

waves

APRIL 2017 ■ THE UNIVERSITY OF TOLEDO | COLLEGE OF NATURAL SCIENCES AND MATHEMATICS

DEPARTMENT CHAIR'S COMMENTS



Sanjay V. Khare

Greetings to all our alumni, friends and well-wishers of the department. I hope this newsletter finds you well.

You may have noticed the change in the photograph on the left. As mentioned by **Prof. Anderson** in the last newsletter, I succeeded him as Chair in June 2016. He chose to retire after 37 years of service to UT! He joined the department as an Assistant Professor in 1978 and rose through the ranks to retire as Chair. He served in that role for five years during a period in which UT, the college and the department went through many personnel changes and difficult budgetary constraints. Prof. Anderson was able to successfully navigate the department through all of these times while maintaining and strengthening our department's strong focus on research, teaching and service. During the past year, he has continued to contribute to the department through both teaching and service in more limited roles. We thank him for his many contributions and wish him well in the future.

At the institutional level, we have a new vice president for advancement, **Michael Harders**. He comes to us after serving at Kennesaw State University in Georgia since 2012, where he tripled the amount of annual support to the university, with significant growth in annual giving and alumni participation and donations. The Division of Advancement, which he will lead, includes Alumni Relations, Development, Marketing and Communications, and Special Events. All of you will hear from his office in the coming months about his new initiatives. As always, we look forward to your continued support through this division and its new leadership.

This year is the 50th anniversary of the Department of Physics and Astronomy, as well as Ritter Observatory and Planetarium. We will celebrate this anniversary with several events planned for the 2017-2018 academic year. You will hear from us about the interesting events planned during the coming months.

We continue to enjoy the good support of our office administrative staff. **Ms. Lori Benschoter** completed her first year with us as the Business Services Officer and managed to streamline and rectify many processes, to the great benefit of the department. During her short time here, she has brought much-needed efficiency to the management of accounts for the department.

Ms. Lynda Obee, our administrative assistant, is always cheering us on with her enthusiasm for the task at-hand, no matter how cumbersome. She is often found busily assisting graduate and undergraduate students, solving their myriad concerns with classes and TA assignments. Another not-so-well-known aspect of her work is keeping the facilities in the McMaster, Ritter and R1 buildings in the best working order and responding to maintenance emergencies. A good working office would not be possible without the two of them serving the department so well. Ms. Benschoter earned a bachelor's degree in business administration with an emphasis in accounting along with a minor in business law from UT in December 2016. Ms. Obee will get her BA degree in May 2017. Congratulations to both of them on their fine academic achievements! They will now also be counted as UT alumni.

A significant development over the last few months has been President Gaber's and Provost Hsu's decision to align the UT semester length with that of other Ohio state universities. This will mean that from the 2017-2018 academic year onward, UT's fall and spring semesters will be 15 weeks instead of the current 16. The creation of the new schedule for our classes to fit this new timeline is in process. This assignment has been handled well by Dr. Song Cheng, Dr. Lawrence Anderson and Ms. Lynda Obee.

We are proud of all the achievements of our faculty, staff, students, retirees and alumni listed in this edition of Waves. Several of these achievements involved bringing significant research

(continued on page 2)

Department Chair's Comments

(continued from page 1)

funds into the department. **Professors Heben, Podraza and Phillips** received a grant from the Ohio Development Services Agency to study scratch- and UV-resistant coatings. **Professor Yan** received a grant award from the DOE to achieve low-cost solar energy from the SunShot initiative. **Professor Emeritus Compaan** received a grant award from the Department of Homeland Security to develop a new device to enhance security at national points of entry of goods by land, sea and air. In addition, I was fortunate to receive a grant award from NSF to accelerate the discovery of hard, wear-resistant and corrosion-resistant coatings for a variety of commercial applications.

Many other accomplishments were reported this year.

Professor Chandar was promoted to the rank of full professor in recognition of her last several years of contributions to research, teaching and service. Due to our astronomy and astrophysics group's excellence in research, teaching and outreach, UT was admitted as the 41st member of the Association of Universities for Research in Astronomy, also known as AURA. A group of UT astronomers discovered a young brown dwarf. The news was highlighted in Jet Propulsion Laboratory News and caught national attention. **Dr. Richardson**, a researcher who also is our alumnus, captured the first sharp image of an exploding star's winds. Several articles by different teams of researchers from our photovoltaic group made major scientific impact in the field of perovskite-based solar cells. This resulted in several papers being highlighted by their respective journals, including *Advanced Energy Materials*, the *Journal of Photonics for Energy* and *American Chemical Society*.

