

University of Dallas

Department of Physics

2016-2017

Admissions Report



Figure 1. Dr. Stephanie Wissel delivers the first Clare Boothe Luce Lecture, September 2015.

Professor Sally Hicks, Chair

July 20, 2016

I. Overview of Departmental Strengths

- Undergraduate research opportunities and financial support for student research
- QEP opportunities to present research at professional meetings
- Clare Boothe Luce Scholarship opportunities for junior and senior female majors
- Laboratory Assistant opportunities after the freshman year
- Several students have received Goldwater, Fulbright, and NSF nationally competitive Scholarships/Fellowships
- Student are often included as co-authors on papers and conference proceedings
- External REUs at prestigious universities are obtained by some majors each year; in 2016, these include UCLA, Notre Dame, Baylor, and the College of Wooster
- Small student-faculty ratio, especially in upper-level courses
- Close-knit department with social opportunities such as a Departmental Christmas Party and Spring Picnic
- New laboratory equipment in upper-level laboratories – x-ray diffraction spectrometer, muon detector, x-ray tomography unit, and a Fabry-Perot Interferometer
- Faculty who care deeply about student success

II. Faculty

Dr. Levente Borvak – laboratory manager and office assistant

Dr. Sally Hicks – Chair and Professor of Physics; research area: experimental nuclear physics

Dr. Jacob Moldenhauer – Assistant Professor of Physics; research areas: cosmology and biophysics

Dr. Richard Olenick – Professor of Physics; research area: observational astronomy and astrophysics

Mr. Arthur Sweeney – runs the experimental astronomy instrumentation and upper-level laboratory manager

III. 2016 Graduates

a. Number of Graduates

The Department of Physics had seven majors graduate with a B.S. degree and one with a B.A. degree in physics at the May 15 graduation. The B.S. students completed a summer research experience, gave talks at the Texas Section Meetings of the American Physical Society or the Division of Nuclear Physics APS Meeting, and completed an undergraduate research thesis. All eight passed their comprehensive examinations. The titles of the senior theses are given below after the graduation plans. These graduates plan to continue the tradition of the Department of having over 26% of graduates going on to obtain Ph.D.'s in physics, engineering, or related areas and over 70% of graduates obtain an M.S. or some advanced degree if their plans after graduation continue on to completion.

b. Graduate Destinations

- Ramses Gonzalez – Rome Summer Program 2016
- Nathan Alexander Henderson – commissioned military officer in the U.S. Army.
- Daniel Jackson – seeking employment at Frazier Corporation
- Alex Jagrowski (Applied Math Concentration) – employed at a statistics and gaming company in Duluth, GA
- ThienAn Nguyen – graduate school in nuclear engineering, University of Florida
- Liam O’Toole – seeking employment
- Samantha Richardson – will join her family’s business
- Mary Zischkau (Applied Math Concentration) – accepted into material science graduate school at UTD, but is considering a laboratory/graduate school position at Catholic U.

c. Senior Theses and American Physical Society Presentations

Three senior physics majors gave talks at the Texas Section of the American Physical Society Fall Meeting held at Baylor University Oct 29-31, 2015 (See Figure 2), two seniors presented at the Division of Nuclear Physics Meeting in Sante Fe, NM, Oct. 29-31, 2015, and two seniors presented at the Texas Sections of APS, AAPT, and Zone 13 of the SPS, Mar. 31–Apr. 2 2016; Beaumont, Texas. The University of Dallas Experience Awards, Conference Experience for Undergraduates Awards from the APS, and TX APS Travel Awards helped cover travel expenses to make this event very successful for our students.

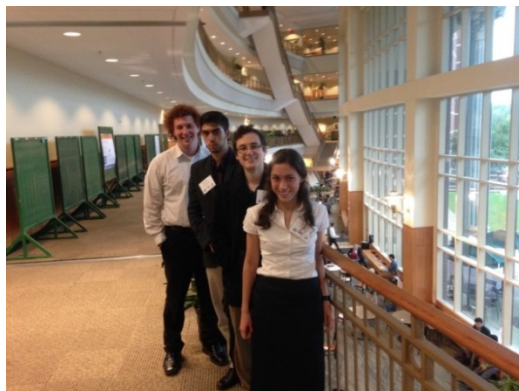


Figure 2. Physics majors Mary Zischkau, Alex Jagrowski, Francis Cavana, and Liam O’Toole at Fall 2015 Joint Meeting of the Texas Section of the AAPT, Texas Section of the APS, and Zone 13 of the Society of Physics Students, Oct. 29-31, 2015, Baylor University, Waco, TX.

