Photo credit: Tammy Schmit, Little Leapling Photography

NOBEL LAUREATE LECTURE REINFORCES PHYSICS EDUCATION REFORM GOALS AT KANSAS STATE UNIVERSITY

Undergraduate education is one of the seven themes in Kansas State University's vision to become a Top 50 public research institution by 2025. In support of the university's undergraduate education theme, the physics department invited Nobel laureate Carl E. Wieman, professor of physics and of the Graduate School of Education at Stanford University, to present "Taking a Scientific Approach to Science and Engineering Education" in September 2015.

The lecture was part of the university's Provost Lectures on Excellence in Scholarship series, which focuses on speakers who have received special recognition and prominence in their fields.

Kristan Corwin, associate professor of physics and Wieman's former thesis advisee, introduced the noted physicist for his lecture by mentioning his success as a Nobel laureate and in educating the next generation in science. Wieman started the lecture by explaining why science, technology, engineering and math, or STEM, education is important.

"In the modern world, we really need all students — no matter which careers they are going into — to be able to think about and understand science more like scientists," Wieman said.

He said there are two big reasons for this. The first is the economy, which is so based on science and technology that to be an effective workforce, people need those scientific skills. The other reason is all the many big societal decisions that involve technical issues.

Wieman's lecture and multiday visit gave the physics department and university leadership an opportunity to discuss with him a few of the department's foremost priorities: science education research and reforming science education.

"Our department has one of the oldest active physics education research programs," said Dean Zollman, university distinguished professor of physics and one of the faculty members who helped bring Wieman to the university. "We started in 1972 and have been conducting physics education research and development ever since."

Zollman said teaching physics to nonmajors is as important as teaching art appreciation.

"I have a much deeper understanding of Rembrandt's work when I understand his special ability to use light and that he was one of the first to use the technique," Zollman said. "Likewise, when I understand how light behaves in a physical sense, I can see a variety of phenomena."

Based on evidence collected from K-State researchers, the department has modified several courses, including Engineering Physics, Concepts of Physics and Descriptive Physics, to make them more involved and interactive for students. According to Zollman, K-State's research and course development is recognized internationally, and researchers in the physics education group have received national awards for their work. The department continually works to improve physics education for many of the same reasons as Wieman.

"Physicists and other scientists have developed a way of thinking about nature that can be valuable for everyone," Zollman said. "First, using scientific logic can help in analyzing almost any situation. Second, understanding how science is done and how scientists use data to develop conclusions helps all of us become better lie detectors. Third, understanding physics gives all of us a better appreciation of nature itself."

Wieman explained in his lecture that science education is challenging but that we know how to do it with the help of cognitive psychology, the study of how people think and learn; brain research; and college science classroom studies. The latter is a common theme at Kansas State University, with the goal of improving science education globally.

Photo credit: Tammy Schmit, Little Leapling Photography

NOBEL LAUREATE ADAM RIESS PRESENTS 2015 NEFF LECTURE

The discovery of dark energy was the topic of the 2015 Neff Lecture in Physics, Oct. 27, at Kansas State University.

In his lecture "Supernovae and the Discovery of the Accelerating Universe," Nobel laureate Adam Riess, distinguished astronomer at the Space Telescope Science Institute and astrophysicist at Johns Hopkins University, discussed how his research team discovered the acceleration of the universe and why understanding the nature of dark energy presents one of the greatest remaining challenges in astrophysics and cosmology.

In 1929, Edwin Hubble discovered that the universe is expanding. Nearly 80 years later, in 1998, the space telescope that bears Hubble's name was used by Riess and other members of the High-z Supernova Search Team to study an even more surprising phenomenon: The expansion is speeding up.

While the origin of the expansion is still not known, it is broadly attributed to a type of dark energy first posited to exist by Albert Einstein and now dominating the mass-energy budget of the universe. Dark energy makes up about 70 percent of the universe.

"It has what looks like a repulsive type of gravity, so it is making the expansion of the universe speed up, or accelerate," Riess said. "That was a great surprise and has led to a lot of work in the last few years."

Dubbed "the Breakthrough Discovery of the Year" by Science magazine in 1998, the discovery led to Reiss being named a co-winner of the Nobel Prize in Physics in 2011 and winner of the Albert Einstein Medal for his leadership in the High-z Supernova Search Team, as well as many other prestigious awards, including the Shaw Prize in Astronomy in 2006, a share of the Gruber Foundation Cosmology Prize in 2007 and a MacArthur Fellowship in 2008.

