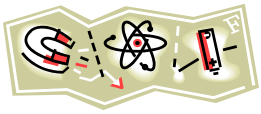

CURPA NEWS

Newsletter of the Council on Undergraduate Research Physics and Astronomy Division
Spring 2015

Message from the Chair

Welcome to this edition of the Physics and Astronomy Division's newsletter. I hope your spring has been going well and that you are getting ready for summer (and all of the great activities that come with this season!). This has been a very busy spring for our organization as it has been instrumental in promoting undergraduate research through a variety of venues such as NCUR, Posters on the Hill, and April's Undergraduate Research Week. Spring is also a very busy time for many campuses as they celebrate a variety of student and faculty accomplishments that often includes hosting their own celebrations of research and scholarly activities. Highlights from several CUR-sponsored events can be found throughout this newsletter.

This summer will be a very busy time for CURPA councilors. We will be managing year 2 of our pilot REU program funded by the National Science Foundation (award number 1358879). Additionally at our upcoming business meeting this June, councilors will be discussing CUR's five strategic pillars (www.cur.org/about_cur/strategicpillars/):

- Integrating and Building Undergraduate Research into Curriculum and Coursework
- Assessment of the Impact of Undergraduate Research
- Diversity and Inclusion in Undergraduate Research
- Innovation and Collaboration in Undergraduate Research
- Internationalization and Undergraduate Research

These pillars were developed to aid the organization in planning and envisioning the future of undergraduate research. We will be sure to keep the Division updated as councilors across CUR begin to map out plans for the coming years and we would appreciate any input or feedback you have on what will be developed.

This edition of the newsletter also features an article by CURPA councilor Toni Sauncy on the Career Pathways Project (CPP), a project she helped lead while serving as Director for the Society of Physics Students and Sigma Pi Sigma. I hope you have some time to read the article and peruse the material found on the SPS website: www.spsnational.org/cup/careerpathways/. It is a great resource to use with your students throughout their time in your program, particularly in assisting them develop the necessary skills along with gaining valuable insight for how to navigate entering the STEM workforce after the bachelor's degree (and beyond).

I would also like to thank everyone who took part in the CURPA councilor elections along with congratulating those individuals who were elected. Advocating for undergraduate research is a passion for many of us. If there is anything the CURPA council can help you with in advocating for and promoting undergraduate research, please contact me.

Finally, I would like to thank Nadine Barlow for taking the time and effort to put our newsletters together over the past five years! This will be her final newsletter as Editor as she will be transitioning into her new role as Chair of the CUR Fellows

Committee. If you have something to submit to our next newsletter, scheduled for the fall, please contact me at jacksonm@cwu.edu – we will be recruiting councilors to serve as the newsletter Editor at our June business meeting. Until then, have a safe and enjoyable summer and we look forward to getting you the next edition of the CUR Physics and Astronomy newsletter in the fall.

Michael Jackson
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Career Options for Undergraduate Physics Students—Resources for Mentors, Departments, and Students

The American Institute of Physics (AIP) recently completed an NSF-funded research project aimed at empowering students and departments to take advantage of the fact that an undergraduate physics degree can open a myriad of STEM career opportunities for students. The AIP Career Pathways Project (CPP) set out to identify common features among physics departments with a strong record of preparing physics bachelor's for the science, technology, engineering, and mathematics (STEM) workforce and to disseminate that information to the physics community. By equipping physics departments and their students with tools for effective career preparation, CPP aims to increase the overall number and diversity of physics graduates, and of those joining the STEM workforce after the bachelor's degree. Departments that implement the curricular and extracurricular features identified by the project are likely to see improvement in both recruitment and retention of physics majors.

