ΦYAST ΦLYER

The Homer L. Dodge Department of Physics and Astronomy

Kuver Sinha and Doerte Blume join faculty

Kuver Sinha

Two new faculty members will join the Homer L. Dodge Department of Physics and Astronomy in the fall. Kuver Sinha is the new assistant professor of the high energy physics group. Doerte Blume will join the atomic and molecular physics group as a professor of physics.

Sinha received his doctorate in 2008 from Rutgers, the State University of New Jersey, where he worked with Emanuel Diaconescu at the interface of algebraic geometry and string theory. His first postdoctoral stint was in the string theory group of Katrin and Melanie Becker at Texas A&M University, where he worked on formal aspects of supersymmetric gauge theories. It was during this time that the Large Hadron Collider and various dark matter experiments started switching on, and he retrained himself as a particle phenomenologist. He first worked on string-inspired phenomenology and cosmology and then dark

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Doerte Blume

Blume will be moving from Washington State University, where she has been a faculty member since 2001. Blume received her undergraduate and graduate degrees from the Georg-August University in Goettingen, Germany. Her thesis work on Monte Carlo simulations of molecules embedded in liquid helium clusters was jointly supervised by professor Peter Toennies from the Max-Planck Institute for Flow Research in Goettingen, Germany, and professor K. Birgitta Whaley from the University of California, Berkeley. As a postdoctoral fellow at JILA with professor Chris Greene, Blume worked on the microscopic characterization of pure rare gas clusters and small dilute Bose gases.

Blume's research program falls into the areas of theoretical atomic and molecular physics, and few-body physics. Central research questions in her work include the characterization of quantum mechanical correlations at

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Lin Hall construction is started

Foundation of Lin Hall. Construction will be concluded by the summer of 2018.

The construction of the department's new laboratory building, Lin Hall, has begun. The construction company Flintco started the demolition of the former Gittinger Hall in November of 2016. The building will be located adjacent to Nielsen Hall on the former site of Gittinger Hall. Together, the two buildings will form the new Homer L. Dodge physics complex. The new building will house much-needed state-of-the-art laboratories for onsite physics and offices for students and faculty. The laboratories were designed by Miles and Associates of Oklahoma City and HDR of Omaha, Nebraska. HDR has built ground-breaking laboratory buildings such as the Advanced Measurement Laboratory at NIST and the Physical Sciences building at Maryland.

This new state-of-the-art laboratory building will arguably be one of the best environmentally controlled research spaces in the nation. The laboratories will have advanced temperature control, vibration and acoustic isolation, and

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From the Chair

Greg Parker

After eight years as chair of the Homer L. Dodge Department of Physics and Astronomy, I am stepping down as chair, effective Aug. 16, and will retire Dec. 31. During the past eight years, the department has made significant progress. At the beginning of my tenure as chair, we established a powerful and influential Board of Visitors, currently with six members: Chun C. Lin (chair of the Board), Neal A. Lane, G. Ward Paxton, A.T. Stair, and two new members, Robert Slocum, and Ben Clark.

We have increased the quality and number of our graduate students. Before 2009, we had about 60 graduate students in our program. That number increased to nearly 90. Since physics and astronomy are labor-intensive subjects we need about four graduate students per faculty or roughly 120 graduate students. Research and education go hand-in-hand in a complex field such as physics.

Outstanding students are a signature of excellence for any physics program. Despite the many new technologies now available for education, astronomers and physicists still learn their profession by studying closely with someone who mentors them as they strive to find answers to challenging questions that reveal nature's inner workings. The results of this approach have led to great advances in both applied and basic research over a long period of time. Producing outstanding students can only be accomplished with facilities that will give them the opportunity to work at the boundaries of our knowledge, where they can explore the unknown.

In the past eight years, our Alumni and Friends of the Homer L. Dodge Department of Physics and Astronomy has donated over $2,863,619, or an average of about $357,952 a year. Thanks to all of you for making the Homer L. Dodge Department of Physics and Astronomy what it is today! In addition, two really transformative gifts from the Avenir Foundation and Chun C. Lin totaling $27,000,000 (or a total of $29,863,619 in eight years) have made it possible to construct a new state-of-the-art research laboratory that is currently being built adjacent to Nielsen Hall to enrich our research efforts and further our aim to provide students with a state-of-the-art education. The laboratory will make it possible for our researchers to work on the frontiers of physics and open exciting, new fields of investigation. The synthesis of research and education that will take place in the facility will increase the standing of the Homer L. Dodge Department of Physics and Astronomy world-wide. The new laboratory will serve to provide economic, intellectual and cultural opportunities in Oklahoma and beyond for many years to come when coupled with our broad vision for promoting the role of physics in other disciplines and society as a whole.

During my tenure as chair, we have hired 14 faculty: John Tobin, John Wisniewski, Doerte Blume, Arne Schwettmann, Ian Sellers, John Stupak, Alberto Marino, Ferah Munshi, Barbara Capogrosso-Sansone, Sinha Kuver, Nate Kaib, Xinyu Dai, Bruno Uchoa, and Mukremin Kilic. In addition, we hired several staff: Cynthia Pack, Deborah Schoenberger, Amanda Tabor, Joyce Hulin, Chad Cunningham, and John Snellings. These new hires are contributing significantly to the success of the department. Four of these faculty received tenure and promotion this year. Two faculty are being considered for tenure and promotion next year. Although the University of Oklahoma has had to deal with significant budget cuts due to the financial crises in Oklahoma, OU recognized our excellence and our faculty received a significant salary increase this year.

The department has three endowed chair positions: Howard Baer is the Homer L. Dodge Chair in High Energy, James P. Shaffer is the Homer L. Dodge Chair in Atomic, Molecular and Optical Physics, and Tobin is the Homer L. Dodge Chair in Astronomy and Astrophysics. Blume, Munshi and Sinha have accepted our faculty job offers. Doerte and Kuver will join our faculty this fall. We are searching for one additional faculty member in physics education. We are also requesting for two additional searches this year: one condensed matter experimentalist and one atomic, molecular and optical theorist.

The department continues to benefit from an REU (Research Experience for Undergraduates) grant by the National Science Foundation, which was recently renewed. Undergraduates, chosen competitively from a national solicitation, are supported for a 10-week period during the summer. This program clearly enhances our undergraduate programs and also is contributing a source of excellent graduate students. We have recently established an undergraduate recruiting committee.

Our newly elected chair, Phillip Gutierrez, will do a great job. Gutierrez has a lot of experience working in large collaborations. I have full confidence in his ability to lead our department to new exciting endeavors in the future.

Board of Visitors Adds Two New Members

Benton Clark

Two new members, Benton Clark and Bob Slocum, recently joined the department Board of Visitors.

Benton C. Clark, the chief scientist for Flight Systems at Lockheed Martin Astronautics, earned his doctorate in biophysics from Columbia University in 1968. He chairs the External Advisory Committee for the NASA Center for Research and Training in Exobiology at the University of California, San Diego, and Salk Institute. Among many accomplishments, he has been honored with the NASA Public Service Medal, Wright Brothers Award and Air Force Service Medal, and he has been selected Inventor of the Year for Martin Marietta Corp. and Author of the Year for Martin Marietta Astronautics.

