

WAVES

Number 17

December 2014

DEPARTMENT CHAIR'S COMMENTS



Anderson-Huang

Greetings to all! I hope this newsletter finds you well. As you may know, the University administration has recently undergone a significant transition. In our last Waves edition, we announced the retirement of Dr. William McMillan as Provost in June 2012, and his replacement by Dr. Scott Scarborough. This year, President Lloyd Jacobs announced his retirement in March, effective 30 June 2014. Dr. Jacobs had served as President for the eight years following the merger of the previous Medical College of Ohio and The University of Toledo. Dr. Jacobs' announcement was followed shortly after with a similar retirement announcement from Provost Scarborough, who has been chosen as the new president of the University of Akron. The Board of Trustees has named College of Engineering Dean Nagi Naganathan as Interim President, and Dr. John Barrett as Interim Provost. Both have very strong academic backgrounds. Under Dr. Naganathan's leadership, the College of Engineering has achieved record high student enrollments, registering an increase in the undergraduate enrollment every fall semester for the last eight academic years. During that time, our department has developed a strong relationship with his college. Dr. Barrett is from the College of Law, and prior to his appointment as Interim Provost, served as Vice Provost for faculty relations and accreditation, assessment and program review. He has also served as President of the Faculty Senate. A search committee for a new President has been appointed; our Dean and former Chair, Dr. Karen Bjorkman, is on the committee.

As noted below under Notable Staff News, as of August 2013 we have two new office staff: Ms. Lynda Obee as Administrative Assistant and Ms. Lindsay McLaughlin as Business Services Officer. Both have made life in the department much easier and more family-like. Ms. Obee very quickly understood what was required to effectively run the office. She has organized and labeled everything. She is very responsive and flexible. She has a great relationship with the student workers, and has developed them into a fine team while giving them a variety of leadership opportunities. I especially have appreciated her help with class scheduling. Often, this

assistance has involved working with student advisors and associate deans in other colleges, particularly the College of Engineering. Ms. McLaughlin faced an overload of disarray in the department finances caused by the rapid turnover of previous staff. However, over the last year, she has achieved a firm control over the accounts and duties. As one of our other staff said, both always adapt to a variety of ambiguous questions, and lead the student, faculty, or co-worker to understand what the topic is about and what information each can provide and what information she will find for the questioner. They always come through.

We are happy to welcome Dr. Jillian Bornak as a new Lecturer, primarily for the introductory astronomy sections, although she is also teaching a section of algebra-based general physics. She has much previous experience with the pedagogy of teaching science, and has restructured the introductory courses to great effect and response from the students.

We are proud of all the efforts reported in this edition of Waves, and hope to develop even more in future years. Of particular note are the elections of Professor Emerita Nancy Morrison as a Fellow of the AAAS, Professor Robert Collins as an APS Fellow, and Professor Steven Federman as the first Chair of the Laboratory Astrophysics Division of the AAS. We are also very proud of the awards received by our students: Best Poster award at the Midwest Graduate Research Symposium for Ms. Michelle Deady, Best Poster award at the 39th IEEE Photovoltaic Specialist Conference for Ms. Tingting Lee, Editor's Suggestion in Physical Review A for now Dr. Ming Li, tied second place papers at a meeting of the AAPM for Mr. Sean Tanny and Mr. Gregory Warrell, and an IPAC/Caltech pre-doctoral fellowship for Mr. Aditya Togi.

We are also particularly thankful for two bequests that are now ready to be awarded. The first is the Helen Luedtke Brooks Professorship in Astronomy, which provides about \$40,000 annually from a bequest from the late Mrs. Brooks, past instructor and Director of the Planetarium and long-time friend and benefactor. The second is the Dorren Canaday Spitzer Fellowship, which provides about \$4,000 annually to a Ph.D. student in astronomy. This fellowship was provided by the late Mrs. Doreen Spitzer, the wife of the famous astrophysicist Lyman Spitzer, both of whom grew up in Toledo.

If you'd like to help us grow and improve, including adding to the planetarium projector upgrade, there is information elsewhere in this newsletter about how you can contribute. There are several funds established to support various efforts within the department. The department is 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 do drop us a line sometime and tell us what you're doing these days. If you happen to be in the area, do stop in and visit us.

Lawrence Anderson-Huang

NOTABLE STAFF NEWS

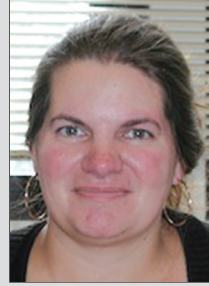


Lynda Obee

APPOINTED ADMINISTRATIVE ASSISTANT

The Department of Physics and Astronomy welcomes Lynda Obee, who joined the department as an Administrative Assistant in August 2013. Lynda began working at UT in December 1992 and has worked in various departments,

including Building Services, Payroll, Music, Theatre and Film, and the Catharine S. Eberly Center for Women prior to accepting her current position. In addition, Lynda received the "Outstanding Staff Award" from UT in April 2013. Lynda is a junior working toward a bachelor's degree in the College of Adult and Lifelong Learning. She reports that she has been married for 36 years and has two adult sons, twin grandsons, a dog and a cat. She also has volunteered at Western Avenue Ministries/Southside Community Center in the Olde South End of Toledo for the past 10 years and has held various positions with CWA 4319. In her spare time, she enjoys spending time with family, gardening and fishing with her husband.



