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August 7, 2020

Biology News

A Publication of a Division of the Council on Undergraduate Research

Volume 10, Number 2 | Summer 2020

The Biology Division of the Council on Undergraduate Research provides networking opportunities, activities, and resources to assist biology administrators, faculty members, students, practitioners, mentors, and others in advancing undergraduate research.

Chair: Lance Burton, Austin College

Newsletter Editors: Jason Askvig (Concordia College) | Gretchen Edwalds-Gilbert (Keck Science Department of Claremont McKenna, Pitzer, and Scripps Colleges) | Kristin Picardo (St. John Fisher College)

Message from the Biology Division Chair

Lance Barton (Austin College)

Hello and welcome to the summer 2020 issue of the CUR Biology Division newsletter! As the new division chair, I wanted to introduce myself. I have been a CUR Councilor for seven years and have previously worked with the mentor awards and MIRIC programs in biology as well as advocated through CUR for student programs and assessment. I represent Austin College, a small liberal arts college near Dallas, where I am a professor and chair of the Biology Department as well as the director for the Center for Research, Experiential, Artistic, and Transformative Education (CREATE). My undergraduate research experiences at Dickinson College transformed my view of science and ultimately shaped my career. As a faculty member, I have dedicated my career to teaching, mentoring, and providing opportunities (like those provided to me as an undergraduate) for my students. Within the CUR community, I have worked to broaden the impacts of the work we do. I am looking forward to working as division chair to support existing programs while working to maintain and enhance a welcoming, diverse, collaborative community that supports promoting broad access to the benefits of undergraduate research. I look forward to representing biology within CUR and working with all of you over the next three years.

Visit CUR's YouTube Channel

Did you know CUR has a YouTube channel? The site features CUR-developed content and videos from member institutions. **Check it out >>**

Serve as a SPUR Reviewer

Interested in serving as a reviewer for *Scholarship and Practice of Undergraduate Research*, CUR's academic journal? Send an email to **SPUR@cur.org** and indicate areas of expertise/interest (e.g., assessment). Of special interest is experience with qualitative/quantitative methods.

Biology Division Honors Three Research Mentors with Awards for 2020

Janet A. Morrison, The College of New Jersey; Chair, Biology Mentor Awards Committee

The CUR Biology Division's Biology Mentor Awards honor biology mentors for their long-term efforts in supervising undergraduates in research. The awardees for 2020 demonstrate a deep commitment to students and full engagement in the pursuit of new biological knowledge.

The early-career Biology Mentor Award recipient is **Anne Brown**, assistant professor since 2017 at Virginia Tech, where she also earned her PhD in biochemistry. Brown holds the positions of science informatics consultant and health analytics coordinator in the Research, Learning, and Informatics Department within the university libraries. Her lab group utilizes computational biology and informatics techniques, with a research agenda focused on molecular dynamics simulations and in silico drug discovery, to understand protein structure-function relationships involved in neurodegenerative disease, among other collaborative areas. Brown developed a comprehensive, accountable, and hierarchical undergraduate research mentoring system such that she can have more than 30 students active in her group at one time, and her extensive collaborations with undergraduates have resulted in numerous publications and presentations at professional conferences. She was awarded one of the inaugural undergraduate research faculty grants at Virginia Tech, aimed at scaling access to undergraduate research by expanding this mentoring model to other areas. Brown's mentoring effectiveness is not due just to her system but also to her personal interactions with students. She received Virginia Tech's Outstanding Undergraduate Research Mentor Award in 2019; her nominators cited her as being patient, encouraging, approachable, and inspiring. Brown also has been very active in developing research preparatory courses for the institution; since 2016, these courses have trained more than 200 students from all majors.