GREETINGS FROM K-STATE PHYSICS

Thank you for another outstanding year in the department of physics. Since February 2016, I have changed offices and now serve as interim dean of the College of Arts & Sciences. Meanwhile, our department was skillfully steered by acting head Professor Michael O'Shea, and now Professor Brett DePaola has taken up the reigns as interim department head.

We had many important accomplishments in 2015. Our enrollment has continued to grow as our advising and outreach programs flourish, and our students and faculty continue to be recognized for their excellence in research and teaching.

This success would not be possible without your generosity and support. Your contributions have helped us recruit talented students, retain excellent faculty, renovate classrooms, launch industry-oriented research and sustain the supportive, intellectually vibrant community that we wish to be. Our advising, recruiting and scholarship efforts have had measurable impact on our number of majors, with an entering class of nearly 30 students! The number of graduates has increased from three in 2010 to 10 students in 2015, with up to 18 anticipated for 2016.

This progress demonstrates what is possible, and justifies ambitious goals. With your help, the department will continue to grow its ability to fulfill its mission for students, researchers and the wider community. Thank you on behalf of the entire department for your continued and very generous support.

Please visit our website, phys.ksu.edu, and our Facebook page, facebook.com/ksuphys, and keep in touch with us.

Sincerely,

Amit Chakrabarti

Amit Chakrabarti
William and Joan Porter Professor and Head
Interim Dean, College of Arts & Sciences

NEFF LECTURE BY NASA'S DANIEL STERN ON THE NUSTAR TELESCOPE

Jet Propulsion Laboratory scientist Daniel Stern gave a 2015 James R. Neff Lecture in Physics. In the public lecture, Stern, an astrophysicist, discussed NASA's Nuclear Spectroscopic Telescope Array, or NuSTAR, launched in 2012.

Stern described the first telescope in orbit to focus high energy X-ray light. High energy X-ray light provides a unique probe of the most energetic phenomena in the universe, from flares on the surface of the sun, to the explosions of stars, to the extreme environments around neutron stars and black holes.

He discussed highlights from the mission and how they are changing our picture of the extreme universe. The telescope has discovered new classes of objects, such as neutron stars accreting at prodigious rates, and has provided uniquely robust measurements of how fast black holes are spinning.

BROOKS DELIVERS PETERSON LECTURE

Michael Brooks presented a Chester Peterson Jr. Public Lecture in Physics on April 27, 2015, titled "Welcome to Wonderland: Making sense of life in a quantum universe." Brooks is noted for explaining complex scientific research and findings to the general public.

Brooks discussed what we have learned about the subatomic world and how it challenges our fundamental understanding of the cosmos. Quantum weirdness, which seems to allow particles to exist in two places at once, was dismissed by Einstein as too spooky to be real but may explain some of nature's most baffling processes.

Brooks holds a doctorate in quantum physics from the University of Sussex. He is a respected British author, journalist and broadcaster. A consultant editor at New Scientist magazine, he writes a weekly column for the UK's New Statesman. His newest book, "At The Edge of Uncertainty," was available for sale after the lecture.

ENDOWED LECTURES

The Neff Lecture Series in Physics is supported by an endowment from James R. Neff in honor of his parents, Everett and Florine Neff.
The Peterson Public Lecture Series is supported by an endowment from Chester Peterson Jr., and focuses on cosmology and quantum mechanics.

12TH PHYSICS MAJOR EARNS GOLDWATER SCHOLARSHIP

In April 2015, Joshua Nelson, a Kansas State University student majoring in physics from Salina, was named the university's 72nd Barry M. Goldwater scholar.

Established by the U.S. Congress in 1986 to honor Sen. Barry M. Goldwater from Arizona, the Goldwater Scholarship is the premier undergraduate award for students in the science, math and engineering disciplines. It awards up to $7,500 per year to around 300 rising juniors and seniors for college-related expenses.

Kansas State University students have won more Goldwater Scholarships than any other public university. Of the university's 72 recipients, 12 have been physics majors.

In 2015, Nelson worked with Carlos Trallero, assistant professor of physics, in the James R. Macdonald Laboratory, developing new techniques to produce usable high-energy, ultrafast laser pulses.

