

Quark

Pittsburg State University Physics Department

Summer 2010 www.pittstate.edu/phys



In this issue—

We are pleased to feature two graduates of the PSU Physics Department in The Quark. Dr. Souder has had a highly successful career in petrophysics and Ms. Jessica Clements is beginning her career in medical physics.

As a PSU Physics alumnus, we hope that you enjoy reading their stories. We want to hear from you, too. Please send us a postcard or email!

Wallace W. Souder, Ph.D., receives Meritorious Achievement Award

Wallace W. Souder, of Bartlesville, Okla., began a lifelong career in physics and service to his community after graduating from Pittsburg State in 1960. Born and raised on a farm in Cherokee County, Kan., Dr. Souder attended Columbus High School and did not plan to attend college until after his parents insisted. During college, he worked summers for the U.S. Forest Service in Idaho in addition to the soda fountain at the Student Center throughout the year to help pay for school.

After receiving a bachelor's degree in physics in 1960, Dr. Souder attended one year of graduate school at Pittsburg State. During this time, he applied for and received an assistantship from the U.S. Atomic Energy Commission and went on to receive his Ph.D. in physics from Iowa State University in 1969.

After graduating, Dr. Souder came to Phillips Petroleum Company in Bartlesville as a research physicist. He later transferred to the company's Department of Exploration and Production and eventually became the worldwide

(continued on pg. 2)



Dr. Souder receives his Meritorious Achievement Award, December 2009. Pictured left to right: Drs. David Kuehn, Alex Konopelko, Wallace Souder, Bruce Daniel, and Charles Blatchley.

Souder (from pg. 1)

director of petrophysics in 1978. Among his many accomplishments while working at Phillips, Dr. Souder developed the first interactive well log analysis software and taught petrophysics to approximately 400 geoscientists and engineers. He served on two U.S. Department of Energy technology steering committees; one to develop tools for evaluating geothermal wells and another for producing electricity from hot dry rocks.

He was elected board member, vice president of technology and president of the Society of Petrophysicists & Well Log Analysts, an international society. He also belonged to the Society of Petroleum Engineers and served as an associate editor reviewing technical papers. He was a board member, secretary, and chairman for the Society of the Petrophysicists & Well Log Analysts Foundation.

After retiring as senior research petrophysicist for Phillips in 2001, Dr. Souder continued to work as a consultant for the Phillips Petroleum project with Green County Petrophysics, also in Bartlesville.

Dr. Souder is active with the OK Mozart Festival, Allied Arts & Humanities Council, and was vital to bringing the Artrain, a traveling exhibit of American Indian art, to the Bartlesville area. He is also involved as an elder and choir member with the First Presbyterian Church. He has served as president for the PSU Alumni group in Bartlesville and remains active with alumni events. Dr. Souder and his wife of more than 44 years, Mary Fern, live in Bartlesville.

Recently, Dr. Souder generously endowed a scholarship fund for physics students at PSU. Thank you very much, Dr. Souder!



The Clements Family: Jessica, Evan, Jake and Dylan. April, 2010.

Jessica (Freeman) Clements

B.S., Physics, 2002

Jessica Clements became a full-time student in the PSU Physics department in fall 1998. In that first year, she married Jake Clements and they welcomed their first son, Dylan.

During Jessica's sophomore year, she spoke with her advisor, Dr. Kuehn, about graduate school options. She had been interested in medicine early in high school and Dr. Kuehn suggested medical physics might be an option.

Jessica researched the field of medical physics and checked the prerequisites for the graduate program at MD Anderson. To learn more, she contacted the medical physicist at Mt. Carmel Medical Center and began shadowing him. She quickly found that a career in medical physics was an ideal fit. She took several classes geared towards preparation for graduate school, including many in chemistry and biology. Dr. Blatchley also introduced Jessica to the PSU NSF/REU program, which gave her several summers worth of undergraduate research experience in physics, biochemistry, and finally medical physics.

