

## Welcome to the PAMS department...

### Dr. Peter Plavchan Assistant Professor, Astronomy



Dr. Plavchan is a 2006 graduate of the University of California, Los Angeles, with both an MS degree and PhD in Physics. Prior to coming to Missouri State, he was a research scientist at the NASA Exoplanet Science Institute at Caltech. His research interests include extra-

solar planets, M dwarfs, debris disks, and primordial disks. Peter is a 2014 recipient of the NASA Honor Achievement Award and is an executive committee member of the NASA Exoplanet Program Analysis Group.

### Dr. Ridwan Sakidja Associate Professor, Materials Science



Dr. Sakidja is a 2003 graduate of the University of Wisconsin-Madison (UW-Madison) with a PhD in metallurgy under the guidance of Professor John Perepezko. While at UW-Madison, Ridwan was a lecturer in material thermodynamics for the Dept. of Materials Science and Engineering and conducted

materials science research as an assistant scientist on high-temperature coating development and ab-initio (first-principles) molecular dynamics.

In 2013, he took a position as an associate research professor at the University of Missouri-Kansas City (UMKC) and worked with Professor W-Y Ching on atomistic-based modeling on and genomic approaches to structural/functional materials.

At Missouri State, Ridwan teaches computational materials science to both undergraduate and graduate students, and his broad research interests span from developing corrosion-resistant high temperature compounds, designing novel carbon-complex assemblies to accelerating discovery processes of functionalized nanomaterials. Ridwan is also interested in product development and a scale-up process that can potentially lead to industrial and commercial applications.



### Dr. Maria Stepanova Associate Professor, Materials Science

Dr. Stepanova is a graduate of the Lomonosov Moscow State University in 1984, a PhD in 1991, and a DrSc degree in 1998. Her extensive experience includes research at the Dept.

of Electrical and Computer Engineering at the University of Alberta and at Canada's National Institute for Nanotechnology. Maria conducted both experimental and computational modeling studies in a broad area of materials science at micro- and nano-scales, including properties of solid surfaces, nanobiological interfaces, and biological polymers.

At Missouri State, Maria teaches the introduction to physics course and mentors undergraduate and graduate students. She is interested in design, fabrication, and deployment of bio-electronic systems integrating stimuli responsive biological materials with electronic devices.

## Trip to Argonne and Oak Ridge National Laboratories



James Thomas, an undergraduate student in the Department of Physics, Astronomy and Materials Science, recently participated in making x-ray scattering experiments at the Advanced Photon Source synchrotron facility located in Argonne National Laboratory and in neutron scattering experiments at the Spallation Neutron Source facility located in Oak Ridge National Laboratory.

Undergraduate student **James Thomas** and **Dr. Bob Mayanovic** in front of the experimental setup at Argonne National Laboratory that was used for their experiments.



The interior of the Spallation Neutron Source facility located in Oak Ridge National Laboratory used by James Thomas and Dr. Bob Mayanovic for their neutron scattering experiments.

## *A Year of Graduates*



### **Bachelor of Science**

#### **Spring 2014**

Adam Brandt, Physics  
Curtis Israel, Physics  
Yen-Ju Lin, Physics/Engineering & Applied Physics  
Daniel Soden, Physics  
Amanda Winans, Physics/Astronomy & Astrophysics  
Steven Youngkin, Physics

*(None in Summer 2014)*

#### **Fall 2014**

Cody Crossley, Physics  
Dayton Kizzire, Physics/Materials Physics  
Austin Shearin, Physics/Materials Physics

#### **Spring 2015**

Julie Barnum, Physics/Engineering & Applied Physics  
Philip Crouse, Physics/Astronomy & Astrophysics  
Steven Harrellson, Physics/Graduate Prep Physics  
Cory Honer, Physics  
Nolan Ingersoll, Physics/Graduate Prep Physics  
Woosung Lee, Physics/Engineering & Applied Physics  
Hayley Osman, Physics/Graduate Prep Physics  
Anthony Pelton, Physics/Engineering & Applied Physics

