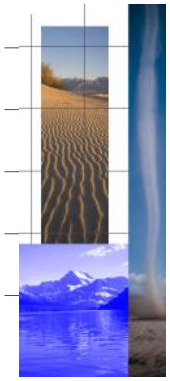


Schrödinger's Tiger

The Clemson University Physics and Astronomy Newsletter

Fall 2014 Volume 9, Issue 2

Clemson Astronomer Discovers Evidence of New Planet Formation

An artist's conception of one of the two gas giants forming around HD100546/The Atlantic.com

A Clemson astronomy and astrophysics professor is the leader of a team that recently made the rare discovery of an entirely new planet currently forming.

The infant planet is at least three times the size of Jupiter and is believed to orbit the star HD100546 about 335 light years from Earth, according to a Clemson University press release. The team reported its findings in *The Astrophysical Journal*.

If the findings are confirmed, it will be one of the first times that scientists have been able to directly observe planet formation occurring. This particular planet is believed to be located inside the star's "disk," an enormous ring-like cloud of dust and gas that extends hundreds of millions of miles from the star's center.

Associate Professor Sean Brittain said his team used a technique known as "spectro-astrometry," which enables small changes in the position of the carbon monoxide emission to be measured. While looking at images of HD100546 over the past decade, Brittain noted a source of some excess carbon monoxide that appeared to be moving in the disk. He said the different positions and velocity are consistent with an object orbiting the star. Brittain said this was the first forming planet ever discovered using the spectro-astrometry method. "It's really exciting to be able to confirm something like this and have a result that's fairly conclusive," he told South Carolina Radio Network in an interview.

Since HD100546 can only be seen from the southern hemisphere, the team analyzed the star using data gathered at the Gemini South Observatory in Chile. They confirmed their hypothesis in 2013, realizing the object was likely a new gas giant whose gravity was attracting gas and matter from the star's disk. Brittain said the discovery could eventually help scientists learn more about how solar systems are created. The Sun was also once a disk system in its infancy, he added. "Now that we've pinpointed where the forming planet is, we can use other technology to study it in other ways," he said.

http://www.southcarolinaradionetwork.com

Continued on page 3

A Message from the Department Chair

As 2014 nears its end, we reflect on another successful year for Physics & Astronomy. Our graduating physics majors are moving on to top graduate schools and jobs. We've had two more Goldwater Scholars, another Astronaut scholar, and the Outstanding Graduate Researcher in the University. National Labs are the most common destination for our Ph.D. graduates this year. We added two excellent faculty members and are just now concluding another search. Professors Alexov, Brittain, Rao, and Valentini all had their work featured in national and international media. We have added three new infants to our family this year, but have lost two other members. Lyndon Larcom, who long served our department and others, and who was the inspiration for a biophysics program that we are now realizing, passed away. We also lost Fran Turner, wife of Ray, who together contributed in many ways for over four decades.

These are interesting times at Clemson University. We have, or soon will have, all new leadership in the upper administration. So far all signs are positive. We see enthusiasm for moving forward and recognition of issues that must be resolved. The recognition of our unusual college structures, including our position in a college dominated by engineering, led to new discussions of reorganization. It is too early to tell what will result, but it is apparent there is much momentum for a traditional college of arts and sciences. Physics and Astronomy figures prominently in that and several other possible colleges. It is nice to be wanted.

We are very grateful to our alumni, current and former faculty, and friends who continued this year to contribute significantly through donations to our programs. Many important activities simply cannot be supported by the state, and fellowships and scholarships allow more students to focus more of their time and energy on learning. We wish all our friends and colleagues a wonderful 2015.