In the fall of 2001, there were only about eight accredited graduate schools in medical physics. There was a particularly cold winter that year, which ultimately resulted in a huge amount of snow. This unusually cold weather motivated Jessica to apply to the accredited programs south and east of Pittsburg. The graduate program she selected was at the University of Florida in Gainesville. While working

on her M.S. at UF, Jake and Jessica welcomed their second son, Evan.

So what is medical physics? The American Association of Physicists in Medicine (AAPM) defines it as an applied branch of physics concerned with the application of the concepts and methods of physics to the diagnosis and treatment of human disease. Medical Physicists specialize in one of four areas: therapy (radiation oncology), diagnostic (imaging), nuclear medicine physics, or medical health physics. Medical physicists receive post-graduate training resulting in either a M.S. or Ph.D. with coursework in radiation detection, radiation interactions, radiation biology, dosimetry, medical radiation shielding and protection, and specific course work for the various specialty areas. Medical Physicists are certified by the American Board of Radiology (ABR). Licensure is currently required in New York, Florida, Texas and Hawaii, and there is currently an effort for additional states including Michigan, Ohio, Pennsylvania and Massachusetts to adopt licensure requirements.

Jessica chose to practice in the specialties of diagnostic, nuclear medicine, and medical health physics. In October of 2004, she joined the staff of radiation control at UF and finished her M.S. in August of 2005. While at UF, she provided quality control testing of several imaging modalities at various hospitals within the Shands Health Care System. In January of 2007, Jessica accepted a position at

the Baylor Health Care System in Dallas, Texas. In June of 2008, she completed board certification from the ABR in Diagnostic Radiologic Physics and is now in the process of earning additional certification in Medical Nuclear Physics. While at Baylor, she helped start a clinical residency program and also became quite active with the AAPM, serving on multiple committees and forming a new one aimed at providing resources to new professionals in the field.

At the end of 2009, Jessica accepted a new position at Texas Health Presbyterian Hospital in Dallas. She now serves as the Radiation Safety Officer (RSO) for several radioactive materials licenses and x-ray registrations with the state of Texas in addition to the standard duties of being an imaging medical physicist. Jessica is still responsible for annual testing of several imaging modalities such as CT, MRI, radiography, fluoroscopy, ultrasound, and mammography. She measures radiation doses and evaluates image quality on these machines as well as supports accreditation programs with the American College of Radiology (ACR). As RSO, she manages the facility's radiation dosimetry program; inventories and leak-tests sealed radioactive sources; audits the radiation safety program; and ensures that programs are compliant with state and federal regulations.

Jessica is very excited about medical physics—it's a very rewarding career option and is in high demand. As a medical physicist, she is part of a health care team, and contributes to making a difference in the lives of patients and staff. There are career opportunities in cancer centers, hospitals, research and development, academia, and regulatory agencies. A nice additional perk of the field is that the salaries are exceptional for the field of physics. More importantly, it's a career where she can maintain balance between work and home and truly enjoy what she does every day. In her free time, Jessica enjoys spending quality time with family, growing waterlilies, photography, traveling, home improvement, cooking/baking, movies, and outdoor activities. If you have any questions or comments about medical physics, email her at jessicaclements@gmail.com.

Faculty Updates

Dr. Chuck Blatchley

Ph.D., Louisiana State University, 1984

Dr. Chuck Blatchley has assumed responsibility for coordination of the Department's teacher education programs, advising B.S.Ed. majors and teaching the Physical Science Lab for Teachers classes. He also serves on the Kansas Board of Education Program Review team. He has continued to work with the new High Purity Germanium (HPGe) gamma spectroscopy system purchased under a previous grant from the NASA EPSCoR Instrumentation program and a smaller NaI(Tl) spectroscopy system. A student working on this latter system, Il Ji Bae, won first place in the undergraduate section of the 2010 annual student colloquium contest based on (unsuccessful) attempts to detect possible solar eclipse effects on radioactive decay rates. Chuck also advised a graduate student, Nakul Padalkar, on another presentation for that contest on color matching functions. They together presented papers at the annual Nebraska Academy of Sciences meeting in Lincoln.