Lindsay McLaughlin

APPOINTED BUSINESS SERVICES OFFICER

The Department of Physics and Astronomy welcomes Lindsay McLaughlin, who was also hired in August 2013 as the department's Business Manager. Lindsay reports that prior to joining the department, she worked at UT for the last two years

in the Department of Music, Theatre, and Film. Prior to that, Lindsay worked for 14 years for National Amusements, opening three new movie theaters and honing her skills at projector maintenance and theater budgets. Lindsay graduated with a Bachelor of Business Administration in Accounting degree from UT. In her free time, she likes to spend time with family and friends, manage her fantasy baseball team, attend concerts, and play trivia.

NOTABLE FACULTY NEWS

DR. JILLIAN BORNAK APPOINTED LECTURER IN PHYSICS AND ASTRONOMY

The Department of Physics and Astronomy welcomes Dr. Jillian Bornak, who was appointed in fall 2014 as a Lecturer in the Department of Physics and Astronomy. Dr. Bornak received her doctorate at New Mexico State University in Las Cruces, New Mexico, in 2012 after carrying out research on the viability of modeling the 3D dust distribution in nova shells using multi-wavelength photometry. Dr. Bornak reports that her involvement with



Dr. Jillian Bornak

teaching started much earlier during her undergraduate experience at Syracuse University, where she was a class assistant for general physics. Throughout graduate school, she taught astronomy laboratory courses and was also heavily involved in the astronomy department's public outreach. Upon graduating, she taught solar system astronomy at Dona Ana Community College in Las Cruces. Jillian reports that in her free time she distracts herself with photography, archery, and anything to do with birds. Welcome, Dr. Jillian Bornak!

UT-SALFORD EXCHANGE PROGRAM CELEBRATES 30TH ANNIVERSARY

(adapted from UT News, April 24, 2014)

The UT-Salford Exchange Program is an opportunity for students from UT and the University of Salford in Manchester, England, to spend a year studying abroad in advanced science curriculum. Students who apply and meet the criteria then get to study abroad while paying tuition to their home institutions. "This long-standing exchange program has enjoyed a rich history of student and faculty exchanges in the biological sciences and, to a lesser extent, students in chemistry and physics," said Dr. Patricia Komuniecki, UT Vice Provost for Graduate Affairs and Dean of the College of Graduate Studies, who directed the program for 20 years.

During the 2013-14 academic year, five Salford students in physics studied here at UT while eight biology/pre-med students and one biology student from UT studied at the University of Salford. "One of the things we pride ourselves on is the success of the students who have come through this program," said Dr. Brian Ashburner, Associate Dean of the College of Natural Sciences and Mathematics, UT Associate Professor of Biological Sciences and Director of the program.

PROFESSOR BO GAO RECEIVES GRANTS TO STUDY ATOMIC AND MOLECULAR PROCESSES



Professor Bo Gao

Professor Bo Gao, whose current research is focused on the theoretical analysis of atomic collisions and reactions, has received a three-year grant from the U.S. National Science Foundation (NSF) to study Quantum Theories of Fundamental Atomic and Molecular Processes. As part of this work, he will develop a set of quantum theories for a systematic understanding of fundamental atomic and molecular

processes over a wide range of temperatures, from zero kelvin, where everything behaves quantum mechanically, to room temperature, where certain aspects of the atomic and molecular motion have evolved into classical behavior, but with subtle quantum effects that may still play a crucial role in astronomy, chemistry, condensed matter, and biology. In addition to this award, Prof. Gao has also received an award from the Chinese National Science Foundation to study atomic interactions and collisions in cold-atom systems.

SEEING STARS: CELEBRATE ASTRONOMY DAY MAY 10

(adapted from UT News, May 8, 2014)



The University of Toledo's Ritter Planetarium held its third annual Astronomy Day May 10, celebrating by hosting an open house. "Astronomy Day is a fun and exciting way for us to thank the community for their ongoing support," said Alex Mak, UT Associate Planetarium Director. Members of the Toledo Astronomical Association also participated and answered questions about telescopes and solar observing.

Shows featured during Astronomy Day included:

- "One World One Sky, Big Bird's Adventure." An age-appropriate introduction to the night sky for children ages 3-6.
- "Tales of the Maya Skies." Featuring an immersion in Mayan astronomy, art and culture.
- "War of the Worlds." The 1938 broadcast by Orson Welles that panicked a nation was accompanied by images of the Red Planet.
- "The City Dark." An award-winning, full-length, feature film about light pollution and its impact not only on astronomers, but also on wildlife, culture and health.