Dr. Mark D. Leising
Chair, Department of Physics and Astronomy
Voice: (864) 656-3416/email: lmark@clemson.edu

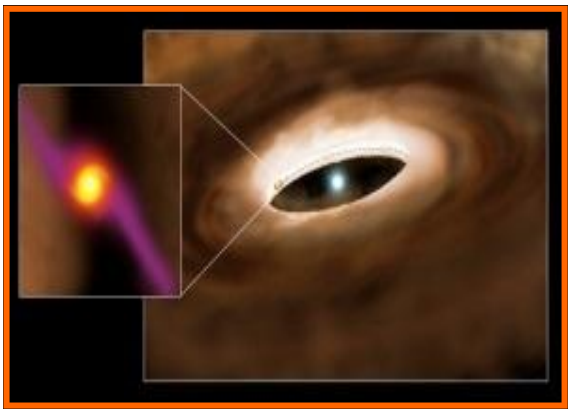
Creating a Legacy — Giving to Clemson Physics & Astronomy

You can create a lasting legacy through your donation to the Clemson University Foundation – designated for the Physics and Astronomy Department. Endowments to Clemson assure the best faculty, the brightest students and the most creative research projects. A substantial endowment can transform a good university into a great one. As a non-profit organization, the Foundation is exempt from federal income tax under Section 501(c)(3) of the1986 Internal Revenue Code, as amended. The Foundation has been classified by the IRS as a public charity operated for the benefit of a state university as defined in the Internal Revenue Code of 1986 Section 170(b)(1)(A)(iv). Contributions to the University through the Foundation by individuals, corporations, organizations and other foundations qualify as tax deductions.

There are several ways to donate. You may use the enclosed envelope or send a check to the Clemson University Foundation, P.O. Box 1889, Clemson, SC 29633. Checks should be made payable to the Clemson University Foundation with Physics and Astronomy specified on the memo line. Alternately, you may visit the Clemson website: **http://www.clemson.edu/giving/how/** and make a secure electronic donation. Again, please specify that the donation go the Physics & Astronomy Department and indicate to which project you would like to donate. Thank you for your continued support of the Department. You may contact the Annual Giving Office at (864) 656-5896 or email cufund-L@clemson.edu, should you have any questions regarding your donations. If you have other questions, you may contact the Department directly at (864) 656-3416.

"And we can understand how you go from gas and dust around a star to something like Jupiter." He noted that more images will be needed of the planet to learn if it has its own "circumplanetary disk" surrounding it. Scientists believe such disks eventually coalesce into moons, but have never been able to observe their existence in real life.

Brittain completed his undergraduate work at LeTourneau University in Texas and later attended the University of Notre Dame, where he received his Ph.D. in 2004. Prior to coming to Clemson, he assumed a NASA-funded Michelson postdoctoral fellowship at the NOAO research facility in Tucson, Arizona. There his research focused on the modeling of the fluorescent emission of CO in disks around young stars.



An artist's conception of the young massive star HD100546 and its surrounding disk. (Image: P. Marenfeld & NOAO/AURA/NSF)

The refurbished Foucault pendulum is now on display between Martin and Kinard Halls.

The Foucault Pendulum is Swinging Again

We're happy to announce that our Foucault pendulum, which hangs in the four-story tower between Kinard Laboratory and Martin Hall, is swinging again. Since this past August, the brass pendulum bob (also shiny again for the first time in years) has been driven in its precession by a table which houses an electronic driving circuit and display lights that arrived through student efforts and some timely donations.

In the fall of 2012, students from **Dr. Chad Sosolik's** experimental physics course constructed a miniaturized driving electronics that was able to monitor and continuously drive the swinging of a small pendulum that had been constructed by our Instrumentation Shop under direction of our former chair, **Dr. Peter Barnes**. The next year, these same students (**Ed Bell**, **Jared Williams**, **Ryan Carracciolo**, **Max Hughes**, and **Dale Hitchcock**) formed a Creative Inquiry group that secured over $70,000 from the student senate to renovate the tower as campus landmark. Although these students have all since graduated, the project continued until this past summer, when the university completed the tower renovation, which included removal of the surrounding walls on the ground floor and the installation of surrounding glass to give a full view of the pendulum in action.

Along the way, Dr. Sosolik secured the help of one more physics major (**Nick Holstead**), a Clemson alumnus (**Mike Chappell**, Class of 1983), and his employer (**Izumi International**), who all donated their time and materials to a scaled-up, professional version of the driving and display electronics that the original student group had constructed back in 2012. If you come by to see the pendulum today, you should know that the driving coil underneath the swinging bob is the same spool of wire put in place by **Dr. Albert R. Reed**, who was a professor in our department from 1925 to 1968, and who designed and installed our pendulum in the early years of Kinard Laboratory.

