

Physics on the Hill

Fall 2010, Volume 8, Issue 1

Message from the Chair



There has been quite a bit of change this year as the university continues to grow to over 21 thousand students and the department adds new a new research center and people. This year President Ransdell has hired a new Provost and Vice President of Academic Affairs to his team, Dr. Gordon Emslie and we are pleased to announce that he is also a new member of the department as an active solar astrophysicist. We also welcome Julie Scott as the new Laboratory Coordinator running all of the undergraduate labs, coordinating graduate students schedules, updating all of the demonstration equipment and maintaining all of the equipment and computers. We are fortunate to have added such talented new people into the department and look forward to their added excitement and enthusiasm in improving our program.

There are a number of exciting ideas contained in the pages herein and I hope these insights provide a glimpse into the exciting place we have become due to your presence. Students have been going off to national meetings and presenting results and heading off to graduate school, entering the work force or becoming the next set of teachers to inspire the next generation about the opportunities of a life in science. The Physics Olympics is coming up on Feb. 26th and the Science Olympiad is right around the corner.

Our newsletter is sent periodically to alumni and friends of the Department to update you on changes in your department and the activities, for more information please visit: <http://www.physics.wku.edu>. There you can learn about the most recent activities of our faculty and current students. We are always happy to hear from former students and departmental supporters and to learn where you are, what you are doing now, and how your careers have developed after studying and preparing in our program. The Physics Olympics is coming up soon and we look forward to hearing from anyone in high school interested in participating in this event. We invite you to call, write, or email at any time to let us hear from you at anytime.

Sincerely, Keith Andrew, Professor and Head of Physics and Astronomy

WKU NOVA Center Conference 2011

March 10-11, 2011
Western Kentucky University
Carroll Knobel Conference Center
Bowling Green, KY 42301
Conference Information:
<http://www.largechamber.com/>
Local Contact:
Dr. Edward Kintzel
phone: 270-745-6200
e-mail: edward.kintzel@wku.edu



Located at Western Kentucky University, we have established the Nondestructive Analysis (NOVA) Center in the Commonwealth of Kentucky. As envisioned, the NOVA Center is the only facility of its kind at a North American University, and will be a nexus for nondestructive measurements. Experts from a wide range of disciplines will present potential research and the needs for this to be a national user facility.

Conference Highlights

- Overview of the WKU NOVA Center
- Presentations for ICCSEM applications:
 - Basic Science
 - Automotive
 - Aerospace
 - Forensics & Forensic Engineering
 - Engineering
 - Art Conservation
 - Research & Development
 - Educational Outreach
- Tours of the WKU NOVA Center and Corvette Plant

Symposium Details
Registration
Housing
Agenda
Important Dates
Confirmed Speakers

Dr. Kenneth W. Herwig, NSTD, ORNL
Mr. Martin Klein, ELLCIE
Dr. Diane E. Vance
Director, Forensic Science Program, EKU
Dr. Max M. Houck
Director, WVU Forensic Science Initiative



WKU Nondestructive Analysis (NOVA) Center Established

The WKU Nondestructive Analysis (NOVA) has been established at Western Kentucky University. The NOVA Center is home to the Large Chamber Scanning Electron Microscope that is the largest instrument of its kind at a university in the world. As appropriate, this Center will draw on the considerable expertise that exists at Western Kentucky University and around the nation.

The primary mission of the WKU NOVA Center is to form strong industry partnerships to make the Commonwealth of Kentucky a national nexus for nondestructive analysis. It is anticipated that research across a wide spectrum of academic disciplines will benefit from Center use, promoting viable research collaborations. Ultimately, the establishment of the NOVA Center at Western Kentucky University will raise the level of the prestige and technical capability within the Commonwealth of Kentucky.

The NOVA Center will become a focal point at Western Kentucky University for student recruitment around the nation and within the Commonwealth of Kentucky. The opportunity exists to develop and further our current research and educational programs designed to make our citizenry better equipped to compete in a global society.

"...the SEM is a unique instrument that places WKU at the forefront of scientific research."