The work was modeled after the highly impactful Strategic Programs for Innovations in Undergraduate Physics (SPIN-UP), which has been instrumental in shaping successful undergraduate physics programs for over a decade. For CPP, site visits were conducted at schools identified as effective in producing large numbers of physics bachelor's recipients who went into the workforce within one year of graduation and who demonstrated a visible intention on including career preparation in their programs. Schools were identified by consideration of data available at the AIP Statistical Research Center (SRC). In addition to site visits, Society of Physics Students (SPS) Summer Interns worked on the impact of career preparation for physics undergraduates for three summers. These student interns also looked to the data available from the AIP SRC and the results of the site visits as guides for determining effective practice for students when considering preparing to enter the workforce with a physics bachelor's degree. The student contribution to the work involved examining widely available career resources in the context of data regarding the type of employment, important skills and knowledge, and pathways found in employment data from students entering the workforce with a physics bachelor's degree. Student interns examined career types, attendance at career fairs, phone and in-person interviewing, and the importance of clear articulation of transferrable knowledge and skills.

Ten features were identified as common among departments that are effective in preparing students to enter the STEM workforce. Several of these common features are very similar to features identified by SPIN-UP in thriving physics departments. These are noted with an [S] in the list below. Overlap with the previous study suggests that some of the features that help undergraduate physics departments thrive in terms of increasing bachelor's degree production overall also help them

succeed when it comes to preparing students to enter the STEM workforce.

Curricular Features

- **Varied and high-quality lab courses**
- **Research opportunities for undergraduates [S]**
- **Curricular flexibility [S]**
- **Building communication skills as part of the undergraduate physics experience**

Extracurricular Features

- **Faculty and staff commitment to physics majors' success at all levels, regardless of career goals**
- **Strong community of students within the physics department [S]**
- **Opportunities for physics majors to be involved in outreach activities**
- **Mentoring and advising physics majors in accordance with their interests and goals [S]**
- **Connections with alumni [S]**
- **Relationship with the career services office**

These identified common features and how departments might use them to improve their own efforts are the subject of one of the published reports from the project and became the central motivation for development of other resources. This exciting set of new resources has been widely disseminated and received with great enthusiasm by students, faculty and department leaders around the U.S. There are three primary resources:

- **For students**

The Careers Toolbox for Undergraduate Physics Students

This publication is a set of tools and engaging exercises designed to help undergraduate physics students prepare to enter the STEM workforce. Tools range from exploring the common job titles of physics bachelor's to preparing for interviews. All the tools and information in this very useful resource are geared specifically for physics students. This resource is the centerpiece used in numerous student and student-faculty workshops over the past year. It is also available online in the companion website hosted by the Society of Physics Students National Office: www.spsnational.org/careerstoolbox/

A second resource for students, the "You have options" poster, has been distributed widely to SPS chapters around the country, department chairs and given away at number of national meetings.

- **For faculty and departmental leaders**

Equipping Physics Majors for the STEM Workforce

This report is aimed at faculty and departmental leaders who wish to improve their efforts at career preparation within departmental programs. The report details specific activities that departments might do, based on the common features mentioned above. This report concludes with a brief discussion about several ways to develop strategies for change. The report is available online at: www.spsnational.org/cup/careerpathways/equipping-physics-majors.pdf

- **For Career Services professionals**

Fact Sheet for Career Professionals

We realized early on in the examination of the information collected from site visits that the role of the career services office on many of the campuses we visited was vital. Anecdotal information indicated that for many departments around the country, this was not the case. Working with several of the key career services professionals from the sites we visited, we developed a resource designed to inform and educate career

services personnel about the many career options available to a well-prepared physics bachelor's degree recipient. The resource is designed to enhance the work being done by career services professionals with physics undergraduates and faculty. The Fact Sheet includes information on common career paths of physics bachelor's recipients, resume and career advising tips, suggested databases for finding physics-related internships and jobs, and more. The Fact Sheet may also be useful for high school guidance counselors and college admissions staff. This brochure-style sheet is available online at: www.spsnational.org/cup/careerpathways/AIP-Careers-Fact-Sheet.pdf

For more information about the AIP Career Pathways Project, contact Toni Sauncy (tsauncy@tlu.edu) or Kendra Redmond (kredmond@aip.org).

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Welcome CUR P&A Councilors

Congratulations to new (*) and returning councilors for 2015. The members of the CUR Physics and Astronomy Division are looking forward to working with all of you.