Senior Conference Presentations in partial fulfillment of the B.S. degree requirements were presented at professional conferences. Each student’s senior thesis is over the same research.

- *Ramses Gonzalez* – “Observations and Modeling of the New delta Scuti GSC 02087-02155,” Ramses Gonzalez, Richard Olenick, and Arthur Sweeney, presented at the Joint Spring 2016 Meeting of the Texas Sections of APS, AAPT, and Zone 13 of the SPS, March 31–April 2 2016; Beaumont, Texas. (mentor: Dr. Olenick, UDE Experience Award)
- *Nathan Alexander Henderson* – “Photometric observations and modeling of the new W UMa binary USNO-B1.) 1163-0308203,” Alex Henderson, Richard Olenick, Arthur Sweeney, Ramses Gonzalez and Tommy Byrd, presented at the Joint Spring 2016 Meeting of the Texas Sections of APS, AAPT, and Zone 13 of the SPS, March 31–April 2 2016; Beaumont, Texas. (mentor: Dr. Olenick)

- *Daniel Jackson* – “Neutron Simulations: The Effectiveness of the University of Kentucky Accelerator Laboratory Pit,” Daniel Jackson, Thien An Nguyen, S. F. Hicks, Ben Rice, J. R. Vanhoy, Bull. Am. Phys. Soc. 60 EA54, 56 (2015), presented at the DNP Meeting in Sante Fe, NM October 28-31, 2015. (mentor: Dr. Hicks; CEU Travel Award)
- *Alex Jagrowski*, “Simulating Neutron Interaction with Cryogenic Dark Matter Detectors,” A. Jagrowski, Rob Agnese, Tarek Saab, and Jonathen Settle, presented at the Fall 2015 Joint Meeting of the Texas Section of the AAPT, Texas Section of the APS and Zone 13 of the Society of Physics Students, Oct. 29-31, 2015, Baylor University, Waco, TX. (Research completed at the U. of FL REU program; mentor: Dr. Moldenhauer, APS Travel Award)
- *ThienAn Nguyen* – “Neutron Scattering Simulations at the University of Kentucky Accelerator Laboratory,” Thien An Nguyen, Daniel Jackson, S. F. Hicks, Ben Rice, J. R. Vanhoy, Bull. Am. Phys. Soc. 60 EA55, 56 (2015), presented at the DNP Meeting in Sante Fe, NM October 28-31, 2015. (mentor: Dr. Hicks; CEU Travel Award)
- *William O’Toole* – “Constraining modified gravity parameters for testing General Relativity,” William O’Toole, presented at the Fall 2015 Joint Meeting of the Texas Section of the AAPT, Texas Section of the APS and Zone 13 of the Society of Physics Students, Oct. 29-31, 2015, Baylor University, Waco, TX. (mentor: Dr. Moldenhauer)
- *Mary Zischkau* - Mary Zischkau and Jacob Ricker, “Next Generation Manometer: Design of Speed of Sound Apparatus for NIST Oil Ultrasonic Interferometer Manometer,” <http://meetings.aps.org/link/BAPS.2015.TSF.J3.2>, presented at the Fall 2015 Joint Meeting of the Texas Section of the AAPT, Texas Section of the APS and Zone 13 of the Society of Physics Students, Oct. 29-31, 2015, Baylor University, Waco, TX. (Research completed at the NIST SURF Program; mentor: Dr. Hicks, UDE and APS Travel Awards)

IV. Growth of the Department

The Registrar’s census conducted in the Fall 2015 showed that the Department of Physics had a record high enrollment of 53 physics majors, with three of these students enrolled in our dual EE/PHY program with UTA. Physics majors by year are shown in Figure 3.