Lyndon L. Larcom — Professor Emeritus (1940-2014)

Dr. Lyndon L. Larcom

Dr. Lyndon L. Larcom, 74, husband of the late **Diane Larcom** passed away on Tuesday, June 17, 2014.

Born April 11, 1940 in Port Allegany, Pennsylvania, he was the son of the late **Lyle** and **Vivian H. Larcom**. He graduated in 1958 from Port Allegany High School as Salutatorian and from Carnegie Tech in 1962 with a B.S. in physics. Dr. Larcom completed his Ph.D. in biophysics from the University of Pittsburgh in 1968. He later taught there, while completing many post-doctoral studies. In 1972, concentrating on quantum physics, cancer, aging and virology, he began teaching at Clemson in the Microbiology Department.

Dr. Larcom was a professor of Physics and Microbiology at Clemson University for thirty-five years. He began his career at Clemson in 1972 and was promoted to Full Professor in 1981. Following his retirement in 2007, he continued in the role of research professor and advisor in the School of Nursing until 2013, at which time he was honored as Professor Emeritus of Physics. During his tenure at Clemson he also held the position of Adjunct Professor in the Hollings Cancer Center at the Medical University of South Carolina for seven years, was a Greenville Hospital System/Clemson University Cooperative Biomedical Fellow, and served as acting head of the Microbiology Department for eight years.

Students from around the world (including many from the former Soviet Union) came to Clemson to ensure they attended both his cancer and aging, and virology courses. He instituted numerous advancements in the treatment of various cancers in such notable canter treatment centers as the Roswell Cancer Institute in Buffalo.

During his career at Clemson Dr. Larcom taught undergraduate and graduate physics and microbiology. As a researcher in both disciplines, he advised twenty-five Ph.D. and thirty Masters students, and he served on over thirty additional student advisory committees. He was awarded two patents for his work in cancer research, authored over fifty refereed journal articles, gave over thirty invited talks and paper presentations, was chairman and member of many departmental committees, and served as the Clemson representative for several national and state advisory committees.

As a principle investigator, he received funding from national institutions and private foundations including NIH, USDA and Pfizer totaling $500K. Additionally, he maintained membership in several professional societies including the Biophysical Society, the American Society for Microbiology, and Sigma Xi. Most notably, he influenced the lives of all of his graduate students in their pursuit of careers in the field of science, which is evident by the success they now enjoy.

Lyndon was preceded in death by his wife, **Diane** in 2007. Survivors include two brothers: **Michael** of Pittsburgh and **David** and wife **Jane** of Hamburg, New York, son **Brian Lollis** and wife **Heather** and daughter, **Kim Rhodes** and husband **Barry,** all of Anderson, grandchildren, who called him "Poppy," **Briana** and **Ethan Lollis**, and **Crate** and **Lauren Rhodes**.

Astronaut Visits Clemson to Present Student Award

Adapted from Clemson Media Release by Paul Alongi

The astronaut who served on three shuttle missions, and later became NASA's deputy administrator, visited Clemson on September 26, 2014, to share his experiences and present a $10,000 scholarship to undergraduate physics student **John Farmer**.

Astronaut Fred Gregory, far right, is pictured on one of his three shuttle missions.

Fred Gregory's visit to the Edgar Brown University Union was part of a program funded by the Astronaut Scholarship Foundation. Farmer, a senior from Chesterfield, is one of thirty-two students nationwide to win one of this year's scholarships.

Farmer has done research on variable stars in the Milky Way at Cerro-Tololo Inter-American Observatory in Chile. He has also served as an intern at Fermilab, a renowned particle physics and accelerator laboratory in Batavia, Illinois. In addition to his academic achievements, he is a skilled trumpet player who graduated from the South Carolina Governor's School for the Arts and Humanities.

Recipients of the Astronaut Scholarship must exhibit motivation, imagination and exceptional performance in science, technology, engineering and math (STEM). It is one of the nation's largest monetary awards given to undergraduate students based solely on merit. "It's a huge honor," Farmer said. "It's great to have all the hard work I've done over the past two years get noticed."