- George Marcus*, SUNY-Geneseo
- Phillip Reed*, Kutztown University
- Nadine Barlow, Northern Arizona University
- Beth Cunningham, AAPT
- John Mateja, Murray State University
- Duncan McBride, National Science Foundation
- Allyn Smith, Austin Peay State University
- Sorinel Oprisan, The College of Charleston
- Richard Thompson, The College of Saint Rose

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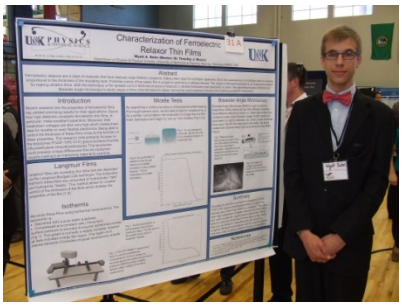

Wyatt Behn at his NCUR 2015 poster. Wyatt is presenting his research entitled "Characterization of ferroelectric relaxor thin films." He is a junior at the University of Nebraska at Kearney and has performed the research under the mentorship of CURPA member Dr. Timothy Reece. Wyatt will be participating in an REU program this summer and plans to pursue graduate school in physics upon graduation.

2015 National Conference on Undergraduate Research

The 2015 *National Conference on Undergraduate Research* was held at Eastern Washington University from April 16 – 18, 2015. This year there were over 90 presentations within the division, along with other interdisciplinary presentations made by physics and astronomy majors. Three of the 2014 CUR REU students presented their research at this year's NCUR. NCUR is great venue for undergraduate students as the entire conference is focused on the undergraduate experience. Along with presenting their research, students can attend the plenary sessions, graduate school fair, and other conference activities.

Congratulations to all of the student presenters and their advisors. Next year will be the 30th anniversary of NCUR. To mark this celebration, the event will be held at the University of North Carolina at Asheville, where it was first held in 1987! If you are mentoring undergraduate students you might want to encourage them to present their research at NCUR 2016.

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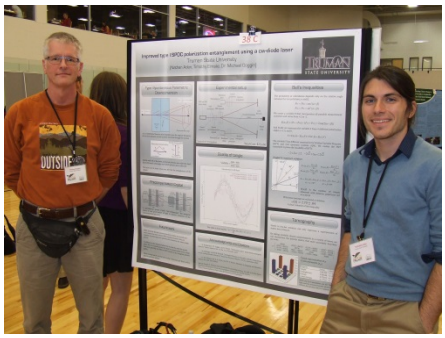

CURPA member Dr. Michael Goggin and Nathan Aden at NCUR 2015. Nathan is presenting his research entitled "Improved type I SPDC photon-polarization entanglement using a cw-diode laser." He is a senior at Truman State University and will be attending graduate school in physics next fall at the University of Miami.

2015 Posters on the Hill

CUR's *Posters on the Hill* was held on Thursday, April 29 in the Rayburn building, Washington DC. This year, 60 posters were selected from over 450 completed applications. The students selected to represent the Physics and Astronomy Division were:

- Haroon Khan, California State University Fullerton, (Advisor: Dr. Geoffrey Lovelace), "Simulating Colliding Black Holes for Gravitational Wave Astronomy,"
- Christopher Christopherson, University of Wisconsin-Oshkosh, (Advisor: Dr. Nadia Kaltcheva), "Observing Nebulosities: the Cygnus Superbubble," and
- Talia Hettie Martin, Bridgewater State University, (Advisor: Dr. Ed Deveney), "Construction of a Laser Frequency Stabilization System for a Magneto Optical Trap."

Additionally, the following students from the Physics and Astronomy Division received an honorable mention:

- Caitlin Hansen and Alexis Ernst, Southern Connecticut State University, (Advisor: Dr. Todd Schwendemann), "Characterization of Bulk Metallic Glasses (BMGs) using Various Microscopy Techniques for Biomedical Applications."

Congratulations to the above students and their advisors. As one might expect, reviewers were impressed by the overall quality of the applications and the research being conducted by undergraduates. The *Posters on the Hill* event is held annually, typically during the month of April. If you are mentoring undergraduate students this summer or know someone who is, please keep this program in mind and encourage your undergraduate students to apply. More information about this program can be found at:

www.cur.org/conferences_and_events/student_events/posters_on_the_hill/

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Dr. Geoffrey Lovelace and Haroon Khan at Posters on the Hill. Haroon is currently in his junior year majoring in Electrical Engineering with a minor in physics. After graduation, he would like to pursue graduate school in areas related to space exploration.