Christopher Lassiter, professor of biology and director of undergraduate research at Roanoke College, is the recipient of the mid-career Biology Mentor Award. Lassiter trained in genetics and genomics at Duke University for his PhD and postdoctoral studies, and has been at Roanoke College for 15 years. He teaches courses in cell and developmental biology and has mentored 29 undergraduates in his zebrafish developmental biology lab. His research collaborations with students have been very productive, resulting in published papers with many student coauthors and numerous posters with students, including many at regional, national, and international professional conferences. Lassiter recognizes and acts on the principle that mentoring extends well beyond the classroom or lab and relies on the forging of personal relationships. To that end, he takes students to national conferences by way of extended road trips so they can stop and visit national parks for hiking excursions. Lassiter has received the Dean's Award for Exemplary Service at Roanoke.

The advanced-career Biology Mentor Awardee is **Terry Hill**, professor at Rhodes College. A mycologist with a doctorate from the University of Florida, Hill has been with Rhodes College since 1978, and he is now the most senior faculty member at the institution. Hill has had an active, productive, and fully funded research program for more than 40 years. He has mentored undergraduates in research over his entire career, focusing on filamentous fungus *Aspergillus nidulans*, with very notable outcomes. He has published many papers with student coauthors and had countless presentations with students at regional and national professional conferences. He was among the first at Rhodes to support student researchers in the summer and was instrumental in growing the current culture of summer research at Rhodes. Notably, he has focused squarely on diversity, developing a program that brings HBCU students to Rhodes for a summer of research. Hill models for his students a deep, sustained passion for biology; by all accounts, he can be found in his lab day and night and on weekends, always eager to learn from his students about their hot-off-the-presses research results.

Find out more information on nominations for the **2021 Biology Mentor Awards**. Mentors can be self-nominated or be nominated by their students or colleagues. The next deadline for student nomination emails to the Mentor Award Committee chair is February 1, 2021, and the next deadline for self- and colleague-nomination materials is March 1, 2021.

More on 2021 Biology Mentor Awards

Faculty Research Awards, CUR Biology Division

Gretchen Edwalds-Gilbert, Keck Science Department of Claremont McKenna, Pitzer, and Scripps Colleges

The CUR Biology Division initiated an award program for research supply grants, up to $250 each, to members of the Biology Division. These awards are intended especially for projects with undergraduates in which a small grant will make a big difference. Given the COVID-19 pandemic, faculty were awarded a stipend that they may spend when they are able to use it. In the first round of awards, seven projects were funded, ranging from laboratory-based research on the tumor suppressor p53 to ecological analysis of Ozark woodlands. All the studies will provide undergraduates with meaningful independent research experiences. The Biology Division will continue the awards program in fall 2020 with funding for four faculty research projects involving undergraduates and intends to make this a regular program of the division.

MIRIC Seeks New Participants for 2020 - 2021

Michael Wolyniak, Hampden-Sydney College

The Mentoring the Integration of Research into the Classroom (MIRIC) network of the CUR Biology Division is seeking new participants for the 2020–2021 academic year. The division seeks both new mentors and mentees as it focuses this year on discussing strategies for teaching science through research in the uncertain times surrounding COVID-19. The goal is to build affinity groups focused on specific challenges of CURE implementation (online instruction, diversity, equity and inclusion, introductory vs. advanced coursework, etc.) that alternate meetings with network-wide discussions on common issues related to developing successful research experiences in undergraduate courses. The plan is to develop a set of strategies that network members can follow as they work to navigate developing engaging class experiences for the coming year and beyond. For further details, visit the **MIRIC webpage**.

Computational Reproducibility in Wildlife Journals

Althea Archer

In summer 2018, a large collaboration of scientists, including two undergraduate students from Concordia College, undertook a test of the computational reproducibility of 80 wildlife ecology publications. Computational reproducibility is the ability for an independent researcher to reach the same conclusions as published in an article by using the original data and the same analysis methods.

Randomly selected were 80 articles published in the previous two years in the *Journal of Wildlife Management* and the *Wildlife Society Bulletin*, which are the flagship journals for the Wildlife Society. Of those selected, it first was determined if they were suitable for review (e.g., had quantitative results that could potentially be reproduced), and then data was sought for the suitable articles. The searches for data began in supplementary materials or in online repositories, but the researchers were obligated to contact authors directly for data from 68 studies. Forty-two authors did not respond, and 13 authors opted out of sharing their data for reasons such as the data being protected for confidentiality or because they did not have the time to assemble the data.