### **Master of Science**

#### **Spring 2014**

Jincheng Bai, Materials Science  
LaShawn Johnson, Materials Science  
Scott Maasen, Materials Science  
Mingwei Shang, Materials Science

#### **Summer 2014**

Lukmon Aminu, Materials Science  
Garrett Beaver, Materials Science

#### **Fall 2014**

Anagh Bhaumik, Materials Science  
Oladeji Fadayomi, Materials Science  
Amrit Laudari, Materials Science  
Justin McCullough, Materials Science

#### **Spring 2015**

Rezwanur Rahman, Materials Science

*(Summer 2015 graduates will be in the next newsletter.)*

## *From the Department Head*



It has been another busy year and we have plenty of new information about the department of Physics, Astronomy and Materials Science at MSU. The biggest news is the major change in our human component over the last few semesters.

As is detailed in the pages of the newsletter, several long-time faculty have retired and several new people have taken their place. As is always the case, change is both scary and exciting. We miss our retired colleagues but welcome all the new faces with great expectations.

A new chapter in the department's research efforts is also starting with the establishment of a CNAS lab in the Jordan Valley Innovation Center (JVIC). This lab is being supervised by our department and is currently home to three PAMS and one Chemistry faculty member. We expect to see broadened interactions with other departments and with the industrial partners at the facility.

I hope you find the content exciting, and we hope to hear from you during the coming year. As always, let me know if you have any comments or thoughts on our department and MSU.

## *Retirements*

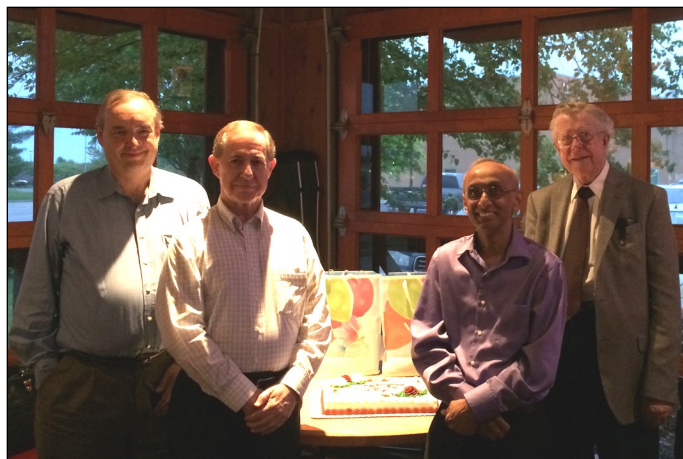
(2014-2015)

#### **Summer 2014**

Dr. Ryan Giedd  
Dr. Kandiah Manivannan  
Dr. William Thomas  
Dr. Robert Whitaker

#### **Summer 2015**

Dr. Cheryl Wrinkle



Spring 2014 recognition of retirees ~ (Left to Right):  
Drs. Giedd, Thomas, Manivannan, and Whitaker

## From the Advisory Board



### Stephanie Blake, EdS, MEd

Stephanie has called Springfield home since she was six years old. She attended Missouri State and first graduated in 2001, majoring in Biology Education (Unified Science) with a minor in chemistry and a minor in physics. In addition, she earned a Masters in Biology Education (2004), a Masters in Educational Administration (2006), and a Specialists degree in Educational Administration (2008).

Her enthusiasm for physics and education motivated her to achieve certifications from the College Board in Advanced Placement Physics: Algebra Based Newtonian Mechanics and Electricity and Magnetism (2003) and Advanced Placement Physics: Calculus Based Newtonian Mechanics and Electricity and Magnetism (2004). She became National Board Certified in Physics by the NBPTS in 2013, an honor only achieved by 60% of the candidates.