Gregory's first mission in space was as pilot of a *Challenger* mission in 1985. He commanded two other missions, one on *Discovery* in 1989 and one on *Atlantis* in 1991. The second day of his *Discovery* mission was Thanksgiving. The crew deployed a $300-million satellite that weighed more than two tons. Then the astronauts ate a meal of irradiated turkey and freeze-dried vegetables. Gregory said that before he went into space he had expectations of what it would be like to be weightless and to look down at the Earth and up at the heavens. But it was nothing like actually being there.

"I was surprised at how beautiful the skies were," he said. "My faith was magnified. Beliefs you had growing up were shattered when you realized we were part of the world, rather than a local community."

Clemson physics student John Farmer, left, received a $10,000 Astronaut Scholarship, presented by astronaut Fred Gregory (not pictured)

SIRPA 2014 at the Madren Center

On August 18, 2014, the Physics and Astronomy Department hosted its fourth Symposium for Introduction to Research in Physics and Astronomy. The full-day event consisted of graduate student and faculty research presentations, followed by a poster session and reception at the Clyde V. Madren Conference Center on the banks of Lake Hartwell.

The purpose of this meeting is to convey new research ideas and results among the various groups, and especially to inform new students about the research opportunities in the department.

Physics graduate students Adriana Delgado-Navarro, Rebecca Robinson, Amanpreet Kaur, and Amber Porter at the symposium.

The highlights of the conference included talks and posters on astrophysics, Earth's atmosphere and ionosphere, fundamentals of quantum mechanics, quantum computing, computational modeling of biophysical molecules, nanoscale materials, and ion beam physics.

The conference was well attended by faculty, students, and department staff. Ten students and our two newest faculty members presented research talks, and **Dr. Julie Martin**, from the Department of Engineering and Science Education, delivered the keynote address. Eleven student posters were available all day, including throughout the evening reception, which was followed by live bluegrass music. Sixty-eight students and faculty members attended the event, which was organized by the graduate students, led by **Nicholas Underwood**.

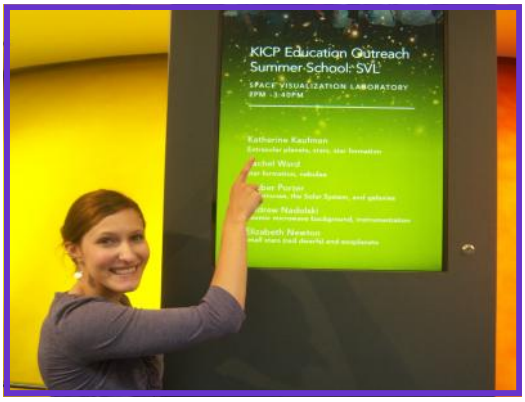
This fall, the office staff engaged in a little Halloween fun, by having a costume and office party. From left to right are **Rise Sheriff**, Office Manager; **Lori Rholetter**, Financial Administrative Assistant; **Dr. Mark Leising** (in the witch's hat), Department Chair; **Celeste Hackett** and **Amanda Crumpton**, Student Services Program Coordinators.

At left is **Dr. Chad Sosolik**, who is featured in this newsletter in the article concerning the refurbishing of the Foucault pendulum, along with **Jeremy Capps**, graduate student of **Dr. Catalina Marinescu**.

Astronomy Graduate Student Amber Porter Participates in Science Education and Public Outreach Summer School in Chicago

by Amber Porter

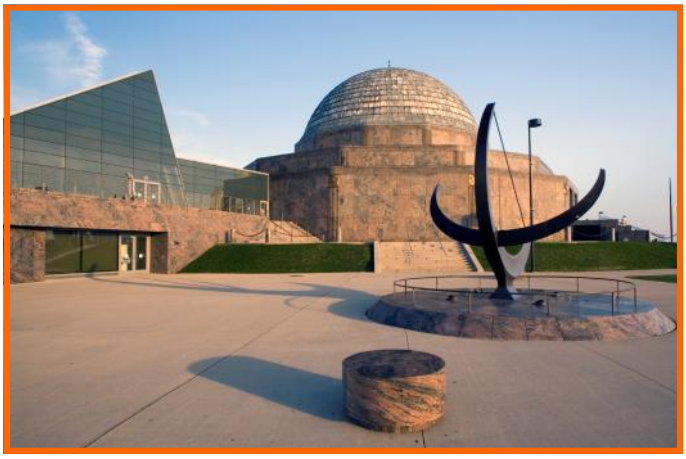
This summer, I joined sixteen other graduate students from around the country to participate in a two-week summer school in Education and Public Outreach (EPO) at the University of Chicago. The school taught us many things about EPO, as well as how to be a better science communicator. Learning to share your research as easily with your neighbor on the elevator as you do with your colleagues is a vital skill for scientists.