Robert E. Slocum is chairman of Polatomic Inc. and founder of Slocum Geophysics and Integrated Photonics. Slocum founded Polatomic Inc. in 1982 and serves the company as chairman and chief technical officer. He also is founder of Integrated Photonics, the world's largest manufacturer of synthetic garnet used in optical isolators for the Optical Internet, and founder and CEO of Slocum Geophysics, a geophysical exploration company that applies Navy sub-hunting technology to oil exploration. Slocum was born in Oklahoma City and grew up in El Reno. He received his bachelor of science degree in 1960 and master's degree in 1963, both in engineering physics, from the University of Oklahoma. He received his doctoral degree in atomic physics from the University of Texas at Austin in 1969. He is the inventor of the diode laser pump source for helium magnetometers, the nuclear-free precession helium-3 magnetometer and the Planar Thin-Film Polarizer, and has published numerous papers on ultra-high-performance optical magnetometers for space, Navy and geophysical applications, as well as strategic planning for small businesses.

Robert Slocum

2017 Alumni Reunion

The Department of Physics and Astronomy's Retirement Banquet and Alumni Reunion, held on May 6, featured an alumni gathering at Nielsen Hall, where alumni met with the faculty and visited the laboratories. The architects of the firm Miles and Associates of Oklahoma City presented the plans for the construction of the new laboratory building, Lin Hall. After the gathering, the alumni and faculty met at the OU Sam Noble Museum, where the retirement banquet was held.

The reunion honored some of the faculty who have contributed to the department over many years. Honorees included professors emeriti Dick Henry, Ron Kantowski, Kim Milton, John Moore-Furneaux and Deborah Watson, and current department chair Greg Parker. The reunion also honored retired staff Andy Feldt, Bill See, Adrianne Wade and Joel Young. The banquet had the participation of the spirit of J. Rudd Nielsen (present thanks to emeritus faculty Stu Ryan) and Kieran Mullen, who helped present the ceremony. Thanks to all the faculty, students and alumni that made this reunion a great event!

In Oct. 27 and 28, the Board of Visitor's meeting and luncheon with board members Chun Lin, Neal Lane, Ben Clark, Robert Slocum, Ward Paxton and A. T. Stair will include an update, presentation and tour of Lin Hall.

(left) Kieran Mullen and the spirit of J. Rudd Nielsen (emeritus faculty Stu Ryan), presenting the ceremony. (center) Board of Visitor Neal Lane. (right) Now emeritus faculty Kim Milton.

OU alumnus launches hurricane measurements partnership

A. T. Stair

OU alumnus and Board of Visitor member A. T. Stair recently launched a partnership between Tropical Weather Analytics Inc. and the Applied Physics Laboratory of Johns Hopkins University. Stair is a founder and CEO of TWAI and has been the chief scientist of many space programs. Along with Paul Joss, founder/CTO of TWAI and professor emeritus of physics at the Massachusetts institute of Technology, the TWAI team will use space-based data acquisition technologies and analytic tools to develop the world's most accurate measurements and forecasts of tropical cyclones to date. This technology will have enormous impact on reduction of loss of life and property caused by hurricanes.

The Johns Hopkins's team has been a prime contractor on several upper-atmospheric and space programs at NASA, including numerous missions using low-cost micro satellites. Once fully operational, TWAI will provide proprietary data, including 3D, wide field, high-resolution cloud maps and thermal maps with more than 50 meter resolution and three degrees Celcius temperature accuracy. For more info: http://www.businesswire.com/news/home/20161013005040/en/Tropical-Weather-Analytics-Launched-Provide-Accurate-Hurricane

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Kuver Sinha: Continued from pg. 1

matter and collider physics. Along the way, he was a member of the particle physics groups of Bhaskar Dutta at Texas A&M and Pearl Sandick at Utah, as well as the cosmology group of Scott Watson at Syracuse. Sinha's current research is multi-disciplinary, and he enjoys talking to astrophysicists, particle experimentalists, and formal theorists. His goal in the long run is to gain a deeper understanding of our most overarching philosophies in particle physics - the fate of naturalness and Occam's Razor in gauge theories and cosmology.

Outside of physics, Sinha enjoys reading and watching movies. The last book he finished was a memoir by Doris Lessing. One of his favorite movies is Krzysztof Kieślowski's *The Double Life of Veronique*.

Doerte Blume: Continued from pg. 1

extremely low temperatures, and understanding the transition from "few" to "many" atoms. Her research efforts have been supported by the National Science Foundation, the Army Research Office and the American Chemical Society-Petroleum Research Fund. Blume is a Fellow of the American Physical Society and has been appointed to a three-year term (2016-2019) as remote associate editor of *Physical Review A*. She has served the larger scientific community through the organization of various international workshops and conferences, and she was recently elected to serve a three-year term on the executive committee of the Division of Atomic, Molecular, and Optical Physics of the APS. Blume is looking forward to getting to know the OU community and to building a strong AMO theory program at OU. In her spare time, she enjoys hiking, bicycling, skiing, cooking, listening to live music and reading.

What Is Where?

The ΦYAST ΦLYER is the official newsletter of the Homer L. Dodge Department of Physics and Astronomy, College of Arts and Sciences, University of Oklahoma, and is published each spring by OU Printing Services at a cost of $1.70/copy to the taxpayers of the State of Oklahoma. The newsletter staff includes Bruno Uchoa, Arne Schwettmann, John Tobin and John Stupak. The University of Oklahoma is an equal opportunity institution. www.ou.edu/eeo

Student Awards

The departmental award ceremony this year was expanded into an afternoon of events, starting with a departmental photo-shoot of the entire department, including the undergraduates, graduates and faculty. This was followed by the presentation of the undergraduate and graduate student awards. After the awards were presented, a buffet of snacks was offered to all who attended the ceremony. Refreshed by the food, the department held its first-ever "Departmental Quiz Bowl" for the entertainment of all. Three-person teams were fielded by graduate students, undergraduates and the faculty to answer questions on physics, OU trivia, departmental trivia, and general trivia. The undergraduate team of Eli Jergensen, Alex Mau and Morgan Turner were the winners of the 2017 edition of the contest. The faculty team trailed far behind the other two teams, but promises to do better next year after a crash-course in modern music!

Listed below are the names of those students who were presented with awards. Note that there are three general classes of undergraduate awards (general departmental awards, P&A awards and Engineering Physics awards). One of our undergraduates also was awarded a prestigious Goldwater Scholarship and another the Astronaut Fellowship. The graduate awards include the Kalbfleisch Award and Nielsen Prize.