KUDOS TO STUDENTS

Undergraduate students:
Many undergraduates have received research scholarships this year, both from the College of Arts & Sciences and the Office of Undergraduate Research & Creative Inquiry. These $1,000 grants are matched by the physics department, typically providing an additional semester of funding. **Brandin Davis,** senior from Derby, one such recipient, was featured during SPARK week for his work with ultrafast laser light in the study of nanoparticles, supervised by Carlos Trallero, associate professor.

Benjamin Archibeque, sophomore from Wichita, was selected as one of six research ambassadors by the Office of Undergraduate Research & Creative Inquiry. Through presentations to classes and student groups, ambassadors share the benefits of undergraduate research with their peers and encourage participation.

Graduate students:
Justin Maughan, physics graduate research assistant, received a Student Poster Competition Award at the American Association for Aerosol Research 34th annual conference in Minneapolis, Minnesota. Maughan's award-winning poster was "Q-Space Analysis of Light Scattering from Gaussian Random Spheres."

"We are very proud of Justin's recognition at the conference," said Amit Chakrabarti, interim dean of the College of Arts & Sciences, former department head and Maughan's research advisor. "We greatly value our graduate students. They are major contributors to our department's research efforts."

In spring 2015, two students were recognized for Outstanding Teaching. **Raiya Ebini** received the award for a graduate student, while **Alex Kramer** received the award for a first- or second-year graduate student. Also, **Nicoleta Ploscariu** received the Outstanding Graduate Student Researcher award. She also received second place in the engineering, mathematics and physical sciences poster session at the Graduate Student Council's 20th annual K-State Research Forum.

KUDOS TO ALUMNI

Lt. Col. Corey Gerving (M.S. Physics 2004) has been hired as academy professor in the physics and nuclear engineering department at the United States Military Academy, West Point. Gerving earned his master's at K-State with Cortelyou-Rust Distinguished Professor Chris Sorensen as his advisor. He earned a doctorate at Georgia Tech in 2013.

Pablo Guimera Coll (B.S., M.S. Physics 2014) won the 2015 National Science Foundation Engineering Research Center programwide "Perfect Pitch" contest in Washington, D.C. He received $5,000 for first prize as well as the Lynn Preston trophy for his talk on "Sound Assisted Low Temperature Wafering for Solar Energy." To compete, students answered three questions in 90 seconds about the impact of their research. Coll is currently enrolled in the materials science and engineering doctoral program at Arizona State University.

William T. Waggoner (Ph.D. 1990) of San Antonio College, San Antonio, Texas, was named an American Association of Physics Teachers fellow for 2015.

Patricia Solís, who earned bachelor degrees in modern languages-German and physics from K-State, and then a master's degree in geography from K-State and a doctorate from the University of Iowa, received the 2015 College of Arts & Sciences Alumni Merit Award. Solís is currently a senior research associate in the Office of the Vice President for Research at Texas Tech University. Throughout her career, she has worked on sustainable development projects in Ghana, Nicaragua, the Philippines and Bolivia, touching the lives of thousands in the developing world. In 2007, Solís received the Enlaces Award from the Council of Latin American Geographers. She is a current member of the K-State geography department's Alumni Advisory Board and a 2013 K-State alumni fellow.

EDUCATING FUTURE ENTREPRENEURS, PHYSICS ALUM DELIVERS NICHOLS LECTURE

A Kansas State University physics alumnus recently shared his success with his alma mater. Jody Brazil, CEO of FireMon LLC, presented the 2015 Ernest Fox Nichols Distinguished Alumni Lecture on Sept. 8 in Hale Library.

Brazil, a 1995 graduate, also was recently named as Ernst and Young's 2015 Entrepreneur of the Year. He has two decades of executive management and networking experience. After holding leadership roles at several companies, Brazil founded Beta Technologies. Additionally, Brazil engineered the security solution that allowed the transfer of criminal history data over the internet.

He brought his extensive entrepreneurship experience to K-State during his lecture, "Physics: The Curriculum of the Entrepreneur," during which he discussed critical skills necessary to foster a successful entrepreneur. Brazil said the study of physics is uniquely positioned to educate future entrepreneurs. In fact, he credits his K-State education as the foundation of his success.

His lecture explored the requirements of becoming an entrepreneur as well as the role that physics has had on his career. Brazil emphasized that the study of physics can have a beneficial effect on shaping tomorrow's entrepreneurial leaders.