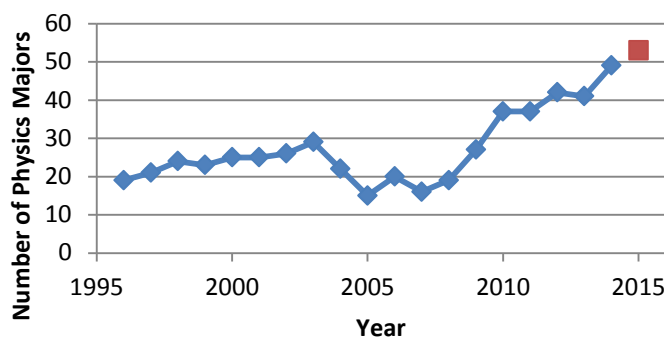


Figure 3. Physics majors by year. Data denoted in blue are from the fall census data distributed by the Provost; the fall census determined there were 53 physics majors in Fall 2015.

The Admissions Office does not predict as many incoming physics and PHY/EE majors in 2016 as we saw in 2015, so the upward trend may be slowing. The yield on the PHY/EE program is not large considering the number of students who express an interest in it during recruiting. We anticipate 50 physics majors in the Fall 2016 semester. This enrollment, while not expected to be

as large as last year's, does make us a rather large physics department with respect to majors (Figure 4), but not with respect to faculty.

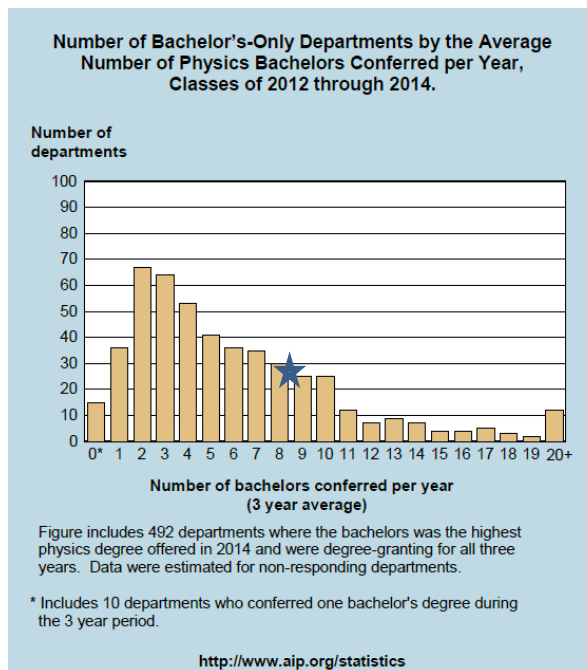


Figure 4. The UD Physics Department had 8.3 majors on average for 2014-2016 graduations. The following figure is from the American Institute of Physics with a star added to indicate UD. The data show that over half of all physics departments grant fewer than five Bachelor's degrees per year. AIP data also show that it is extremely rare for so many Bachelor's degrees to be given in a department with so few faculty.

V. Departmental Accomplishments and News

a. Undergraduate Conference Presentations – several undergraduate students completed summer research projects and presented their research at a professional meeting

- *MacKenzie Warrens*, “Distribution of Ions in Laser-Driven Fusion Reactions,” MacKenzie Warrens, Matteo Barbarino, Also Bonasera, and Dario Lattuada, <http://meetings.aps.org/link/BAPS.2015.DNP.EA.135>, presented at the DNP Meeting in Sante Fe, NM October 28-31, 2015, over REU research completed at TX A&M University and at TX A&M University. (UDE and CEU Travel Awards)
- *Anna Poulsen*, “A Study of the Contribution from Non-Perturbative Effects to Di-jet Yields at Forward Rapidity,” A. Poulsen, Z. Chang, and C. A. Gagliardi, presented at TX A&M University. (CEU Travel Award to DNP meeting; medical withdrawal before attending)
- *Francis Cavana*, “Investigating spatial curvature by adding Hubble Parameter datasets,” Francis Cavana, Jacob Moldenhauer, and Liam O’Toole, presented at the Fall 2015 Joint Meeting of the Texas Section of the AAPT, Texas Section of the APS and Zone 13 of the Society of Physics Students, Oct. 29-31, 2015, Baylor University, Waco, TX. (APS Travel Award).

b. Undergraduate Research Experiences and Internships for Summer 2016

Physics majors continue to be accepted into quality external summer research programs or complete research under UD physics faculty. The following students have research opportunities for Summer 2016:

- Joseph Archer – University of Notre Dame REU
- Steven Block – Neutron scattering with Dr. Hicks
- Stephen Byrd – Neutron scattering with Dr. Hicks
- Andrew Chang – Biophysics with Dr. Moldenhauer
- Matthew Fournier – Baylor University REU
- James Frisby – Biophysics with Dr. Moldenhauer
- Alvaro Hu – Cosmology with Dr. Moldenhauer
- Matthew Nickel – Neutron scattering with Dr. Hicks
- Blake Palmer – Cosmology with Dr. Moldenhauer
- Tessa Rosenberger – College of Wooster REU
- Mark Rodriguez – Exoplanet Searches with Dr. Olenick
- MacKenzie Warrens – UCLA REU in Engineering
- Alessandra Marchi – James Loudspeaker Corporation
- Ted Morin – internship at Duke Medical Center

Physics majors continue to win prestigious awards because of their academic, research, and service accomplishments. In 2015-2016 the following awards were received:

- Steven Block – Second round of SMART Scholarship
- Elizabeth Derdeyn – Clare Boothe Luce Scholar
- Alessandra Marchi – Clare Boothe Luce Scholar
- MacKenzie Warrens – Clare Boothe Luce Scholar

c. Research Publications

The Department of Physics has a very active undergraduate research program that encourages students and faculty to publish articles and to give presentations.

c1) Full Articles (UD students are denoted in red; alumni are denoted in black):

- i) “Photometric Observations and Numerical Modeling of SDSS J162520.29+120308.7”, M. M. Montgomery, Richard Olenick, Irina Voloshina, **Kyle Meziere**, Vladimir Metlov, **Jared Rovny**, Amit Goel, Submitted and under review to New Astronomy.
- ii) “E0 transitions in 106Pd: Implications for shape coexistence,” E.E. Peters, F. M. Prados-Estévez, A. Chakraborty, M.G. Mynk, D. Bandyopadhyay, S.N. Choudry, B. P. Crider, P.E. Garrett, S. F. Hicks, A. Kumar, S. R. Leshner, C. J. McKay, M.T. McEllistrem, J.N. Orce, M. Scheck, J.R. Vanhoy, J.L. Wood, and S.W. Yates, Eur. Phys. J. A (2016). 52: 96. DOI 10.1140/epja/i2016-16096-y.

c2) Talks without Proceedings (UD students noted in deep red; alumni are denoted in black):

The following talks were given by Assistant Professor Jacob Moldenhauer and included slides from research completed by UD Physics majors **Francis Cavanna** and **Liam O'Toole**.

i) "Gravitational Waves, Dark Matter, Dark Energy: Recent Success and shortcomings of General Relativity", J. Moldenhauer, presented at DCCCD Mountain View College, Mar. 3, 2016, Dallas, TX.

ii) "Gravitational Waves, Dark Matter, Dark Energy: Recent Success and shortcomings of General Relativity", J. Moldenhauer, presented at DCCCD Richland College, Mar. 4, 2016, Dallas, TX.

iii) "Computational Cosmology: What can models and simulations teach us about the universe?" J. Moldenhauer, presented at The University of Texas at Dallas Physics Colloquium, April 13, 2016 Richardson, TX.

iv) "Exploring the consequences of parameter values in cosmological models with CosmoEJS, an interactive package of cosmology Java simulations," J. Moldenhauer, presented at the Texas Symposium on Relativistic Astrophysics, Geneva, Switzerland, Dec. 14, 2015.

The following talks were given by Dr. Richard Olenick, or collaborators, over research conducted with UD students, who are listed after each citation.

i) "How White Dwarfs Evolve into Supernovae," Richard P. Olenick, presented at Northern Michigan University Physics and Astronomy Colloquium, Sep. 14, 2015. Research students: **Danny Malutich, Kyle Meziere, Jared Rovny, Christian Clerc, and Joshua Torres.**

ii) "Using Small Telescopes for Extrasolar Transit Searches: Candidates and Incidental Discoveries" Richard P. Olenick, presented at Michigan Tech University Colloquium, November 9, 2015. Research collaborators: Arthur Sweeney, **Ramses Gonzalez, Alex Henderson, Tommy Byrd, Laura Aumen, Anthony Kersting, Andrew Bechter, Eric Bechter, Blaise Dufrain, Daniel Lyons, James Meier, Jeff Schneiderjan, Matt Heuser, Nick Hedlesky, Matt Melendez, Thaddeus Howard.**