Homer L. Dodge Departmental Awards

Dodge Outstanding Sophomore	Dodge Outstanding Junior	Fowler Prize
Nathaniel E. Lydick	Avraham A. Revah	Patrick J. Vallely

J. Clarence Karcher Award

Jonathan D. Kunjummen

Duane E. Roller Award

Collin J. Riggert

William Schriever Award

Hunter J. Melton

Outstanding Graduating Senior

Stephen D. Lacina, Anthony R. Burrow
Sean T. Bruton, Robert B. Anderson

Meritorious Scholarships

Samuel K. Bayliff, Nathaniel J. Beck, Finnian J. Bender, Ismael Beraza, Philip D. Bobek, Maxwell A. Bowman, Miranda Brugman, Sean T. Bruton, Caroline N. Buckles, Jeremiah J. Buenger, Anthony R. Burrow, Josiah B. Claypool, Krysta Colahan, Chad A. Cole, Phillip R. Collins, Courtney L. Crawford, Collin M. Dabbieri, Hannah J. Day, Jacob A. Dolezal, Alex M. Dorio, Jimmy D. Dutton, Aleksia N. Elmborg, Gary D. Ervin, Erik R. Flom, Chase S. Galbraith, Grayson C. Garmaker, Kendall E. Gehrke, Dustin R. Gier, Jacob T. Gill, Ryan S. Hazlett, Phillip P. Heitert, Braden M. James, Gavin E. Jergensen, Ethan D. Kahn, Willow E. Kirkpatrick, Alexander H. Konieczny, Jonathan D. Kunjummen, Stephen D. Lacina, Christopher Lenhart, Christopher A. Leonard, Adam N. Marrs, Angelo A. Marshall, George A. Mau, Joshua L. McDermett, Collin L. McLeod, Hunter J. Melton, Connor J. Moore, Michael C. Nipper, Lucas M. Orman, Cameron S. Parker, Matthew Peters, Thomas S. Pharis, Avraham A. Revah, Colin J. Riggert, Claire L. Riggs, Alison J. Roeth, Julia A. Rusert, Dayna C. Sloane, Visal So, Brian G. Stephenson, Lukas Stone, Collin A. Swander, Morgan B. Turner, Patrick J. Vallely, Cassidy M. Wagner, Joshua D. Watson, Ethan B. White, J. Alexander O. Yates, Conrad Young.

Engineering Physics

J. Clarence Karcher Award

Christopher Brown

Duane E. Roller Award

Drew G. Wild

William Schriever Award

Alec Gaddie

Meritorious Scholarship

Robert B. Anderson, Christopher Brown, John E. Brown, Jessica G. Chandler, Zachary T. Chesnut, Alexandra H. DiCarlo, Tyler J. Erickson, Virginia K. Felkner, Alec C. Gaddie, Bryan C. Gorman, Alexander G. Grove, Hannah L. Harrell, Russell B. Hobson, Jordan J. Horsell, Madison E. Jones, Nathanial E. Lydick, Antonio Martinez Escalante, Louisa A. Mcnaughton, Roger L. Montgomery Omar Robles, Jackson D. Sloan, Delano P. Usiukiewicz, Jacob T. Whitson, Drew G. Wild, Nicholas B. Wiley, Jacob A. Young, Israa G. Yusuf.

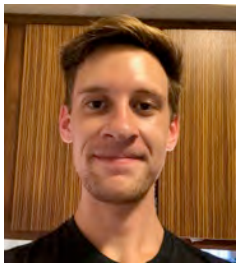
Alison Roeth Named Goldwater Scholar

University of Oklahoma honors student Alison Roeth has been named a 2017 Goldwater Scholar. The prestigious scholarship is awarded on the basis of potential and intent to pursue research careers in mathematics, the natural sciences or engineering. “We are extremely proud of Alison Roeth’s achievement in winning this very competitive national scholarship,” said OU President David L. Boren.

Roeth, a junior pursuing dual degrees in physics and Chinese, is from Charlotte, North Carolina. She is working with Ian Sellers, OU assistant professor of physics and astronomy, to research intermediate band solar cells. She has presented her work with Sellers at the American Physical Society March Meeting 2017. In addition, Roeth participates in ongoing projects with Kate Scholberg, professor of physics and Bass Fellow, Duke University, to research supernova neutrinos. Her work with Scholberg has produced two public presentations at the Deep Underground Neutrino Experiment collaboration meetings in September 2016 and January 2017, and the 2016 fall meeting of the Conference Experience for Undergraduates/ American Physical Society Division of Nuclear Physics. This past January, she joined researchers from the collaboration to continue work on her project at Fermilab. Her summer plans are to complete an intensive Chinese language immersion program in Taiwan. Upon graduation from OU, she plans to pursue a doctorate in physics and conduct research in experimental particle physics and teach at the university level.

The national scholarship competition is conducted by the Barry M. Goldwater Scholarship and Excellence in Education Program. This year, 1,286 college sophomores and juniors across the country competed for the 240 scholarships. 307 students received Honorable Mentions. The one- and two-year scholarships cover the cost of tuition, fees, books, and room and board up to a maximum of $7,500 per year. For more info: http://www.ou.edu/web/news_events/articles/news_2017/student-named-goldwater-scholar.html

Matthew Peters, Astronaut Scholar



Matthew Peters, a sixth-semester undergraduate studying physics and math, has been named a 2017 recipient of the Astronaut Scholarship Foundation's Astronaut Scholarship. The Foundation, a nonprofit organization, was created by the Mercury 7 astronauts in 1984 to aid the United States in retaining its world leadership in science and technology by providing scholarships to the very best and brightest college students pursuing these degrees. The Mercury astronauts have since been joined by more than 100 astronauts from the Gemini, Apollo, Skylab and Space Shuttle programs, making the foundation a true legacy of America’s space pioneers. Scholarship recipients are presented with their award at the foundation's Innovator's Gala in Washington, D.C. by an astronaut. In addition to receiving a scholarship worth up to

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Kalbfleisch Award to Rifki; Nielsen Prize to Hasib and Griffin; Kerr Receives Shafer-Ray Award


Othmane Rifki

The George Kalbfleisch Memorial Scholarship is awarded to deserving graduate students of strong character showing potential in the field of physics, with preference to students studying high energy physics. It is not restricted to a graduating student, and the preference for the field of high energy is only applied if candidates are otherwise equal. The Graduate Studies Committee voted to give the award and a $1,000 check to **Othmane Rifki**.

The Nielsen Prize is awarded to graduating doctoral students who have displayed excellence in research. It is intended to be given only to students who are exceptional among those who have been awarded doctoral degrees from the Department of Physics and Astronomy over the years. The award is intended for students who have completed their thesis and defense in that academic year, and there is no limitation on their number, nor a requirement to give out any award at all if the faculty so chooses. The award comes with a $1,000 check and a standing invitation to return in the future to give a departmental colloquium on a research topic of their choice. This year, faculty voted to award the Nielsen prize to two graduate students:


Ahmed Hasib


Rhi Griffin

Ahmed Hasib for "Measurement of the top quark pair production cross section with a tau lepton in the final state at $\sqrt{s} = 8$ TeV," under the supervision of Phil Gutierrez, and **Rhi Griffin** for "Galaxy clusters across the electromagnetic spectrum," with Xinyu Dai.


Alex Kerr

The Shafer-Ray award, which includes $2,000 check, was given to **Alex Kerr**. Kerr is working with Kieran Mullen in the subject of machine learning. Congratulations!

Ph.D.s, Master's Degrees Awarded

Since May, 2016, 17 students have successfully defended their dissertations. Those students who completed their Ph.D. degrees (and advisers) are: **Amhed Hasib** (Gutierrez), **Haoquan Fan** (Furneaux), **Hasan Baris Serce** (Baer), **Benjamin Pearson** (Strauss), and **Rhianon Griffin** (Dai) . Twelve students also defended their master's thesis: **Rishabh Jain** (Kao), **Steven Silverberg** (Wisniewski), **Jin Yang** (Shaffer), **Dylan Frizzell** (Gutierez), **Mohammadja Dowran** (Marino), **Akbar Jahangiri** (Shaffer), **Qimin Zhang** (Schwettman), **Deleram Nematollah** (Mullen), **Yuanxi Chao** (Shaffer), **Evan Rich** (Wisniewski) and **Alex Kerr** (Mullen). We congratulate these individuals and wish them well in their careers.

