

ON THE MOVE

Physics student combines science and dance to teach new concepts



Scientific exploration is growing by leaps, bounds and pirouettes thanks to a Kansas State University undergraduate student. Daniel Phillips, senior in physics and nuclear engineering, Kaiser, Oregon, is using his dual interests in physics and dance to help performers discover scientific concepts. “The personality of a performer is not necessarily conducive to sitting in a lecture hall and getting talked at about physics,” Phillips said. “I wanted to see if there was a viable way to teach science through performance art to performance-minded individuals.”

Phillips, who has danced in several K-State performances, stumbled upon the idea for his research after working on a related project with two K-State professors. Laura Donnelly, assistant professor of dance, and Amit Chakrabarti, head of the physics department, are developing the three-part “Crystal Ballet,” which demonstrates the process of making glass by heating crystals and then suddenly cooling them. Phillips performed in the premiere of the first movement, “Solid Crystal,”

in the university’s 2014 SpringDance, and also acted as a liaison between the two disciplines. “I don’t see either field as deeply as the experts, but I know enough about each that I can guide them toward the middle,” Phillips said. The second act was polished before the 2014 WinterDance performance. Phillips has transitioned from a performer to a rehearsal assistant, helping dancers with techniques. Additionally, Phillips has begun his own research using the ballet as a method to teach physics to the dancers.

“In any performance, the story you’re telling doesn’t really hit home until you’re actually telling it to the audience,” he said. “Up to that point, you’re worrying about your lines and individual performance. When you perform for an audience, you become part of the story. It has to be real to you to be real for them.” Phillips gave each of the 12 dancers a questionnaire to gauge their prior physics knowledge. Then, throughout the course of rehearsals, he would inject physics terminology into his dance instruction to explain why

the molecules — or dancers — reacted in certain ways. “I could see them absorbing it,” Phillips said. “I’ve heard them tell each other, ‘we turn this way because,’ and explain the science correctly. If you can teach people science in a way that relates to their interests, it’s a powerful tool.” Phillips added that one of the best ways in which to learn is to teach the subject to someone else. In his research, it’s twofold — not only is he deepening his physics knowledge by teaching the dancers, but the dancers are learning by “teaching” the audience. In the upcoming third act, Phillips said he hopes to actually sit down with the dancers to explain the molecule movement, further connecting the ideas. “It’s so cool seeing the two loves of my life — physics and dancing — come together,” he said. “Above anything else, I love physics, and anytime I can help someone understand a new concept, I’m happy.”

Phillips plans to graduate in December 2015, and later plans to pursue a graduate degree in physics.



GREETINGS FROM K-STATE PHYSICS



I am excited to share with you an annual update on our student and faculty achievements. Many of the success stories of our faculty and students are presented on these pages. These achievements are a direct result of students and faculty working together on their passion for physics.

To reach a higher level of distinction, an academic department must achieve three pillars of success: high quality students, top-notch teaching and research facilities and outstanding faculty. Our incoming classes of physics majors are larger than ever, thanks in large part to our focused recruitment efforts. Even as they increase in number, our incoming students are of excellent quality. Renovations of our teaching and research laboratories help students form a positive attitude about physics and link directly to our successful recruitment and retention efforts. And our faculty continue to be recognized for their research and teaching excellence.

Our high aspirations to move up in the national rankings can only be achieved by three cornerstones of support: university funding of infrastructure, research grants and private philanthropy. Because of your generosity, we are able to retain and recruit outstanding faculty and students. Your contributions help us with

providing departmental scholarships to our incoming physics majors, providing additional scholarships to undergraduate researchers recognized by the College of Arts & Sciences, offering endowed positions to our outstanding faculty and recognizing our extraordinary graduate teaching assistants, who are critically important for providing teaching instruction in our undergraduate laboratories and interactive studios.

Please visit our website (phys.ksu.edu) and Facebook page (facebook.com/ksuphys) and keep in touch with the department. I would love to hear about what is happening in your life (amitc@phys.ksu.edu).

Once again, I thank you for your continued support of our department.

