

## Physics Education Research at Georgia State University

Physics, a science of matter and energy, is crucial in understanding the world inside us, the world around us, and the world beyond us. It forms the basis of many fields of sciences and engineering. The Physics Education Research (PER) Group at GSU is dedicated to identifying physics-specific learning difficulties and implementing effective instructional tools for teaching undergraduate-level physics so that students can maximally benefit from correct concepts and principles of such an important science from the get-go. The PER group at GSU consists of faculty Drs. Brian Thoms, Joshua von Korff, Sumith Doluweera, John Evans, Ruili Wang, and Deepak Raghavan.



GSU instructors have mastered the collaborative and hands-on approach to effectively teach freshman physics.

The PER faculty along with

their students Ozden Sengul (graduate) and Laura Kiepura (undergraduate) are currently addressing many PER topics, including: (i) implementation of studio physics, (ii) mechanics, and electricity and magnetism concepts, (iii) textbook reading strategies, (iv) scientific skills development and (v) high-school physics teacher development. The group is currently funded by the National Science Foundation (NSF), American Physical Society, University System of Georgia, and Georgia State University. These projects are helping Georgia State University address the severe shortage of physics teachers at the state and national levels.

### Department Highlights (2014)

**Dr. Mark Stockman** became an elected SPIE fellow, an editor of [Light: Science and Applications](#), and a visiting professor to [Chinese Academy of Sciences Institute](#).

**Dr. Misty Bentz** received the college's Dean's Early Career Award and Outstanding Junior Faculty Award.

**Dr. Xiaochun He** became a GSU Distinguished University Professor.

Office manager **Ms. Felicia Watts** received the college's Senior Staff Award.

**Dr. Rachel Kuzio de Naray** became an executive member of the AAS Division on Dynamical Astronomy. In a TV interview with GPB, she discussed the Big Bang.

**Dr. Steve Manson** was appointed to a Fellowship Committee for the American Physical Society.

**Dr. Mukesh Dhamala** organized the Functional Neuroimaging Workshop on April 24, which included neuroimagers from GSU, GaTech, Emory and UGA, supported by [the William H. Nelson Research Endowment](#).

**Margaret Jezghani**, a graduate student working with Dr. He, received a Department of Energy fellowship.

Grad Student **Tianyu "Mark" Ye**, working with Dr. Mani, won the GSU International Student of the Year award.

Welcome to the 2nd edition of our Departmental Newsletter, which we have decided to distribute annually. We hope you enjoy reading about the accomplishments and goals of our faculty, staff, and students. The Department continues to grow, with two additions to our faculty and a new administrative coordinator, as described on page 3. Our faculty continue to make groundbreaking discoveries in physics and astronomy; the accomplishments of two of our senior faculty members are described on page 2.

On this page, we highlight our

faculty in physics education research. Thanks in large part to their efforts, led by Associate Chair Dr. Brian Thoms, the number of B.S. degrees in Physics awarded at GSU has more than tripled from 2012 to 2014. During this time, 26% of the graduates were from underrepresented minorities (URM). In our Gateway to Physics course, for mostly freshman physics majors, 59% of the students this past fall were URM. We are proud of these achievements and look forward to more progress in this area.

A few selected highlights of this past year are listed on this

page. Many more can be found on the home page of our Department web site (listed at the top of this page). More news about our students and ways to support our efforts can be found on the back page.

Sincerely,

Dr. D. Michael (Mike) Crenshaw



# GSU Physics & Astronomy

## Dr. Unil Perera



Dr. Unil Perera

Photo-detectors are highly capable electronic ‘eyes’ with a wide range of applications such, from identifying toxic gases to detecting heavenly objects behind dusty regions in space. These devices convert incident electromagnetic energy into electrical pulses. Who knows this better than Regents’ Professor Dr. Unil Perera? He is one of the world leaders in photo-detection and detector design. This year, his group led a ground-breaking

discovery in photo-detector design, by realizing sensors capable of detecting ultralong wavelengths. Their findings were published in this year’s May issue of *Nature Photonics*. In an interview to *Nature*, he explained how the devices worked and how they could be improved. Dr. Perera has recently received grant funding from the US Army research office to take this technique to a new level. He has received funding from DOD,

DOE, NASA, and NSF. He is a Life Fellow of the American Physical Society and the Society of Photo-Instrumentation Engineers, a Fellow of the Institute of Electrical and Electronics Engineers and a Fellow of the IEEE Photonics Society. Notably, the [2014's Nobel Prize in physics](#) was awarded for the invention of blue LEDs and 2015 is going to be celebrated as the [international year of light and light-based technologies](#).