Mz. B. (as her students call her), taught physics, chemistry, and anatomy and physiology at Parkview High School in Springfield for 15 years with all of her classes being dual enrollment through MSU and Ozarks Technical Community College (OTC). During that time, her students were often on campus participating in research opportunities, internships, Science Fair, Science Olympiad, Bridge Building, and Junior Engineering Team. She joined the PAMS Advisory Board eight years ago with the intent of increasing communication between the local high schools and the PAMS Department on matters of curriculum, dual enrollment and recruitment.

Beginning in Fall 2014, Stephanie moved to OTC full time where she teaches physics and chemistry, specializing in at-risk students who struggled in high school. This summer, she will join forces with CNAS professors at MSU, as well as researchers from Jordan Valley Innovation Center (JVIC), to bring research to life for 15 of her top physics students at OTC in an effort to retain local talent and build interest in the areas of Physics R and D.

As all of the PAMS board members know, physics is the “Mother of All Sciences,” and the basis for any “why” question ever asked in any science class. Sharing physics with her students is a passion, not a job. Stephanie says, “I am so lucky; I don’t work. The taxpayers actually pay me to ‘play’ every single day, and my physics classroom is the best sand box on the planet.”



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## PAMS Alumni & Friends

Please take a few minutes to send us an email at: [physics@missouristate.edu](mailto:physics@missouristate.edu). Include your current contact information, graduation year and Missouri State degree. Let us know where you are working now, job title or other career or personal accomplishments.

Stay current with the MSU Alumni Association at <http://alumni.missouristate.edu>.

Update your contact information online and learn about upcoming alumni events, such as MarooNation.

## Staying Connected

State universities could not operate without generous contributions from alumni and friends. Your support enables us to provide scholarships, teaching equipment, and more. We hope you will consider making a contribution to the PAMS department or to one of the scholarships; your gift is tax deductible.

To learn more about how you can help, visit <http://physics.missouristate.edu/Alumni.htm>. Please make checks payable to Missouri State University Foundation in support of the PAMS department and mail to the PAMS department, Kemper Hall 101, 901 S. National Ave., Springfield, Missouri 65897.

Also, donations can be made online at: [www.missouristatefoundation.org/waysofgiving.asp](http://www.missouristatefoundation.org/waysofgiving.asp). Select Natural & Applied Sciences/Physics, Astronomy, & Materials Science.

*Thank you!*



CNAS Graduation Reception

Left to right: Julie Barnum, Steve Harrellson, Philip Crouse, Hayley Osman, Dr. David Cornelison



College of Natural and Applied Sciences Spring 2015 Graduates

## Scholarship Winners Spring 2015

**Andereck Family Scholarship**  
Caroline Byrd  
Li Guan

**Banks Family Scholarship**  
Laura Ketzner

**Howard Petefish Award**  
Shannon Dulz

**John W. Northrip Memorial Scholarship**  
Daniel Jones

**Kenneth A. Soxman Memorial Scholarship**  
Garrett Cornman

**Ozark Chapter Missouri Society of Professional Engineers Leo Day Scholarship**  
Jared Golden  
Nathan Webb

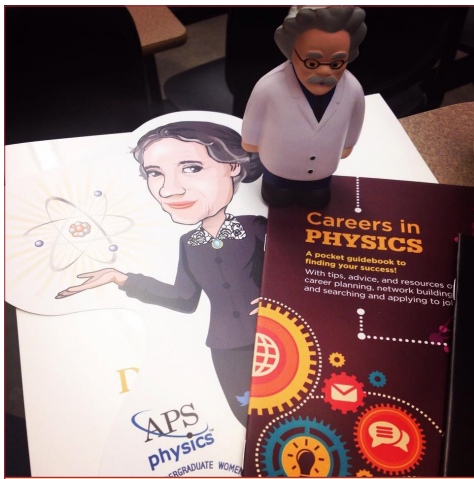
**Physics and Astronomy Department and Friends Scholarship**  
Slate Hayes  
Kent Mastroianni  
Madison Schwinn

**Pre-engineering/Engineering Physics Scholarship**  
Eiad Hamwi

**Thurman Family Scholarship**  
Shannon Dulz



To be eligible for General and Departmental Scholarships, complete the online application in the spring by March 1. Learn more at: [www.missouristate.edu/FinancialAid/Scholarships/](http://www.missouristate.edu/FinancialAid/Scholarships/)



American Physical Society's Conference for Undergraduate Women in Physics at Purdue University in January 2015

Throughout the conference, emphasis was placed on supporting women in physics and material sciences. It is important to acknowledge the continued gender disparities in physics so that we can work towards minimizing gender bias in the future.