We continue to maintain and develop several facilities, such as the Ritter and Brooks observatories, which were upgraded, and a planetarium that keeps increasing its number of visitors every year. The atomic ion accelerator, several medium-sized computer clusters for large-scale computing and world-class facilities dedicated to our condensed matter and optical physics research in the R1 and McMaster buildings also continue to support our research and teaching mission.

If you'd like to help us grow and improve, including adding to the planetarium projector upgrade, you'll see information about how you can contribute in this newsletter. There are several funds to support various efforts within the department. We are very fortunate to have strong supporters in the community and beyond, and we are grateful to all of you.

In closing, let me just say that we value all our supporters, friends, former students and colleagues. We'd love to hear from you, so please drop us a line sometime and tell us what you're doing these days. If you happen to be in the area, stop in and visit.

Sanjay V. Khare

Yan Receives Award from DOE

Professor Yanfa Yan has been awarded a grant from the Department of Energy and the Office of Energy Efficiency and Renewable Energy to develop, in collaboration with a team of researchers from Texas State University and the National Renewable Energy Laboratory, industrially relevant photovoltaic technologies to reduce the solar energy cost toward the \$0.06/kWh SunShot DOE goal.



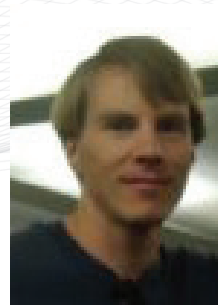
Yanfa Yan

Heben, Phillips, Podraza Receive Grant from Ohio Development Services

Professor Michael Heben, Research Assistant Professor Adam Phillips and Associate Professor Nikolas Podraza received a grant from the Ohio Development Services Agency to develop scratch- and UV-resistant coatings.



Michael Heben



Adam Phillips



Nikolas Podraza

Article on Perovskite Solar-Cell Stability Among Top 5 Accessed

An article on perovskite solar cell stability co-authored by **Prof. Michael Heben, Research Prof. Adam B. Phillips and Zhaoning Song, Suneth C. Wathage and Geethika K. Liyanage**, UT graduate students, as well as collaborators **Antonio Abate, Ullrich Steiner and Michael Graetzel**, was recently listed as among the top five accessed papers in the July 2016 issue of the journal *Advanced Energy Materials*.

Recent Work on Perovskite Solar Cells Represents a Step Forward in the Development of Practical, More Environmentally Friendly Perovskite Solar Cells

A recently published article on the fabrication of efficient, low-band gap perovskite solar cells has been highlighted by the American Chemical Society. In the article, co-authored by **Prof. Yanfa Yan, Prof. Randall Ellingson, Associate Prof. Nikolas Podraza, UT postdoctoral research associates Weiqiang Liao, Dewei Zhao, Changlei Wang** and **UT graduate students Yue Yu, Niraj Shrestha, Kiran Ghimire, Corey Grice** and **Alexander Cimaroli**, the researchers discuss the development of a new precursor solution for the formation of perovskite solar cells. The resulting tin-lead perovskite cells had low-band gaps and up to 15 percent power conversion efficiency. The reduction in lead content and improved efficiency for a low-band gap cell represent a significant step toward practical, more environmentally friendly perovskite tandem solar cells.

Khare Receives NSF Grant

Professor Sanjay Khare has been awarded a three-year National Science Foundation DMREF (Designing Materials to Revolutionize and Engineer our Future) grant to develop, in collaboration with experimentalist Professor Daniel Gall of Rensselaer Polytechnic Institute, hard nitride coatings by design. The results of this theoretical research are expected to accelerate the discovery of hard, wear-resistant and corrosion-resistant coatings, yielding new coating materials for applications, including fuel-efficient jet engines and gas turbines, environmentally friendly, lubricant-free cutting tools, high-temperature concentrating solar power plants, and wind turbines.



Rupali Chandar

Congratulations to Rupali Chandar

Rupali Chandar has been promoted to full professor.

Compaan Receives Grant to Develop New Radiation Detector

(adapted from *UT News*, July 2016)

The U.S. Department of Homeland Security awarded two Toledo-area companies a contract to develop a new device that could enhance security at ports, and monitor the more than 17 million land, sea and air shipping containers in transit each day. Lucintech, a University of Toledo LaunchPad incubation startup founded by UT Distinguished **University Professor Emeritus of Physics and Astronomy Al Compaan**, will work with Lithium Innovations Co. LLC to create a lightweight, portable, sensitive and low-cost radiation detector that can find neutrons in industrial shipments entering the country. This collaboration leverages technologies recently developed by these companies for applications outside radiation detection.