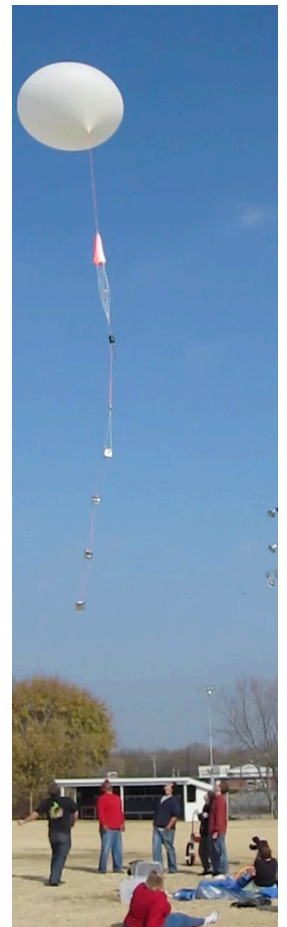
Students launch balloon into near-space

November 20, 2010 marked the return of a high-altitude ballooning program to Physics and Astronomy. Under the guidance of Drs. Louis-Gregory Strolger and Lachlan Campbell, WKU and Gatton Academy students launched exploratory payloads into near-space from Warren East High School in Bowling Green, KY. The launch was the basis for experiments run by the students for their Astronomy 214 course this fall.

Rising to a maximum altitude of about 94,000 ft, the balloon traveled for nearly 3 hours, returning to earth outside Glens Fork, about 75 miles east of the launch site. The balloon came within 6,000 ft of its expected altitude, and landed within 10 miles of its expected target. Two student chase teams ensured a successful recovery by tracking the balloon in real-time using radio beacons and GPS signals.

The program collected a good deal of atmospheric and astronomical data, paving the way for practical applications in future launches. Dr. Strolger has received an initiative grant from the NASA Kentucky Space Grant Consortium to develop the high-altitude ballooning program and its instructional curriculum, and he seeks further funding to facilitate partnerships with NASA centers such as the Jet Propulsion Laboratory and the Marshall Space Flight Center.

"It's wonderful to see this activity reinvigorated. It's a testament to the work in initiating the program by our Emeritus Professor Dr. Karen Hackney, and the late Dr. Richard Hackney. It's a privilege, and an adventure, to continue that legacy," said Dr. Strolger.





WKU Physics students attend the 77th Annual Meeting of the Southeastern Section of the American Physical Society (SESAPS)

On October 20th, Physics students from Western Kentucky University traveled to Louisiana State University in Baton Rouge, LA to present their research at the 77th Annual Meeting of the Southeast Section of the American Physical Society (SESAPS). In total, 9 students (shown to the left ready to enjoy some fine Cajun cuisine) made the trip. Student presentations from a wide range of disciplines included:

- Jacob D. Baxley - Development of a Portable Automated Gas Environment System (PAGES²)
- Aaron Bell - Seeing the Spiral from the Arms: Modeling the Interstellar Medium of the Milky Way
- Jessica Crafton - Fractal growth of ultrathin films of p-sexiphenyl on alkali halide substrates
- Jonathan Newton - Determining Properties of HI Emission Regions in the Interstellar Medium
- Michael Phillips - Modeling of Thermal Time Evolution and Gradients on Extended Samples
- Suzanna Sadler - Tests of Environmental Effects of SN Ia Production
- Tara Wink - Investigations of thermal gradients on extended samples
- Schuyler Wolff - Investigating Type Ia Supernovae Progenitors from Local Rates

"I really learned what it meant to be a physicist..."

Some conference attendees shared their experiences with Physics on the Hill:

Michael Phillips of the Gatton Academy of Mathematics and Science in Kentucky: "SESAPS was a great experience. I really learned what it meant to be a physicist by sharing what I have learned while doing research."

Tara Wink: "The conference was a great chance to meet other like-minded students, view/tour their physics department, and bond with my fellow WKU peers. Also, we got the opportunity to view all of LIGO!!!!"

Suzanna Sadler: SESAPS is an experience to be had. It's a great learning experience for students doing research who will be presenting at large conferences.

Jacob Baxley: "SEASAPS gave me the opportunity to see student research conducted in other fields at various universities."

Next year a large contingent of WKU undergraduates is expected to attend as ambassadors for WKU Students who want to participate in 2010 are encouraged to contact their research supervisor.

WKU Student Wins Marsh White Award

Jonathan Newton of WKU won the Marsh White Award for outstanding student presentation at the 77th Annual Meeting of the Southeastern Section of the American Physics Society (SESAPS) conference at Louisiana State University on October 24th.

Jonathan's work "Determining Properties of HI Emission Regions in the Interstellar Medium" tied with Ryan Blum from Francis Marion University for best poster in the student competition. Each of them received a certificate and cash award.





WKU Chapter of Sigma Pi Sigma Celebrates 50th Anniversary



The WKU chapter of the Sigma Pi Sigma physics honor society celebrated its 50th anniversary on April 24, 2010 at its annual banquet and induction ceremony. Held at the Kentucky Library and Museum, the celebration was highlighted by WKU SPS alumni (below) recounting department stories over the five decades.