At the conclusion of the conference, there was an opportunity to present posters on student research. Claire presented a poster on research conducted with Dr. Peter Plavchan on the design of a new telescope array. Shannon presented on her work with Dr. Mike Reed on Hot Jupiter-like exoplanets. In the end, it was a great opportunity to meet other female scientists and gain further insight in future career paths.

## Women in Physics

by Shannon Dulz and Claire Geneser

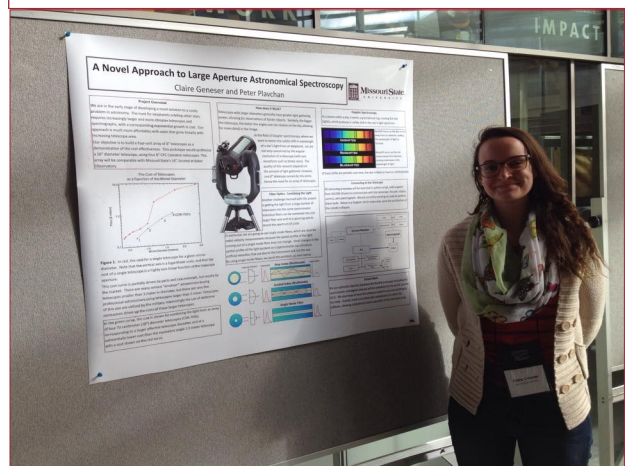
We were fortunate to drive to Purdue University in northern Indiana to attend the 2015 APS Conference for Undergraduate Women in Physics with three other female undergraduate students. The purpose of the conference was to provide an opportunity to network with other physics majors in the area.



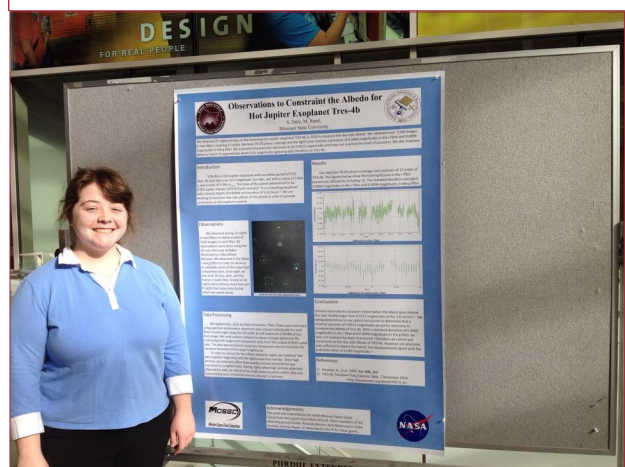
Left to Right: Shannon Dulz, Hayley Osman, Julie Barnum, Laura Ketzer, and Claire Geneser at the APS conference at Purdue.

We were privileged to attend presentations from women in both academia and industry. We also attended panels to speak with graduate students about furthering our education. It was inspiring to hear from senior female scientists that we don't have to have our futures decided right now. We all have room to decide what we want to be and what we want to research.

"A Novel Approach to Large Aperture Astronomical Spectroscopy" - Claire Geneser and Dr. Peter Plavchan



"Observations to Constraint the Albedo for Hot Jupiter Exoplanet Trés-4b" - Shannon Dulz and Dr. Mike Reed



## Tomorrow's Scientists Performing Research Today

by Stephanie Blake



Missouri State University Chemistry and Physics professors combined forces with researchers from Jordan Valley Innovation Center to provide a **Science Research and Design Summer School Class** for local high school students at Ozarks Technical Community College—Middle College (OTC-MC) from May 18—June 12.