Compaan had led a research effort in thin-film photovoltaic materials and devices

that convert sunlight directly into electricity for nearly 30 years. His company, Lucintech, is developing and scaling up innovative processes for making solar windows and sunroofs for vehicles.

“We are following on our successful exploratory work, which demonstrates a new approach to high-efficiency neutron detection,” Compaan said. “Neutron detectors are also important for oil and gas exploration, as well as nuclear medicine.”

“Advanced screening is an important component of domestic security,” Congresswoman Marcy Kaptur said. “I am especially pleased that two northern Ohio companies are collaborating to produce a nationally significant, state-of-the-art technology that enhances our nation’s security efforts.”



Alvin D. Compaan

“
We are following on our successful exploratory work, which demonstrates a new approach to high-efficiency neutron detection
”

Review Article on Perovskite Solar Cells Highlighted by SPIE

A review article on perovskite solar cells published in the April 2016 issue of the *Journal of Photonics for Energy*, written by **UT graduate students Zhaoning Song** and **Suneth Wattage**, **UT Research Prof. Adam Phillips** and **Prof. Michael Heben**, was highlighted in the October 2016 edition of the professional magazine of the *International Society for Optics and Photonics* (SPIE).

UT Astronomers Discover Young Brown Dwarf

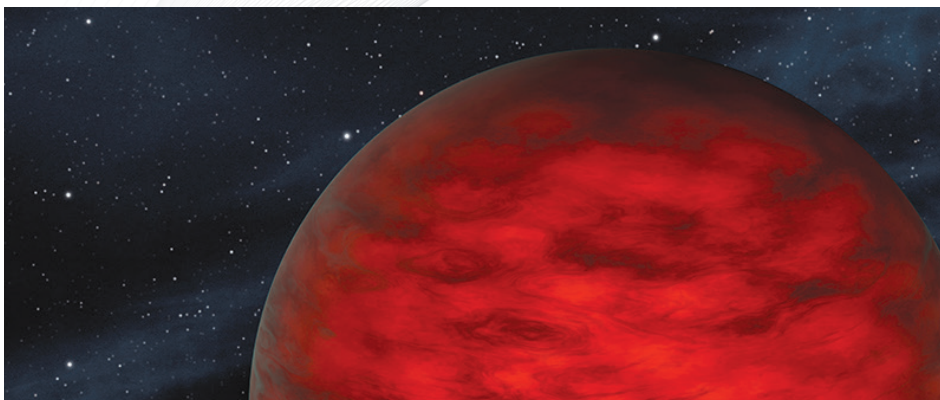
(adapted from NASA's Jet Propulsion Laboratory News, April 2016)

In 2011, astronomers announced that our galaxy is likely teeming with free-floating planets. In fact, these lonely worlds, which sit quietly in the darkness of space without any companion planets or even a host sun, might outnumber stars in our Milky Way galaxy. The surprising discovery begged the question: Where did these objects come from? Are they planets that were ejected from solar systems, or are they actually light-weight stars called brown dwarfs that formed alone in space like stars?

A new study using data from NASA's Wide-field Infrared Survey Explorer, WISE, and the Two Micron All Sky Survey, or 2MASS, provides new clues in this mystery. Scientists have identified a free-floating, planetary-mass object within a young star family called the TW Hydrae association. The newfound object, termed WISEA 1147 for short, is estimated to be between roughly five to 10 times the mass of Jupiter.

"With continued monitoring, it may be possible to trace the history of WISEA 1147 to confirm whether or not it formed in isolation," said **Adam Schneider**, postdoctoral researcher at The University of Toledo and lead author of a new study published in *The Astrophysical Journal*. "We can understand exoplanets better by studying young and glowing low-mass brown dwarfs," he added. "Right now, we are in the exoplanet regime."

Other authors of the study include undergraduate **James Windsor** and **Prof. Michael Cushing** of The University of Toledo, **Davy Kirkpatrick** of NASA's Infrared Processing and Analysis Center at California Institute of Technology, and **Ned Wright** of UCLA, who was also the principal investigator of the WISE mission.