iii) "Using Small Telescopes for Extrasolar Transit Searches: Candidates and Incidental Discoveries" Richard P. Olenick, presented at University of North Texas Colloquium, November 9, 2015. Research collaborators: Arthur Sweeney, **Ramses Gonzalez, Alex Henderson, Tommy Byrd, Laura Aumen, Anthony Kersting, Andrew Bechter, Eric Bechter, Blaise Dufrain, Daniel Lyons, James Meier, Jeff Schneiderjan, Matt Heuser, Nick Hedlesky, Matt Melendez, Thaddeus Howard.**

iv. "Exoplanet Hunting is Alive and Well in Texas! Can You Help?," Arthur Sweeney, presented at the 2016 Texas Star Party, May 4, 2016. Research Collaborators: Richard P. Olenick, **Ramses Gonzalez, Alex Henderson, Tommy Byrd, Laura Aumen, Anthony Kersting, Andrew Bechter, Eric Bechter, Blaise Dufrain, Daniel Lyons, James Meier, Jeff Schneiderjan, Matt Heuser, Nick Hedlesky, Matt Melendez, Thaddeus Howard.**

The following talks were given by Dr. Sally Hicks, or collaborators, over research conducted with UD students: citations are as published.

i) "Neutron cross-section measurements for ^{56}Fe ," A.P.D. Ramirez, M.T. McEllistrem, T.D. Harrison, S.F. Hicks, **T.J. Howard, D.T. Jackson, P.D. Lenzen**, S. Mukhopadhyay, **T.D. Nguyen, R.L. Pecha**, E.E. Peters, B.G. Rice, B.K. Thompson, J.R. Vanhoy, and S.W. Yates, WINS2016, Sante Fe, NM April 13-15, 2016.

ii) "Neutron Scattering Studies at the University of Dallas: MCNP Modeling and Experimentation, S. F. Hicks, **A. French, Daniel Jackson, Thienan Nguyen, Luke Pecha, Thaddeus Howard**, Ben Rice, J. R. Vanhoy, E. E. Peters, M. T. McEllistrem, A. P. Ramirez, and S.W. Yates, Stewardship Science Academic Programs (SSAP) Symposium, Feb. 17-18, 2016, Bethesda, MD.

iii) "Differential Cross Section Measurements of Neutron Elastic and Inelastic Scattering on Structural-Related Materials at the University of Kentucky Accelerator Lab," J.R. Vanhoy, S.F.Hicks, M.T. McEllistrem, S. Mukhopadhyay, E.E. Peters, A.P. Ramirez, and S.W. Yates, Stewardship Science Academic Programs (SSAP) Symposium, Feb. 17-18, 2016, Bethesda, MD.

iv) "Elastic and inelastic scattering of neutrons from ^{56}Fe ," Anthony Paul Ramirz, M. T. McEllistrem, S. H. Liu, S. Mukhopadhyay, E.E. Peters, S.W. Yates, J.R Vanhoy, T. D. Harrison, B.G. Rice, B. K. Thompson, S. F. Hicks, **T. J. Howard, D. T. Jackson, P.D. Lenzen, T. D. Nguyen, R. L. Pecha**, Bull. Am. Phys. Soc. 60 JC06, 102 (2015). Presented at the DNP Meeting in Sante Fe, NM October 28-31, 2015.

c3. Activities for Students to Promote Community and Intellectual Growth

The department hosted several events during the year to provide students opportunities to learn about active research areas in physics and to promote community within the department.

Department of Physics Supported Talks and Seminars by External Scientists and Engineers:

i) Dr. Stephanie Wissel of Cal Poly San Luis Obispo "*Searching for the highest-energy, cosmic particles at the ends of the Earth,*" Clare Boothe Luce Speaker Series Lecture, Thursday September 3, 2015 at 5:00 in Gorman Faculty Lounge. Over 40 people attended this event with 35 students present. As part of this Clare Boothe Luce event, Stephanie had dinner with nine UD mathematics, physics, and electrical engineering majors. She and Nathan Keim also met with students for breakfast on Friday morning and talked to students from 7:30-10:00 in the UD cafeteria. Fifteen students attended the breakfast event to talk about research and graduate school opportunities.

ii) Dr. Nathan Keim of Cal Poly San Luis Obispo, QEP and Physic Department Event, September 3, 2015 delivered a seminar on "*Memory in Cyclically Driven Systems,*" Over 35 people attended this event with 28 students present.