**Middle College** is a School of Choice High School offered through the cooperation of Springfield Public Schools (SPS) and OTC. These outstanding junior and senior high school students are simultaneously earning a high school diploma (from their home high school) and an Associates of Arts Degree (AA) from OTC. During the regular school year these students meet all day on the OTC campus taking college classes for both high school and college credit. However, the summer class met with a different researcher every day for four weeks in an attempt to survey various aspects of scientific research in the area.



The summer program this year was the brain child of **Dr. David Cornelison**. “Dr. C”, as his students call him, is the MSU department head of Physics, Astronomy and Materials Science (PAMS). He and OTC Physics/Chemistry Instructor Stephanie

Blake worked together to develop this class with three objectives:

- 1) Recruit students into the underrepresented sciences of chemistry and physics;
- 2) Show students how the College of Natural and Applied Sciences (CNAS) at MSU was a great transfer option for them after finishing their AA degree at OTC, and specifically the articulation between OTC and the PAMS department;
- 3) Recruit students to become researchers and showcase academic and industry research positions available in the area to keep Springfield's gifted and talented students local.

Students participated in facility tours, research discussions, and laboratory procedures. They



were exposed to millions of dollars of equipment, including: Raman Spectroscopy, X-Ray Diffraction, Gas Chromatography, Infrared Spectroscopy, Scanning Electron Microscopy, PCR Amplification, Gel Electrophoresis, Thin Film Lithography, materials science development, as well as chemistry synthesis techniques, NASA observatories and data, and current research device development.

Through MSU, students had the opportunity to work in the laboratories of **Dr. Dua, Pierson, Ghosh, Plavchan, Cornelison, Reed, Mayanovic, Tomasi, Breyfogle, Durham, and Sakidja**. Through JVIC, students had the opportunity to work with **Brewer Science, Mercy Research and Development, the Center for Biological and Life Sciences, and the Center for Applied Science and Engineering**.

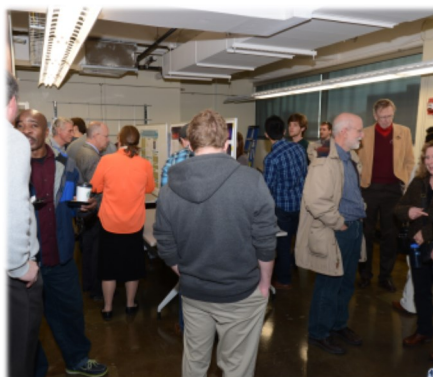
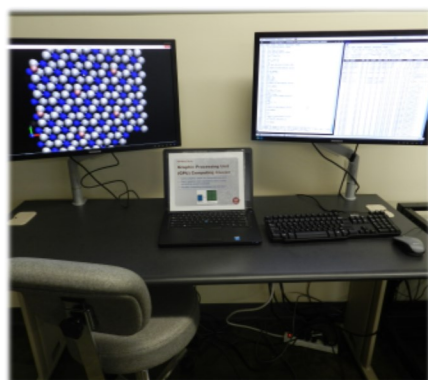
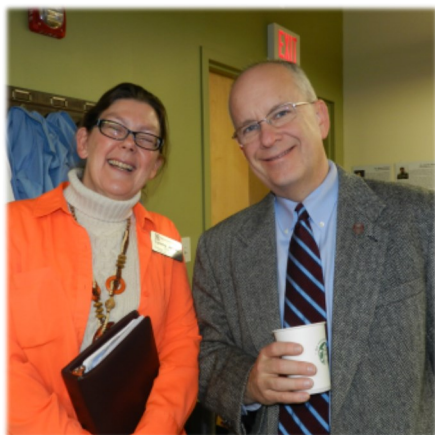


Students compared and contrasted academic research with industrial research, soft money funding with hard money funding, basic research with applied research, and various college and career paths. Students not only learned valuable science, but also discovered the importance of laboratory notebooks, the Internal Review Board (IRB) process, the patent process, and other details of product development processes.