PHYSICS FACULTY MEMBER RECOGNIZED AS ONE OF K-STATE'S BEST IN TEACHING

Brian Washburn, associate professor of physics, was one of four individuals at Kansas State University who received a 2015 Presidential Award.

Washburn earned the Presidential Award for Excellence in Undergraduate Teaching. The award recognizes and rewards excellence in teaching performance in the undergraduate program.

"This award shows that people really do value the effort and devotion that is needed for outstanding teaching," Washburn said. "Furthermore, this award supports my beliefs about the role a professor has at a research-active university such as K-State. My role is to be both a scholar and an educator, so it is important for me to produce high-quality research while providing students the best education."

"The hard work and dedication that these educators contribute in and out of the classroom for Kansas State University students is not only helping students succeed now, but also in their future careers," K-State President Kirk Schulz said. "I appreciate the continued support of Chris Curtin and Curtin Property Co. to reward these talented individuals and advance K-State's goal of becoming a Top 50 public research university by 2025."

HITS LASER

As highlighted in Nature Photonics and reported in Optics Express, vol. 23, pg 4563 (2015), K-State physics faculty Carlos Trallero, Itzik Ben-Itzhak, Vinod Kumarappan, Kevin Carnes and other co-authors have constructed a remarkable laser source in the J.R. Macdonald Laboratory in Manhattan. Named the HITs laser, the system boasts carrier-envelope phase, or CEP, stability at high laser pulse energies, being the first laser to have both long-term CEP stability and peak powers that put it in the terawatt regime. Furthermore, its broad spectrum promises synthesized laser pulses spanning multi-octaves of bandwidth at an unprecedented energy scale.

MIKE WELLS RETIRES

On May 5, 2015, the Physics Department gathered to celebrate the 40-plus year career of Mike Wells with a retirement party. Wells has been an integral part of the James R. Macdonald Lab since he started there on May 1, 1974. Over the years, he has had a hand in almost every phase of lab operation.

Most people that have interacted with Wells over the years know of his phenomenal mechanical aptitude and his boundless creativity in solving problems. He can fix just about anything and is never afraid to tackle a problem, no matter how complicated.

Wells couples his technical abilities with a gregarious, outgoing personality and can-do attitude. One of the most frequent comments heard from our students after leaving K-State for postdocs or permanent jobs is, "There's no one like Mike or Al here!"

Wells continues to make himself available for questions that only he can answer. Few people have left such an indelible mark on the Macdonald Lab as Mike Wells. Congratulations, Mike, on a well-deserved retirement!

PROFESSOR CONTRIBUTES TO NEUTRINO RESEARCH, RECOGNIZED WITH BREAKTHROUGH PRIZE

Glenn Horton-Smith, associate professor of physics, is part of an international team that received the 2016 Breakthrough Prize in Fundamental Physics. He has been recognized for his work with the KamLAND neutrino detector in Japan.

The $3 million prize was awarded to five collaborative experiments conducted by more than 1,300 physicists who are investigating neutrino oscillation: the KamLAND collaboration, the Daya Bay collaboration, the K2K and T2K collaboration, the Sudbury Neutrino Observatory collaboration and the Super-Kamiokande collaboration.

KamLAND, short for Kamioka Liquid-Scintillator Antineutrino Detector, is an experiment at the Kamioka Observatory, an underground neutrino observatory in the mountains near Toyama, Japan. Neutrinos are neutral elementary particles that come from nuclear reactions or radioactive decay. Because their interactions with ordinary matter are so weak, large detectors are needed to capture and measure them.

KAADZE COLLABORATES WITH CERN

Ketino Kaadze, assistant professor of physics, is leading a project to design and produce specialized electro-optical calibration units for the Compact Muon Solenoid detector at the Large Hadron Collider at the European Center for Nuclear Research.

Kaadze is collaborating with engineers and undergraduate student technicians at the university's Electronics Design Laboratory to carry out her work on upgrades for the Compact Muon Solenoid hadronic calorimeter.