PROFESSOR EMERITA NANCY MORRISON ELECTED A FELLOW OF THE AAAS



Professor Emerita Nancy Morrison

Professor Emerita Nancy Morrison, who served as Director of the Ritter Observatory as well as Director of the Ritter Planetarium and Brooks Observatory from 1980 until her retirement in 2010, was elected an AAAS Fellow in 2013 in the AAAS Division of Astronomy. AAAS Fellows are elected annually by the AAAS Council for meritorious efforts to advance science or its applications.

Fellows have made significant contributions in areas such as research, teaching, technology, services to professional societies, and the communication of science to the public.

PROFESSOR ROBERT COLLINS ELECTED A FELLOW OF THE AMERICAN PHYSICAL SOCIETY

Professor Robert Collins, whose research is in the areas of photovoltaics and ellipsometry, has been elected a 2013 Fellow of the American Physical Society in the Division of Industrial and Applied Physics for his contributions in “advancing the understanding of the optical properties and structures of thin film materials and devices, as well as for his innovations in real-time spectroscopic ellipsometry, and leadership of research collaborations of industrial, government, and university laboratories.” Professor Collins joins five other faculty, Prof. Steven Federman, Prof. Bo Gao, Prof. Yanfa Yan, Emeritus Prof. Curtis, and Emeritus Prof. James, who are also Fellows of the American Physical Society.

PROFESSOR LLOYD KNOX PRESENTS MCMASTER COSMOLOGY LECTURE



Professor Lloyd Knox

Dr. Lloyd Knox, Professor of Physics at the University of California, Davis, presented the 2014 McMaster Cosmology Lecture titled “Confirmed Truths and Remaining Mysteries Regarding the Origin of the Universe” Feb. 27, 2014, in the Driscoll Alumni Center Auditorium. During his talk, Professor Knox traced the history of the “big bang” picture of our origins, clarifying its observational successes

and highlighting the remaining questions that drive us toward deeper exploration.

PROFESSOR STEVEN FEDERMAN ELECTED FIRST CHAIR OF LAD

Professor Steven Federman was elected to a two-year appointment as the first Chair of the newly formed Laboratory Astrophysics Division (LAD) of the American Astronomical Society (AAS). The object of this newly-formed AAS Division is to advance our understanding of the universe through the promotion of fundamental theoretical and experimental research into the underlying processes that drive the cosmos. Prof. Federman also reports that his appointment as Scientific Editor of *The Astrophysical Journal* has been renewed for another three years.

PROFESSOR JACQUES AMAR RECEIVES NSF GRANT



Professor Jacques Amar

Professor Jacques G. Amar, whose current research is focused on the use of computational methods to obtain a fundamental understanding of non-equilibrium processes, has received a three-year grant award from the U.S. National Science Foundation (NSF) for his project, “Simulating Non-equilibrium Processes over Extended Time- and Length-Scales using Parallel Accelerated Dynamics.” As part of

this work, he will develop methods to extend the time and length-scales of simulations of non-equilibrium processes. These methods will then be used to study a variety of technologically relevant processes, including the growth of semiconductor thin-films used in solar cells, polycrystalline thin-film growth, island nucleation in metal on semiconductor growth, and defect formation and healing of damage in boron nitride nanostructures arising from exposure to electron radiation.

PROFESSOR VICTOR KARPOV'S RESEARCH HIGHLIGHTED IN PHYSICAL REVIEW APPLIED AND SCIENCE SHOT

(May 2014)



Professor Victor Karpov

It has been known for more than 60 years that fine metal whiskers can spontaneously form at the surface of a stressed metal, and that these whiskers can cause current leakage or short circuits in computer servers, satellites, and electronic storage devices, thus raising significant reliability issues. In addition, metal whiskers, such as the tin whiskers pictured below, have incapacitated four satellites and short-circuited more than \$10 billion in electronics since their discovery in the 1940s, yet until now the mechanism behind whisker formation remained a mystery.

In a recently highlighted article in the American Physical Society journal *Physical Review Applied*, Prof. Karpov



Tin Whiskers

presented the results of an electrostatic theory in which the existence of metal whiskers is attributed to the energy gain due to electrostatic polarization of metal filaments in the electric field. According to Prof. Karpov, imperfections on metal surfaces can form

small patches of net positive or negative electric charge. The similar charges repel one another, producing an outward stress. As a result, where the material is weak enough, metal whiskers can grow up to one centimeter per year. Prof. Karpov also suggests that treating metal surfaces with electrolytes, which