- 1960's: Dr. William G. Buckman, Sr., *Professor of Physics Emeritus, WKU; Founder, Chairman, and CEO of Buckman Jet Drilling Inc.*
- 1970's: Dr. Dwight P. Russell, *Associate Professor of Physics, Baylor University*
- 1980's: Mrs. Melissa Smith Rudloff, *SKyTeach Master Teacher, Western Kentucky University*
- 1990's: Dr. Idelfonso J. Guilaran, *Associate Professor of Physics, Union University*
- 2000's: Dr. Gavi E. Begtrup, *Congressional Science Fellow, Office of Congresswoman Gabrielle Giffords of Arizona*

Speakers provided words of advice and encouragement to four new students who were inducted into the WKU SPS chapter. The new inductees (below) bring the total membership in the WKU chapter to 267. To receive this honor, students had to meet high standards of general scholarship and excellence in physics scholarship. An overall GPA of 3.0, a 3.3 GPA, and completion of a set of core physics courses.

- **Jacob Daniel Baxley**, a junior physics major from Hartford, KY
- **Kyle Wayne Cook**, a senior physics and mathematics major from Bowling Green, KY
- **James Robert Phelps**, a senior physics major from Morgantown, KY
- **Schuyler Grace Wolff**, a junior physics and mathematics major from Tulsa, OK.

Phelps is the 2010 recipient of the **Dr. George V. and Sadie Skiles Page Award for Excellence in Scholarship**, which is awarded to the graduating physics major with the highest academic standing. Phelps' association with the Cyber Defense Laboratory at WKU led to an opportunity to develop software for the Army Research Laboratory in Adelphi, Md. He currently works for Electronic Warfare Associates and plans to pursue a graduate degree in computer science or other technology related fields.

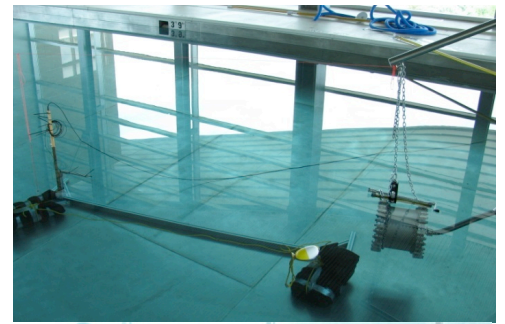
Wolff is the 2010 recipient of the **Dr. Randall Harper Award for Outstanding Research in Physics and Astronomy**, which is awarded to the junior or senior student with research exhibiting significance, effort, originality, and creativity. Wolff is a student in the Honors College, a member of Phi Mu Epsilon, an Ogden Dean's List honoree, and a President's List honoree. She has won scholarships from the Gatton Academy for Mathematics and Science and the Kentucky Space Grant Consortium. She has presented her work in supernova progenitor studies at several regional and national conferences, won Best in Session at the 40th WKU Student Research Conference and won her Research Experiences for Undergraduates (REU) with the University of Göttingen and the Harvard-Smithsonian Center for Astrophysics. After graduation, she plans to earn her doctorate in astrophysics and pursue a career in professional astronomy as an academic at a research institution.

Cook is the 2010 recipient of the **Dr. Douglas Humphrey Award for Outstanding Service**, which is awarded to the junior or senior student with a record of department service and to science outreach in the community. Cook receives the Humphrey service award for an unprecedented third year in a row due to overall good citizenship that he portrays in his interactions with faculty and students in the department. He was instrumental in revitalizing the Hilltopper Astronomy Club and has served as an undergraduate laboratory technician. He has assisted with student recruitment by visiting high schools and assisted with outreach activities like Physics Olympics. Performed research with Professor Mike Carini on a Blazar monitoring project. He gained national recognition for this by receiving the Chambliss Student Astronomy Achievement Award from the American Astronomical Society. Cook is currently working on a doctorate in astrophysics at Texas A&M University.