Of those studies for which data was obtained (n = 19), it was found that 68 percent were mostly or completely reproducible. Common features of reproducible studies included well-documented and well-organized data, sharing code for analyses, and thorough descriptions of the analysis methods in the manuscript text. It was concluded that sharing data would be the easiest way to increase reproducibility across the board and that scientists should focus on creating, using, and sharing well-documented data and analysis code. The complete findings of the research study can be found in the following:

ArchMiller, Althea A., Andrew D. Johnson, Jane Nolan, Margaret Edwards, Lisa H. Elliott, Jake M. Ferguson, Fabiola Iannarilli, et al. 2020. "Computational Reproducibility in The Wildlife Society's Flagship Journals." *Journal of Wildlife Management* 84: 1012–1017. doi: 10.1002/jwmg.21855.

Maintaining Momentum during Curricular Reform

Tara Phelps-Durr, Radford University

Radford University's Department of Biology is one of 24 departments participating in the CUR Transformations Project (CURTP). During this four-year project (2017–2021), participants will develop research-rich undergraduate curricula. Each participating department receives $2,000 annually and is guided by two CUR consultants. The progress of each department is discussed at an annual retreat where the CURTP project leaders, CUR consultants, and representatives from participating departments convene and engage in various activities designed to provide updates and learn from each other. Data are also gathered through two annual reports: one written from the consultants' perspective following their onsite visit and the other written from the department's perspective. The student perspective is gathered by administering a survey designed by CUR. At the conclusion of CURTP, CUR will understand factors that influence departmental change, and the participants will have a curriculum that provides more students with the benefits of undergraduate research.

Reflecting on the progress of Radford's Department of Biology during the first 2.5 years of CURTP has identified several characteristics that maintain forward momentum when challenges emerge. These characteristics may be of interest to others engaged in reform efforts.

Understand the beginning and end of the journey. Studies of organizational change state that understanding context and clearly defining the end goal are important to achieve lasting change. As Radford entered CURTP, there was overwhelming support to change the biology curriculum. Less defined was a meaningful reason as to why curricular reform was needed (i.e., something beyond "we don't like the current curriculum") and what broad, critical changes were necessary. Taking the time to understand why curriculum revisions were needed was critical for keeping colleagues engaged in long-term reform efforts. Having a clearly defined end goal provides focus each time the path forward becomes unclear.

Provide a framework for how things happen during the middle of the journey. CURTP requires participating departments to engage with the backward-design process and end with a research-rich curriculum for undergraduates. Radford's Department of Biology was eager to participate in CURTP partly because of numerous failed attempts at curricular reform in the past. Reflecting on the failed attempts prompted the creation of a process document that outlined how reform would happen. The process document includes descriptions of the voting process, the procedure for forming committees, and the management of departmental discussions.

Revisit the goals and framework when the path becomes unclear. What happens in the middle of the journey will be influenced by circumstances beyond your control. When CURTP launched in 2017, higher education was already battling financial challenges bought on by declining enrollments and state funding. No one could have predicted that, by summer 2020, higher education would be trying to survive a pandemic. In between launching CURTP and grappling with COVID-19, Radford welcomed eight new colleagues into the Department of Biology as the result of a merger and launched an initiative to redefine the general education curriculum. There will be disruptions. At times, the path forward will be unclear, and clearly defined goals and a framework are critical for re-establishing momentum.

Seek external advice and examine existing models. Curriculum reform should not solely focus on courses. Instead, reform efforts should also aim to alleviate faculty and student workload challenges, remove barriers to student success, and create sustainability by defining clear incentives and rewards in faculty tenure and promotion guidelines. Addressing these broader challenges inevitably lead to difficult conversations. Carefully examining existing models at other institutions and engaging with external reviewers or advisory boards is essential. CURTP provides an invaluable opportunity to work with the CUR consultants and interact with the other departments participating in transformational reform. Departments striving for meaningful change should look for opportunities to examine external models and include external perspectives in their efforts.