Warm regards,

Amit Chakrabarti

Amit Chakrabarti
William and Joan Porter Professor and Head

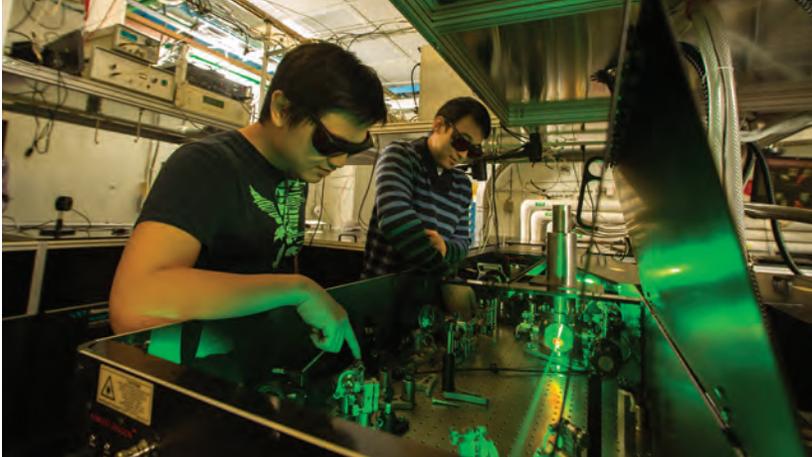
CHRISTOPHER M. SORENSEN PHYSICS INCUBATOR FUND ENDOWED

Physics alumna Michelle Munson (B.S., 1996) and her husband Serban Simu have endowed a new fund with over \$1 million. The fund is named for Chris Sorensen, Cortelyou-Rust University Distinguished Professor and University Distinguished Teaching Scholar, who taught and advised Michelle as an undergraduate in Engineering Physics. She and Serban wish to honor Sorensen for the special support that had a significant impact on her life. The funds will be used at the discretion of the Department Head, for purposes of creating innovation and entrepreneurship in physics and promoting opportunities for new interdisciplinary research projects.

"This generous gift propels a project that is very close to my heart," Department Head Amit Chakrabarti says. "We facilitate the connection of physics research to marketable applications by cultivating a culture of "producing products," as it's called in distinguished physics alum Bill Porter's autobiography. To reach this lofty goal will require significant additional private support for personnel and infrastructure. Michelle and Serban's funding is a fantastic start for this process, and I am really grateful for their support and excited about the department's future."



Top, Michelle Munson (right) converses with Bill Porter (left) at his California home during a K-State Physics alumni function in 2003. Bottom, Michelle Munson delivers the Nichols lecture at K-State in 2013.



COMMISSIONING OF THE HITS LASER

Last summer, the high-intensity tunable source, or HITS, laser was installed at the James R. Macdonald Laboratory at Kansas State University. This state-of-the-art laser provides the most intense laser pulses obtained at K-State. The laser is funded by the National Science Foundation, Department of Defense, Department of Energy and K-State. HITS allows researchers to study a new optical regime in which they have control of the electric field's waveform. This means they can synthesize optical pulses with complex features just as common electronics manipulate sound or radio frequencies, but at much shorter time scales. Basic research with HITS will contribute to new understanding of how synthesized strong fields interact with nano-sized solid samples. In turn, these results will lay the foundation for new optoelectronic devices that can operate at speeds that are several orders of magnitude faster than current technologies.



MACDONALD LAB CREATES A CIRCUIT OF EXCELLENCE FOR DOCTORAL STUDENTS



The James R. Macdonald Laboratory has a track record of attracting and facilitating award-winning individuals.

Adam Summers, doctoral student in physics from Lenexa, is the latest in a list of

high-achieving doctoral students at the lab. He was awarded a National Defense Science and Engineering Fellowship from the Department of Defense and the American Society for Engineering Education for his research with ultrafast laser physics.

Summers and his advisor, Carlos Trallero, assistant professor of physics, are researching how intense laser pulses

interact with gold nanowires and other nanoscale samples. An ultrafast laser pulse could be used to create a current in these samples, leading to new types of electronic circuits.

"These new circuits would operate at very high speeds, which is of interest to the Department of Defense as well as the optics and electronics industries," Summers said.

Other students from the lab who have recently received national awards include Derrek Wilson, doctoral student from Liberal, Missouri, who received a National Science Foundation Graduate Research Fellowship in 2013, and Bethany Jochim, doctoral student from Pierre, South Dakota, who received a Department of Energy Graduate Fellowship in 2012.

SHEDDING LIGHT

Multimillion-dollar EPSCoR grant helps researchers understand ultrafast dynamics

The James R. Macdonald Laboratory is involved in a collaborative National Science Foundation project to understand a long-standing mystery: how light interacts with matter.

Itzik Ben-Itzhak, laboratory director and university distinguished professor of physics, is a co-principal investigator on the multimillion-dollar project, "Imaging and Controlling Ultrafast Dynamics of Atoms, Molecules, and Nanostructures." The project involves nine researchers in the university's physics and computer science departments as well as researchers at the University of Kansas, or KU, and the University of Nebraska, Lincoln, or UNL.

The NSF's Experimental Program to Stimulate Competitive Research, or EPSCoR, recently supported the project with a three-year, \$6 million award. The grant is for developing a regional Nebraska-Kansas consortium to understand how ultrafast laser technologies

influence photonics and electronics.

The project — which focuses on atomic, molecular and optical physics — involves 30 physicists, chemists, computer scientists and electrical engineers from Kansas and Nebraska. The researchers will collaborate on imaging and controlling ultrafast dynamics in atoms, molecules and nanostructures. "We want to see what light does to molecules so that we can try and use light to control molecular processes," Ben-Itzhak said. "We can use this knowledge to develop tools for useful future applications."

Some of these applications include scientific, technological, experimental and theoretical tools that can be used in laser technology, solar energy capture and nanotechnology.