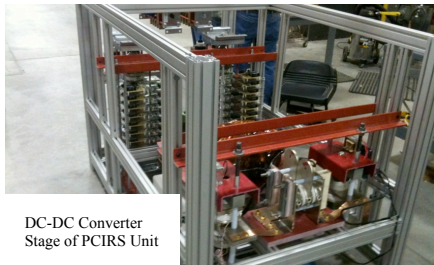
Applied Physics Institute's Projects

Waterborne Threat Interdiction

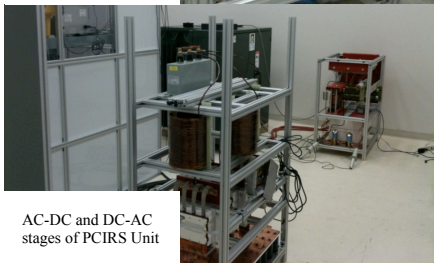
The Waterborne Threat Interdiction (WTI) System was recently demonstrated for personnel from the National Institute of Hometown Security (NIHS) who sponsored the project. The demonstration, which completed the current work on the project, was conducted at the aquatic center of the West Virginia High Technology Consortium (WVHTC) Foundation who collaborated on the project. This project involved the design and fabrication of an underwater transducer capable of generating a 240dB (re. 1 μ Pa) pressure wave in the water. This intense pressure wave would be used to disrupt divers or underwater autonomous vehicles that have been identified as a threat in ports or near large shipping lanes. Future work with this device will include the design of a transducer array that will be able to collimate the pressure wave using constructive and destructive interference.



WTI System Demonstration. WKU, WVHTCF, and NIHS Personnel.



DC-DC Converter Stage of PCIRS Unit



AC-DC and DC-AC stages of PCIRS Unit

Portable Community Infrastructure Resiliency System

PCIRS was developed to address a need for a lightweight, easily deployable transformer that can be utilized in disaster areas, whether it is natural or man-made. The project is currently in the final phase of fabrication and a demonstration for NIHS, DHS, FEMA, and DoD personnel is tentatively scheduled for the end of November. The PCIRS unit includes an electronic transformer (light-weight power converter (LPC)), which is comprised of mainly solid-state components reducing the weight and size compared to a traditional iron-core type. The system also includes a communications package, which allows remote operation of the PLC with satellite or cellular communication in case other terrestrial

Broadcast Methods for the Elimination of Random Anomalous Peak Loads

This project is funded by the Kentucky Commercialization Fund (KCF) and involves the development and commercialization of a wireless AC cycling switch and integrated stochastic prediction algorithm. AC cycling is a method of reducing the demand on the electric grid in summer months by turning on the compressor of the AC for small amount of time. This process can also be used to reshape the demand curve, which has separate benefits. The algorithm is being developed by Dr. Jonathan Quiton (Math and Computer Science) under a separate KSEF grant. For the first version of the "Smart Switch", an IEEE802.11b/g Wi-Fi protocol is being used for wireless communication. The switch generates a random number and compares that to a stochastic value generated by the prediction algorithm. Based on this comparison, the control signal to the compressor is either interrupted or allowed to function as normal. Research into existing cycling programs and other means of energy conservation is being conducted under this project as well.





Annual Department Christmas Party

On December 15, 2010 the department celebrated the end of another successful semester by having our annual Christmas lunch. This is always one of our most popular events, and is a great way for students and faculty to gather, and share some great food!!! We hope everyone has a Merry Christmas, and a Happy New Year!!! We will see you all next semester, and look forward to seeing you at all of our events.



Merry Christmas
and
Happy New Year!!!

Society of Physics Students



To the Department of Physics and Astronomy,

Western Kentucky University's chapter of the Society for Physics Students has had an interesting year. New officers, a new outreach program, and an influx of incoming freshman have provided a breath of fresh air for the group. Last May, the organization elected a set of new officers. I, Schuyler Wolff was elected as President, Mike Simpson was elected Secretary, Kyle Curry was elected Treasurer, and Suzanna Sadler was elected as the President Elect and will be taking over in the next academic year. Since the recent elections, we have worked to incorporate new outreach programs into our activities. The Physics Public Night began in September to work in collaboration with the Astronomy Public Night. The Public Night takes place on the third Wednesday night of each month. Faculty members instruct the public on various topics including optics, electricity and magnetism while SPS members act as assistants. In addition to these public nights, the SPS hosts a variety of activities. There is a departmental picnic once a semester. The Fall 2010 picnic was a hit including Frisbee, corn hole, pumpkin carving and great food. The SPS also funds members to attend a conference where students present research. In the fall, we attended the SESAPS conference in Baton Rouge, LA. The trip included a day in New Orleans, and two of our students were finalists for poster presentations. In addition to these activities, membership in the Society for Physics Students entitles students to a wide variety of internship and scholarship opportunities. The WKU chapter of SPS has served as a support group for physics majors for many years (our faculty advisor, Dr. Harper was once a member) and will continue to be a stepping-stone to success in the future.