2014 CUR REU Profiles

In this year's newsletters we have briefly discussed the first year of our division's pilot REU program funded by the National Science Foundation (award number 1358879). During the 2014 summer, seven undergraduates, all rising juniors, participated in this REU program with

additional support provided by CUR and the Washington Space Grant Consortium. The profiles for the final two students from the 2014 cohort appear in this edition.

Top: The Burrito Timbon Challenge (approximate dimensions are 13 inches long, 4 inches wide, and about 2.5 inches high). Bottom: The three 'winners' of the challenge, having eaten their respective burritos within 20 minutes. From left to right are Mike Jackson (5 minutes, 35 seconds), Zach Swanson (9 minutes, 34 seconds), and Juin-Wan Zhou (16 minutes, 5 seconds).

Zach Swanson, Doane College: Zach's project, "Developing oxide materials for optoelectronic applications" was performed at the University of Wisconsin-La Crosse with Dr. Seth King and Dr. G. R. Sudhakaran. Zach is pursuing a degree in physics.

Jose Barajas, Yakima Valley Community College: Jose's project, "Measurement of optically pumped far-infrared laser frequencies" was performed at Central Washington University with Dr. Michael Jackson. Jose has co-authored a manuscript of his summer research that has been published in the April issue of the *IEEE Journal of Quantum Electronics*, **51** (4), Article No. 1500105, DOI: 10.1109/JQE.2015.2398352 (2015). He also is assisting in the preparation of a second manuscript. Jose received his Associate's degree from Yakima Valley Community College and is currently pursuing his mechanical engineering degree at Washington State University.

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2015 CUR Physics and Astronomy REU Site

Councilors and members of CUR's Physics and Astronomy Division are currently in the second and final year of their pilot REU program funded by the National Science Foundation. The project is intended to provide research experiences to students who are early in their physics and/or astronomy career, who come from underrepresented groups and/or who are enrolled at small four-year comprehensive institutions and community colleges. Although the grant formally supports 6 students, additional funding has been provided by the Council on Undergraduate Research to support a seventh student. The students, their projects, and their mentors are listed below and were selected from a field of over 140 applicants. The program will run from June 1 through August 7, 2014.

- Erin Flowers (Columbia University), "Exploring the limits of planetary habitability using orbital dynamics," with Dr. John Armstrong, Weber State University
- Becca Reimer (Carroll Community College), "Exploring the limits of planetary habitability using orbital

dynamics," with Dr. John Armstrong, Weber State University

- Riley Jordan (Whitman College), "Gyrochronology of Main Sequence Stars in the Kepler Field," with Dr. Terry Oswalt and Dr. Saurav Dhital, Embry-Riddle Aeronautical University
- Marc Amaral (Cape Cod Community College), "Gyrochronology of Main Sequence Stars in the Kepler Field," with Dr. Terry Oswalt and Dr. Saurav Dhital, Embry-Riddle Aeronautical University
- Marija Glisic (University of Washington), "Time Resolved Tandem Faraday Cup for High Energy Target Normal Sheath Particles," with Dr. Stephen Padalino, SUNY Geneseo
- Christopher Case (Missouri State University), "Developing Oxide Materials for Optoelectronic Applications," with Dr. Seth King and Dr. G. Sudhakaran, University of Wisconsin-La Crosse
- Tegan Marianchuk (Arizona State University), "The Persistence Length of Microtubules with Multi-rigidity Segments," with Dr. Tav Hawkins and Dr. G. Sudhakaran, University of Wisconsin-La Crosse

Michael Jackson
Central Washington University
and
John Mateja
Murray State University

Kudos

(We are always looking for contributions to the Kudos section from all P&A Division members. If you have exciting news about yourself and/or your undergraduate research students, please let us know so we can include it in the next newsletter.)