For the project, researchers from K-State's atomic, molecular and optical physics group are observing how fundamental systems react in strong laser fields. The researchers

want to determine how to control strong laser fields and drive reactions in matter. Other K-State researchers involved include Daniel A. Andresen, associate professor of computing and information sciences, and Kevin Carnes, Bret Flanders, Vinod Kumarappan, Anh-Thu Le, Chii-Dong Lin, Artem Rudenko, Uwe Thumm and Carlos Trallero, all physics faculty members. The Kansas and Nebraska consortium is also planning education, outreach and workforce development activities that involve small colleges in the two states, summer workshops for high school physics teachers and student programs.

The project's lead principal investigators include the NSF EPSCoR project directors in their respective states: Kristin Bowman-James, KU distinguished professor of chemistry, and Fred Choobineh, UNL professor of industrial and management systems engineering. Anthony Starace, UNL professor of physics, is also a project leader.

KUDOS TO STUDENTS AND POSTDOCS

Undergraduate major **Kevin Carr** was a member of the winning student team that tackled computer programming problems for prizes at a programming contest hosted by the K-State chapter of the Association for Computing Machinery on Oct. 18, 2014, in Nichols Hall. Open to K-State students of all majors, teams spent five hours attacking 10 programming problems of varying degrees of difficulty.

Graduate students **Neda Dadashzadeh** and **Mary Harner** were selected as top presenters at the 18th annual K-State Research Forum. Harner received first place and Dadashzadeh received second place in the Oral Presentations in the Engineering, Math and Physical Sciences Session.



Graduate student teaching and research award recipients recognized at the Department of Physics annual scholarship luncheon on May 9, 2014: **Pablo Guimera Coll** received the award for Outstanding Teaching by a First- or Second-Year Graduate Student; **Jessica Changstrom** is the recipient of Outstanding Service in Teaching by a Graduate Student; and **Mohammad Zohrabi** (Ph.D., 2014) was awarded Outstanding Graduate Student Researcher and presented a research poster in the department. The scholarship luncheon featured alumnus **Roger Lanksbury**, dual major in physics and nuclear engineering, 1974, as the speaker.

Physics postdoc **Sadia Khalil** has been named a distinguished researcher at the Compact Muon Solenoid (CMS) LHC Physics Center at Fermilab for 2015. She receives this fellowship for the second consecutive year. The 15 colleagues selected as distinguished researchers are accomplished individuals at different stages of their career. This program provides resources to help strengthen and expand their research programs. Khalil will lead the physics group on the vector-like quark searches at CMS.

THREE NEW FACULTY JOIN PHYSICS TEAM



Lado Samushia, assistant professor, joined the physics faculty last fall. As a cosmologist, he studies the mysterious,

invisible portions of the universe: more than 25 percent made of dark matter and about 70 percent composed of dark energy. His research works with 3-D maps of galaxy distributions to study the properties of dark energy. Researchers from the Sloan Digital Sky Survey, or SDSS, collaboration have used the most recent data set to measure the distances to remote galaxies with better than 1 percent precision and to measure the expansion rate of the universe with a 4 percent precision.

“Effects of gravity and the expansion of the universe leave subtle imprints in these large maps of galaxies,” Samushia said. “My recent work within SDSS collaboration was related to extracting these signals and checking if they concur with the predictions of Einstein’s theory.”

The next generation of spectroscopic galaxy surveys will provide data sets that are orders of magnitude larger than today’s, significantly elucidating the nature of dark energy. Lado also is involved with the Euclid satellite mission (<http://www.euclid-ec.org>) and DESI experiment (<http://desi.lbl.gov>), both scheduled to start by 2020.

“Lado works at the boundaries between theoretical and experimental physics and between high energy physics and astrophysics,” said Tim Bolton, professor of physics. “He’s plugged into two very exciting science projects in the world, Euclid and DESI, that have a good chance to tell us something about this very strange thing called dark energy. He’s one of the world experts in this field, and we’re glad to have him.”

Samushia received a Bachelor of Science from Tbilisi State University and a doctorate at K-State in 2009 with Bharat Ratra as his lead professor. Prior to joining the faculty, he was a senior research associate at the University of Portsmouth in the United Kingdom.

Ketino Kaadze, a former CERN fellow and a Fermilab research associate, joined the K-State faculty in fall 2014 as an assistant professor. Her research is in experimental high energy particle physics. She is working on the CMS experiment at the large hadron collider, or LHC, where she leads the working group that searches for new physics in collision events containing leptons and jets.

Using the proton-proton collisions at the highest to date center-of-mass energy of 8 TeV, she studies the properties of the Higgs boson and searches for new particles. She will continue to search for new phenomena using data of proton-proton collisions at 13 TeV, expected to be delivered by the LHC starting in summer 2015. She also is leading the design of calibration components for the hadron calorimeter, one of the major upgrades of the CMS detector, planned for 2018-2019.