A young, free-floating world sits alone in space in this illustration. The object, WISEA 1147, is thought to be an exceptionally low-mass "brown dwarf," which is a star that lacked enough mass to burn nuclear fuel and glow like a star. Image credit: NASA/JPL-Caltech

Medical Physics News

Bachelor of science-master of science student **Hossein Lavvafi** received the 2016 Expanding Horizons Travel Grant award offered by the American Association of Physicists in Medicine (AAPM). This is a highly competitive award for which graduating students and residents from around the country are eligible to apply, with only the top proposals demonstrating a strong commitment to expanding the scope of research in medical physics selected for the award.

The award includes \$1,500 and a certificate from the AAPM.

Hossein came to UT after earning his PhD in mechanical engineering from Case Western University. He is expected to complete his BS-MS in medical physics by June 2017.

Recent medical physics PhD graduate **Gregory Warrell** won the first place student research award at the Penn Ohio Chapter of the AAPM meeting for his research – conducted with **Prof. Diana Shvydka** and **Prof. Ishmael Parsai** – on dual modality thermobrachytherapy. Dr. Warrell is now a medical physics resident at the Case Medical Center in Cleveland.

UT Elected to Association of Top Astronomy Programs

(adapted from *UT News*, June 2016)

The University of Toledo has been selected to join a prestigious association that includes many of the top astronomy programs in the nation.

In recognition of the astronomy and astrophysics program's strengths in research, education and outreach, UT was admitted as the 41st member of the Association of Universities for Research in Astronomy, which goes by the acronym AURA.

"We are impressed with your strong astronomy program and with your commitment to the future," AURA President **Matt Mountain** wrote in his welcome letter to the University. "It is our mission to advance astronomy and related sciences, to articulate policy and respond to the priorities of the astronomical community, and to enhance the public understanding of science. We do this by developing and operating national and international centers that enable merit-based research by members of the astronomical community. I believe and trust that The University of Toledo and AURA have many goals and objectives in common."

AURA was founded in 1957 and has had a strong role in providing input and guidance on matters of astronomy policy. "It is one of the most important voices for professional astronomers in the United States to have input on decisions made on astronomy in this country," said NSM **Dean Karen Bjorkman**, who will serve as UT's member representative to AURA.

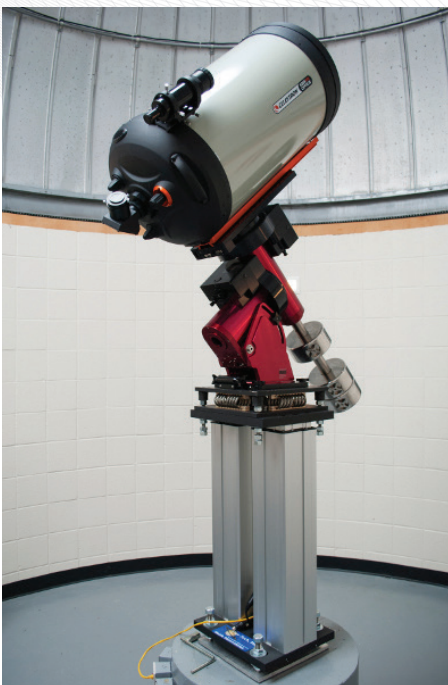
In addition to the now-41 U.S. institutional members, AURA also receives input from four international affiliates in Chile, Japan and Australia. Having a voice at the table on the future of astronomy is key, as are the opportunities for UT faculty and students who will benefit from interactions with colleagues at AURA member universities, Bjorkman said.

UT qualified for membership because of its robust research efforts that include undergraduate and graduate students who experience hands-on training. That research also gets communicated to the community through strong outreach programs via the Ritter Planetarium and Brooks Observatory, Bjorkman said.

"We have a program that has intentionally intertwined education, research and outreach," she commented. "The research we do gets communicated back to the community, the students and the public. That is an important responsibility of scientists."

Some examples of the program's many competitive achievements include two researchers who were among the first to access the European Space Agency's Herschel far-infrared space-based telescope to study the creation of stars and life cycles of galaxies. **Dr. Tom Megeath**, professor of astronomy, led the Herschel Orion Protostar Survey (HOPS), and **Dr. J.D. Smith**, associate professor of astronomy, led a team in the Key Insights on Nearby Galaxies: A Far Infrared Survey with Herschel (KINGFISH).

"Astronomy is a science that really gets people excited," Bjorkman said. "Even if people don't become astronomers, they get excited about science at young ages, and that helps with curiosity and scientific literacy that is important in whatever they do."