The gamma spectroscopy work has previously been the basis of grant proposals in collaboration with the astrobiology group at KU. Dr. Blatchley is also still an Adjunct Professor at the University of Nebraska Medical Center in Omaha in the Department of Orthopedic Surgery and Rehabilitation, where he has continued his collaboration with Professors Fereydoon Namavar and Hani Haider at the Scott Technology Center at UNMC, developing and testing new wear-resistant materials for biomedical implants. The latest development there is a nanocrystalline form of zirconium that maintains cubic structure without any other ceramic dopant.

Dr. David Kuehn

Ph.D., New Mexico State University, 1990

Dr. Kuehn attended the Physics Teachers Education Coalition (PTEC) Conference

last February 11-12 in Washington, D.C. There was much discussion about current practices for preparing physics teachers. Immediately following was the combined meeting of the American Physical Society (APS) and the American Association of Physics Teachers (AAPT). The best sessions were about the Large Hadron Collider which has recently started up in Europe; black hole dynamics; a session on Enrico Fermi, which featured his last graduate student from 1953; and particle physics, which featured five members of the "Gang of Six" that published the papers that led to quantum chromodynamics. It was a very enlightening and exciting meeting!

Lately, Dr. Kuehn has been preparing for a new course for the Fall 2010 semester: Computational Fluid Dynamics. This course is being taught for students who are interested in numerically solving the Navier-Stokes equations. Always looking for a challenge!

This summer, Dr. Kuehn will be working with his colleagues Dr. Nancy Chanover and Dr. David Voelz at New Mexico State University on the construction of an acousto-optic tunable filter (AOTF) spectrometer in combination with an Ion Extraction Unit that is intended to be launched on an unmanned rover to Mars. The instrument is meant to quickly analyze surface sample spectrally using the AOTF. When there is a sample with likely biological material, a laser will volatilize parts of the sample to be analyzed by a mass-spectrometer.

Dr. Serif Uran

Ph.D., Illinois Institute of Technology, 2000

Dr. Uran taught a variety of courses such as College Physics, Elementary Physics Labs, Electronic Circuits, Electromagnetic Theory, Physical Science, Engineering Physics, Electricity and Magnetism and Solid State Physics in 2009. He attended the

Gordon Conference - High Temperature Oxidation section and presented a poster in New London, NH in the summer of 2009. More recently, he attended the IDEa Network of Biomedical Research Excellence (INBRE) at University of Arkansas and a bio-nanotechnology applications conference at SUNY-Albany.

Dr. Uran served as a panel judge at the PSU Research Colloquium where new research projects from the physics department as well as other departments were presented. He also served in the PSU Faculty Senate's executive committee and in various subcommittees across the campus.

Dr. Uran accepted two new graduate students, Tai-Yun Huang and Tushar Deshpande, to work on solid state electronic device applications. Dr. Uran is in the process of establishing a collaboration with Honeywell in Kansas City to work on magnetic nanosensors, devices that could potentially detect very small amount of magnetic fields.

Dr. Rebecca Butler

Ph.D., Ohio State University, 2002

Dr. Butler is in her fifth year teaching at PSU. Her main new experience this year was applying for both tenure and promotion.

She taught College Physics II lecture and lab for both semesters. In the fall she taught Physical Geology lecture again, and taught the lab for the first time. This spring, she taught the Intermediate Physics Lab and graduate Quantum Mechanics. She has gotten involved with the annual Science Day for high school students, and runs the Rock Recognition competition.

She continues her research on molecular spectral analysis, collaborating with spectroscopists from the Jet Propulsion Laboratory and Ohio State University. She is co-author on two papers entitled "Global modeling of the lower three polyads of PH₃: Preliminary results" and "The rotational spectrum of chlorine nitrate (ClONO₂) in the four lowest n₉ polyads".