Daniel Rolles, formerly of Deutsches Elektronen-Synchrotron in Hamburg, Germany, joins K-State’s faculty this spring as an assistant professor. He will conduct research in experimental atomic, molecular and optical physics and ultrafast X-ray science.

His research focuses on visualizing nuclear and electronic dynamics during photoionization and other photochemical reactions in gas-phase molecules by means of femtosecond pump-probe experiments. His experiments combine lab-based studies using intense few-cycle optical lasers and their high-order harmonics in the XUV domain with intense and short-pulse VUV and X-ray radiation from free-electron lasers.



MASS APPEAL

Enrollment in physics courses, major steadily increasing

The numbers don't lie: Physics courses offered at Kansas State University are amassing a lot of student interest.

Debra Dandaneau is part of the large faculty team on the physics department's popular two-semester Engineering Physics (EP) courses, which have seen a spike in student enrollment.

"In the past two years, these physics courses have really exploded in popularity," Dandaneau said. Enrollment in EP1, for example, has increased 25 percent, from 302 in Fall 2012 to 390 in Fall 2014. This has meant big changes in the department, including the renovation of a laboratory room

to convert it to a studio and all-new student laboratory equipment, to accommodate the increased student numbers.

Upper level courses are growing too. Physics 3, a sophomore-level course required of both majors and minors, has doubled in student numbers over the last decade, and the laboratory component is being reorganized and reinvigorated as a result. For more advanced courses, the numbers have swelled even more; Intro to Quantum Mechanics has grown from 7 to 25 students, and many of our upper level courses are now at 18-25 students. Simultaneously, physics is seeing an increased number of declared majors, many nearing graduation.

Much of the growth in EP is linked to the state's University Engineering Initiative Act, aiming to increase the number of engineering graduates in Kansas by nearly 60 percent over the next decade, said Dandaneau, who is also active with undergraduate advising, recruitment and retention along with Sarah Golin. Increased outreach and recruitment activities, as detailed in this newsletter, may also be a factor. The department and university have facilitated double majors and dual degree paths, so more students have been able to major in physics. Said Dandaneau, "We want physics to be appealing to all students."



UPCOMING EVENTS

The second Nobel lecture will be given Feb. 23, 2015, by former K-State faculty member Hongxing Jiang, now at Texas Tech University, on the recent prize for blue LEDs. Join us for the All-University Open House from 9 a.m. to 3 p.m. on April 11, 2015! And at 4:30 p.m. April 23, 2015, the department will host the documentary "Particle Fever" in the K-State Student Union's Little Theatre. The events are open to all.

SCHOLARSHIP CONTRIBUTION

Jane Clay contributed \$25,000 to the **Clarence S. and Jane Clay Physics Scholarship** established in 1996 by her and her late husband, Clarence Clay '47, to honor former professors R.H. MacFarland and A.B. Cardwell. Recipients will be physics undergraduate and graduate students pursuing secondary teaching with preference to those who will teach grades 5-12 and/or conduct research in physics education.

MORE KUDOS TO FACULTY



Brett DePaola, professor, advises at the national level. He spoke at the Jefferson Science Fellows program's 10-year event on July 15, 2014, in Washington, D.C., where the fellows gathered to celebrate the program's anniversary. DePaola was a Jefferson Science Fellow in 2010-2011, serving as a scientific adviser to the U.S. Department of State in Washington, D.C. At the anniversary event, DePaola

was a panel member, discussing the impact of his experience on his work at K-State. "It all comes down to institutional support," DePaola said. "With the encouragement of my department head and academic dean, I was able to create a course based on my experiences at the U.S. Department of State. Further, with the support of President Schulz, we were able to create a new distinguished lecture series that invites past Jefferson Science Fellows to K-State to interact with our faculty."

Also in 2014, DePaola's comments on the bright future of atomic clocks were featured in SCIENCE 2034, an initiative by The Science Coalition to mark its 20th anniversary by looking forward 20 years and focusing on the possibilities of the future.



Dean Zollman, university distinguished professor, is one of six Kansas State University faculty members selected as an inaugural participant in the Oz to Oz program, a new part of the university's Australia Initiative. The Oz to Oz program supports short-term visits to Australia for K-State faculty to advance collaborative research activities, and for Australian Fulbright scholars to come to K-State. Zollman will

work with Australian colleagues to develop effective teaching-learning techniques for online physics courses.



Chris Sorensen, Cortelyou-Rust university distinguished professor and a university distinguished teaching scholar, was named a fellow of the American Association for the Advancement of Science. He was selected for pioneering contributions in soft matter physics, disperse particulate systems and light scattering; teaching curriculum development and outreach; and service to the scientific community.