## Dr. Douglas Gies

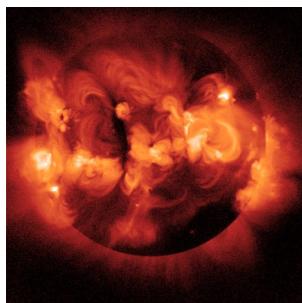


Dr. Douglas Gies

Hot, massive stars are responsible for generating “heavy” elements in the Universe, and the spectacular explosions at the ends of their lives provide the material that constitutes our planet and our bodies. Dr. Doug Gies, a longstanding member of our department, is an expert on hot stars and their properties, including stellar winds, abundances, binaries and clusters, and stellar

mass black holes. He has active programs on the *Hubble Space Telescope*, *Kepler Mission*, and *Gemini* 8-meter telescope. Dr. Gies is a Regent’s professor and a promoter and frequent user of GSU’s [CHARA array](#). Since 2009, he has been a scientific editor with the [Astrophysical Journal](#), the most highly-regarded scientific journal in astronomy. He continues to be a mentor and ad-

visor to many graduate students, who in the past have moved on to prestigious post-doctoral and faculty positions. He is a frequent organizer and invited speaker at international conferences, and has won several GSU awards for his outstanding contributions to research. Dr. Gies is a mean fiddle player and is known around the Department as the “nicest man in the Universe”.



*“If we can do a couple of previous cycles correctly, we think we can confidently predict the future.”*

[Dr. Petrus Martens](#), a professor in the Department of Physics and Astronomy at Georgia State University, has received a three-year, \$1.2 million NASA Grand Challenge grant to develop a system to predict solar cycles and determine the long-term frequency of events such as solar flares, potentially more than a decade in advance. Martens is collaborating

## NASA Grand Challenge Grant

with an international team of researchers from India, England, Scotland and France, as well as NASA’s Ames Research Center in California’s Silicon Valley and the National Solar Observatory in Tucson, Ariz.

This research area is significant because of the solar cycle’s potential economic impact on the United States.

“We think we can forecast the cycle about 11 years ahead, so one cycle,” Martens said. “We will use the latest data both from ground-based observatories and spacecraft ... If we can do a couple of previous cycles correctly, we think we can confidently predict the future.” For more, see the [GSU news article](#).

## Physics Graduate Student Association

Astronomy Graduate Students, and Sri Lankan Student Association that was open to all GSU. During November, 2014, PGSA took a trip to the DOE Savannah River National Lab, South Carolina. PGSA hosted its Fall 2014 Research Conference. More information can be found at <http://www.phy-astr.gsu.edu/pgsa>.

PGSA took a hiking+biking trip to the Silver Comet Trail this fall. There was a Halloween Trivia event hosted by PGSA,

## New Faculty and Staff

### Dr. Yohannes Abate



Dr. Yohannes Abate joined the Center for Nano-optics (CeNO) and Department as a tenure-track assistant professor this past fall. His previous appointments were as an assistant professor at California State University, Long Beach, and a postdoctoral fellow at the University of California, Berkeley. Dr. Abate is an expert experimentalist in nano-optics. He will work with the faculty at CeNO headed by Dr. Mark Stockman. Dr. Abate knows all of the best Ethiopian restaurants in town. Welcome Yohannes!

### Dr. Piet Martens



Dr. Piet Martens joined our Department as a tenured professor in August 2014 through GSU's Second Century Initiative program on Stellar Astrophysics and Astroinformatics. Dr. Martens joins us from Montana State University where his previous appointment was as a research professor. He is well known for his work on the automated classification and tracking of solar features and their relevance to solar flares and devastating coronal mass ejections. Within weeks of arriving at GSU, Dr. Martens was being interviewed by CNN for his expert opinion on solar storms. Dr. Martens, his collaborator Dr. Rafal Angryk in Computer Science, and Dr. Sebastien Lepine form the core of the new astroinformatics cluster. Welcome Piet!