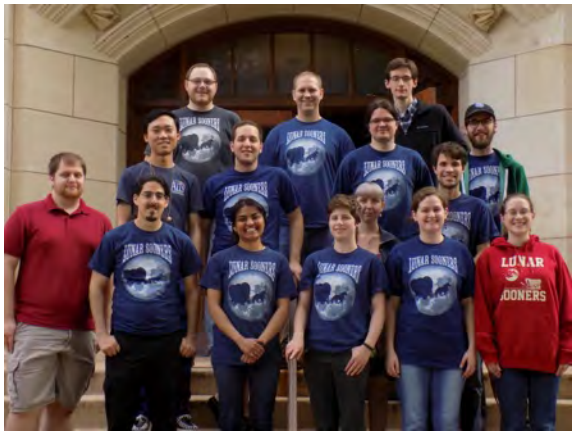
Summer Research for Undergraduates

The Research for Undergraduates (REU) program at OU will have 19 students from different universities as well as from OU. These students will help conduct research in the department for two months during the summer. This program is sponsored by NSF. The OU program is overseen by Brad Abbott and Mike Strauss.

The students, home institutions and OU mentors are: Christopher Cain (Azuza Pacific; Baron), Antonius Ghanin (Whitworth, Bumm), Nia Burrel, (Lafayette, Abraham), Jessica Johnson (Hastings, Stupak), Jeremy Norris (South Mississipi, Schwettemann), Jordan Van Nest (Trevecca, Kilic), Matthew Henry (East Central, Kao), Katherine Sheppard (Sarah Lawrence, Kaib), Sean Bruton (OU, Dai), Miranda Brugman (OU, Abbott), Ethan White (OU, Kaib), Hannah Harrel (OU, Sellers), Christoffer Leonard (OU, Shaffer), Lisa Patel (OU, Tobin), Collin Dabbieri (OU, Leighly), Tristan Thrasher (OU, Sellers), Jill Kozlowski (OU, Sellers), Courtney Crawford (OU, Kilic), Melissa Marchon (France, Santos).

We wish them a productive summer!

A Yearly Review for Lunar Sooners



Back Row from left: Shaun Steele, Tim Miller, Aleksander Kosakowski. Middle row: Joseph Choi, Nickalas Reynolds, Kyra Dane, Evan Rich, Brennan Kerkstra, Kellen Lawson. Front: James DerKacy, Paul Canton, Hora Mishra, Willow Kirkpatrick (undergraduate), Jenna Miller and Renae Wall.

Lunar Sooners had another great year of astronomy outreach! This year, they hosted 24 events around the state of Oklahoma along with the weekly star parties held at the OU observatory. They continue to build a reputation in the community as many of our events are repeat events. Yet, they are reaching for new and exciting opportunities. In the past few months, Loonar Sooners acquired new equipment. Two members of the community from Edmond, Oklahoma, donated their 11-inch Schmidt-Cassegrain telescope to Lunar Sooners' outreach activities. Lunar Sooners also purchased a Celestron camera, which is capable of imaging and live video feeds that can be projected either onto monitors or onto a sidewalk. This year they are saying goodbye to three long-term members, Tim Miller, Jenna (Nugent) Miller, and Shaun Steele, who are all graduating this summer. Looking forward to next year, they are preparing for the solar eclipse on Aug. 21. Through the NASA Night Sky Network, they have received 500 solar glasses for eclipse viewing. They would like to welcome back three returning officers: Evan Rich (president), and Kyra Dame (treasurer), along with two new officers: Hora Mishra (vice-president) and Nick Reynolds (engineer).

Thanks to all the students, faculty and staff who have made this work possible. We look forward to another great year for astronomy outreach!

Faculty Research Programs

Astronomy, Astrophysics and Cosmology

John Wisniewski's research group this past year included Anthony Burrow, Brennan Kerkstra, Kellen Lawson, Jamie Lomax, Matthew Peters, Evan Rich, and Steven Silverberg. Rich submitted a paper detailing the fundamental stellar parameters of the SEEDS survey. Silverberg published his analysis of stellar flares on GJ 1243, and discovered a new M dwarf containing dusty debris via the Disk Detective program. Lomax constrained the location of potential planets vi analysis of multi-epoch imagery of AB Aur before leaving to take a postdoc at the University of Washington. Burrow, Kerkstra, and Peters worked on ground- and space-based observations of Be stars.

Eddie Baron's supernova numerical radiative transfer group is proceeding apace. We finally published our PHOENIX analysis of late time SN 2011fe spectra (Brian Friesen, first author). Jeremy Lusk's paper on bolometric light curves was also published. Malia Jenks spent the summer in Kyoto, Japan, working with K. Maeda, supported by an NSF travel grant. We were funded by NASA to work on 3D models of stellar abundances and we were co-authors on "Preparing NERSC users for Cori, a Cray XC40 system with Intel Many Integrated Cores" submitted to the Cray Users Group, which will be presented at the Super Computing 2017 conference. The group consists of Lusk working on core collapse photometry and spectra; Jenks working on metallicity variations, physical properties in the Supernova factory dataset and carbon accretion in Type Ia; Lisa Simpson is in her third year and will present her general exam this spring. Second-year student James Derkacy is exploring possible projects and learning PHOENIX. Undergraduates include Patrick Vallely, who is working on kilonova for his Capstone project; Braden James, who is working on HDF5 for restarts and checkpointing; and freshman Claire Riggs, a member of the First Year Research Experience program, who is comparing energies found for observed core collapse supernovae to those obtained from theory.

Mukremin Kilic's research group has published nine journal papers in 2016, including papers led by postdoctoral fellow Alex Gianninas, graduate students Sara Barber (who now works for the U.S. House Committee on Science, Space and Technology), Claudia Belardi and Kyra Dame. Kilic's group also includes graduate students Paul Canton, Alekzander Kosakowski and Renae Wall, and undergraduate

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students Brandon Curd (now in graduate school at Harvard), Courtney Crawford, Ryan Hazlett and Will Kirkpatrick. Over the past year, Kilic's group has used the ground-based Gemini North and South 8m telescopes, Kitt Peak 4m and the SOAR 4.1m telescopes, as well as the Hubble SpaceTelescope. All of our students are making excellent progress in their research projects ranging for the search for planets in the habitable zones of white dwarfs to calibrating the Ultraviolet photometry from NASA's GALEX mission.

Dick Henry continues his push to understand the origin and evolution of carbon, nitrogen and oxygen in the Universe. He has compiled a sample of planetary nebula abundances of these elements derived using UV (HST, IUE) and ground-based observations and is using them to assess the relevance of stellar evolution models, which predict these abundances. In a second project using HST, Henry and team have observed significant, unexpected scatter of C/O for constant metallicity (O/H) in numerous low metallicity dwarf galaxies. Chemical evolution models, including gas inflow/outflow in galaxies are planned as a way to investigate this result. Collaborators include Brian Stevenson (OU-REU), Karen Kwitter (Williams College), Bruce Balick (Washington-Seattle), Marcelo Miller-Bertolami (MPI), Danielle Berg and Dawn Erb (Wisconsin-Milwaukee), Evan Skillman (Minnesota) and Letizia Carigi (UNAM).

Astro group. From left: Baron, Dai, Henry, Leighly, Kaib, Kilic, Tobin and Wisniewski.

