GPC.

**PAGSA -- Physics and Astronomy Graduate Student Association:** 2nd Place Ribbon at Mizzou Adventures in Graduate Education (4/20/12)  
<http://gradschool.missouri.edu/about-us/initiatives/graduate-education-week/>

**Jacob Brown:** Harry E. Hammond Award for Excellence in Undergraduate Teaching; Dept. of Physics & Astronomy (5/3/12)

**Jagath Gunasekera:** Harry E. Hammond Award for Excellence in Undergraduate Teaching; Dept. of Physics & Astronomy (5/3/12)

**Keshab Paudel:** Harry E. Hammond Award for Excellence in Undergraduate Teaching; Dept. of Physics & Astronomy (5/3/12)

**Deepika Menon:** 2012 recipient of the Chancellor's Excellence Award for Graduate Student Leadership.



Matt Mower, TA Choice Award 2012

Deepika Menon, Chancellor's Excellence Award, 2012



## Undergraduate Students:

**Cody Allard:** Rose Marie (Rice) Dishman Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Michael Andrade:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Richard Barber:** Newell S. Gingrich Scholarship Award, Dept. of Physics

& Astronomy (2/21/12)

**Alexander Buffard:** Newell S. Gingrich Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Nathan Frey:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Justin Grayer:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Jared Grice:** Donald L. Packwood Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Colby Johnson:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Christopher Lutsch:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Lucas Miller:** Clifford W. Tompson Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Antony Pace:** Newell S. Gingrich Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Nicholas Parmely:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Dylan Register:** Newell S. Gingrich Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Lee Seeow:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

**Sean Sweany:** Paul E. Basye Scholarship Award, Dept. of Physics & Astronomy (2/21/12)

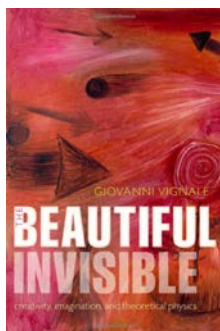
**Jordan Wheeler:** Clifford W. Tompson Scholarship Award, Dept. of Physics & Astronomy (2/21/12)



PAGSA-2012 Chancellor's Award in Public Outreach (2nd Place) at the Mizzou Adventures in Graduate Education Event (from left to right): Kevin Tarwater, Raghu Sanganna Gari, Matt McCune, Chris Owens, and Dr. George Justice (not shown: Matt Mower, Deepika Menon, and Nelson de Souza).



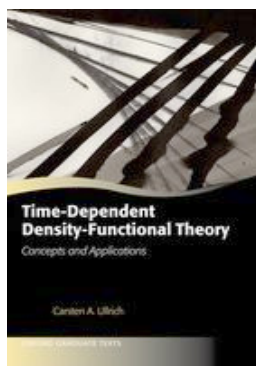
## For Your Bookshelf:



### Giovanni Vignale, *Beautiful Invisible*

Publication Date: April 15, 2011

Challenging the image of theoretical physics as a dry discipline, *The Beautiful Invisible* shows that this highly abstract science is in fact teeming with beautiful concepts, and the task of imagining them demands profound creativity, just as creative as the work of poets or magical realist novelists such as Borges and Musil. "A good scientific theory is like a symbolic tale, an allegory of reality," writes Giovanni Vignale, as he uncovers the unexpected links between theoretical physics and artistic creativity. In engaging and at times poetic prose, and with ample quotations from many of the writers he admires, Vignale presents his own unorthodox accounts of fundamental theoretical concepts such as Newtonian mechanics, superconductivity, and Einstein's theory of relativity, illuminating their profound implications. Throughout, the author treats readers to glimpses of physics as "exercised in the still night, when only the moon rages." Indeed, as we delve behind now-familiar concepts such as "electron spin" and "black hole," the world that we take for granted melts away, leaving a glimpse of something much stranger.



### Carsten Ulrich, *Time-Dependent Density-Functional Theory, Concepts and Applications*

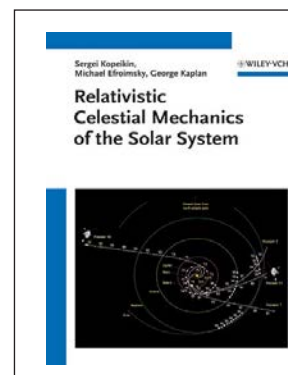
Released Dec. 22, 2011 By Oxford Graduate Texts

This is a first, comprehensive, self contained textbook in the field of TDDFT, written by a leader in the field. The book has a strong emphasis on a pedagogical treatment, with many examples and 125 exercises, and is suitable as a textbook or companion book for graduate courses in electronic structure theory, theoretical spectroscopy, theoretical and computational chemistry, materials science and many other topics

The book presents an overview of the state of the art of the field of TDDFT, with over 800 references.

Many additional resources are contained in the appendices, including a long list of review literature and available computer codes.

Time-dependent density-functional theory (TDDFT) describes the quantum dynamics of interacting electronic many-body systems formally exactly and in a practical and efficient manner. TDDFT has become the leading method for calculating excitation energies and optical properties of large molecules, with accuracies that rival traditional



### Sergei Kopeikin, Michale Efroimsky, George Kaplan, *Relativistic Celestial Mechanics of the Solar System*

Published August 2011

This authoritative book presents the theoretical development of gravitational physics as it applies to the dynamics of celestial bodies and the analysis of precise astronomical observations. In so doing, it fills the need for a textbook that teaches modern dynamical astronomy with a strong emphasis on the relativistic aspects of the subject produced by the curved geometry of four-dimensional spacetime.

The first three chapters review the fundamental principles of celestial mechanics and of special and general relativity. This background material forms the basis for understanding relativistic reference frames, the celestial mechanics of N-body systems, and high-precision astrometry, navigation, and geodesy, which are then treated in the following five chapters. The final chapter provides an overview of the new field of applied relativity, based on recent recommendations from the International Astronomical Union.

The book is suitable for teach-

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***Coming up, Fall 2014:  
Department of Physics and Astronomy  
Alumni Reunion!***

**For up-to-date news, reference:  
[Physics.Missouri.edu](http://Physics.Missouri.edu)**

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