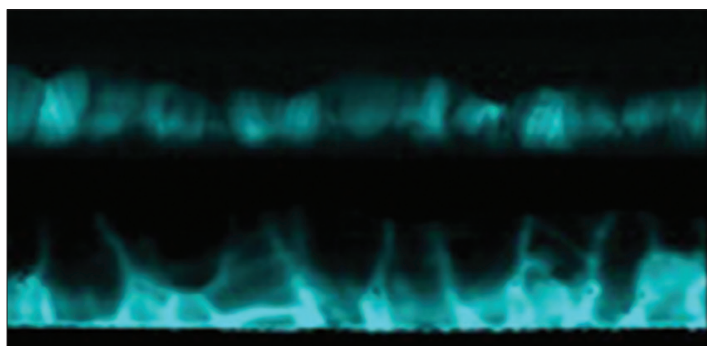
contain free-moving charges, could neutralize these electrically charged patches, thwarting the growth of any wicked whiskers. This work has also been highlighted in the online Science magazine website "Science Shot."

WORK BY PROFESSOR YANFA YAN AND COLLABORATORS HIGHLIGHTED BY PHYSICS FOCUS

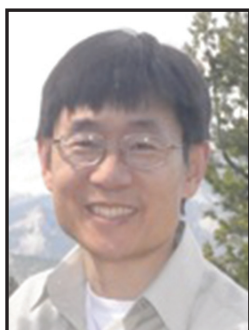
Recent work by Professor Yanfa Yan and collaborators on grain-boundary-enhanced carrier collection in cadmium telluride (CdTe) thin-film solar cells has been published in *Physical Review Letters* and also highlighted in *Physics Focus* and *Science Daily*. Through

a combination of atomic-resolution electron microscopy and density-functional theory, the authors studied the atomic and electronic properties of grain boundaries and showed that they play an unexpected role. During treatment with cadmium chloride (CdCl₂), Cl takes the place of a large fraction of Te atoms at the grain boundaries. This turns the boundaries into local p-n junctions, which

separate photogenerated electrons from holes, protecting them from unwanted recombination. The results explain the benefits of the passivation treatment and may suggest new fabrication strategies for further efficiency improvements.



Cross-sectional electron beam density maps show difference in cadmium telluride solar cells before (pictured above) and after (below) cadmium chloride treatment. The increased brightness after treatment indicates higher current collection at the grain boundaries.



Professor Yanfa Yan

NEWS FROM RITTER PLANETARIUM-BROOKS OBSERVATORY



Scene from "Santa's Secret Star," which premiered at Ritter Planetarium in late 2014

Ritter Planetarium had another productive year in 2013. Attendance increased for the third year in a row, while the repertoire of full-dome shows was also expanded, and the planetarium continued to increase its interactions with the UT community. The planetarium underwent a major renovation in the summer of 2011, centered around the installation of a fully digital projection system. Ever since, attendance has been steadily rising, and 2013 continued this trend with an increase in attendance of 20 percent over 2012.

Five new full-dome programs, "Stars: The Powerhouses of the Universe," "The Birth of the Solar System," "Earthquake: Evidence of a Restless Planet," "Firefall" and "Back to the Moon for Good" were also acquired. These new programs expand and enrich the subject matter that can be presented in the planetarium and have been very popular with both the public and school children.

The most exciting development at Ritter Planetarium in 2013 was the creation of The University of Toledo Full-dome

Studio (UTFS). The goal of the UTFS is to create quality full-dome programs at a significantly lower price by tapping the tremendous talents of the students and faculty at UT. To that end, Morgan Hayward, a UT graduate who earned a Bachelor of Fine Arts with a concentration in New Media degree in 2013, was hired. In a remarkably short amount of time, Morgan has become an expert in creating the digital imagery required for these programs. She has begun converting an old, slide-based program called "Santa's Secret Star" into a fully digital program that premiered during the holiday season of 2014. She has also been working with Professor J.D. Smith as part of his Cottrell Scholar research to produce a short full-dome program to exploit the 3D power of the planetarium to explain the Hertzsprung-Russell diagram, one of the fundamental diagrams used to describe stars. Ritter representatives are optimistic that the UTFS will produce multiple high-quality programs each year.

R1 BUILDING SOLAR ARRAY BOOSTED

The solar array in front of the R1 building has been boosted in power, generating capacity from 12.5 kW to 31 kW with the addition of 216 new panels donated by First Solar, Inc. The new panels, representing some of the latest technology from First Solar, work perfectly alongside its early technology. The Physics and Astronomy Department and the Wright Center for Photovoltaics Innovation and Commercialization would like to thank First Solar and Mike Koralewski for the donated panels.



MEDICAL PHYSICS NEWS

Since the beginning of 2013, many new events have affected the Division of Medical Physics faculty, staff, and students.