Kyla Scarborough

MS, Pittsburg State University, 2005

Ms. Kyla Scarborough has been teaching in the Physics department since 2005. Last fall, along with teaching Descriptive Astronomy, Physical Science, Planetary Atmospheres, and supervising the Physical Science labs, she taught a lab and lecture that were designed to meet the needs of current middle school teachers who wished to add Middle School Earth and Space Science to existing license. Kyla's teaching assignment for the spring semester includes Physical Science, Solar System Astronomy, and supervising the Physical Science lab sections. She supervises the L. Russell Kelce Planetarium, which presents programs to a few thousand students annually. Kyla organized the Physics Frolics and Earth & Space Sciences portions of PSU Science Day 2010. Her research interests have included wear testing of biomedical implants and engine parts and also vertical structure modeling of Saturn's upper atmosphere from narrowband near-infrared imaging.

Dr. Alexander Konopelko

Ph.D., Tomsk University of Technology, 1990

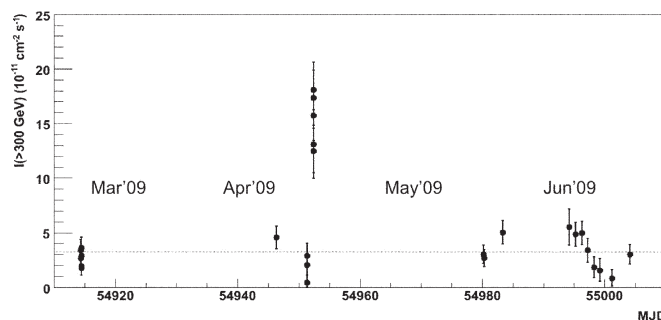
Dr. Konopelko is a second year Assistant Professor in the Physics Department at PSU. His research area is high-energy astrophysics. He is currently involved in the VERITAS (Very High Energy Radiation

Imaging Telescope Array System) project, which is a major ground-based observatory with an array of four 12 m optical reflectors for gamma-ray astronomy in the GeV – TeV energy range. Dr. Konopelko represents Pittsburg State University in the consortium of the universities of Kansas that joined the Pierre Auger experiment. The Pierre Auger Observatory project is a world-class research project proposed to be built in southeastern Colorado ("Auger North"). The project involves the collaboration of 400 scientists from more than 70 universities in 17 countries. This observatory would create an opportunity in education and outreach. Dr. Konopelko is a principal investigator of two joint research projects of VERITAS and space-born experiments, Fermi-LAT (Large Array Telescope), Chandra X-ray Observatory (see figure below), funded by NASA.

In June 2009, Dr. Konopelko attended the 214th American Astronomy Society meeting in Pasadena, Calif., where he presented the recent results on "Modeling the broadband high-energy emission spectrum of pulsar wind nebula associated with the PSR J1617-5055."

In November, Dr. Konopelko attended

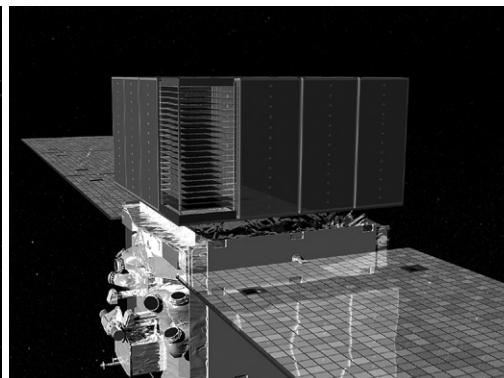
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This plot shows the light curve of the high-energy gamma-ray emission of Markarian 421 measured in 2009.



Fermi-LAT (Large Array Telescope)



Chandra X-ray Observatory

I am a physicist!

My name is Shea Smith and I am an undergraduate physics student at Pittsburg State University. Did you know that there is physics behind most things that take place on the Earth? There is physics in the Olympic sport of curling and the sweeping of the ice in front of the curling stone. There is physics present in the calculations



Shea Smith performs the Franck-Hertz experiment.

of the GPS satellites circling the Earth. There is physics behind the propulsions of cannons and how far they will fly and where they will land.