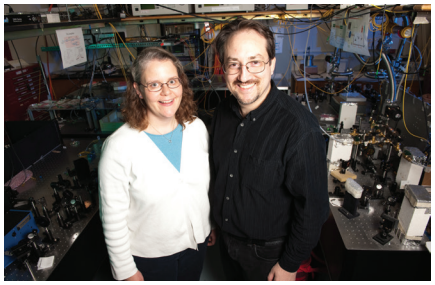
Kaadze also was selected as a Fermilab Compact Muon Solenoid LHC Physics Center Distinguished Researcher for 2016. She was selected as a senior recipient, and Lovedeep Saini, research associate in physics, was chosen for a junior award.

As recipients of the award, they will receive $10,000 to $15,000 in travel funds and receive more visibility at CERN and Fermilab, which can strengthen and expand their research programs.

K-STATE PROFESSORS ORGANIZE FARADAY DISCUSSION

Last April, two K-State professors and one former student made history. Bruce Law, professor of physics, and Chris Sorensen, university distinguished professor of physics, organized a Royal Society of Chemistry Faraday Discussion titled, "Nanoparticle Synthesis and Assembly." These time-honored conferences have encouraged discussion and collaboration for more than 100 years. Before April 2015, only two conferences had taken place in the United States. Law and Sorensen worked with former doctoral student Xiao-Min Lin to develop the Faraday Discussion at the Argonne National Laboratory near Chicago. Sorensen credited Law for his vision and persistence in bringing the Faraday Discussion to the U.S., and added that more than 25 submitted papers were presented.

NEW LASER PATENTED



In 2011, Kristan Corwin and Brian Washburn, associate professors of physics, along with Andrew Jones (Ph.D. physics, 2012) and Rajesh Kadel (Ph.D. physics, 2014), both now working as industry research scientists, began developing a new kind of laser — one that is fiber-based and uses various molecular gases to produce light at difficult-to-reach wavelengths.

"Because it's a fiber-laser technology, it may ultimately prove to be very portable," Corwin said. "Also, because it's based on a gas-lasing medium, it may prove inexpensive to produce."

Kansas State University researchers in collaboration with the University of New Mexico designed the laser technology from a hollow-core photonic crystal fiber that is about half the width of a human hair. This optical fiber is filled with a molecular gas, such as hydrogen cyanide or acetylene. The gas is excited with another laser in the near infrared, causing a molecule of the excited gas to spontaneously emit light. Other molecules in the gas quickly follow suit, resulting in laser light in the mid-infrared.

"The technology that led to this is remarkable," Corwin said. "The unique optical fiber we use is manufactured by colleagues in Limoges, France, and has a complex matrix of glass and air that is uniform and micron-sized down many meters of fiber. By using the hollow fiber, we can have very high intensities of light even with relatively low powers. This reduces the lasing threshold with respect to free-space traditional systems and again makes more portable applications accessible."

The laser received U.S. patent No. 9,106,055 in August 2015.

Kristan Corwin, associate professor, took sabbatical leave at JILA, University of Colorado, where she was a JILA visiting fellow in fall 2015. She particularly worked with Jun Ye, JILA fellow, in the development of optical frequency combs in the XUV spectral region.

Lado Samushia, assistant professor of physics, has been selected for membership in the Euclid Consortium, a team responsible for a space mission to map the dark energy and dark matter in the universe. Once launched in 2020, it will spend six years mapping the locations and shapes of over 2 billion galaxies.

Around 1,000 European scientists and engineers are working on the Euclid mission. Samushia is one of a few U.S. scientists chosen to be part of a 43-member U.S. team being led by scientist Jason Rhodes from the Jet Propulsion Laboratory.

"Measuring properties of the universe and understanding the nature of dark energy requires the collaborative effort of thousands of scientists around the globe," Samushia said. "I'm honored and excited to be part of one of the biggest cosmology space missions of the next decade."

Uwe Thumm was recognized by Kansas State University with a 2014-2015 Commerce Bank and W.T. Kemper Foundation Distinguished Graduate Faculty Award. He presented "Tracing and steering electrons with ultra-short laser pulses: how atomic movies help us to unravel the interplay of light and matter at the basis of life" to a capacity crowd on Feb. 19, 2015.

Eleanor Sayre, assistant professor, and Paul Irving, formerly a K-State postdoc, co-authored an article that was featured in the June 12 online edition of the American Physical Society's publication Physics Today in its The Dayside column. "Identity statuses in upper-division physics students," published in Cultural Studies of Science Education, tracks three K-State undergraduate physics students as physicists across the curriculum, focusing on the middle years. The authors use the theories of identity status and communities of practice to describe how the students found their paths through undergraduate physics and developed a physics subject-specific identity. The data comes from interviewing the students and observing their participation in an advanced physics lab course.