- The Medical Physics program continues to provide academic excellence to students in its Master of Science in Biomedical Sciences (MSBS) and Ph.D. programs. This year, four MSBS candidates and two Ph.D.s graduated from the program. Many of the success stories about our graduates can be found on our web page at: <http://www.utoledo.edu/med/depts/radther>
- In April, Dr. Michael Dennis, Medical Physics faculty member known to many, went on an unexpected medical leave, which led to his early and premature retirement. The UTMC Department of Radiology immediately started the

recruitment process and Dr. Kerry Krugh was hired as an Assistant Professor to replace Dr. Dennis in August. Dr. Krugh has more than 12 years of diagnostic imaging medical physics experience, and is board certified by the American Board of Radiology.

- It took nearly two years of planning and construction to convert the Dana Conference Center on the Health Science Campus to a new, state-of-the-art building that was named the Eleanor N. Dana Cancer Center. This center has all cancer related sub-specialties under one roof, including: radiation oncology, medical oncology, surgical oncology, fusion center, and mini-radiology. All equipment is new and the latest technology. The Department of Radiation Oncology has been the centerpiece of this upgrade and received most of the space and equipment. This includes a Varian True Beam Linear Accelerator with Cone Beam CT capability, a large bore PET/CT unit with radiotherapy simulation package, and an upgraded High Dose Rate Brachytherapy unit. The sum of these advanced technologies brought the Department of Radiation up to date with capabilities, such as Image Guided Radiation Therapy, Gating (to treat tumors of the lung), and Volumetric Modulated Arc Therapy (VMAT), also known as Rapid ARC. This particular feature entails rapid execution of a sequence of control points, each defining multileaf collimator (MLC) shape, MLC segment dose, and a gantry-angle window across which each shape sweeps dynamically while the beam of radiation is on and the patient being treated. The simple outcome of VMAT treatment is that it can deliver highly conformal dose distributions similar to those created by other forms of intensity-modulated radiation therapy (IMRT) units, including the multiple-static field MLC technique, the dynamic MLC (DMLC) technique, static and helical tomotherapy, the CyberKnife, scanned-beam therapy. This, added to the capability of flattening filter free (FFF) beams with very high dose rate, results in highly conformal and fast delivery of radiation highly localized to delineated target volume, while minimizing the damage to surrounding and normal tissues.
- This year, UT agreed to expand the Department of Radiation Oncology by adding a second vault and fill that with sophisticated technology from Varian Medical System known as the "Edge" linear accelerator. The University of Toledo Medical Campus is the 4th site in the world to receive this technology, which contains a specialized unit for treatments of small tumors of the brain, or extracranial lesions, using a modality known as Stereotactic Radiosurgery (SRS) for cranial tumors, or Stereotactic Body Radiotherapy (SBRT) for extra-cranial lesions. This unit has all the features of the True Beam and more. It offers three photon beams, an optical imaging system for initial setup and real-time monitoring of patient motion; planar x-ray (MV-based) imaging at any time during treatment; cone-beam CT; and a six-degree of freedom couch for auto control from outside the treatment room.

*E. Ishmael Parsai, Ph.D., FACRO, FAAPM
Professor and Director of the Medical Physics Program*

RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)



REU 2013 students, mentors and other research students

REU SUMMER 2013 PARTICIPANTS

NAME	INSTITUTION	MENTOR	RESEARCH
Timothy Anderson (Minnesota State Mankato)	Itasca Community College	T. Kvale/R. Irving	Plasma Physics
Anna Barnes	The University of Toledo	Nikolas Podraza	Plasma Physics
Abril Galang	The University of Toledo	Michael Heben	Condensed Matter
Jennifer Jin	Mary Baldwin College	Jacques Amar	Mathematical Physics
Luke Kwiatkowski	The University of Toledo	Mao-Pei Tsui	Mathematical Physics
Kody Kamunen (Minnesota State Mankato)	Itasca Community College	Jon Bjorkman	Astronomy
Kevin Kelbach	The University of Toledo	A. Compaan/R. Irving	Plasma Physics
Elise Mesenbring	Gustavus Adolphus College	Nikolas Podraza	Plasma Physics
Brandon Schurter	Berea College	T. Kvale/R. Irving	Plasma Physics
Demi St. John	Murray State University	Adolf Witt	Astronomy
Nathan Ross	Albion College	D. Ellis/R. Irving	Atomic Physics
Rebekah Thomas	Bowling Green State Univ.	Victor Karpov	Condensed Matter
Andrew Yandow	Harvey Mudd College	Yanfa Yan	Condensed Matter

The Summer 2013 NSF-REU program in Physics and Astronomy gave enhanced research opportunities to 12 undergraduate students from nine colleges and universities in six states. Student participants were chosen competitively from 146 applications submitted by students in 32 states and Puerto Rico. Six of the 12 REU students participated in our program from community colleges and/or small liberal arts colleges.

We are pleased to report that our students had three refereed publications and two conference presentations this year. In addition, several other manuscripts from the 2013 REU program are in preparation and will be submitted to refereed journals and/or presented at conferences.

The REU program of 2013 was the first year of collaborating with national facilities to give the students a “blended” research experience in a national research facility.