Here at the physics department at PSU one can learn all about the physics that is taking place on our tiny planet. The classes taken can help to answer these questions and more. Projects outside the classroom can help to go into further depth on subjects that a student wants to know more about. The professors are available to help with classes and with plans after college. I decided to major in physics in order to be a high school physics teacher. I am also a dual major in secondary chemistry education.

My classes have taught me more about our world and how things work. Also, it has allowed me to see that there is more to the universe in the realm of astrophysics, and it has helped me see that there are strange phenomena that go on in the realm of quantum mechanics. Don't forget that for every action there is an equal and opposite reaction. The effort that I have put into my major has helped me to attain my goal to become a teacher and to see that the world we live in can be drastically different than we perceive it if we only dig into deeper investigation.

Faculty Updates (from pg. 4)

the Fermi Symposium in Washington, D.C., where he gave a talk entitled "VERITAS Observations of the active galactic nucleus Markarian 501 in 2009. A flare, or high-emission state, of Markarian 421 was detected during two days in April and May. In late November, Dr. Konopelko was invited for the Colloquium talk at the Department of Physics at Kansas State University to discuss the recent results of the very-high energy gamma-ray astronomy with VERITAS.

Konopelko published a collaboration paper on the observations of the Cassiopeia A supernova remnant with VERITAS in the *Astrophysical Journal* (ApJ, 714 (2010) 163-169; online: <http://xxx.lanl.gov/abs/1002.2974>).

In spring 2010, Dr. Konopelko taught a

new course in High-Energy Astrophysics. He wrote a review of the textbook "University Physics with Modern Physics" recently published by McGraw-Hill Higher Education companies. He attended the meeting of the Executive Science Advisory Committee for VERITAS in Chicago in April 2009. In December, Dr. Konopelko reviewed the research article for the *Astrophysical Journal*, Institute of Physics, Bristol, UK. In April 2010, Dr. Konopelko served on the review panel for the Cycle III Guest Investigator Research program with the Fermi-LAT in Baltimore, MD. In June 2009, Dr. Konopelko attended the meeting for new physics faculty of America in College Park, MD, sponsored by the American Association of Physics Teachers. This meeting offered a nice update of modern methods used in the college physics education.

Society of Physics Students

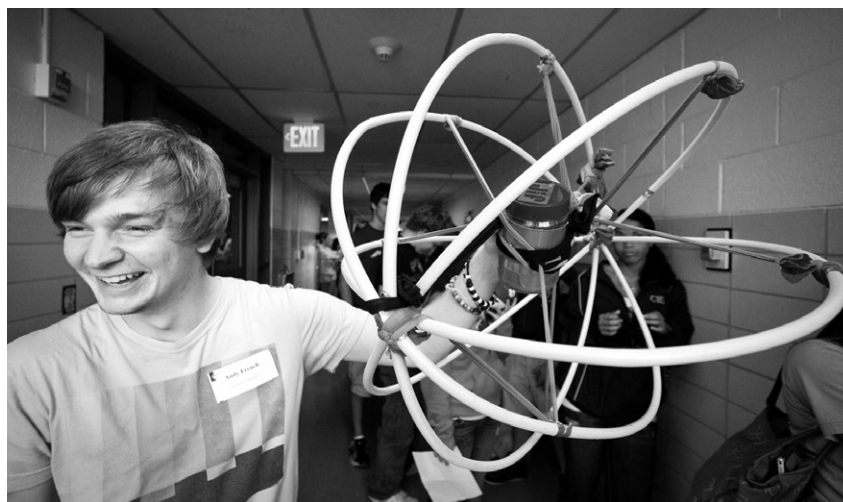
SPS students hosted SPS zone 12 meeting on April 23-24, 2010. Undergraduate physics students from PSU, Dongqing Huang, Charini Indumini Wanigarachchi, presented their research at the zone meeting. Adrian Melott from University of Kansas delivered the keynote speech. The SPS students played a "Jeopardy" physics game where different physics-related questions were asked. They also watched a documentary called "Percy Julian: Forgotten Genius" produced by NOVA. The grandson of Alabama slaves, Julian broke the color barrier in American science more than a decade before Jackie Robinson did in baseball. A brilliant innovator, he discovered a way to turn soybeans into synthetic steroids on an industrial scale, helping to make drugs like cortisone available to millions.