Nathan Kaib's planetary research group includes Billy Quarles (postdoc), Matt Clement (graduate student), Ethan White (undergraduate), and Chris Foley (undergraduate). Billy Quarles' most recent paper constrained the compositions of the newly discovered TRAPPIST-1 exoplanets and received significant media coverage. He is studying whether an early instability among the solar system's giant planets could have been delayed by hundreds of Myrs after their formation. Clement recently published a paper showing that terrestrial planet formation naturally gives rise to chaotic, marginally stable systems comparable to the inner solar system. In addition, he is currently studying how terrestrial planet formation is altered when the outer giant planets undergo a major dynamical instability, as hypothesized in our own solar system. White is determining how much a distant binary stellar companion can distort the ring around the exoplanet host star Fomalhaut A and Foley is measuring the dynamical lifetimes of binary objects in our solar system's Kuiper belt.

Xinyu Dai's research group continues working on areas of extragalactic astronomy, including gravitational lensing, galaxy clusters, and active galactic nuclei. Utilizing the gravitational microlensing technique, with nano-arcsecond resolutions, Dai's group, including Eduardo Guerras and Shaun Steele, constrained the accretion disk structure, non-thermal emission, and spin of quasars. The group has been awarded another Large Program from the Chandra X-ray Observatory. Jenna Nugent used the Suzaku X-ray Observatory to constrain the baryon fractions of two poor galaxy groups. Saloni Bhatiani and Hora Mishra are analyzing Kitt Peak 4m and MDM 2.4m observations of Swift detected galaxy clusters.

Karen Leighly was awarded a new NSF grant in fall 2015. The goal of the program, called SimBAL, is to use spectral synthesis to extract the properties of the absorbing gas in Broad Absorption Line Quasars. Collaborators include Don Terndrup from Ohio State University, Sarah Gallagher from the University of Western Ontario, and Gordon Richards from Drexel University. During the past year, SimBAL went from being a good idea to something that actually works. Early in 2016, we purchased a computer server to run the code on, and preliminary results were presented at a workshop in London, Ontario in May 2016. OU undergraduate students Adam Marrs and Cassidy Wagner worked on the problem of modeling the continuum during summer 2016, and they presented their results at the AAS meeting in Grapevine, Texas, in January 2017. OU graduate students Francis MacInnis and Hyunseop (Joseph) Choi, and OU undergraduate Collin Dabbieri are working this summer on the project.

John Tobin's research group has been coalescing over the past six months, and includes both graduates (Nickalas Reynolds and Rajeeb Sharma) and undergraduates (Brian Stephenson, Lisa Patel, and Kyler Rogers). This fall, Patrick Sheehan will join the group as a postdoc after finishing a Ph.D. at the University of Arizona. The group is examining a wide variety of phenomena associated with star formation, and they have received all their data from two major surveys of over 300 protostars with the Very Large Array and Atacama Large Millimeter Array. Reynolds, Stephenson, and Patel are examining the formation of disks, multiple star systems, and their outflows shortly after star birth, and Rogers and Sharma are examining the chemical evolution of the star-forming clouds, aiming to determine if Deuterium-

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Tobin News Release: "Rare, Newborn Tri-Star Discovered: Research team uses ALMA -- a revolutionary observatory in Chile," https://www.sciencedaily.com/releases/2016/10/161026133058.htm

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bearing species track the evolution of the cloud as star formation progresses. Sheehan will be leading the modeling effort of disks to examine the structure of the early proto-planetary disks. Last fall, Tobin led a paper that was accepted to *Nature* that showed direct evidence forcompanion stars to form within a disk. Reynolds made an observing run to the IRAM 30m radio telescope in Spainlast fall, and the group will be starting to use APO to examine accretion in protostar systems.

Atomic, Molecular and Optical Physics

Arne Schwettmann's group succeeded in laser cooling and trapping an ultracold gas of sodium with their new apparatus. Graduate students Shan Zhong, Anita Bhagat, and Qimin Zhang first observed the yellow glowing cloud and measured its temperature and size using absorption imaging. Since then, they have been working towards creating a Bose-Einstein condensate by further compressing and cooling the cloud. Justin Kittel (REU) made use of OU's 3D printers to build a magnetic field control unit, and Logan Narcomey (Capstone) started experiments on nonlinear optics in hot sodium vapors. The group presented their progress at the DAMOP conference in Providence, Rhode Island.

AMO group. From left: Abraham, Marino, Schwettman, Shaffer, Watson and Parker

Jim Shaffer's group is working hard on research. Haoquan Fan graduated and took a position at the Joint Quantum Institute at the University of Maryland. Jiteng Sheng, a postdoc in the group, accepted a faculty position at East China Normal University. His group published six papers during the past year, including two papers in *Physical Review Letters* and one in *Scientific Reports*. Shaffer taught a summer school at the ICTP-SAIFR in Sao Paulo, Brazil. We also are giving invited talks at several workshops over the summer. We have a visitor from the University of Stuttgart, Fabian Munkes, who is visiting for us for six months. Shaffer is going to visit the University of Stuttgart this summer for a month as a visiting faculty member at the Institute for Quantum Science there. The group is really looking forward to seeing the ground-breaking this year.

Alberto Marino's group made great progress over the last year on the use of quantum states of light for quantum metrology. Graduate student Javad Dowran and postdoc Ashok Kumar implemented a quantum enhanced plasmonic sensor. Graduate student Tim Woodworth has been working on the theory for determining the ultimate precision in transmission measurements with quantum resources, while graduate student Saesun Kim has been working on techniques to shift the frequency of our source of quantum states of light to atomic resonance. Over the past year, the group published papers in *Optica* and *Physical Review A* and presented at several international conferences, such as *DAMOP*, *FiO*, *Quantum Optics 8* in Brazil, and *PIERS* in China.

Recently retired, **Deborah Watson** is actively doing research. Recently she was funded by NSF to study thermodynamic properties of finite systems of cold fermions. The study uses "symmetry-invariant perturbation theory" to offer a conceptually different way to determine the degeneracies of the energy levels as well as to enforce the Pauli principle, both of which circumvent the numerically demanding construction of an explicitly antisymmetric wave function. Her current work is focused on a model system of confined, harmonically interacting fermions. A senior capstone student, Nathan Beck, completed a separate study of the excitation gap and the Bertsch parameter for large systems of cold fermions in the unitary regime. This regime is relevant to several other areas of physics including the quark-gluon plasmas of the early universe, superfluid systems, and neutron stars.

Last year, **Eric Abraham**'s group was led by a new graduate student, Matthew Holtfrerich, who took over our experiments using ultracold rubidium gases. In collaboration with former graduate students, Thomas Akin and Sean Krzyzewski, we submitted another paper on this work which is under review. An undergraduate student, Erik Flom, has been working with us this year studying laser beams with orbital angular momentum. After completing an independent study and a summer Research Experience for Undergraduates, he has presented his work at two undergraduate research conferences at Rice University and the University of Oklahoma.

Condensed Matter Physics

Bruno Uchoa's group include postdoc Kangjun Seo and graduate students Xu Dou, Sang Wook Kim and Geo Jose, who just joined the group. In the past 12 months, Uchoa gave invited talks at the University of California, San Diego, University of California Irvine, University of Wurzburg in Germany and in the Polytechnic of Lausanne, in Switzerland. Dou was the leading author in a paper published in *Scientific Reports* about designing quantum spin-orbital liquids. Kim is the first author in a paper about the 3D anomalous quantum Hall effect in a special family

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of lattice models, which will be submitted soon. Recently, Uchoa and Seo proposed the possibility of a novel quantum state of matter, where superconductors under a magnetic flux form striped domains, rather than vortices, even in the thermodynamic limit. This novel smetic state is triggered by the proximity to a quantum critical point and could be observed in an exotic class of materials called semi-Dirac metals.