Sanjay Rebello, professor, was named the Ernest K. and Lillian E. Chapin professor of physics. His research is in the area of physics education. He and his group have focused on understanding how students develop problem-solving skills and transfer these skills to new situations. Most recently, through collaborations with faculty in the departments of Psychological Sciences and

Mathematics, his group has investigated the connections between learners' eye movements and cognition and the use of visual cueing to facilitate problem-solving. This research has implications for online instruction. The Ernest K. and Lillian E. Chapin endowed chair also is held by Brett Esry, university distinguished professor.



Uwe Thumm, professor, received the 2014 Commerce Bank Distinguished Graduate Faculty Award in recognition of his outstanding scholarly achievements and contributions to graduate education at K-State. The award is supported by the William T. Kemper Foundation and Commerce Bank. He also received an Alexander von Humboldt Foundation Research Award, given to academics

whose research has had a significant impact on their own discipline and who are expected to continue producing cutting-edge achievements in the future. Thumm's research focuses on attosecond physics, which involves the study of optical pulses interacting with matter so fast that electron motion can be stroboscopically frozen and mapped. Attosecond science targets the underpinnings of chemistry, biochemistry and the biochemical basis of life.



Ellie Sayre, assistant professor, co-authored a recent article that was highlighted in EurekAlert! and in an article in Pacific Standard magazine. She and co-authors Adrian Madsen (Ph.D. 2013) and Sarah B. McKagan investigated why women routinely score lower than men on common physics assessments. Sayre also was recently awarded a National Science Foundation grant with co-principal investigators

Sanjay Rebello and Dean Zollman titled "Foundational Research on Problem Mathematization in Undergraduate Physics." They are studying how students make sense of physics problems across the undergraduate physics curriculum.



In memory of Jane Peterson



It is with great sadness that we report the death of Jane Peterson, department secretary for undergraduate and graduate studies. Peterson was found

deceased on Feb. 28, 2014. She was born June 26, 1957, in Wamego, the daughter of Mark and Isabel (Gros) Torrey, and had been a lifetime area resident. Peterson graduated from St. George High School in 1975, and from Manhattan Area Vo-Tech in 1976. She came to the Department of Physics in 1985 after working a few years in the College of Education dean's office. She married Monty Peterson in 1989. Her children are Audrey, a University of Kansas graduate; Torrey, a 2014 K-State graduate in political science and pre-law who is now a law student at St. Louis University; and Ben, a junior in mechanical engineering at K-State.

Throughout her years in the department, Peterson was the point of contact for all incoming undergraduates, guiding them through the advising procedures and making them feel welcome. She worked with graduate students, processing their applications and guiding them through their first days at K-State and assisting

them throughout their studies. Peterson was an invaluable asset in maintaining a student-friendly environment in our department. She was recognized for her contributions with the College of Arts & Science's Classified Employee of the Year award in 2003.

Peterson thoroughly enjoyed working with the students and faculty in the department and went above and beyond her job duties to make them feel at home, including sewing and purchasing baby gifts for children born to faculty and staff.

Chris Sorensen, Cortelyou-Rust university distinguished professor, found the following quote from a letter of recommendation written on Jane's behalf: "She was like a great dance partner. Despite my inability to dance well, she always anticipated my next move and made me look really good. This was in addition to her being a wonderful person, outstanding secretary and a great friend."

"Jane was dedicated to her job here in the department, and always wanted each and every task she worked on to be perfect. She was never too busy to help any of us complete a deadline," said Peggy Matthews, the department's office manager and a supervisor. "Jane made a huge impact on my

experience at K-State, both personally and professionally," said Kristan Corwin, associate professor. "She coordinated applications from hundreds of undergraduate students and administered honor society inductions with efficiency, creativity and humor. She helped me with a lost button during my job interview, gave my family kittens and embroidered clothes and linens for my infant son. She made the department feel more like a family."

Peterson will be missed by all who had the pleasure of coming in contact with her during her time in the department.



OUTSTANDING FRIENDS AND ALUMNI

Jo Clay, clinical assistant professor of mathematics education at Washington State University, presented a special colloquium, "Student Learning in Inquiry-based STEM Classrooms," on Sept. 15, 2014. The talk was sponsored by the K-State departments of Physics and Mathematics and the Center for Science Education. Clay discussed characteristics of an inquiry approach to teaching utilizing a National Science Foundation-funded Math/Science Partnership grant, "Making Mathematical Reasoning Explicit," as the context to illustrate how inquiry can support students' learning. Clay also provided an example from her personal teaching experience to illustrate how to approach students' learning in science. Clay is the daughter of Clarence Clay, a 1947 physics alumnus, and his wife, Jane, for whom a K-State physics scholarship is named (more on Page 5).

Dyan Jones (Ph.D., 2009), was honored with the 2014 Homer L. Dodge Citation for Distinguished Service to the American Association of Physics Teachers, or AAPT, at the association's 2014 summer meeting in Minneapolis, Minnesota. Jones, assistant professor of physics at Mercyhurst University, has been an active member of the association for nearly a decade, serving in many ways. Jones received her Master of Science in physics in 2005 at Miami of Ohio, and earned her doctorate in physics at K-State under the advisement of Dean Zollman, university distinguished professor.