Sincerely,

Schuyler Wolff

Public Nights Expanded to Include Physics

Due to public demand and with phenomenal departmental support, Fall 2010 saw the expansion of the already popular Astronomy Nights to include Physics themed evenings. With the ongoing assistance of the Hilltoppers Astronomy Club, advised by Dr. Rachel Campbell, the Astronomy nights continued to be held once a month while the participation of the Society of Physics Students, advised by Prof. Doug Harper, enabled the introduction of monthly Physics Activity evenings. Both the Astronomy and Physics nights have proven to be highly popular with more than 150 parents, children and WKU students attending the 7 nights



The Astronomy nights, hosted by Dr's Campbell, Strolger and Gibson as well as Rico Tyler and aided by student liaison officer Schuyler Wolff, utilized the 12" rooftop telescope and several smaller telescopes to view objects such as Jupiter and it's moons at their closest approach to Earth, Saturn and it's rings, the Geminid meteor shower, star clusters and distant galaxies.

The Physics nights, hosted by Dr's Andrew and van der Meer with Physics Laboratory Manager Julie Scott, were assisted by student liaison officer Suzanna Sadler. Program highlights of these nights included talks, demonstrations and hands-on experiments covering the wonders of electricity, the origin of magnetism, and the creation of lasers.

One 10-year-old participant best sums up the true measure of the success of these evenings at the end of the night that told his mother "I can't wait to go to College!" With such a positive response and continued support the Physics Activity Evenings are set to become a permanent part of the departments outreach

Upcoming Physics Meetings

Conference	Date	Location
WKU Physics Olympics	February 26	TCCW 246, WKU
1 st Annual WKU NOVA Center Conference	March 10-11	Carroll Knicely Conference Center
41 st Annual WKU Student Research Conference	March 26	Gary A. Ransdell Coll. of Ed. Bldg.
American Physical Society	March 21-25	Dallas, TX
Materials Research Society	April 25 - 29	San Francisco, CA
Microscopy & Microanalysis 2011	August 7-11	Nashville, TN
78 th Annual Meeting of SESAPS	October 19-22	Blacksburg, VA

New to the Department

We are pleased to have Julie Scott as our new Laboratory Coordinator running all of the undergraduate labs, coordinating graduate students schedules, updating all of the demonstration equipment and maintaining all of the equipment and computers. She has a B.S. in Geology from WKU with a Physics minor, and extensive laboratory experience in Chemistry, Geology, and Forensic Studies. In addition to being the lab coordinator, she is a Graduate student at WKU.





Dr. Emslie has studied several areas and holds a Doctor of Science and a Ph.D. from the University of Glasgow in astrophysics, he also holds an M.S.E. in mechanical engineering science, a M.S. in atmospheric science, a M.S. in materials science and a B. A. in French from the University of Alabama in Huntsville, he has an active Professional Engineering license, is a Visiting Professor at the University of Glasgow and has a B. Sc. from University of Glasgow. His research has focused on the study of energy release and transport in solar flares, with an emphasis on the diagnostics provided by hard X-ray observations, spectra, images and polarization. Most recently, this project has been fueled with the exciting new imaging spectroscopy data from the NASA Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) satellite, which uses a Fourier transform imaging technique. He has also studied flare electrodynamics and the hydrodynamic

response of the solar atmosphere to flare energy input. After the launch of the BATSE instrument on the Compton Gamma Ray Observatory, I spent some time studying the anisotropy and brightness distributions of gamma-ray bursts, and I have dabbled in cosmology, celestial mechanics, and circumstellar polarization. He serves as a Harlow Shapley lecturer for the American Astronomical Society. He has a pilot's license and keeps a plane parked out at the airport. He has helped establish a winter term research methods program for students. Working with Drs. Gelderman and Andrew at WKU and Drs. Zank and Bonamente, at University of Alabama in Huntsville and the Marshall Space Flight Center he has helped develop a program leading to research and graduate opportunities for students interested in common research areas. Our first students are on the UA Huntsville campus this January.

In the news...

First MS Thesis Student Graduates

Our first student in the M.S. in Homeland Security Sciences graduate program was graduated in Dec. 2010 (shown in the picture left to right Dr. Barzilov, Melinda Whitfield, and Dr. Womble). This graduate program was initiated in 2007 by Dr. Womble and is currently directed by Dr. Barzilov. Melinda Whitfield working with Dr. Phil Womble completed her thesis defense in early December after a year of collecting data and building her experimental setup at the Applied Physics Institute. Her thesis was on Doppler Broadening of Light Nuclei Gamma Ray Spectra. The program has expanded to eleven students and will start a special fellowship program in the Fall with annual stipends of \$25k. Melinda is now working at the Cyber Defense Laboratory.



PHYSICS OLYMPICS

February 26, 2011