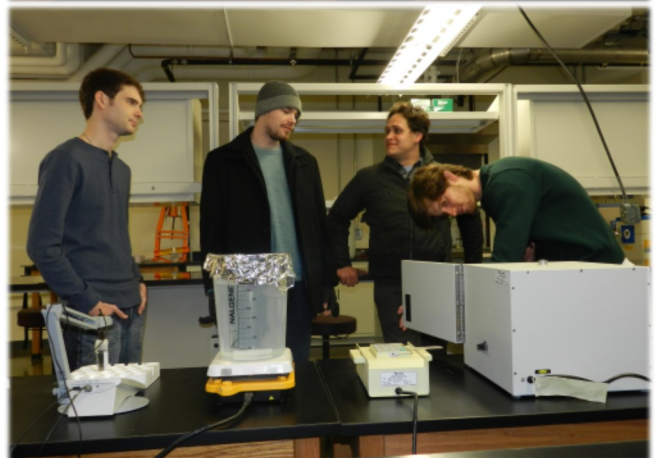
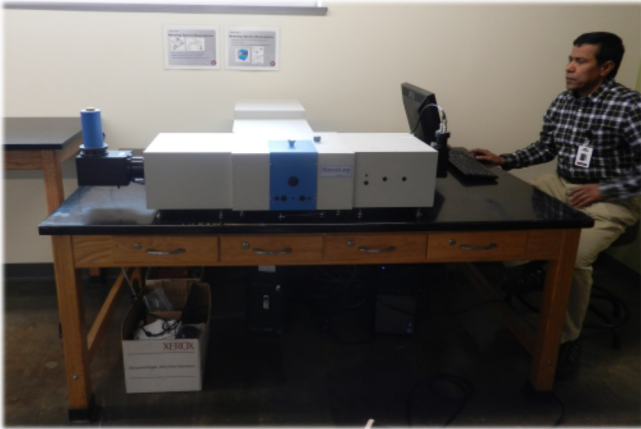
Previously, none of the students were considering physics as a college or career pathway. By the end of the program, half of the students were considering both options. This summer research survey class has historically been a great recruiting tool for PAMS and the future of science researchers.

## ***CNAS Lab at JVIC ~ Open House***

In February, CNAS faculty, staff, and graduate students gathered to celebrate the opening of the CNAS lab at JVIC. New lab equipment and research posters were on display. President Smart, Provost Einhellig, CNAS Dean Jahnke, and PAMS department head David Cornelison gave special remarks during the Open House.







## Publications

This past year, the PAMS faculty and students did tremendous research and more than 20 papers have been published. An effort will be made to feature some of these in the upcoming newsletters.

**Dr. Peter Plavchan** co-authored a paper accepted for publication in *The Astronomical Journal*, “CSI 2264: Characterizing Young Stars in NGC 2264 with Short-Duration Periodic Flux Dips in their Light Curves,” Volume 149, Issue 4, article id. 130, 30 pp (2015).

This [paper](#) looks at young stars in the process of forming and finding periodic repeating eclipse events likely due to gas and small solid particles falling onto the star along magnetic field lines. The events repeat, but they come and go with time with varying amounts of obscuration of the star.

PAMS students:

**Anagh Bhaumik, Ariful Haque, Priyanka Karnati, M.F.N. Taufique, Rishi Patel, and Dr. Kartik Ghosh** [published](#) their research, “Copper oxide based nanostructures for improved solar cell efficiency,” in *Thin Solid Films*, 572 (2014) 126-133.

## Presentations

**Dr. Peter Plavchan** co-chaired a [presentation](#) at the American Astronomical Society meeting in January on “Study Analysis Group 8: Requirements & Limits of Future Precise Radial Velocity Measurements.”