News from Ritter Planetarium-Brooks Observatory

The past year has been very exciting and productive for Ritter Planetarium-Brooks Observatory. Total attendance increased by a few percent for the fourth consecutive year. We continue to offer public programming, programs for visiting K-12 groups, UT classes (both astronomy and non-astronomy) and civic organizations. Our children's birthday parties continue to be very well received.

The planetarium also debuted a new, full-dome production describing the Physics and Astronomy Department's partnership with the Lowell Observatory and the Discovery Channel Telescope. This mini-program has been seen by nearly 20,000 visitors in the past year. We also are working on a new production on the solar

neighborhood that we hope to complete later this year. Sadly, our funding ran out for our artist, Morgan Hayward, and she took a new position at the University of Michigan.

Renovations at the Helen and Elgin Brooks Observatory on the 6th floor of McMaster Hall, which began in fall 2015, are now complete. The aging refractor has been replaced with a new Celestron 14 Edge telescope on a state-of-the-art Paramount mount under the 16-foot Ash dome. The facility also houses several small, portable telescopes. This new telescope has allowed us to completely re-tool the Astronomy 1010 observing program that serves more than 1,000 students each year. The observatory is planning its 50th anniversary celebration in 2017.

UT Astronomer Helps Capture First Sharp Image of Famous Exploding Star's Raging Winds

(adapted from *UT News*, October 2016)

A researcher at The University of Toledo is part of an international team of astronomers pioneering a new way to understand how extremely massive stars lose mass as they evolve.



Noel Richardson

Dr. Noel Richardson, postdoctoral research associate in UT's Department of Physics and Astronomy, was part of a research team focused on the most luminous and massive stellar system in the Milky Way galaxy called Eta Carinae. Its primary star is 100 times more massive and five million times more luminous than the sun. That star also is famous for losing 10 suns' worth of material — huge amounts of gas and dust — into space in an enormous explosion in the 1830s.

These astronomers are the first to use what is called the Very Large Telescope Interferometer at Chile's European Southern Observatory to study the violent wind collision zone between two stars in the system and discover new and unexpected structures.

"The scale of the images is roughly equivalent to being able to read the small print in a newspaper from 50 miles away," said Richardson. The team's methods used to revolutionize infrared astronomy and the resulting discoveries recently were published in the international journal *Astronomy and Astrophysics*.

The researchers used interferometry, which is a technique combining the light from up to four telescopes to obtain an image about 10 times higher in resolution than that of the largest single telescope. "It's phenomenal," said Richardson, who earned his bachelor's degree in mathematics and master's degree in physics from UT in 2004 and 2006. "Until now, we couldn't study the Eta Carinae star system's wind collision zone because it was too small for the largest telescope."

The Eta Carinae star system is 7,500 light-years from Earth, where winds from two tightly orbiting stars smash together at speeds up to 10 million kilometers per hour approximately every five years. Temperatures reach many tens of millions of degrees — enough to emit X-rays.

Richardson observed the images with spectroscopy and spotted structures in the data that hadn't been seen before. "We've learned the secondary star's wind is carving a cavity

into the primary star's enormous wind," he said. "We saw large structures pushed out into space after the winds collide, were able to pinpoint how they were moving, and learned they keep that geometric shape. It's amazing to see the tails coming off, which are the shocks in the secondary star going into orbit. We have computer and 3-D print models that can now explain the X-rays, Hubble Space Telescope observations, unusual spectroscopic features, and the incredible images from the Very Large Telescope Interferometer."

"Our dreams came true because we can now get extremely sharp images in the infrared regime," said Dr. Gerd Weigelt of the Max Planck Institute for Radio Astronomy in Germany, who led the team of astronomers from the U.S., Canada, Chile, Japan and Brazil.

"Dr. Richardson's work is a nice example of the kinds of international collaborations with which our UT astronomers are involved," said **Dr. Karen Bjorkman**, dean of the UT College of Natural Sciences and Mathematics, Distinguished University

“

The scale of the images is roughly equivalent to being able to read the small print in a newspaper from 50 miles away

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Professor of Astronomy and Helen Luedtke Brooks Endowed Professor of Astronomy. "The results, which use data from the Hubble Space Telescope, show a very interesting way to map the fossil remnants of material thrown off by a famously unstable binary star system. I congratulate him on this work and am proud to note that he is a UT alumnus."