As a participant in CURTP, the Department of Biology at Radford is making progress toward the goal of scaffolding undergraduate research throughout the curriculum. The department's past and previous attempts at curricular reform have solidified the concepts that change is hard and the process is slow. During the CURTP journey, faculty have learned more about each other (e.g., what we teach, how we teach) and the experiences of students. The CURTP experience has helped us understand challenges and provided the support needed to develop strategies that will ultimately lead to a new research-rich curriculum for undergraduates.

We gratefully acknowledge support of the CUR Transformations project, which is supported by the National Science Foundation (NSF) through an NSF DUE IUSE grant to the Council on Undergraduate Research (#16-25354).

Pay-It-Forward Peer-Mentoring in Research

Shere Byrd, Fort Lewis College, Durango, CO

Shere Byrd (center) with fourth-year peer mentors (left to right): Bay Vagher, Jennica Peter, Alyssa Yocky, and Victoria Quintana.

Peer mentoring has long been recognized as a valuable high-impact practice in higher education. Mentoring roles can include service as a tutor, teaching assistant, or senior partner in research labs. Whatever role is involved, a peer mentor gives students a more approachable and relatable avenue of communication about their academic and social life as a budding academic. This can be particularly useful if a mentee is a first-year student, a first-generation student, or a student from an underrepresented group. A good mentor can have a transformative and lasting impact on forward movement in science and life. But how many students think about peer mentoring as a pay-it-forward activity?

In spring 2019, after I successfully mentored a group of six fourth-year female students through their thesis research projects, I discovered that several still had a semester of coursework to finish before they graduated. Among this group were two minority students (one who was a NIH MARC USTAR scholar focused on a future PhD and one who had just completed her first research project), the student body vice president and captain of the basketball team who was targeting medical school admission, and a student who wished to be a future teacher/scholar at a primarily undergraduate institution (PUI). At the same time, department faculty had been discussing how more first- and second-year students could be engaged in the role of student/scientist outside of the classroom. Given the nature of Fort Lewis College as a non-tribal, Native-serving institution with a student population that is 30 percent Native American and 51 percent minority and/or first-generation students, this discussion was particularly important. I decided to pilot a “pay-it-forward” mentoring experience in my research lab that would focus on underserved students.

First, I asked my fourth-year students whether they would be interested in mentoring a first-year student as a continuation of their thesis lab project. Topics discussed were their role, my role, and the mutual expectations for this experience. I then emailed the self-identified minority or first-generation students in my first-year Biology of the Cell class, inviting them to work with a fellow student on a research project in my lab. My lab group met with those students who expressed interest, and the fourth-year students described their research projects, the level of time and effort involved for the first-year students, and their role as a mentor. I facilitated discussions about potential independent-study credits, the approach to writing mini-grants for research funding, and the nature of my expectations. The students had time to consider if they were still interested, and eventually, a student mentee was found for each fourth-year student. New students were assisted in writing mini-grants, reading and discussing literature pertinent to each study, keeping a tidy and informative lab notebook, and generally serving as a productive member of the lab. Such a scenario was not novel. Many labs, particularly those at PUIs, use an advanced student/new student mentoring scheme as a way of keeping research moving forward. The difference here was that I had targeted for diversity and coached mentors to have a “pay-it-forward” mind-set.

In reflecting on the experience, I believe I should have coached mentoring more formally. My fourth-year mentors expressed the same frustrations with their mentees that I had with many of them such as a lack of focus and time management skills, as well as an “aha!” moment about the lack of knowledge of beginning students about lab culture. Their mentees felt like they were always being taught and were not given enough independence in the lab (they wanted to run before they could walk). The individual projects varied in how much they moved forward. The most important thing that came out of the focus on paying it forward generally occurred in the lab but outside of the actual project. Fourth-year students became advocates for their mentees, encouraging them to apply for summer Research Experiences for Undergraduates (REUs), helping them to contact the MARC USTAR program director, and talking about their experiences and futures as women in science. A year later, the mentor-mentee pairs are still in communication with each other, celebrating admission to graduate and professional programs, engagements, and progress on their science. All of the new researchers continue to work in my lab on projects of their own. I now look for a mechanism to

incorporate “pay it forward” mentoring as a part of a new research-based second-year seminar class in the department.