This year, two students conducted research in high temperature plasma physics at UT and through our collaboration with the Nevada Terawatt Facility (NTF). While at UT, they prepared for their research by electronic communications with the senior research team leader at NTF prior to their travel to Reno, Nev., to participate in the actual experiments. After travelling back to Toledo, they stayed in continual contact with the NTF research team to finish analyzing the data taken at NTF. The NTF team even participated in the students’ final presentations via Skype.

As part of our NSF program, the REU students helped host a Physics and Astronomy outreach program. This year, we decided on a workshop format for the event. The outreach activity aimed to teach aspects of physical computing by utilizing a Raspberry Pi, a cheap credit card-sized computer, while highlighting the science involved. As in previous years, Jackie Kane (a high school teacher at St. Ursula), was

instrumental in helping bring the event to fruition. Twelve of her science students participated in the workshop, which took place July 20. One particular goal of the workshop after setting up a Raspberry Pi and circuitry was to measure the lab room's temperature. The group was exposed to many concepts, including the use of Python programming to interface with the temperature sensor, electronics, and the physics associated with the temperature sensor. Naturally, the students were offered refreshments throughout the event, including raspberry juice, raspberries, raspberry cream cheese on bagels, and last but not least, raspberry pie!



REU STUDENT DREW POLASKY STUDIES SOLAR POWER FORECASTING

Drew Polasky, an REU student from Carleton College in Northfield, Minn., spent the summer of 2014 primarily working with graduate student Neale Haugen and UT professor Randy Ellingson on the study of localized surface plasmon resonances in iron pyrite. He also holds a keen interest in the science of forecasting solar power from photovoltaic arrays based on weather forecast data provided by the National Weather Service. As solar power increases its share of the electricity market, it is increasingly important to know how much power will be available at a given time. To this end, Drew worked with Prof. Ellingson and Dr. Dan Adriansen at the National Center for Atmospheric Research (NCAR) in Colorado to develop numerical models to calculate solar position, clear sky irradiance, and cloudy-sky irradiance, using data from the National Digital Forecast Database (NDFD). The empirical and semi-empirical models developed show very good correlation with ground-based measurements on clear days, and moderately good correlation on cloudy days. Drew will end his summer research with a one-week mini-internship at NCAR before completing his senior year in Minnesota. Drew hopes to attend graduate school in atmospheric science to continue his forecasting research, and Prof. Ellingson continues to develop photovoltaic system monitoring capabilities for solar power forecasting research.



Drew Polasky giving his summer 2014 REU presentation.

GRADUATE AND UNDERGRADUATE AWARDS CEREMONY

The Department of Physics and Astronomy's Thirteenth Annual Recognition Ceremony and Sigma Pi Sigma induction were both held on April 23, 2014. The following awards were presented:

UNDERGRADUATE AWARDS

Physics & Astronomy Outstanding Graduating Undergraduate Student: Emily Safron

Elgin C. Brooks Memorial Astronomy Scholarship: Nathan J. Lewis

A. Jackson and Sally K. Smith Scholarship: Anna Barnes

Chad Tabory Memorial Award for Outstanding Undergraduate Research in Physics and Astronomy:
First Place: David Kinder
Second Place: Tyler Kinner

Robert and Noreen Stollberg Award: Adam Smercina

Edwin Jayamaha Scholarship Award: Brooke Paquin

C.V. Wolfe Scholarship in the Natural Sciences: Kristin Jackson

GRADUATE AWARDS

David Turnbull Scholarship in Materials Science: Tingting Shi

Robert and Noreen Stollberg Graduate Award for Teaching Achievement: Negar Heidarian Boroujeni

Robert and Noreen Stollberg Graduate Award for Leadership & Service to the Department: Kevin Hardegree-Ullman

Recognition of Society of Physics Students (SPS) Officers
President: Emily Safron
Faculty Advisor: Dr. Richard Irving

The 2014 Sigma Pi Sigma Inductees (Professor Scott Lee, faculty advisor) were:

Jillian Bornak	Kevin Kelbach
Nicholas Franzer	Robert Maltby
Kevin Hardegree-Ullman	Brooke Paquin
Nicole Karnath	

ALISON CROCKER

University of Toledo post-doctoral researcher and astrophysicist Alison Crocker competed in the World Orienteering Championships in Vuokatti, Finland, in July 2013. In Finland, Crocker was the only American, man or woman, to get through the qualifying rounds and make the finals in any race in a sport that has been dominated by the Scandinavians, Swiss and Russians. In the women's sprint event, which covered urban terrain in a Finnish village, she placed 25th. In the middle distance race, which was more technical and carried more challenging navigation, Crocker was 29th — the best ever finish by an American at that race distance. In the long race, which covered about 14 kilometers, Crocker placed 18th — again recording the best American finish in the history of the event.