Richardson hopes this new research helps astronomers come closer to understanding what triggered Eta Carinae's explosion in the 1800s. "That is one of the driving motivators for myself," Richardson said. "How do we connect the physics of what is happening today to what happened back then? There is still a lot we don't understand about the stars we have looked up and seen in the sky for a long time. Science is a process, and we want to push the envelope to solve the mystery."

Research Experience for Undergraduates (REU)

The summer 2016 NSF-REU program in physics and astronomy, directed by **Dr. Richard Irving** and **Dr. Thomas Kvale**, provided enhanced research opportunities to 17 undergraduate students from seven colleges and universities in six states. Participants were chosen from 137 applications submitted by students in 37 states.

We are pleased to report that during the 2015-2016 academic year, research involving previous REU students led to five refereed publications and four conference presentations. We expect additional manuscript(s) from summer 2016 are in preparation and will be submitted shortly to refereed journals and/or presented at conferences. Also, our 2016 REU site had a student, **Tim Alderson** (mentor: S. V. Khare) competitively selected to participate in the Council on Undergraduate Research's Research Experiences for Undergraduates Symposium, which took place on Oct. 23-24, 2016. Tim presented his summer research, Calculating Optical Properties of Delafossite Nitrides from First Principles, during a poster session at the symposium. This makes two consecutive years during which one of our REU students was selected to participate

at this symposium. Last year, **Mikhael Semaan** (mentor: J. Amar) was selected to present his research, Submonolayer Growth with Sub-Diffusive Walkers, and won the Helen Quinn first-place award for Undergraduate Research Theory.

One important component of the REU program is outreach. In summer 2016, the students decided to volunteer at Imagination Station to help with the "Nerdy Derby." This event took place on Saturday and Sunday afternoons. The REU students helped local children and their parents design, build and race their cars down the hills and valleys of a 40-foot track. The cars were made of balsa wood, bolts and washers, straws, rubber bands and glue. The coordinator of the



event said about 400 cars were built each day! Part of this stock was utilized by the REU students for their own race-off at the end of each day!

The REU group decided to check out some of the local renewable energy technologies, so tours were organized. A tour of Bowling Green's 7.2-megawatt wind farm provided an opportunity to explore the wind turbines inside and out. Students had many good questions ranging from the impact on the wildlife (e.g. birds and bats) to career opportunities as a wind turbine technician. A tour of the First Solar plant was no less informative. A very illuminating presentation with a question and answer period preceded the tour. Our department's history associated with the beginnings of First Solar also was discussed. The First Solar tour guides escorted groups of students through the plant to view various aspects of the manufacturing process for CdTe solar panels. People were impressed with the methodologies utilized to provide the quality control needed to produce a good solar panel.

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Research Experience for Undergraduates (REU)

(continued from page 18)

Social events during the 2016 program included two camping expeditions with star-gazing in mind. One site recommended by the Toledo Astronomical Society was at Lake Hudson in Michigan. This is Michigan's First Dark Sky Preserve. In fact, with the passage of Michigan Public Act 57, 1993 (MCL 322.821-826), Michigan became the first state in the nation to designate a tract of public land as a "Dark Sky Preserve." One of the REU students, **Aaron Harder**, brought his own telescope for the occasion. The other campsite visited was Sterling State Park near Lake Erie in Michigan. On the Ohio side of Lake Erie, one of the last group outings was to none other than Cedar Point! Screams filled the air as our group experienced the best Cedar Point had to offer.



REU students and other research students



REU Summer 2016 Participants

Name	Institution	Mentor	Research
Tim Alderson	University of Toledo	Khare	Condensed Matter Physics
*Sanskar Basnet	University of Toledo	Irving/Kvale	Atomic Physics
Ed Cichewicz	Ohio State University	Karpov/Shvydka	Condensed Matter
Sean Davis	University of Toledo	Amar	Computational Physics
Shaeley Diemer	University of Toledo	Podraza	Condensed Matter
Nicholas Dulaney	University of Toledo	Bjorkman/Richardson	Astrophysics
**Hayden Graham	University of Toledo	Irving	Computational Atomic Physics
Aaron Harder	University of Toledo	Witt	Astrophysics
Nmandi Ike	St. Peter's University	Pearson	Medical Physics
*Heidi Kuchta	University of Toledo	Megeath	Astrophysics
Sarah Richie	University of Evansville	Yanfa/Grice	Condensed Matter
Logan Riney	University of Louisville	Amar/Shim	Computational Condensed Matter
Raul Rodriguez	St. Mary's University	Shvydka	Condensed Matter
**Ben Shafransky	University of Toledo	Irving	Atomic Physics
**Nathan Szymanski	University of Toledo	Khare/Liu	Condensed Matter Physics
Pa Chia Thao	Mount Holyoke College	Bjorkman/Richardson	Astrophysics
*James Windsor	University of Toledo	Collins	Condensed Matter