Amber Porter at the Education and Public Outreach summer school at the Univ. of Chicago

The program started with a bang with a full-day workshop by the Alan Alda Center for Communicating Science. The presentation was centered around improvisational exercises that helped you to get out of your own head in order to effectively distill your message. The take-aways: lure in your audience by starting with the fun stuff, keep it conversational, tell a story, and pay more attention to them than yourself. The rest of the days passed with panel discussions involving the National Science Foundation on how to improve the broader impact statements in proposals and case studies of highly successful outreach programs. A couple of the highlights of the experience were meeting **Emily Graslie** of the Youtube channel "The Brain Scoop," and talking to the exhibit creator of "Science Storms" at the Museum of Science and Industry.

The school concluded with a week-long practicum which I spent at the Adler Planetarium's Space Visualization Lab (SVL). The SVL is a laboratory filled with interactive toys that allow the public to immerse themselves in astronomy. As a guest presenter in "Astronomy Conversations," I was able to put the skills I learned from the improv sessions to good use. At the lab I discussed the wonders of supernovae with museum guests, as 3D simulations of the explosions played in the background and then allowed their questions to lead the discussion from there. As part of the practicum, I also created a short movie about the light curves of Type Ia supernovae which has been added to the SVL database for other astronomers to use in their conversations.



The Adler Planetarium on Chicago's Lakeshore Drive is close to both the Field Museum and Shedd Aquarium.

The Adler Planetarium, the country's first planetarium, was founded in 1930 by Chicago businessman Max Adler and is located on the city's lakeshore.

The Adler is home to three full-size theaters, extensive space science exhibitions, and one of the world's most important antique astronomical instrument collections on display. It is a recognized leader in science education, with a focus on inspiring young people to pursue careers in science. For more information on the planetarium's activities, visit: www.adlerplanetarium.org

Alberto Dominguez is New Post-Doc

Alberto Dominguez

The Department is pleased to welcome **Alberto Dominguez** as its newest postdoctoral researcher. Dominguez comes to Clemson after a postdoctoral position at the University of California at Riverside, working with **Dr. Brian Siana**. At Clemson he is working with new faculty member **Dr. Marco Ajello**. Dominguez obtained his Ph.D. in astrophysics in 2011 from the University of Sevilla, splitting his graduate research time between Sevilla and the University of California at Santa Cruz. While studying in Sevilla, he was supervised by **Drs. Francisco Prada** and **Manuel Lozano**.

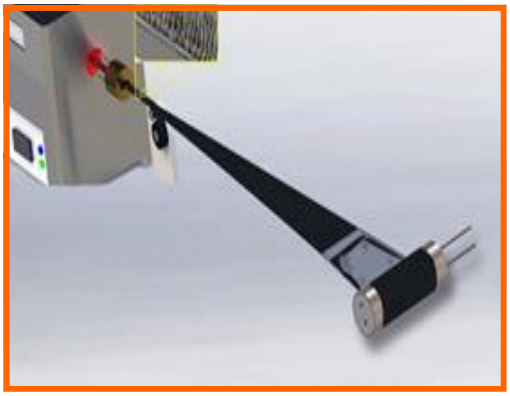
Dominguez's dissertation focused on studying the extragalactic background light from both the galaxy evolution point of view and its consequences for the observation of extragalactic gamma-ray sources. He is also interested in other aspects of galaxy evolution, high-energy astronomy, cosmology (such as dust extinction in star-forming galaxies), dwarf galaxies in the high-redshift Universe, high and very-high energy sources, green-valley galaxies and axion-like particle detectability. His research has also involved work with the MAGIC, Hubble, and Fermi Space Telescopes.