PAMS student, **Gavin Hester**, was invited to present a paper at the iDeA Network of Biomedical Research Excellence (INBRE) conference in November. His paper, “Neutron Scattering Study of Lithium-Ions in Conducting Glassy Electrolytes for Battery Applications,” won 2nd place for oral presentations in physics.

## Materials Research Society Convention in Boston

by Ariful Haque and Priyanka Karnati

In December 2014, a group of students from our department of Physics, Astronomy and Materials Science traveled to Boston to participate in the 2014 Materials Research Society (MRS) convention.

We were able to meet scientists from around the world and learn about their research work. We attended a number of scientific talks by renowned persons in their respective fields. There was a Career Fair and company exhibition at the convention center. While in Boston, we went to the Massachusetts Institute of Technology (MIT), which was really amazing!

As a bonus, we visited the Freedom Trail and Boston National Historical Park. The natural beauty of this park is amazing. On those days, we felt lucky because the weather was nice and sunny. Last but not least, we went to a number of different Bangladeshi, Indian, and Italian restaurants to taste varieties of food. Overall, we enjoyed every second of the whole trip!

The 2015 [MRS fall meeting](#) and exhibit is scheduled for November 29 through December 4 in Boston.



Dr. Plavchan with former astronaut, and now head of the NASA Science Mission Directorate, **John Grunsfeld**.

*There were more than 3,300 spoken presentations and 3,000 posters about materials science on display at the Hynes Convention Center.*



## Alumni News



**Jennifer Bean** (MSU PAMS, 2011) is a post-graduate student working on several projects at Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. She completed her master's degree in nuclear engineering from the University of Missouri.



Jennifer is part of radiological engineering in the radiation protection programs group. She explains, "I evaluate new and existing projects and facilities that are undergoing a change in radioactive materials, project equipment, or that want to move into a different location at LANL. I evaluate the radioactive hazards associated with the project. My evaluations have included:

- External and internal dose estimates from normal operations
- As Low As Reasonably Achievable (ALARA) analysis of off-normal events for internal dose estimates
- Stating recommended and required engineering and administrative controls
- Radioactive airborne hazard analysis
- Recommended and required radiation detection equipment
- Radioactive particle deposition in ventilation ductwork

I've worked on several projects over the past year while at LANL. I have extended my skills with different radiological codes (MCNP, ATTILA) and with a fluid mechanics simulation (Ansys FLUENT)."

## Future Plans



**Steve Harrelson** will be pursuing a PhD in physics at Columbia University in New York... "I've always loved the academic atmosphere here. Being a large university with small class sizes gives us the best of both worlds for an undergraduate education."



**Julie Barnum** will be participating with the Center for Severe Weather Research in a field project, in which several universities and governmental agencies are participating from the end of May until mid-July. The project is called "Plains Elevated Convection at Night" (PECAN). It deals with monitoring overnight formation of storms with mobile radar, releasing weather instruments attached to balloons into storms. Afterwards, Julie will be moving to Fort Collins, Colorado, to begin her master's degree in atmospheric science at Colorado State University under the direction of Dr. Steven Rutledge. Julie's thoughts on leaving MSU... "It's very weird to be leaving MSU. I've made a lot of friends and learned a lot about who I am and that I am capable of achieving much more than I ever thought possible. I am thankful to MSU, and particularly to all the faculty and friends in the PAMS department, who have helped me through my undergraduate degree in physics. While I'll miss them, I am unbelievably excited to transition to being fully immersed in the fascinating world of meteorology."



**Hayley Osman** will be attending the University of Colorado at Boulder to pursue a PhD in Materials Science and Engineering. Hayley says, "I have been offered a research fellowship and will be serving as a Teaching Assistant for the first year. I am excited to start this new adventure but hate to leave my PAMS family at Missouri State!"

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### MOMENTUM

The Newsletter of the Department of Physics, Astronomy, and Materials Science at Missouri State University

To submit information for the next Momentum newsletter, e-mail Kristy Teague at [Momentum@MissouriState.edu](mailto:Momentum@MissouriState.edu)

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