The **Lloyd Bumm** group is developing advanced real-space analysis methods for studying molecular monolayers with picometer accuracy to elucidate the structure of the molecular interface and the dynamics of the molecules in these soft materials. These methods can extract measurements of molecular position from scanning tunneling microscope (STM) images and time series stacks of STM images to reveal the structure and dynamics of the monolayer through statistical measurements. Interpretation of those measurements is guided by molecular dynamics simulations performed in collaboration with Lianglaing "Paul" Huang in Chemical Biological and Materials Engineering. The collaboration has recently been awarded a three-year grant for $442,000 from the NSF for Advanced Real-Space Measurements with STM: Application to Molecular Monolayers, Monolayer Defects, and Surface Chemistry.

CM group. From left: Uchoa, Bumm, Mullen, Santos, Sellers and Mason.

It has been a very productive 12 months in **Ian Sellers**' Group, with a number of exciting advances in the investigation of next-generation solar cells. Recent progress has led to several publications, including articles in *RSC Advances*, *ACS Applied Materials and Interfaces* and the *Journal of Applied Physics*, as well as in the premier photovoltaics journal: *Progress in Photovoltaics*. Students from the group also have presented their data at several international conferences including: the Photonics West meeting in San Francisco (Collin Brown), the IEEE Photovoltaics Specialists meeting(s) in Baltimore and Washington, D.C. (Yang Cheng), and the MRS Spring Meeting in Phoenix (Hamidreza Esmaielpour). In addition, Hamidreza and undergraduate student Alison Roeth also presented work at the APS March Meeting in New Orleans. Roeth was the first undergraduate student to present work from the group at a major conference, and recently received a Goldwater Fellowship.

The molecular beam epitaxy of narrow-gap semiconductors continues to be the focus of **Mike Santos**'s research group. They collaborate with Ian Sellers's group on superlattices and dilute nitride materials for photovoltaic applications. They also collaborate with Rui Yang's group (in Electrical Engineering) on infrared lasers and detectors made from complex multilayer structures. This year's highlights include Kaushini Wickramasinghe completing her doctoral degree (and moving to City College of New York to work as a postdoc), three-month visits by student researchers from Japan and France, and an invited talk at the Narrow Gap Semiconductors Conference in Germany.

Kieran Mullen has continued his work on the fundamentals and applications of heat transfer. With his graduate students (Alex Kerr and Tim Burt), he has focused on using genetic algorithms (GA) to find molecular chains that efficiently transfer heat into carbon nanotubes. The GA approach treats different designs as different "chromosomes" and cross-breeds successful designs to find even better ones. While the physical problem itself has many industrial applications, the computer software may be useful in many other scientific applications. Promising molecular chains may be synthesized by collaborator Daniel Glatzhofer, an OU professor of chemistry.

High-Energy Particle Physics

In 2016, **Howard Baer**'s group pushed ahead further investigations into natural supersymmetric models. His group has devised a generalized mirage mediation model that allows for mixed moduli-anomaly mediation of SUSY breaking as suggested by string theory, but also allows for naturalness. This class of models is not guaranteed to be seen even at high luminosity LHC, so a LHC energy upgrade to 33 TeV seems required. Baer's group also investigated further detection of higgsino-like WIMP dark matter and axion dark matter both from natural SUSY, and also investigated scenarios for Affleck-Dine leptogenesis via decay of a lepton number violating condensate in the early universe. They also completed a report for the Japanese government MEXT committee on prospects for new particle detection at the proposed International Linear e+e- Collider.

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Dai News Release: "Collapsing Star Gives Birth to Black Hole," https://media.stsci.edu/news_release/news/2017-19

Wisniewski News Release: "OU Researchers Team with Citizen Scientists to Discover a Rare Circumstellar Disk," http://cas.ou.edu/ou-researcher-team-discover-rare-circumstellar-disk

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Phillip Gutierrez continues work with his graduate students as members of the ATLAS LHC collaboration. This year, graduate student Ahmed Hasib graduated and took a postdoc position at the University of Edinburgh. An article based on his dissertation was published in *Phys. Rev. D.* Graduate student Qing Wang continues to make progress toward his degree based on the search for single top-quark production in association with a Z boson. His dissertation will include a search for vector-like top quarks, which has a similar production mechanism. Dylan Frizzell received an Argonne National Lab fellowship and is primarily working on components of the silicon pixel detector upgrade. Hyoyeon Lee has been working on completing her general exam and on various aspects of the silicon pixel upgrade.

HEP group. From left: Abbott, Baer, Gutierrez, Milton, Skubic, Strauss, Stupak and Kao.

Although retired since Jan. 1, **Kim Milton**'s research group remains active, with three-day-per-week meetings involving local and remote collaborators (Trondheim, Norway, and College Station, Texas, as well as others). Milton has just published a paper on the freezing of ice on silica surfaces (returning to a problem he studied in the lab as a high school student) in *Phys. Rev. B*. His graduate student Li Yang, along with Prachi Parashar (now a postdoc at the Norwegian University of Science and Technology) and Pushpa Kalauni (teleconferencing from home with her new baby) have been working for months on a difficult problem of the entropy of a sphere with a general electromagnetic coupling, part of our attempt to understand the puzzling phenomenon of negative entropies in Casimir (quantum fluctuation) interactions. In May, he will be attending conferences in St. Petersburg and Trondheim. He is also helping organize meetings in Barcelona and Singapore.

Pat Skubic has continued in his role as PI for DOE and NSF grants that support the work of the OUHEP group. All experimental OUHEP group members have continued their work on the ATLAS experiment at the Large Hadron Collider located at the international research laboratory, CERN, in Geneva, Switzerland. The LHC is continuing its second run this year after collecting 36/fb of proton-proton collision data at a center-of-mass energy of 13 TeV. Skubic has continued his work on searches for supersymmetric (SUSY) particles in collaboration with OU faculty **Brad Abbott**, OU graduate students Yu-Ting Shen and Othmane Rifki, OU programmer C. Walker, and researchers from other institutions. Skubic was on sabbatical during the fall 2016 semester and made an extended trip to CERN. While there, he worked on determining the sensitivity of searches for SUSY particles predicted by a well-motivated model (NUHM2) that has been carefully studied by members of our theory group, including Baer and his students. This work resulted in this model being included in searches using a selection-criteria requiring at least two same-sign-charge leptons (electron or muon). A conference paper (ATLAS-CONF-2017-030) with the results of this analysis has just been approved, and the results were presented at the Phenomenology 2017 Symposium, Pittsburgh, May 8-10, 2017. Since no SUSY signal was observed, a limit was set (considering gluino pair production) on gluino masses up to 1.85 TeV at 95% confidence level. Skubic plans to continue this work as new LHC data become available. His group also is interested in extending the searches to other related channels that require leptons in the final state.

Professor **Mike Strauss** and graduate student David Shope are making measurements of the standard model Higgs particle decay to two W bosons that subsequently decay to two charged leptons and two neutrinos. The CERN LHC continues to collide protons at high energy and at high rates providing a wealth of proton-proton collision data to investigate. Precision measurements of this decay, along with the kinematic distribution of the leptons, can probe the nature of the Higgs particle to determine if there are any discrepancies from what is expected in the standard model.