Roll-to-Roll Synthesis of CNT Supercapacitor Electrodes

In the last decade, there has been a considerable growth in the wide-spread use of carbon nanomaterials across a range of industries. But the most common bottleneck to further development is the scalability of their production. Although CNTs can be synthesized in large quantities, current processes for the growth of vertically-aligned CNTS (particularly in electronics) are limited to a small range of substrate materials. A group of researchers from Clemson have developed a relatively low-cost roll-to-roll method – their system can grow vertically-aligned CNTs (VACNTs) directly onto aluminum foil ribbons that are continuously drawn through a reactor.

Today's supercapacitors tend to use carbon materials in their electrodes, with their performance related to the electrode's surface area. But issues of substrate preparation and high operating temperatures have rendered the system complex and inefficient.

What the Clemson team, (**Dr. Aparao Rao** and graduate students **Mehmet Karakaya** and **Jingyi Zhu**), has done is to develop a system that negates these issues. Adapting a Chemical Vapour Deposition (CVD) system, they have managed to decrease the growth temperature to 600 °C, below the melting temperature of aluminum. This means that it can be used to directly synthesize VACNTs onto a current collector substrate – in this case, aluminum foil ribbons. The work, recently published in *Nano Energy* 8 (2014) 9-16 demonstrated the real potential for this technique, and the team believe that it offers a viable process for the production of supercapacitor electrodes.

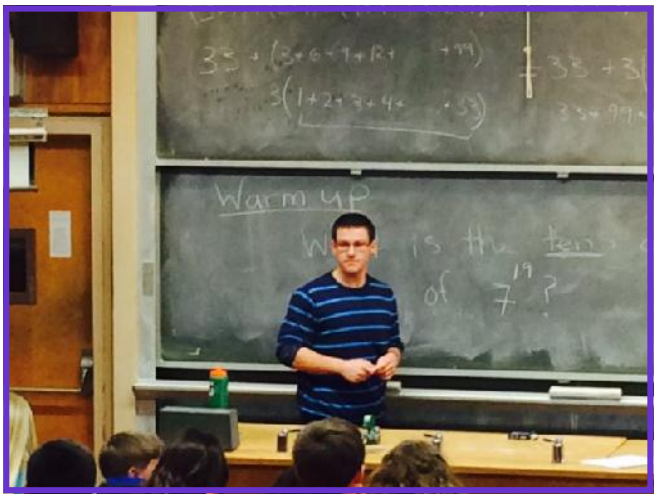


Graphical abstract from *Nano Energy 8* (2014) 9-16

Adapted from http://www.materialstoday.com/carbon/news/rolltoroll-synthesis-of-cnt-supercapacitors/

Physics and Astronomy Department Hosts Math Competitions

Clemson's Physics and Astronomy Department will host a series of mathematics competitions for K-12 students, in an effort to promote enthusiasm and a positive attitude towards mathematics and science, and to stimulate the students' interest in continuing their study in these fields beyond the high-school years.



Andrew Garmon, physics graduate student, helps tutor students in advance of the competition.

The main purpose of the Math Kangaroo and AMC 10/12 is to spur interest in mathematics and to develop talent through the excitement of solving challenging problems in a timed multiple-choice format. The problems range from the very easy to the extremely difficult.

The contest is intended for everyone - from the average student at a typical school who enjoys mathematics, to the very best student at the most advanced school.

On February 3 and 25, 2015 at 6 p.m., for students in grades 9-12, the Department will organize the AMC 10 and 12 competitions. The AMC-10 is a twenty-five question, 75-minute multiple-choice examination containing problems that can be understood and solved with algebra and geometry concepts. The AMC 12 is a twenty-five question, 75-minute multiple-choice exam containing problems that can be understood and solved with pre-calculus concepts. They serve as primary selection tests for the national math team that represents the United States at the International Math Olympiad, the most prestigious precollege math competition. The University will cover the cost of participation. Certificates of achievement and small gifts will be awarded to the top scorers.

For students in grades K-12, the Math Kangaroo will take place at Clemson at 7 p.m., March 19, 2015 and is an international math competition that currently engages more than six million students. The contest is based on a 75-minute multiple choice test, with twenty-four questions for students up to grade 4 and thirty questions for grades 5 and up.