Upon receiving the honor, Jones said, "Thank you so very much for this amazing award. I'm just so honored."

Allen Landers (Ph.D. 1999; Bachelor of Science, physics and mathematics, 1993) is the Howard Carr professor of outreach in Auburn University's Department of Physics. He is the 2014 recipient of the Award for Excellence in Faculty Outreach, Auburn's highest recognition honoring the engagement of exemplary faculty members whose outreach is making a significant impact in the community. He also received Auburn's 2013 Most Outstanding Professor Award, the 2013 Dean's Award for Outstanding Outreach and the Physics Department's Eugene Clothiaux Faculty Award for 2014.

Please send us your news for inclusion in the next newsletter.

MELOTT PRESENTS 2014 PETERSON PUBLIC LECTURE

The 2014 Chester Peterson Jr. Public Lecture in Physics featured Adrian Melott, professor of physics and astronomy at the University of Kansas. Melott presented the lecture "Death from the Skies: Astrophysical Threats to Life on Earth" on Tuesday, April 1.

Melott discussed his research on astrophysical threats to life on earth, such as asteroid impacts, radiation events and solar flares that may be strong enough to cause mass extinction or technology problems. Most of these events are unpredictable and constitute a threat at some level.

Melott's work has been featured on the National Geographic program "Extinctions" and on The Weather Channel's "Forecasting the End." Melott is a fellow of the American Physical Society and the American Association for the Advancement of Science.

The Peterson Public Lecture Series, supported by an endowment from Chester Peterson Jr., focuses on cosmology and quantum mechanics.

CHELIKOWSKY PRESENTS DISTINGUISHED ALUMNI LECTURE

The 2014 Ernest Fox Nichols Distinguished Alumni Lecture in Physics featured an alumnus and prominent researcher in the field of computational materials science.

Jim Chelikowsky, W.A. "Tex" Moncrief, Jr. chair of computational materials and professor in the departments of physics, chemical engineering and chemistry at the University of Texas, presented the distinguished alumni lecture on Monday, Sept. 29, 2014.

Chelikowsky's lecture was "Addressing Dirac's challenge: Practical quantum mechanics to predict the properties of materials."

"Professor Chelikowsky's presentation gave a historical background of using computational methods in predicting properties of materials," said Amit Chakrabarti, professor and head of physics and the William and Joan Porter chair in physics. "One starts from fundamental principles of quantum

mechanics, the governing laws of physics at the atomic level, and then develops approximate practical methods that are solved by using sophisticated algorithms and large supercomputers."

The Ernest Fox Nichols Distinguished Alumni Lecture in Physics lecture series honors distinguished physics alumni from Kansas State University. Chelikowsky graduated summa cum laude with a bachelor's degree in 1970.

Chelikowsky's research has focused on the optical and dielectric properties of semiconductors and the development of high performance algorithms to predict the properties of materials. He has published more than 370 papers, including five monographs. He is a fellow of the American Physical Society and a fellow of the Materials Research Society, among many other achievements and honors.

REACHING OUT WITH ASTRONOMY AND COSMOLOGY



Image of M46 by Tracy Tuttle, Undergrad Lab director of teaching labs, using department's new 8" astrograph and one-shot color imager.



The amateur astronomers in our department connect with the community. Chris Sorensen, Cortelyou-Rust university distinguished professor presented an invited public talk on astronomy, "Comet ISON," at the Community Center in Waterville, Kansas, to an audience of more than 175 community members.

Bharat Ratra, professor, gave a public lecture for the St. Louis Astronomical Society at Washington University titled "Dark Matter, Dark Energy, Einstein's Cosmological Constant and the Accelerating Universe."

On Oct. 23, 2014, many physicists stepped outside to look at the partial solar eclipse and show it to many curious passers-by.

Tracy Tuttle, director of undergraduate labs, along with the North Central Kansas Astronomical Society, ran two public visual observing sessions at Northeast Community Park in Manhattan. Dozens of area residents were delighted to learn about the heavens and were treated to

beautiful views of Jupiter and its major moons, some very delightful binary star systems and the new, crescent moon. About 100 students passing by viewed sunspots, solar prominences and interesting features in the solar atmosphere when Tuttle set up a special narrow band and projection telescope on campus.

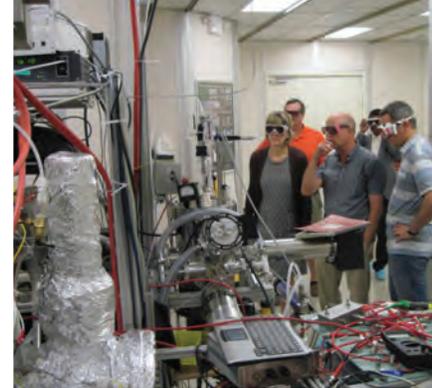
Our Dark Skies site near Riley, Kansas, is ideal for viewing faint objects, both with the human eye and with sensitive digital viewing equipment. Tuttle hosted sessions at the site, letting participants learn about image processing and analysis, and took some spectacular photos, <http://ksu-astro.nckas.org/gallery.html>. One session was specifically for gifted elementary students, their parents and teachers. They learned how telescopes operate, how astronomical images are acquired, analyzed and observed through two of our main visual scopes: the 16-inch reflector and 100-mm refractor. A few images of some globular clusters and open clusters of stars were also taken.