John Stupak has transitioned from the CMS experiment to the ATLAS experiment, both of which study proton-proton collisions at the Large Hadron Collider. He is investigating a new technique to improve the ability of the ATLAS experiment to cope with multiple overlapping collisions. He and postdoc Giuliano Gustavino are searching the ATLAS data for signs of dark matter, which would escape the detector undetected, producing a momentum imbalance among the rest of the collision debris. He also is preparing for the upcoming upgrade of the innermost ATLAS subdectector, the so-called "pixel detector."

Quarles News Release: "Astrophysicists identify the composition of earth-size planets in TRAPPIST-1 system," https://phys.org/news/2017-06-astrophysicists-composition-earth-size-planets-trappist-.html

Two faculty members received University awards this year. **Bruno Uchoa** received the Ted and Cuba Webb Presidential Professorship, while **Mike Santos** was presented with the Patent Award. Congratulations to both!

A New Way of Looking at Quasars

Karen Leighly and collaborators are developing a novel method for analyzing the spectra of broad absorption line quasars. Inverting traditional methods, their new method SimBAL (spectral synthesis for broad adsorption line quasars) performs forward modeling, comparing synthetic spectra with observed spectra. Recently, they have measured the properties of one quasar, SDSS J0850+4451, revealing evidence for velocity substructure, and a decrease in covering fraction with increasing velocity that may support an ablation scenario. OU students are contributing to this project by helping to develop the code infrastructure and analyzing spectra of other quasars.

Observations show that galaxies and black holes evolve together across cosmic time, indicating feedback between the quasar and its host. Since the black hole's gravitational sphere of influence is tiny, the mechanism for feedback is not obvious. One possibility is that powerful winds emerging from the quasar carry energy into the galaxy. The light emitted by the quasar, produced by accretion onto a super massive black hole, is often a large fraction of the Eddington luminosity, so the presence and influence of a powerful wind seems inevitable.

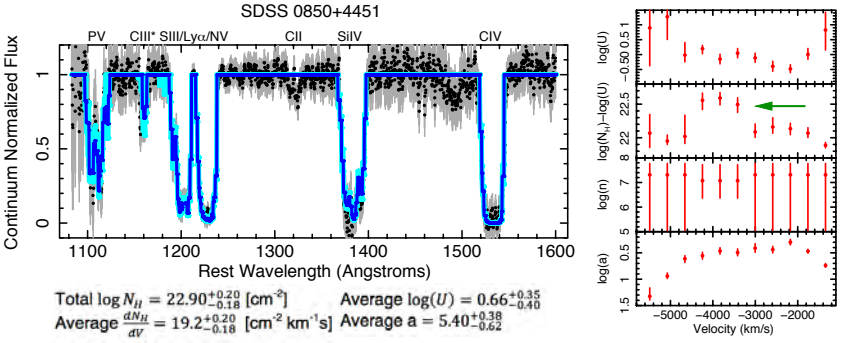
The restframe optical and ultraviolet spectra of about 20% of quasars show blue-shifted absorption lines that indicate the presence of a wind. The traditional method for analyzing these spectra, by measuring individual lines and comparing results with photoionziation models, is tedious and time consuming. The biggest problem was discovered by former OU undergraduate Adrian Lucy (Lucy et al. 2014): he showed that a synthetic spectrum constructed from the best fit obtained using the traditional method was a very poor match to the observed spectrum.

Leighly and collaborators (Donald Terndrup, Ohio State University; Gordon Richards, Drexel University; Sarah Gallagher, University of Western Ontario) have developed a way to invert the process. SimBAL uses precomputed grids of ionic column densities to construct simulated spectra. These are compared directly with the observed spectrum, and parameter space is explored using Markov Chain Monte Carlo. This project was funded by the NSF in 2015.

The figure below shows results from a Hubble Space Telescope observation of the quasar SDSS 0850+4451. The broad absorption lines are divided into 11 bins as a function of velocity, and the physical conditions of the gas in each bin are determined. Average properties are obtained by integrating over the entire profile; for example, we find that the outflow carries 27^{+43}_{-15} solar masses per year. There is evidence for velocity substructure in the outflow, with the gas in 3 bins found to be about 3.5 times thicker than in the remainder. The decrease in covering fraction with velocity might imply that the higher-velocity outflow is formed by ablation from a lower-velocity cloud.

The analysis of samples of objects will reveal trends and correlations that will strengthen our understanding of winds in quasars. This summer, OU students Joseph Hyunseop Choi, Collin Dabbieri, and Francis MacInnis are analyzing a sample of FeLoBALs, quasars that display absorption lines from Fe^+. The Fe^+ atom is complicated, so FeLoBALs present varied spectra rich in diagnostic lines. Their preliminary results find outflows spanning a large range (4 dex) of distances from the central engine. A proposal for application of SimBAL to the HST spectra of the Large Bright Quasar Survey BAL quasars has recently been approved. These luminous objects are the monsters of the class, hosting some of the most powerful outflows known.

The OU astronomy group is known for development of spectral synthesis software. SYNOW, developed for supernova applications by David Branch and collaborators, and PHOENIX, a general radiation transfer code developed by Eddie Baron and collaborators, are already well-known. Presentations at recent meetings have generated considerable interest in SimBAL among quasar astronomers. It is expected that SimBAL will join the ranks of these venerable codes and continue the tradition.



Analysis of the HST spectrum of SDSS J0850+4454. Top far left: the spectrum normalized by dividing by the continuum. The dark blue line shows the best fitting spectrum, while the light blue lines show the 95% confidence levels. Lower far left: derived average properties of the outflow. Left: The physical properties of the gas as a function of velocity. Note the high column-density concentration at ~-4000 km/s (green arrow), and the decrease in covering fraction with velocity.

March for Science

Graduate student Brent McCoy performing a demonstration.

On April 22, groups across the country participated in the March for Science, both in Washington, D.C., and in local support marches. Several members of the department participated in the Oklahoma City march at the state capitol. Professor Eddie Baron and graduate student Brent McCoy ran a booth during the science expo showing many of the Dr. Indestructo demonstrations, generating some of the largest crowds at the science expo. Lunar Sooners hosted a booth with hands-on demonstrations, including the 8-inch Celestron telescope. Professor Kieren Mullen organized and distributed postcards for the public to write their representatives both at the local and national levels and express the importance of science to the general welfare. Approximately 200 postcards were written or distributed over a two-day period, both by march attendees and OU students. In total, it was estimated that 1,000 people from the Oklahoma City metro area attended the march at the capitol.

Graduate student wins NASA award

The Disk Detective team lead by graduate student Steven Silverberg has been awarded NASA's Robert H. Goddard Exceptional Achievement Outreach Award. Disk Detective is a citizen science project that leverages the talents and efforts of people across the globe to identify new debris disks, which are systems where planets are likely to have formed recently. Silverberg served both as one of the primary liaisons to the project's citizen scientists and was the leader for most of the science output of the project. At right, Steven (center), along with project PI Marc Kuchner and citizen scientist Katie Lowe, shortly after receiving the award at NASA's Goddard Space Flight Center. Congratulations!

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Lin Hall: Continued from pg. 1

Portion of the first floor and the second-story floor, where faculty, postdoc and student offices will be located.

electromagnetic shielding in addition to providing critically needed space.