RISE PROGRAM

High-school student Lily Yan, who participated in the Department's RISE program with graduate student Zhaoning Song, Research Professor Adam Phillips, and Professor Heben during summer 2013, placed first of all high school poster presenters at the Ohio Junior Science and Humanities Symposium. Ms. Yan also presented the research she conducted over the summer for RISE at district science day, and qualified for state science day in addition to winning two monetary awards. The RISE program was begun by Adam Phillips in 2010 to provide Research Experiences in Science and Engineering (RISE) to aspiring high school students. Since its inception, the RISE program has hosted 14 students from Woodward, Sylvania Southview, Maumee Valley Country Day and Ottawa Hills high schools. Students have been provided with stipends from PVIC and ORSP endowments, and the program has been integrated with an NSF Sustainable Energy Pathways award led by Professor Yan.

MICHAEL HEBEN

Professor Michael Heben received a grant entitled "Evaluation of Manufacturing Viability of Scratch and UV Resistant Coatings for Automotive Body Parts" from Radco Infusion Technologies/Ford Motor Company. The award is to develop scratch-resistant coatings for automobile body parts using UT's expertise in the production and characterization of thin-film materials. The effort is a collaboration between Prof. Heben and Professor Podraza.

TOM MEGEATH

Professor S. Thomas Megeath received a NASA grant entitled "Observing the Formation of Disks: ALMA and HST Observations of Edge-On Protostars" from the Origin of the Solar System program.

J.D. SMITH

Professor J.D. Smith received a Humboldt Fellowship for Experienced Researchers from the German Alexander von Humboldt Foundation for his project entitled "The Role of Gas and Dust in Galaxy Evolution."

YANFA YAN

Professor Yanfa Yan received a DOE grant through subcontract from NREL in December 2013. The project is "Density Functional Theory for FPAGE II Project Approaching the Shockley-Queisser Limit with Epitaxial CdTe."

JIAN LI

Jian Li, Research Assistant Professor in the Photovoltaics Innovation and Commercialization Center (PVIC), received two awards as Principal Investigator for his research on copper indium gallium diselenide (CIGS) materials and solar cells covering one and a half years of research activity. The first grant from the Department of Energy's Alliance for Sustainable Energy, entitled "In Situ Spectroscopic Ellipsometry for Monitoring and Control of Copper Indium Gallium Diselenide Deposition," supported the development of optical techniques for the control of alloy composition and stoichiometry in the fabrication of CIGS by the challenging three-stage process that yields efficient solar cells. He also received a continuation grant from the DoE's Photovoltaics Manufacturing Consortium entitled "CIGS Materials and Device Analysis," enabling him to transfer his capabilities to industry members of the consortium.

GRADUATE STUDENT NEWS

Ph.D. student Michelle Deady won the best poster award at the Midwest Graduate Research Symposium for her poster entitled "*Numerical simulations of microturbulence in hot stellar atmospheres.*" She also received the Association for Women in Science 2nd prize award.

Ph.D. student Tingting Lee won the best poster award at the 39th IEEE Photovoltaic Specialist Conference for her poster entitled "*Density-functional theory study of Al and O related defects in Si.*"

Ph.D. student Ming Li's doctoral work, a paper entitled "*Multichannel quantum-defect theory for ion-atom interactions,*" has been selected as an Editor's Suggestion by Physical Review A.

Ph.D. student Paul Roland received a Best Student Presentation nomination at the 40th IEEE Photovoltaic Specialists Conference for his oral presentation entitled "*Photoluminescence Spectroscopy of Cadmium Telluride Deep Defects.*"

Ph.D. student Sean Tanny's paper, presented at the Ohio River Valley chapter spring meeting of the AAPM (American Association of Physicists in Medicine) entitled "*Compton Currents and Polarity Effects in Large Electron Radiation Fields*" was awarded 2nd place (tied with Gregory Warrell) by a panel of judges.

Ph.D. student Aditya Togi was awarded an IPAC/Caltech pre-doctoral fellowship, spending six months in Pasadena studying molecular gas in galaxies under the supervision of Dr. Lee Armus.

Ph.D. student Gregory Warrell's paper, presented at the Ohio River Valley chapter spring meeting of the AAPM (American Association of Physicists in Medicine) entitled "*Retrospective Evaluation of Thermal Coverage by Thermobrachytherapy Seed Arrangements of Clinical LDR Prostate Implants*" was awarded 2nd place (tied with Sean Tanny) by a panel of judges.

ALUMNI NEWS

JOSHUA THOMAS (Ph.D. 2012) has been named an Assistant Professor of Physics at Clarkson University.

BRUCE CANTOR (Ph.D. 2000), who received his Ph.D. studying Mars weather at The University of Toledo and is now a Senior Scientist at Malin Space Science Systems, has discovered a new crater on Mars less than one day after impact.

STEPHEN ARNOLD (B.S. 1964), who is a University Professor of Physics & Chemistry at New York University and is also currently the director of the Microparticle Photophysics Laboratory, has recently developed a new type of "whispering gallery mode" biosensor that can detect even the smallest known RNA virus.