* Funded by OUR (Office of Undergraduate Research) and/or faculty grants

** Self-supported

Graduate Degree Awards

The following graduate students successfully defended their PhD dissertations or received MS degrees during the 2015-2016 academic year:

Laxmi Karki Gautam, PhD
 Zhiquan Huang, PhD
 Abedl-Rahman Ibdah, PhD
 Alexander Mulia, PhD
 Paul Roland, PhD
 Aditya Togi, PhD
 Zhaoning Song, PhD
 Carl Starkey, PhD
 Sean Tanny, PhD
 Gregory Warrell, PhD
 Nicholas Franzer, MS
 (professional science master's degree in photovoltaics)
 Kiran Ghimire, MS
 Negar Heidarian Boroujeni, MS
 Maxwell Junda, MS
 Zhi Liu, MS
 Brandon Tompkins, MS (professional science master's in photovoltaics)

Graduate and Undergraduate Awards Ceremony

The Department of Physics and Astronomy's Fifteenth Annual Recognition Ceremony and Sigma Pi Sigma induction were held April 18, 2016. The following awards were presented:

Undergraduate Awards

Physics & Astronomy Outstanding Graduating Undergraduate Student:

Tyler Frey

Elgin C. Brooks Memorial Astronomy Scholarship: **Amanda Menechella**

A. Jackson and Sally K. Smith Scholarship: **Heidi Kuchta**

Chad Tabory Memorial Award for Outstanding Undergraduate Research in Physics and Astronomy:

First Place: **Nicholas Dulaney**

Second Place: **James Windsor**

Robert and Noreen Stollberg Award: **Samantha Windsor**

Edwin Jayamaha Scholarship Award: **Kevin Schelkun**

C.V. Wolfe Scholarship in the Natural Sciences: **James Windsor**

Graduate Awards

David Turnbull Scholarship in Materials Science: **Maxwell Junda**

Physics & Astronomy Outstanding Service Award: **Jennifer Greco**

Robert and Noreen Stollberg Graduate Teaching Award: **Wayne Oswald**

Recognition of Students Receiving Undergraduate Degrees

Justin L. Davoll, BA – astronomy

Tyler Frey, BS – physics

Youssef Jabaly, BA – astronomy

Jessica Moore, BS – astrophysics

Jacob Noon, BS – physics

Recognition of Society of Physics Students (SPS) Officers

President: **James Windsor**

Secretary: **LaLaina Shumar**

Treasurer: **Aaron Harder**

Webmaster: **Heidi Kuchta**

Faculty Advisor: **Dr. Richard Irving**

The 2015 Sigma Pi Sigma Inductees (Professor Scott Lee, faculty advisor)

Amanda Menechella

Give a gift. Make a difference.

The support of our alumni and friends is paramount to the success of our educational programs. Your generous financial support will impact the lives of current and future students in the Department of Physics and Astronomy at The University of Toledo.

For more information about giving, including setting up scholarships or additional gift funds, please contact **Nick Butler**, development officer for the College of Natural Sciences and Mathematics, and College of Arts and Letters at 419.530.5428 or nicholas.butler@utoledo.edu

Gifts to the UT Foundation are tax-deductible as provided by law. Make your gift online at: give2ut.utoledo.edu or return this form to: The University of Toledo Foundation, PO Box 586, Toledo, OH 43697-0586

Support the Department of Physics and Astronomy

Yes! I would like to make a GIFT/PLEDGE in the amount of:
 \$1,500 \$1,000 \$500 \$250 \$100 Other \$ _____

Please designate my gift to the following fund:

- | | |
|--|--|
| <input type="checkbox"/> Physics and Astronomy Funds for Excellence (1300328) | <input type="checkbox"/> Planetarium Progress Fund (2401117) |
| <input type="checkbox"/> John J. Turin Memorial Fund (1300083) | <input type="checkbox"/> College of Natural Sciences and Mathematics Progress Fund (2401937) |
| <input type="checkbox"/> Chad Tabory Outstanding Undergraduate Research Fund (1300483) | <input type="checkbox"/> Reach For the Stars Fund |
| | <input type="checkbox"/> Other |

Payment Options:

- Enclosed is a check made payable to the UT Foundation
- Charge my: Visa MasterCard American Express

Card # _____ Exp. Date _____

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 Annually Quarterly Semi-annually Monthly

Start Date _____ Installment Amount _____

Matching Gift:

- My company/ my spouse's company will match my gift.
Please include a completed matching gift form from your Human Resources office.