UNDERGRADUATES IN RESEARCH

Jeff Murray, Manhattan, was recognized for best undergraduate oral presentation at the 18th annual K-State Research Forum. In addition, Murray was one of 10 student researchers selected to present his work at the Undergraduate Research Day at the Capitol in Topeka.

Physics undergraduate majors **Josh Nelson**, Salina; **Yukun Qin**, China; **Ryan Luder**, Overland Park; and **Ben LeValley**, Salina, presented research results at the American Physical Society-Division of Laser Sciences meeting in Tucson, Arizona, on Oct. 20, 2014. **Jeff Murray**, Manhattan, presented results at the National Association for Research in Science Teaching on April 2, 2014, in Pittsburgh, Pennsylvania. **Edward Schenk IV**, Junction City, and **John Thompson**, Salina, attended the American Association of Physics Teachers Conference and presented results at the Physics Education Research Conference in Minneapolis, Minnesota, on Aug. 1, 2014.

Nine physics majors have received 2014 College of Arts & Sciences Research Awards, while eight physics students are receiving the awards in spring 2015. The students work closely with a faculty mentor to engage in active research. The recipients spend at least 100 hours working on their projects and receive a scholarship of \$1,000 as part of this award from the college. The Department of Physics extends the college funding for another 100 hours of research time for each of these students through the generosity of the department's friends and alumni.



OUTREACH FROM PHYSICS

The department continues to expand its outreach programs. On March 3, 2014, Yurii Maravin, associate professor, inaugurated a new lecture series on the Nobel Prize in Physics, which is designed for a public audience. Maravin gave a talk on the Higgs boson and its relevance to society to a packed house. Our faculty members and students have given lectures and demo shows in K-12 schools across the state. On March 12, 2014, Chris Sorensen kicked off a new lecture series in the Wichita area with a visit to Wichita East High School. Larry Weaver, Bharat Ratra and Peter Nelson continued their tradition of presenting a day of demo shows/lectures for physics classes at Manhattan's Anthony and Eisenhower middle schools and Manhattan High School, reaching more than 800 students. Also, we once

again presented the annual demo show at Theodore Roosevelt Elementary School in Manhattan, and on Nov. 18, 2014, the Physics Club presented hands-on experiments and small demonstrations at Marlatt Elementary School, also in Manhattan.

At the 2014 All-University Open House, Sorensen once again led the physics demo show. Beforehand, the Physics Club members presented many hands-on physics experiments to would-be scientists of all ages, including the popular Van de Graaff generator and liquid nitrogen freezing. The newly formed OSA student chapter joined in, and physics graduate students in this research area presented a variety of optics demonstrations and gave tours of laboratory facilities.



PHYSICS REU PROGRAM OFFERS RESEARCH OPPORTUNITIES FOR UNDERGRADUATES NATIONWIDE

Twelve undergraduate students from across the U.S. spent summer 2014 at Kansas State University for a 10-week program where they conducted world-class physics research.

Every year, the university's Physics Research Experiences for Undergraduates, or REU program — funded by a National Science Foundation grant — pairs students with faculty mentors who assist them in experiencing and contributing to real physics research. The student projects culminate with an oral or poster presentation summarizing their research projects.

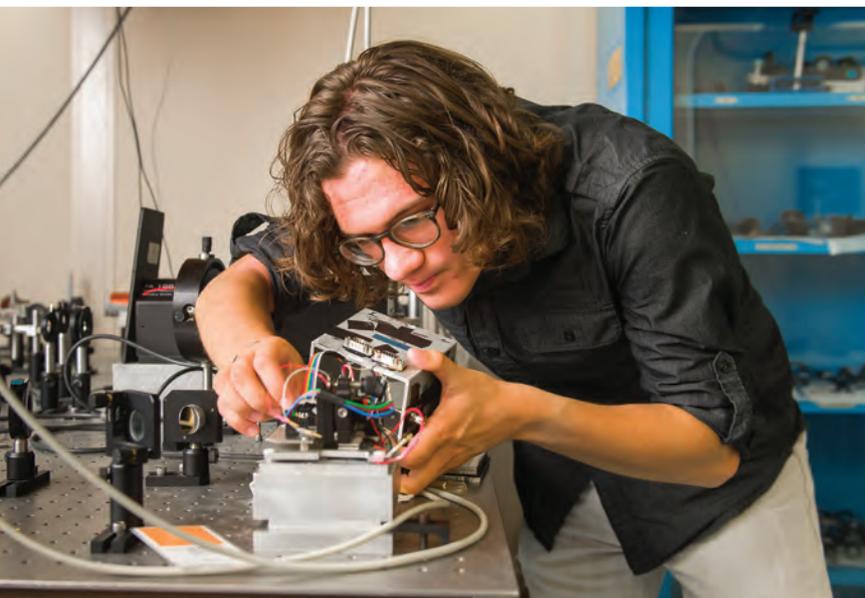
In addition to experimental or theoretical work, students also learn about the physics behind faculty research projects and discuss ethical issues in physics.