iii) "Meaningful STEM Careers: A Clare Boothe Luce Panel," Formulation Chemist from NCH Chrissy Burton, Raytheon Engineering Fellow and UD alumnus Dr. John Coogan, Senior Associate Dean of Engineering, UTA Dr. Lynn Peterson, U.D. CBL Luce Scholar Anna Poulsen, Senior Software Architect at Z Option and U.D. alumnae Anastasia Zaruba, U.D. CBL Scholar Mary Zischkau, Sep. 20, 2015, approximately 28 in attendance.

iv) "Electrical Engineering Opportunities at UTA," presented by UTA EE Chair Dr. Jonathan Bredow, Associate Chair Dr. Kambiz Alavi, EE Undergraduate Advisor Dr. Saibun Tjuatja, and Academic Advisor Ms. Pauline Mason, approximately 30 students attended the event held on October 13, 2015 in HSC 2.

v) Dr. Moldenhauer's Ph.D. mentor, Dr. Mustapha Ishak-Boushaki gave a colloquium on November 20, 2015. Title: Why is the Expansion of the Universe Accelerating? Over 30 students and faculty attended the event, which was warmly received by all.

vi) Dr. Jodi Cooley-Sekula, Associate Professor of Physics at SMU presented the Clare Boothe Luce lecture titled "Whispers in the Dark." Over 50 students, faculty, and staff attended the event. Dr. Cooley-Sekula also had lunch with students and dinner with our female students to promote women in physics and to encourage our female students to continue on in their studies.

Department of Physics Internal Events: The department has several events each year to build community within the department. The faculty believe strongly that such events help retain students.

- i) SPS Meeting – Seniors presented talks over their summer research as part of a Society of Physics Students meeting in September. Over 25 students attended. This event was supported by the department; pizza, cookies and drinks were served. Dr. Jacob Moldenhauer organized the event.
- ii) Practice APS Talks – seniors presenting their research at the TX APS meeting gave their talks in front of faculty and other students in October. Dr. Jacob Moldenhauer organized the event.
- iii) Physics Department Christmas Party – 11/30/2015; All students taking physics classes were invited to the department Christmas party at Dr. Hicks' house for a lasagna dinner.
- iv) Welcome back Dr. Olenick event in January, 2016. Cake and soft drinks were served in HSC 18 to welcome Dr. O back from sabbatical.
- v) Sigma Pi Sigma Induction and Clare Boothe Luce Scholar announcements 4/6/2016 – three students were inducted into Sigma Pi Sigma this year and three physics majors were named Clare Boothe Luce Scholars.
- vi) Physics Week (March 14-20)– SPS activities to promote physics on the UD campus.
- vii) Physics Department Spring Picnic – 4/20/2015. All students were invited to the Physics Spring Picnic at Dr. Hicks's house. About 20 students and faculty attended the event.
- viii) Student assistants' appreciation lunch – 5/8/2015. Tio Carlos in Irving, TX, 10 faculty/students participated.
- ix) Graduation reception – 5/16/2015. Reception held for seniors and their families in the Cap Bar area.
- x) SPS events held regularly and organized by the SPS officers.

c4) Community Service – The department provided service to the surrounding community through astronomy viewing sessions and be conducting a workshop for science and mathematics teachers.

- i) Drs. Moldenhauer and Hicks organized and conducted a 2-day (15 hours of instructions) workshop for Region 10 public school teachers to learn about waves and the electromagnetic spectrum. Over 75 teachers and counselors attended the event on July 28-29, 2015. Dr. Borvak helped set up the materials needed for the workshop.
- ii) Dr. Richard Olenick organized and directed T.J. Lee Elementary Parent Student Night at the Observatory, April 14, 2016 (85 students and parents). Undergraduate Assistants: Joe Archer, Ramses Gonzalez, Alex Jagrowski, MacKenzie Warrens, Mary Zischkau
- iii) Dr. Richard Olenick organized and conducted University Hills "Astronomy in the Park", April 16, 2016. Undergraduate Assistants: Ramses Gonzalez, Daniel Jackson, Mary Zischkau.

c5) Grants and Awards – the faculty in the department received several grants and awards during the 2015-2016 year. Dr. Moldenhauer received a grant for supercomputer use at UT. Dr. Hicks received a grant from the DOE-NNSA for \$178k and was accepted into an AAPT/APS/AIP Experience Faculty Workshop in College Park, MD. Dr. Hicks was also named a Piper Professor from the Minnie Stevens Piper Foundation. The Clare Boothe Luce grant for the year was \$90k.