### Ms. Dondette Wendler



Dondette Wendler is the new Administrative Coordinator, Senior at the Physics & Astronomy Department. She comes to us from the GSU College of Business where she spent the last 10 years employed as the International Admissions Coordinator. Dondette is originally from Brooklyn, NY. She is a music and movie buff who enjoys attending jazz concerts and catching a matinee at the theater, especially if there is a new drama to be seen. Welcome Dondette!

## Outreach



Dr. Misty Bentz teaches Junior Girl Scouts about the Sun on a beautiful September Saturday afternoon at GSU.



Students from Riverstone Montessori Academy visited the Department on October 16th to get help from professional astronomers in constructing a scale model of the Solar System. Fortunately the clouds parted enough that day to also allow everyone to view the Sun with our solar telescope in Woodruff Park.



GSU physics faculty run many physics events in Science Olympiad for students from middle schools in the Atlanta areas around February and March every year. This picture shows a physics faculty member Dr. Vadym Apolkov (in a blue T-shirt) running one of the physics events in 2014.



SPS members at Brookhaven National Lab with Dr. Xiaochun He.



SPS organizes picnic every year at the Camp Creek, GSU. This picture shows an instance of this year's picnic: grilling and exchanging ideas.



Astronomy Club members with Dr. Neil deGrasse Tyson

## Astronomy Club

The Astronomy Club (Dr. Kuzio de Naray, advisor) had an exciting Spring semester in 2014. Over spring break, they traveled to NYC where they visited the Hayden Planetarium at the American Museum of Natural History. They were able to meet and speak with astrophysicist Dr. Neil deGrasse Tyson; by all accounts, this was the highlight of the trip. Throughout the semester they hosted professors and graduate students from the Department to give talks about their astronomy research at Club meetings. In April, they also held another well-attended Star Party at GSU's [Hard Labor Creek Observatory](#).

## Society of Physics Students

During the Spring semester, members of the Society of Physics Students (SPS; Dr. Bentz, advisor) volunteered to run two events at the regional competition of the Science Olympiad. Members also took a spring trip to visit Brookhaven National Laboratory on Long Island. They were given a private tour of the PHENIX experiment by GSU faculty members Dr. Xiaochun He and Dr. Murad Sarsour, who happened to be on site with their research groups. SPS also organized the annual department picnic, which was held at Indian Creek Lodge.

We are on the web: <http://www.phy-astr.gsu.edu>

Follow us on Facebook: [GSU Physics and Astronomy](#)

## Support Physics & Astronomy at GSU

There are a number of ways to show your support for our programs through giving:

- Endow an undergraduate scholarship or award in physics and/or astronomy. Set up a general fund or fine-tune the award to a specific field of research, disadvantaged students, etc. (An example is the annual [Robert H. Hankla Award for Outstanding Physics Major.](#))
- Set up an endowment for a graduate research fellowship in your field of interest or contribute to an existing annual student award in physics or astronomy (see [http://www.phy-astr.gsu.edu/new\\_web/2312.html](http://www.phy-astr.gsu.edu/new_web/2312.html)).
- Fund a Visiting Distinguished Scholar for a semester-long visit or a Distinguished Speaker Series. (An example of the latter is the [William H. Nelson Fund.](#))
- Endow a professorship or postdoctoral fellowship in a specialized field.
- Help to establish new facilities or enhance existing ones. (Examples include partnerships in large telescope consortia, or the new CeNO).
- Contribute directly to the general fund of our Department (fund code: 0241). Contributions support faculty, staff, and students, professional and social functions, and recruitment. Any amount is appreciated.
- There are many ways and options to support Physics & Astronomy at GSU. See <http://giving.gsu.edu> or call Hope Carter, Senior Director of Development (404-413-5739, [hcartier8@gsu.edu](mailto:hcartier8@gsu.edu)) for more information about giving opportunities. Come visit us! Contact our Chair, Dr. Mike Crenshaw (404-413-6036, [crenshaw@phy-astr.gsu.edu](mailto:crenshaw@phy-astr.gsu.edu)).