The SPS is a national and academic student organization. Each SPS zone includes different states. The Pittsburg State University chapter of the SPS is in Zone 12, which includes Kansas, Oklahoma and Missouri. Science education via student organizations such as Society of Physics Students (SPS) is an important part of university experience. The idea of SPS zone meetings on our campus is to generate student interest in physics and provide interaction among students, faculty and campuses within the zone. Each year, a campus volunteers to host the SPS zone meeting and this time PSU volunteered for the event. Meetings like this promote a renewed sense of purpose for studying physics among students. SPS also awards research scholarships and fellowship opportunities with SPS membership. The list of SPS students and their presentation titles are provided below:

Dongqing Huang, PSU: "The broadband Multiwavelength Observations of High-Energy Blazars MRK501 and MRK421".

Charini Indumini Wanigarachchi, PSU: "Observation on Cassiopeia A SNR with Fermi LAT and VERITAS".

Michela Alexander and Jonathan Brooks, Southwestern Oklahoma State University: "Stellar spectroscopy and Astrophotography at SWOSU".



Andy French, Osawatomie High School, prepares to test a device he designed and made to protect an egg in a three-story fall.

High school students compete at Science Day

More than 450 high school students participated in Pittsburg State University's Science Day 2010 on Thursday, April 22.

Students competed individually and in teams in four areas: Chemistry Capers, Physics Frolics, Earth and Space Science, and the Biology Bowl.

Some of the competitions included the popular mouse trap car, in which students design and build cars powered only by a mousetrap; the water balloon drop, in which students attempt to design and build a container to protect a water-filled balloon in a 3-story fall; and seismic shakers, in which students construct a tower of craft sticks and glue that can withstand an earthquake.

Other events included written and oral exams, rock recognition and the design of a Mars colony.

Our Faithful Supporters

The Physics Department and the student scholarship recipients thank alumni and friends who faithfully support the department and its students year after year. We especially thank the following donors who made gifts between July 1, 2009 and June 3, 2010 to a scholarship or in support of other departmental needs.

Dr. and Mrs. Bob Backes

Mr. and Mrs. Randall Bishir

Dr. and Mrs. Charles Blatchley

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Boeing Company - matching company
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Graduate Student Awards

Tai-Yun (Terry) Huang – **Excellence in Scholarship**

Nakul Padalkar – **Excellence in Research**

Nathaniel Smith – **Excellence in Scholarship**

Scholarships

Students receiving Physics Alumni Scholarships:

Ashley Collins, Michael Graham, Brady Johnson, Jonathon Mayfield,

Tyler Shallenburger, Shea Smith, and Talon Thompson

Endowed Scholarships

Anthony Ison – was offered the **T. Bruce & Yoshiko Iwabe Daniel Scholarship**

Michael Graham – was offered the **Wallace Souder Scholarship**

Jonathon Mayfield – was offered the **James Thomas Scholarship**

Talon Thompson – accepted the **Larry Long Memorial Scholarship**

Charini Wanigarachchi – accepted the **T. Bruce & Yoshiko Iwabe Daniel Scholarship**