IN MEMORY OF CHANDER BHALLA

Professor emeritus and former department head Chander Perkash Bhalla, 81, of Corinth, Texas, died peacefully on Jan. 16, 2015, in Irving, Texas. He was known as a generous, loving man who cared a lot for others.

He served as a professor of physics at Kansas State University for 35 years, including serving as department head for five years. His research interests included theoretical physics, atomic collisions, and radiative and nonradiative transitions. He published more than 150 papers as well as presented at international conferences. He was named professor emeritus at Kansas State University.

Bhalla's full obituary, written by the Bhalla family, can be found at https://www.phys.ksu.edu/news/news-stories/2015/bhalla.html.

SARA CRANDALL, PHYSICS GRADUATE STUDENT, DISCUSSES HER EXPERIENCE AS AN EIDROP FELLOW

The EIDRoP program is a collaboration of K-State's Department of Physics and Division of Biology and Junction City High School, part of USD 475. This collaboration began under the auspices of a grant awarded to K-State's Carolyn Ferguson, biology, in 2008 from the National Science Foundation GK-12 program. It continues today with the support of generous donors to the KSU Foundation, including Gary and Becky Hoover. This year we have one graduate student from each department participating. Sherry Hall, biology, and I work with Junction City High School science teachers Rebecca Steiger and Judy Ball. This program allows Sherry and me to interact with high schoolers in ways that benefit both the classroom and our professional development.

Throughout the year I design modules based on my cosmology research. They are formulated to give students an idea of what it's like to be a real physicist, and to connect the physical ideas they are learning in the classroom to current research topics. We recently completed a module that bridged the ideas of special relativity they had been discussing in class to general relativity, the effects on space-time and the consequences of these things that cosmologists encounter. We further explored the idea of cosmological parameters. Students created a mock universe using three different kinds of Hershey's Kisses to represent the three universal components. They decided how much dark energy, dark matter and baryonic matter Kisses made up their universe based on what they knew about each component.

When I am not presenting a module, I get to interact with the students during their regular classroom activities. Many of them have expressed how much they enjoy hearing about my experiences with their current subjects. My hope is to inspire them to pursue physics, whether it be as a major, minor or even a single class.

I get a great deal out of this program, just as they do. Although I already have some teaching experience at the college level, it was a challenge learning how to describe my research in a high school classroom environment. I have gained experience in explaining the big ideas of cosmology. I feel more comfortable presenting my research to the general public, and recently used this skill in an interview with my hometown's newspaper. Of course, this skill is also useful even when presenting to others in my field. I am extremely appreciative for this experience that I have been given.

It is my sincere hope that this program endures. EIDRoP can continue to greatly benefit both current scientists and budding ones.

By: Sara Crandall

LUNAR ECLIPSE BRINGS HUNDREDS

On Sunday, Sept. 27, 2015, the physics department offered a view of the lunar eclipse through telescopes. The eclipsing harvest moon drew more than 400 people, according to Chris Sorensen, Cortelyou-Rust university distinguished professor of physics. "It was an electric night," he said. People gazed up at the moon, discussing and asking questions as they waited for a view through the telescopes or binoculars. Groups of both physicists and amateur astronomers hosted the event.

Photo credit: Tammy Schmit, Little Leapling Photography

BRIDGING ART AND PHYSICS

Carlos Trallero, assistant professor of physics, together with faculty in art from K-State and the University of California, Santa Cruz participated in the K-State LASER series, which is co-sponsored by the DX Media Program, Department of Art, Kansas State University and Leonardo/ISAST, the International Society for the Arts, Sciences and Technology. LASERs foster community and discussion around the intersection of art and science, serving as a platform for the dynamic cross-disciplinary conversations necessary to generate innovative ideas and perspectives.

Our NSF-funded Research Experience for Undergraduates, or REU, students and several physics faculty were hosted at the K-State's own Marianna Kistler Beach Museum of Art by its director, Linda Duke, to explore the connections between art and science. In particular, students learned to call out particular features that led them to various interpretations of a painting or sculpture, and we discussed the similar skills needed to interpret scientific data and images.