Peer mentoring is more than just one student helping another student learn a technique in the lab. It should include an advocacy mind-set, and many students—particularly underserved students—could benefit from “pay it forward” peer mentoring.

Promoting Undergraduate Research through the S-STEM Catalyst Scholars Program

Irene Reed, University of Saint Joseph; CUR Biology Councilor

Catalyst Scholars, University of Saint Joseph

In fall 2018, the University of Saint Joseph (USJ) in West Hartford, CT, was awarded NSF S-STEM grant no. 1742667. To date, 19 first- and second-year students have been recruited into two cohorts that are collectively known as the Catalyst Scholars. The main themes of the Catalyst Scholars Program are early advising within the Departments of Biology and Chemistry, exposure to a wide variety of STEM careers through various events and outreach efforts, and early placement into research.

USJ is a small, liberal arts university that offers undergraduate programs, master’s programs, and doctoral degrees. The campus is committed to promoting research and experiential learning in addition to engaging students in a diverse selection of disciplines. The opportunity to build an S-STEM program at the institution has fostered several outcomes, including increased academic support for STEM students with financial need and expanded opportunities for undergraduate research.

Efforts are ongoing to diversify the types of research experiences in which students are engaged. So far, two of the first-year students have participated in research experiences over the summer—one at a local R1 research institution and hospital (University of Connecticut Health) and another in field research testing levels of E. coli in the Scantic River. Several other students will be engaging in research experiences at Jackson Laboratories and the USJ School of Pharmacy in the upcoming months. As an alternative option, an interdisciplinary, course-based undergraduate research experience (CURE) may be developed to engage students in a research experience as a group during the academic year. All of the students will present their research at USJ’s Annual Symposium Day and participate in regional conferences such as the Beta Beta Beta Biological Honors Society Regional Convention.

One unique aspect of the program is the heavy integration of writing, particularly in the sciences. Students are part of a cohort in a Scientific Writing course that focuses on key skills important in research, including finding and reading primary literature, developing a hypothesis, and evaluating the validity of sources. Students will also compile other samples of scientific writing throughout their participation in the program,

which will be assembled into a writing portfolio that can be showcased to employers or graduate/ professional programs.

Finally, the organization of an S-STEM Student Research Symposium is in process with the collaboration with other institutions in CT that have received S-STEM grants. Since Connecticut is a relatively small state, inviting S-STEM students from various institutions in the state to present their research can easily be facilitated. This type of collaboration among S-STEM recipients is a novel idea, at least in this region of the country. The symposium will feature individual and group research projects in which students have engaged through their respective programs and include poster and oral presentations in addition to a keynote address and opportunities to network with other students, faculty members, and leaders in local bioscience industries.

Future activities include the involvement of Catalyst Scholars in outreach opportunities with middle and high school students through established programs at USJ, which will promote advocacy for undergraduate research and exploration of careers in STEM.

UPCOMING DEADLINES

CUR EVENTS

- Please visit the **CUR website** and **events page**.

CONFERENCES

- **ABRCMS.** November 11–14, 2020. In-person (San Antonio, TX) and remote.
- **SACNAS**. October 22–24, 2020. In-person (Long Beach, CA).
    - Check conference schedules for updates due to the COVID-19 pandemic.

GRANTS & AWARDS

- **Fulbright Scholar Program.** Application deadline: September 15, 2020 (for research and/or teaching abroad for the 2021–2022 academic year).
- National Institutes of Health. **Research Enhancement Award (R15).** Annual deadlines: February 25, June 25, and October 25 for most applications.
- National Science Foundation. **Improving Undergraduate STEM Education (IUSE).** Key deadlines: December 1, 2020; February 2, 2021 (depends on the application track).
- **Research Coordination Networks in Undergraduate Biology Education.** Full proposal deadline: January 19, 2021.

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