CONGRATULATIONS!

The following graduate students successfully defended their Ph.D. dissertations or received M.S. degrees in late 2013 or early 2014:

Dr. Puruswottam Aryal, Ph.D.

Dr. Rajendra Raj Khanal, Ph.D.

Dr. Adam Lark, Ph.D.

Dr. Ming Lee, Ph.D.

Dr. Hasitha Mahabaduge, Ph.D.

Dr. Constantinos Makrides, Ph.D.

Dr. Nava Paudel, Ph.D.

Dr. Jason Roehl, Ph.D.

Dr. Nicholas Sperling, Ph.D.

Daniel Bergman, M.S. (Professional Science Master's in Photovoltaics)

Jonathan DeWitt, M.S. (Professional Science Master's in Photovoltaics)

Tejas Prebhakar, M.S.

Ligang Ye, M.S. (Professional Science Master's in Photovoltaics)

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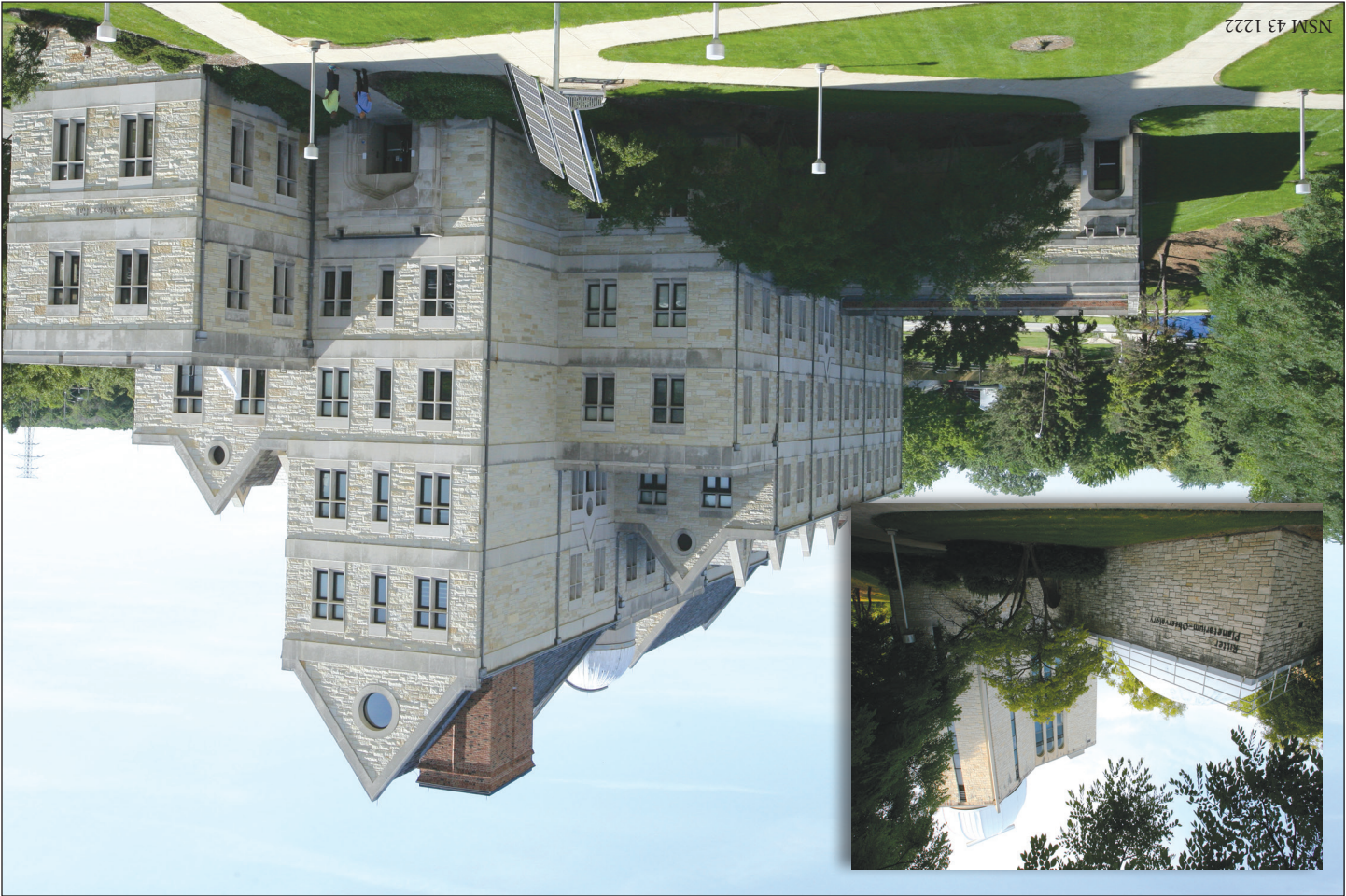
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