Juin-Wan Zhou, a 2014 REU participant and physics major at Fordham University, recently received first place in the poster competition held at the statewide CSTEP conference in New York this past April. She presented her 2014 summer research on microtubule persistence length performed with Dr. Tav Hawkins at the University of Wisconsin-La Crosse. This summer, Juin is planning on doing research at Albert Einstein College of Medicine.
Congratulations Juin!

Opportunities

(If you have a job opening or program that you would like to advertise here, please send the information to us for inclusion in the next newsletter)

New PhD Program in Astronomy and Planetary Science. The Department of Physics and Astronomy at Northern Arizona University is pleased to announce its new PhD program in Astronomy and Planetary Science, beginning in Fall 2016. Program emphases include exoplanet science, astrochemistry, solar system formation and evolution, astroinformatics, and use of telescopes to study solar system objects and exoplanets. Students will be able to work with astronomers and planetary scientists at Northern Arizona University, Lowell Observatory, the US Geological Survey Astrogeology Science Center, and the US Naval Observatory, all based in Flagstaff, AZ. Students with at least a bachelor's degree in astronomy, planetary science, physics, or a related field are encouraged to apply. For updated information, visit the NAU Physics and Astronomy website at http://www.physics.nau.edu.

Moving On

As noted in Mike's Message from the Chair column, I am stepping down as editor of CURPA News effective at the June Business Meeting, so this is my last issue. It has been a pleasure serving as editor of the Division newsletter these past 5 years and passing along information about all the

wonderful things that CUR does and offers to its members. I am remaining active in CUR, continuing on for another 3-year term as a Councilor for the Physics and Astronomy Division and taking over as Chair of the CUR Fellows Committee, but additional demands on my time associated with our new PhD program (see Opportunities) require me to pass on the editor duties. Thanks so much for your contributions as well as the feedback that you have provided on past issues and please continue to support your Division Newsletter.

Nadine Barlow
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Your CURPA Councilors

John Armstrong, Weber State University. Integrating Research into the Curriculum Task Force and CURPA Webmaster.

Nadine Barlow**, Northern Arizona University. CURPA News Editor and Co-Chair CUR Fellows Committee.

Maria Bautista, Kapi`olani Community College. Diversity and Inclusion Task Force.

Matthew Beaky, Juanita College. CUR Finance Committee.

Mark Biermann, Valparaiso University. Constitution and ByLaws Committee.

Horace Crogman, University of California Merced.

Beth Cunningham**, AAPT. CURPA Mentoring program.

Chris Hughes#, James Madison University. Program Review Committee.

Michael Jackson, Central Washington University. CURPA Chair, CUR Posters on the Hill Committee, Innovation and Collaboration Task Force, and CUR Executive Board.

Liubov Kreminska, City College of New York.

George Marcus*, SUNY Geneseo

John Mateja**, Murray State University. CUR/Barry Goldwater Scholar Faculty Mentor Award Committee and NCUR Oversight Committee.

Duncan McBride**, formerly at the National Science Foundation. CUR Treasurer, CUR Finance Committee, and CUR Investments Committee.

David McGee, The College of New Jersey. Internationalization and Undergraduate Research Task Force.

Sorinel Oprisan**, College of Charleston. CUR Quarterly Editors Board.

Terry Oswalt, Embry-Riddle Aeronautical University Daytona Beach. Advocacy Advisory Committee.

Raul Peters, Paine College. Nominations Committee.

Phillip Reed*, Kutztown University.

Mohammad Samiullah, Truman State University. Internationalization and Undergraduate Research Task Force.

Toni Sauncy, Texas Lutheran University.

Allyn Smith**, Austin Peay State University. CUR Posters on the Hill Review Committee.

Gubbi Sudhakaran, University of Wisconsin La Crosse. NCUR Oversight Committee.

Brian Utter, James Madison University.

Richard Thompson*, The College of Saint Rose.

Andrew West, Boston University. Diversity and Inclusion Task Force.

* Term begins at June 2015 Business Meeting
** Re-elected to new term
# Term ends at June 2015 Business Meeting

CURPA News Deadline

CURPA News comes out three times per year and we welcome your contributions! Please send your submissions, comments, achievements, opportunities, etc. to Mike Jackson (jacksonm@cwu.edu). Deadline for the Fall 2015 issue is ***September 15, 2015***.