2009-10 Graduates

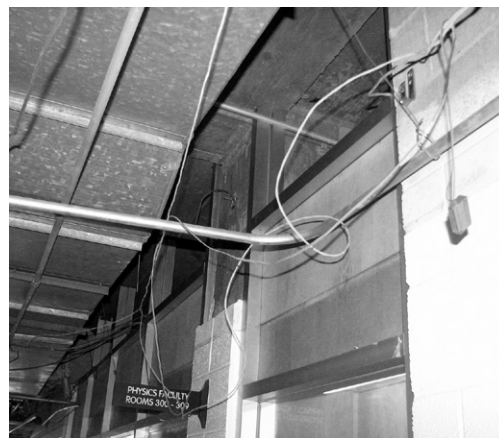
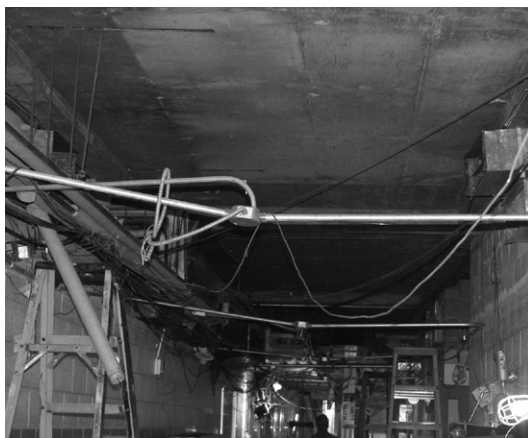
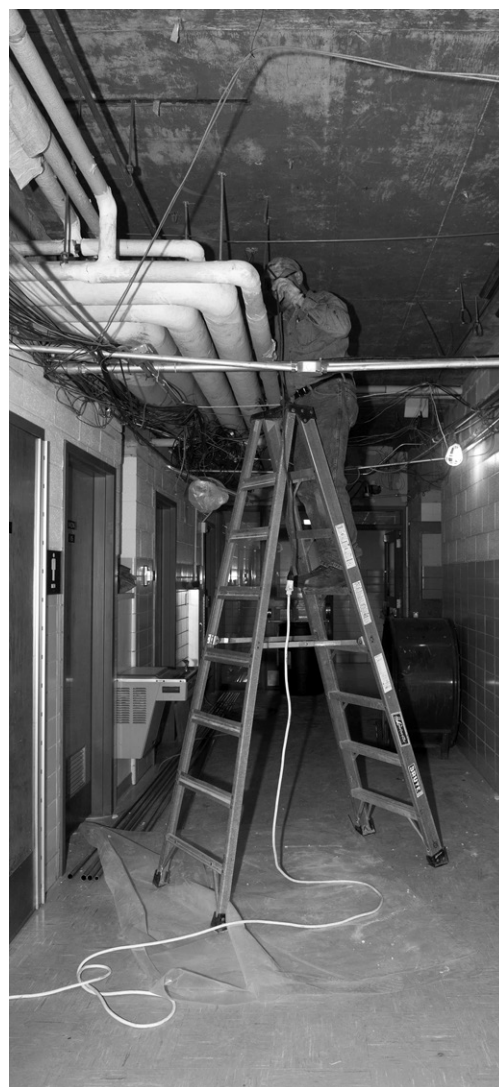
Congratulations to Nathaniel Smith (Fall 2009), Il Ji Bae and Nakul Padalkar (Spring 2010). Good luck in the next steps of your career!

Yates Hall, the home of the PSU Physics Department since 1962, is undergoing renovation during the summer of 2010.



If you had a class in Yates Hall in the past couple of decades, you will remember being too cold in the summer and too hot in the winter. Faculty will always remember saying to students that “hot air rises because of lower density (EXCEPT in Yates Hall where the fourth floor was always cooler than the first floor!).”

To fix these problems and save precious campus utility dollars, contractors are replacing all the windows, replacing the roof and ceiling tiles, and installing a new computerized heating, ventilation, and air conditioning system. Funds awarded to the State of Kansas from the federal government are being used to pay for the work. For the most part, summer classes are meeting in other buildings on campus. Work is to be completed in August so that everything will be back to normal for the Fall 2010 semester. The faculty, staff and students who use Yates Hall hopefully enjoy a more comfortable working environment and at less cost for years to come.



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Other\$

☐ yes ☐ no

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Thank you for your continued support!