The foundation is particularly important with regards to reducing vibrations, and has now been poured. The building will meet the NIST-A vibrational criterion, providing the ultra-low vibration environment needed for many high-precision experiments. Very recently, construction of the first- and second-story floors, where faculty, postdoc and student offices will be located, has been started. The foreground of the picture on the left shows where the Dodge Physics courtyard will be located. On the second floor overlooking the courtyard is the observation deck, where everyone will be able to enjoy the outside weather.

The condensed matter and atomic, molecular and optical faculty will move to the new building once it is completed. Completion is expected by the summer of 2018. The department community is grateful for the support from the lead donors for this project. The new physics laboratory will give the department a facility that will be one of the best, if not the best, in the world. It will allow the department to provide high-quality laboratories for student research projects, provide better training for our graduate students and compete at the top level for grants. In addition, with open faculty lines, the department has an unusual opportunity to make a transformative leap in its international standing by attracting high-profile theorists and experimentalists to enhance the program.

Nielsen Hall Radio Telescope Online

A group of undergraduate and graduate students constructed a 10-foot radio telescope on the the roof of Nielsen Hall last November and December. The group was led by OU Astronomy Professor John Tobin. The dish was brought fully online in early February. The group followed the small radio telescope plans made available by MIT Haystack Radio Observatory and constructed the dish entirely from off the shelf equipment.

The radio telescope presents exciting teaching and outreach opportunities because it operates in a fundamentally different way from optical telescopes. Instead of observing the light from stars and planets, this radio telescope observes the matter between the stars, the interstellar medium, through spectroscopy. The radio telescope specifically observes Hydrogen atoms throughout our Milky Way Galaxy emitting at a wavelength of 21 cm, from which the rotation of the Galaxy can be clearly seen through the Doppler effect. Introductory Astronomy students and those attending outreach events will see the operation of a radio telescope first-hand and observe the spectral line from Hydrogen in real-time. More advanced students will learn the fundamentals of radio astronomy and will carry out experiments such as mapping Hydrogen in space and measuring the rotational velocity of our Galaxy. The project had the participation of undergraduate students Brian Stephenson, Lisa Patel and Jacob Gill, and of graduate students Nick Reynolds, Rajeeb Sharma, Joseph Choi and Paul Canton.

Students Observe at Apache Point Observatory

The Astronomy 4523/5523 class led by John Tobin took a class field trip for a three-day on-site visit to Apache Point Observatory to conduct observations with the 3.5m telescope. Although the weather during the trip was poor, the class was able to have a couple hours on sky to control the telescope and conduct observations. All the students became familiar with taking the necessary calibration data for both imaging and spectroscopic observations. Eleven students made the trip this year, eight graduates and three undergraduates. Now, they are all qualified to operate the 3.5m remotely from Norman, or wherever they are in the world! Members of the Observatory Methods class who traveled to APO in April are shown in the photo at right with the 3.5m telescope in the background.

From left: Brian Stephenson, Burak Dogruel, Sean Bruton, Evan Rich, John Tobin, Hyunseop (Joseph) Choi, Hora Mishra, Nickalas Reynolds, Patrick Vallely, James DerKacy, Rajeeb Sharma, Matt Clement.

Matthew Peters: Continued from pg. 6

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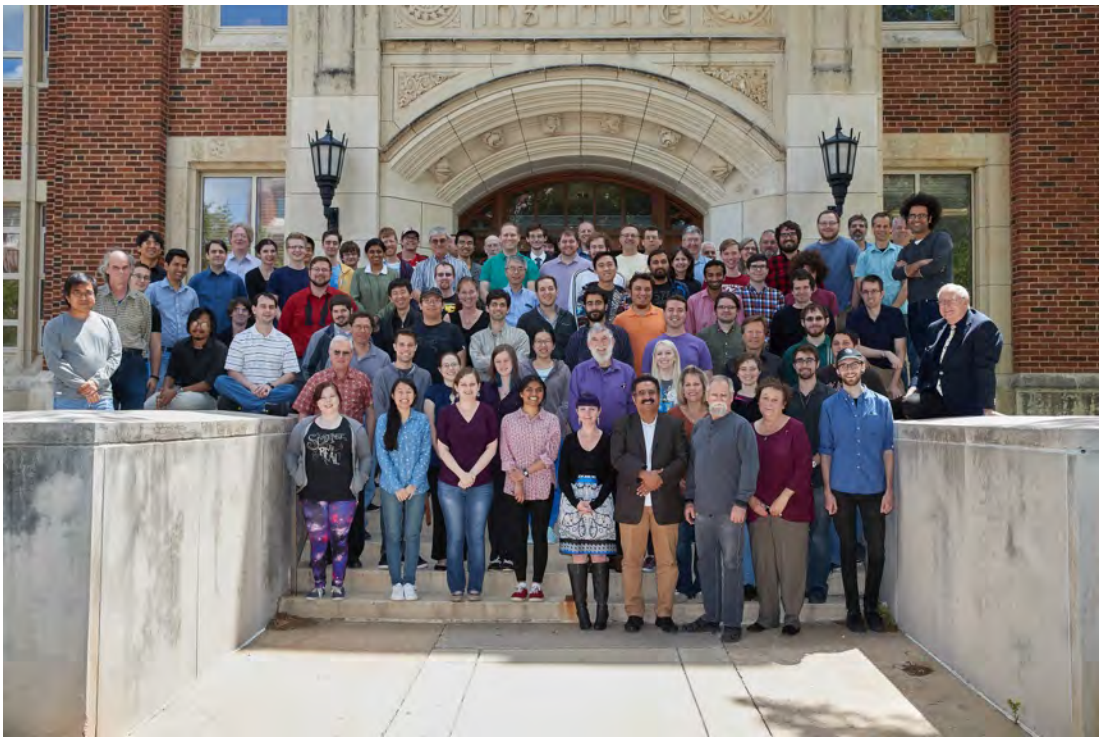
$10,000, recipients also are paired with an industry partner, astronaut scholar alum, or an astronaut for one-to-one mentoring throughout the year. Peters received his high school diploma from the Oklahoma School of Science and Mathematics in 2014. He has excelled in his academic endeavors at OU, and was a 2016 recipient of the Duane E. Roller Award in our department. He also has excelled in his research endeavors during his tenure at OU. Peters has most recently been working with John Wisniewski analyzing multi-epoch observations of the Andromeda Galaxy (M31) from the Hubble Space Telescope (HST). Specifically, Peters has been leading efforts to identify and characterize massive stars in this galaxy that are ejecting mass from their surface, creating circumstellar gas disks. He is writing up these results for publication in a refereed astronomy journal.



Members of the Homer L. Dodge Department of Physics and Astronomy, May 2017. Photo by Hugh Scott.

Please consider making a donation to the Homer L. Dodge Department of Physics and Astronomy

Your donations to our General Fund are used to support such critical departmental activities as physics and astronomy conferences on the OU campus; high-profile colloquium speakers; programs for women and minorities; outreach; alumni reunions; faculty and student research; postdoctoral fellows; graduate research assistants; and newsletter publication. The two major immediate needs are the building and a buy-in to a national telescope. Remember, what you give to the department stays in the department. Go to https://www.nhn.ou.edu/friends-alumni/donate for details.

Nielsen Hall, home of the Homer L. Dodge Department of Physics and Astronomy

Foucault pendulum, located in the Nielsen Hall atrium, where tea is served each weekday from 3:30 to 4:00 pm.