For more information on the AMC 10 and 12 competitions, visit http://www.maa.org/math-competitions/amc-1012. Need more information? For questions about any of these competitions, contact **Dr. Jason Brown** at brown6@clemson.edu or by phone at 864-656-1217.

At left: students waiting for the competition. The Math Kangaroo and AMC 10/12 are becoming yearly events sponsored and facilitated by Physics and Astronomy.

CU Nanomaterials Center Produces an All-Carbon Optical Diode for Photonic Computing

Silicon transistors have been made smaller year after year, but they are approaching a point of physical limitation. Their increasingly small dimensions, now reaching well into the nanoscale, will prohibit any gains in performance due to the nature of silicon and the fundamental laws of physics. Within a few more generations, classical scaling and shrinkage will no longer yield the sizable benefits of lower power, lower cost and higher speed processors to which the industry has become accustomed. Carbon materials, such as carbon nanotubes and graphene, are heavily researched as potential replacement for silicon in electronics applications. While the present day carbon nanotechnology is well set to carry forward the scaling in size, a concomitant scaling in speed enforces the need for all-carbon photonic devices. "Carbon-based photonic technologies ostensibly lag their electronic congeners in development," says **Ramakrishna Podila**, an assistant professor of physics at Clemson. "A key element missing in the all-carbon offering of photonic devices is the optical diode, a fundamental element in any photonic logic circuit, which allows nonreciprocal transmission of light similar to current flow in an electronic p-n junction diode." Harnessing the optical properties of graphene-based materials offers an opportunity to create the all-photonic analogs of diodes, transistors, and photonic logic gates that will one day enable construction of the first all-photonic computer. In new work, researchers at Clemson Nanomaterials Center, and their collaborators at the Raman Research Institute **(Reji Philip)** and the Sri Sathya Sai Institute of Higher Learning **(Benoy Anand)**, have demonstrated the experimental realization of the first all-carbon optical diode that is ready for scalable integration.

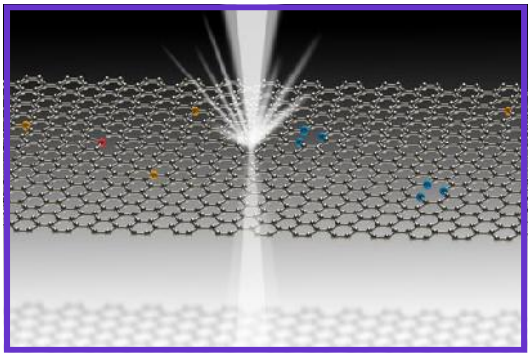


Image courtesy of Achyut J. Raghavendra, Clemson Nanomaterials Center

Graphene exhibits peculiar non-linear optical properties, which as shown by researchers at Clemson Nanomaterials Center can be used to break 'time-reversal symmetry' of light to achieve photonic diodes and photonic logic. The red, orange, and blue dots are nitrogen atoms that can dope graphene sheets in different configurations (viz., pyridinc, graphitic, and pyrrolic) to help tune its optical and electronic properties. A 'passive' optical diode functioning in an all-carbon on-chip platform will be indispensable in integrated photonics for optical signal processing and signal isolation.

However, such a realization is prevented by the reciprocity in light transmission i.e., 'if I can see you, you can see me too.' In a diode, light transmission is needed in one direction only. This is not trivial to achieve and necessitates breaking the inherent time-reversal symmetry of electromagnetic waves. The team fabricated a solid-state all-carbon passive photonic diode that achieves unidirectional light transmission by employing a saturable absorber (graphene) and a reverse saturable absorber (C60) in tandem. By engineering the fundamental differences in the non-linear optical properties of graphene and C60, they were able to break the time-reversal symmetry. "In our optical diode, we used thin-films of C60 (~5 nm) and graphene (~2 nm) to achieve a moderate optical nonreciprocity factor (ratio of forward to backward transmission) of ~4," explains **Apparao M. Rao**, Director of the Center. "Further, by varying the number of graphene layers and the thickness or concentration of C60 coating, we demonstrated tunability of key nonlinear parameters that determine the nonreciprocity factor." The innovative aspect of this work is the utilization of an abrupt jump in the nonlinear absorption coefficient of two different allotropes of carbon to break the time-reversal symmetry – as opposed to traditional periodic variation of refractive index or dielectric constant.