"Our REU program provides students from across the country the opportunity to engage with our outstanding faculty for a genuine hands-on research experience," said Kristan Corwin, associate professor of physics and PI of the NSF REU grant. "In turn, our department gains access to outstanding students who are candidates for our graduate program and contribute to a thriving research environment in the summertime."

The 12 participants for summer 2014 were chosen from 200 applicants of college sophomores and juniors who expressed interest in physics research careers. REU students live in university residence halls and work closely with physics graduate students, postdoctoral researchers and faculty members as they learn a variety of research techniques.

Students who participated in the university's 2014 Physics REU program included **Alexander Armstrong**, Santa Ana, California; **Wyatt Behn**, Kearney, Nebraska; **Alison Gomez**, Edinburg, Texas; **Michael Hastings**, Blue Jay, California; **Emily Herman**, Black Creek, Wisconsin; **Stephen Houston**, Tribune, Kansas; **John Lyons**, Wheaton, Illinois; **Madilena Mendiola**, San Diego, California; **Joshua Nelson**, Salina, Kansas; **Maria Prado**, Williamstown, Massachusetts; **Jaime Richards**, Glassboro, New Jersey; and **Daniel Todd**, West Chesterfield, New Hampshire.

Several Kansas State University students also participated in the program while funded through other sources: **Ben LeValley**, Salina; **John Thompson**, Salina; **Ryan Luder**, Overland Park; and **Edward Schenk**, Junction City.



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PIGSKIN AND ALUMINUM

As Professor Brett DePaola can attest, football doesn't just bring people together, it leads to scientific opportunities. Using a friend's extra ticket to attend a K-State football game, DePaola sat next to Kay Meggers, the executive vice president and global president of global rolled products at aluminum maker Alcoa Inc.

At Alcoa, Meggers is responsible for the company's global mill products and rigid packaging businesses. He also oversees the Australian rolled products businesses and Alcoa's operations in Russia. A K-State fan, Meggers was catching a football game during his annual visit to the College of Business Administration.

"My friend introduced us and we started talking," DePaola said. "It turned out Kay wasn't just a business wonk, he was a PhD physicist. Whenever you get two physicists together they start talking shop, which is what we did.

"I found Kay really interesting and engaging," DePaola continued. "Here's a guy with a physics background who works in industry and uses what he learned as a scientist in the business world. At the game I proposed that he speak to the department because we don't typically get that industry perspective."

On Sept. 25, Meggers presented "Driving Profitable Growth with Aluminum Flat Rolled Products" at the physics department's 2014 fall James R. Neff Lectureship in Physics. Meggers' lecture focused on aluminum. He discussed its origins as a metal that was once more precious

than gold and silver, how its value declined with new extraction techniques and current and future applications for the metal, including with aluminum vehicles. The lecture was a hit. Audience members asked many questions and a particularly high number of undergraduate students attended.

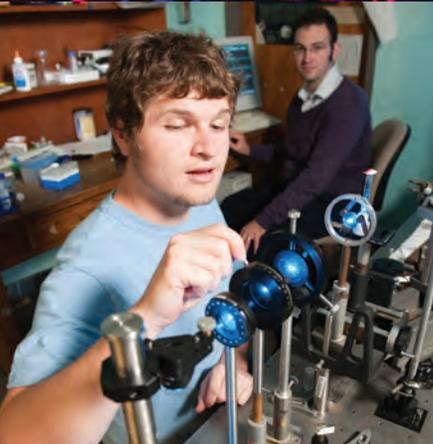
"Everyone seemed to really enjoy it, and it was very interesting to us as scientists because we could see how he used the scientific skills and problem solving he learned as a physicist to tackle the problems that he has as a vice president of a major international company," DePaola said. "It was a great lecture that was completely fortuitous in its origination."

Before joining Alcoa, Meggers earned his doctorate in physics in Germany and conducted extensive research in applied nuclear physics and materials sciences while earning the degree.

The lectureship is named after James R. Neff, an alumnus of the university. Neff was an internationally recognized orthopaedic surgeon and professor at the University of Nebraska Medical Center in Omaha. He developed a surgical implant with a titanium intramedullary nail known as the Neff nail.

The lectureship is funded by an endowment established with a bequest from Neff, to perpetuate and honor his parents, Everett and Florine Neff, and further represent Neff's gratitude for the opportunities and education that he received at Kansas State University.





THANKS FOR YOUR SUPPORT

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