Personal Information:

Name _____

Address _____

City/State/Zip _____

Phone _____ E-mail Address _____

Thank you for supporting The University of Toledo.

The UT Endowment Fund Campaign

Alumni and friends of the Department of Physics and Astronomy are urged to remember our department and college as they consider giving and pledging. The department has several established funds, some of which are endowed and others may not yet be endowed. Other funds may have dipped below the threshold required by the UT Foundation for returning spendable earnings that can be used, for example, for scholarships, honoraria for speakers, etc.

John J. Turin Memorial Fund

Established to honor former department chair and dean of the Graduate School, **John J. Turin**. He was integral in building UT's first PhD program in the 1960's. This endowment funds annual awards to physics students, based on merit (3.5 GPA or higher).

Chad Tabory Outstanding Undergraduate Research Fund

This account, founded in memory of **Chad Tabory**, a UT physics graduate and research lab technician, funds the outstanding undergraduate research award.

Ritter Observatory Publication Fund

This fund helps to support the cost of publishing the Ritter Observatory annual report, as well as student papers when possible.

Reach for the Stars Fund

This fund supports student access, research, and remote observing with the Discovery Channel Telescope (DCT) in Arizona. UT established a long-term scientific partnership agreement with the Lowell Observatory in 2012 to guarantee access to the DCT for UT students, postdocs, and faculty to carry out cutting-edge research in astronomy and astrophysics at this new, state-of-the-art facility located at an excellent observing site.

The Planetarium Progress Fund

The purpose of the Planetarium Progress Fund is to hold the subscription donations of the Friends of Ritter Planetarium and all other gifts in support of our astronomy outreach programming. All funds are used for large capital expenses and the growth of an endowment portfolio, the interest from which will help cover operating expenses.

Physics and Astronomy Funds for Excellence

The Funds for Excellence supports scholarships and fellowships, acquisition of research equipment, special colloquia, etc. which are so essential for departmental excellence.

Sigma Xi Dion D Raftopoulos Outstanding Faculty Research Award

This is a perpetual memorial in honor of **Dion D. Raftopoulos** for support of the Sigma Xi Award for Outstanding Research at UT. This award remains one of few awarded by the faculty to peers in recognition of their outstanding contributions to the research enterprise at the UT. We are proud to note that 8 of the total 29 winners of this award through 2014 have been from the Department of Physics & Astronomy.

Alumni News

Jason Roehl (PhD, 2014) is working at Toledo-based Midwest MicroDevices. He writes that he is “learning the processing techniques for the MEMs (microelectromechanical systems) we fabricate” as he “transitions into an engineering role for the upcoming expansion, and has been learning and using photo-lithography, E-beam-CVD, LPCVD, PECVD and metrology, to name a few.” He also writes, “I get to apply the research techniques I learned and apply them to engineering issues concerning fabrication; literature surveys concerning the state-of-the-art of the technique in question; developing tests and analyzing data to improve the fabrication technique. The job is certainly more applied than theoretical, but I still enjoy it.”

Anca Sala (PhD, 1998) dean of the College of Engineering at Baker College, has been named 2016 Educator of the Year by HI-TEC, the High Impact

Technology Exchange Conference. Sala was recognized for her diverse and dedicated work toward building the infrastructure of photonics education. The award is presented to a community or technical college faculty member who has made significant contributions to the education and training of today’s advanced technological workforce. The recipient must have demonstrated impact on technology education, both locally and nationally.

John Wisniewski (PhD, 2005) is now an assistant professor at the University of Oklahoma, and has been named a 2016 Presidential Professor, which is a faculty member who excels in his/her professional activities and who relates those activities to the students he/she teaches and mentors. Presidential Professors exemplify to their students and to their colleagues the ideals of a scholar through their endeavors in teaching, research/creative activity and service.

Recognizing Our Donors

The Department of Physics & Astronomy recognizes and thanks all donors who generously made gifts during the past calendar year from January 1, 2016 to December 31, 2016. Donors are listed alphabetically.

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