Continued on next page

As Podila and Rao point out, the resulting all-carbon optical diode, built from a graphene and C60 sandwich structure, is passive, all-optical, polarization independent and has no phase-matching constraints." The device organization is extremely simple, inexpensive and provides ample scope for scalability," Podila notes. "With a tunable nonreciprocity factor and potentially large bandwidth combined with its ultra-compactness (~7nm thickness) and solid-state nature, our optical diode is promising for cost-effective large-scale integration in photonic circuits." Currently, these researchers are focusing on improving the optical/electronic properties of graphene films by doping them with nitrogen in various configurations. "We expect to increase the nonreciprocity factors of the optical diodes to >10 by changing the non-linear optical properties of graphene by doping. With ultrafast carrier dynamics of nanocarbons, especially graphene, our device could offer unprecedented speed levels in photonic logic circuits," Rao concludes with an eye to the future.

Adapted from www.nanowerk.com/spotlight/spotid=37157.ph

Clemson Students Garner Awards at Sigma Xi Society Research Conference

Clemson students from left to right: Luke Tremblay (physics); Taylor Gambon (bioengineering); Jared Klingerberger (computer science); Jorge Rodriguez, Ph.D. (mentor, physics); and, Amanpreet Kaur (physics).

Sigma Xi, the Scientific Research Society recognized twenty-four high school, undergraduate, and graduate students on November 8, 2014 for their superior research poster presentations at the Society's 2014 International Research Conference in Glendale, Arizona. More than 100 students participated in the conference. Members of Sigma Xi, the honors society for scientists and engineers, judged the presentations. During the conference, students met and talked with Sigma Xi members, graduate school recruiters, and potential employers. They attended sessions on grant writing, science communication, and critical issues on water and food, and were welcome to hear presentations by Sigma Xi's award winners.

Students selected peers for the Student Choice Awards, sponsored by the Sigma Xi District of Columbia Chapter. **Sarah Stringer** of Rockford University won the first Student Choice Award. The second award went to **Taylor Gambon** of Clemson University. Both winners will receive a monetary award. Physics and Astronomy's representative to the conference was **Amanpreet Kaur**. Sigma Xi President **George Atkinson** awarded medals to the superior presenters and commended them for providing a positive look into the future Sigma Xi membership. "The future looks very good," he said.

Sigma Xi, The Scientific Research Society is the international honor society of science and engineering. One of the oldest and largest scientific organizations in the world, Sigma Xi has a distinguished history of service to science and society for more than one hundred and twenty five years. Scientists and engineers, whose research spans the disciplines of science and technology, comprise the membership of the Society. Sigma Xi chapters can be found at colleges and universities, government laboratories, and industry research centers around the world. More than 200 Noble Prize winners have been members. For more information on the society please visit: https://www.sigmaxi.org/about#sthash.49EI7xWE.dpuf

The Clemson University Physics and Astronomy Newsletter

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Department News

The Department expresses its condolences to retired faculty Dr. Ray Turner, whose wife Frances (Fran) Turner, passed away peacefully at her home on Sunday, November 23, 2014 after a long illness.

Dr. Joan Marler and her husband Marcin Ziolkowski welcomed new twins, born September 18, 2014: daughter Julia and son Mikolaj. Joan recently joined the faculty as a professor of atomic physics.

On Wednesday, December 10, 2014, Dr. Pooja Puneet welcomed a new baby girl. The baby's name is Abhigna Swetcha, Sanskrit for "intellectual freedom." Pooja is a lecturer in the department and is married to Dr. Rama Podila, a research professor in Dr. Aparao Rao's group. In addition to this milestone, Pooja and her husband have recently published a ground breaking article which has received international attention: http://www.materialstoday.com/energy/comment/defects-provide-material-advantage/

Dr. Deepika Saini, who graduated from Dr. Rao's group last summer, has published a manuscript in the Nature Scientific Reports journal. Her research has received international attention, as evidenced by a news report which can be accessed at the following link: http://www.nanowerk.com/spotlight/spotid=37933.php. Deepika is now employed as a post-doctoral research associate at the Savannah River National Laboratory.

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