FACULTY RECRUIT DIVERSE STUDENTS

Several of our faculty attended professional events targeting underrepresented groups in the sciences. Associate professors Bret Flanders and Kristan Corwin jointly presented a booth at the National Society of Black Physicists to actively recruit for our undergraduate and graduate research programs. Assistant professor Carlos Trallero and student Jaime Minjarez attended a workshop at Emporia State University called Sí Se Puede Hacer Ciencias y Matemáticas, Yes I can do Science and Math. The workshop brought together about 50 Hispanic middle school students with Hispanic professionals representing disciplines across science, technology, engineering and math, or STEM, fields.

LIGHT IT UP, K-STATE PARTICIPATES IN 2015 INTERNATIONAL YEAR OF LIGHT

The Kansas State University Department of Physics took full advantage of the 2015 International Year of Light. Designated by the United Nations, the yearlong celebration focused on the importance of light science and its applications.

Chris Sorensen, distinguished professor of physics, brought the celebration to K-State. He developed a K-12-focused public event, during which he displayed several optics demonstrations, including the colors of the rainbow and why light is considered a wave.

This Saturday morning event in November also featured student volunteers from the K-State chapter of the Optical Society of America, who led kids in hands-on optic demonstrations.

Other International Year of Light activities included the physics department Nobel Prize Lecture in February. This lecture was given by Hongxing Jiang, an electrical and computer engineering professor from Texas Tech University. Sarah Golin, K-State physics instructor, said that in keeping with the Year of Light theme, Jiang highlighted the 2014 Physics Nobel Prize for the invention of efficient blue light-emitting diodes, or LEDs.

These LEDs have enabled bright and energy-saving white-light sources. Jiang discussed the history and development of efficient blue-white LEDs, the current status and effects of LED lighting and future LED lighting and applications.

For more information about the International Year of Light, visit light2015.org.

OUTREACH TO HIGH SCHOOLS

The physics department has a new outreach push during the 2015-2016 school year. Individual physics high school teachers from across Kansas have been invited to bring their classes to visit the physics department. This is an all-expense paid trip for the students, where they can see our J.R. Macdonald laser facilities, other research labs and participate in hands-on physics activities. Students also learn about what they can do with a physics degree and what it is like to be a student in a scientific field. So far, six high schools have visited us during this school year, including schools from Clay Center, Norwich, Newton, Cheney, Kingman and Nickerson. Current schedules are being made for visits from Holcomb and Atchison high schools.

LONG-RUNNING QUARKNET OUTREACH PROGRAM RECOGNIZED

Physicists at Kansas State University are collaborating with Kansas high school teachers to engage students in high energy physics through field trips, lectures and hands-on teaching.

For 12 years, K-State has participated in the QuarkNet program, a high energy physics outreach program jointly funded by the U.S. Department of Energy and the National Science Foundation. Featured in the October 2015 issue of QuarkNet Friday Flyer, K-State's program was noted for working with Kansas high school teachers in rural areas.

Tim Bolton, professor of physics, started the QuarkNet program at Kansas State University in 2003 in an effort to expose high school teachers and students to contemporary topics in high-energy physics.

Bharat Ratra, professor of physics and principal investigator of the program since 2012, organizes QuarkNet's spring Masterclass meeting at K-State. Ratra said a dozen Kansas high school teachers and 20 to 50 high school students typically attend the meeting. Students benefit from analyzing real particle physics data taken by the Compact Muon Solenoid detector at the Large Hadron Collider at CERN in Switzerland.

"High school students learn about recent discoveries in particle physics while also strengthening their understanding of basic physics — ideas that underpin many of the technological issues our society has to deal with," Ratra said. "These students typically also end up with a stronger STEM foundation that they can build on by majoring in physics or another STEM field in college."

In April 2015, QuarkNet participants also watched the documentary "Particle Fever" in K-State Student Union's Little Theater. The film was followed by a Q-and-A session led by Bolton. "Particle Fever" gave students a front-row seat to the discovery and science of the Higgs boson — a particle that is hypothesized to give mass to elementary particles.

Renee Teague, chemistry and physics teacher at Cheney High School, has participated in K-State's QuarkNet program for four years.

"QuarkNet has opened up a vast area of physics to my students and myself," Teague said. "It has been a great opportunity for me to learn about physics today at no cost to myself, just my time and focus. If not for QuarkNet, I would not be nearly as likely to teach about modern physics and certainly not with the knowledge base I have gained through lectures and field trips."

Through the program, Teague has traveled with the K-State QuarkNet group to a data boot camp at Fermilab in Batavia, Illinois; Oak Ridge National Laboratory in Oak Ridge, Tennessee; and the Sandford Underground Research Facility in Lead, South Dakota.

Ratra also plans QuarkNet's summer cosmic ray detector workshops, where teachers learn how to use cosmic ray detectors from Fermilab to collect data with their students. Ratra noted that past students in the program used a detector to design shielding for a human mission to Mars and were finalists in an international NASA competition.

Five Kansas high schools now have cosmic ray detectors. Teague's classroom has benefited from using data collected from the detector to perform authentic research.

"QuarkNet's programs have allowed my students to investigate something 'real' — as my students describe it — and has inspired many of them to choose STEM careers, some specifically in physics," Teague said.

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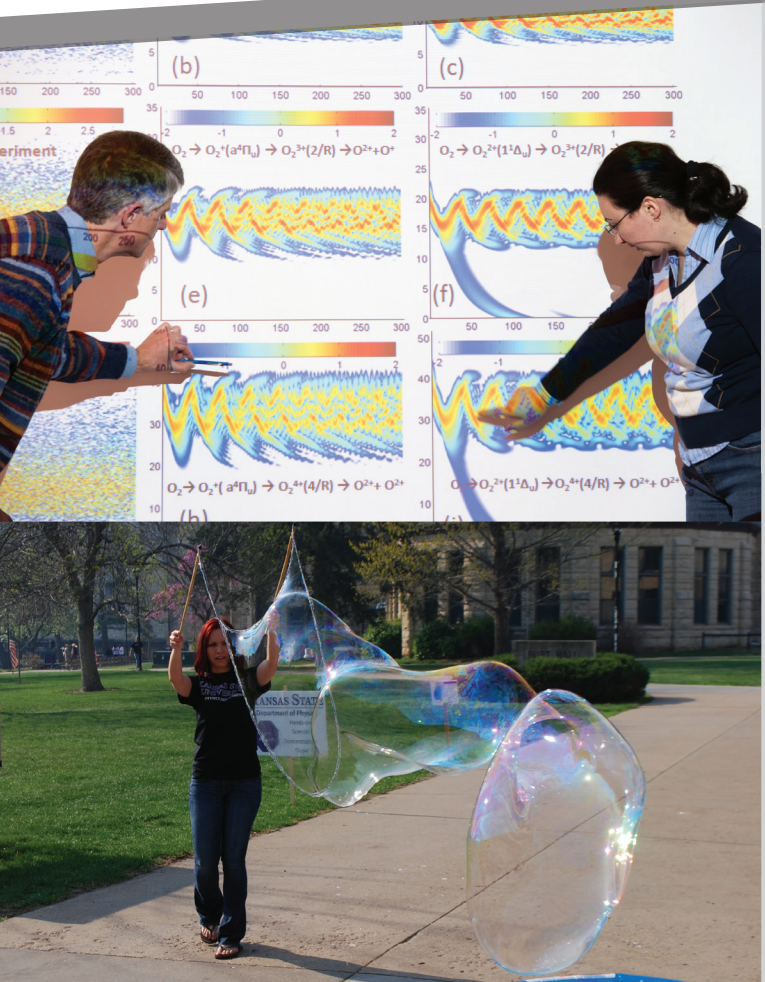

THANKS FOR YOUR SUPPORT

Thank you for all you do to help us improve our department's impact on science, students and the community!

Even as we celebrate the dramatic growth in our number of undergraduate majors, we recognize that those students need increasing support, especially in the face of rising tuition and dwindling state funding.

There are many ways your support makes a difference:

- Student scholarship dollars now reach more students.
- Undergraduate research scholarships make research more accessible to all students.
- Classrooms have been renovated and additional equipment purchased to accommodate increased demand for laboratory instruction.
- Endowed research support has allowed the creation of intellectual property.
- Excellent faculty have been recruited and retained through endowed faculty positions.
- Outreach activities, including lectureships, increase our value and visibility to the community.

To learn how you can support the people, places and programs of K-State Department of Physics, please contact the KSU Foundation Arts & Sciences development team at (800) 432-1578. To make a gift online, visit phys.ksu.edu/giving/. Thank you!