About CUR’s Math and Computer Sciences Division (MCS)

The Math and Computer Sciences Division of the Council on Undergraduate Research provides networking opportunities, activities, and resources to assist mathematics, statistics, and computer sciences administrators, faculty members, students, practitioners, and others in advancing undergraduate research.

MCS is the Division of the Year!

At the 2019 Annual Business Meeting (ABM) our Division won the coveted ‘Division of the Year’ Award.

Incoming Chair’s Message

I am honored to have the opportunity to represent the Mathematics, Statistics, and Computer Science membership of the Council on Undergraduate Research. I’d like to thank outgoing chair, Patrick Rault, for his continued service to our division and CUR, as well as recognize the contributions of all our division councilors. Our division works to support and recognize undergraduate research in Computer Science, Statistics, and Mathematics. As a result of this hard work, our division won CUR’s “Division of the Year” award this past June at the Annual Business Meeting. Our division is energetic, creative, and hard-working! The work is important, and we make it fun, so I’d like to encourage you to consider running in our upcoming councilor election this year.

In addition to councilor, there are numerous opportunities to get involved in CUR. Here are some of my favorites:

- Have your students submit to Posters on the Hill, or sign up to review for Posters on the Hill. This is a unique opportunity to make undergraduate research visible to congressional representatives and their staff members.
- Submit an article to, or sign up to review for, the Scholarship and Practice of Undergraduate Research (SPUR), CUR’s quarterly journal. SPUR also accepts submissions of “Research Highlights” – short summaries of recently published research that includes undergraduate co-authors.
- Present at or attend one of CUR’s annual conferences. Students can submit their research to the National Conferences on Undergraduate Research (NCUR), and the CUR Biennial Conference brings together faculty, administrators, staff, academic and
community partners, and policy-makers to discuss undergraduate research at diverse institutions.

For additional information, please see details in this newsletter or on the CUR website.

I’d also like to take this opportunity to congratulate CUR MCS councilor Allison Henrich and her co-authors Michael Dorff and Lara Pudwell on the recent publication of their book, *A Mathematician’s Practical Guide to Mentoring Undergraduate Research*. This is one example of the wonderful work being done by our membership to support undergraduate research.

Finally, I invite suggestions on what we can do as a division to support undergraduate research in Statistics, Mathematics, and Computer Science. Please contact me with ideas.

Andrea Tartaro
Incoming Chair, CUR MCS Division
Associate Professor of Computer Science at Furman University
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**Upcoming Events and Deadlines of Interest to Faculty**

1. **UNCG RMSC** - Scheduled for November 2, 2019.
2. **CUR-Goldwater Scholar Faculty Mentor Award** - Nominations due November 22, 2019.
3. **CURM** – Applications due November 15, 2019.
4. Election for CUR Councilor positions – Nomination now opens until November 15
5. **CUR Fellows Award** – Now open until January 15, 2019.
6. **JMM** - The meetings are scheduled for January 15-18, 2020 in Denver, CO.

10. **CUR Division Mentoring Awards**
Nomination - The deadline for applications will be due around March, 2020.
11. **CUR ABM** - Scheduled for June 25-27, 2020 at Purdue University in West Lafayette, IN
14. **SPUR** - Submissions are accepted at any time.
15. **CUR Institutes** - Deadlines vary.

**Upcoming Events and Deadlines of Interest to Students**

1. **UNCG RMSC** - Scheduled for November 2, 2019.
2. **Posters on the Hill** - Applications are open September 4 through November 5, 2019
3. **ASA Fall Data Challenge** – Due October 28, 2019
4. **NCUR** - The deadline for abstracts is December 6, 2019. The conference will be held March 26-28 at Montana State University in Bozeman, Montana
5. **REUs in Math and CS** - Deadlines range from December to April
6. **JMM Undergraduate Poster Session** - the meetings are scheduled for January 15-18, 2020 in Denver, CO.

**CUR Resources**

*What can CUR do for you?*

1. **CUR Department/Program Reviews**
2. **CUR publications about Undergraduate Research**
3. **CUR Resources on the benefits of Undergraduate Research**
Maia Wichman wins CUR Sponsored Pi Mu Epsilon Award
by Chad Awtrey

Maia's presentation, "Doubly Chorded Cycles in Graphs", was based on work she did this past summer for her Student Summer Scholars project at GVSU, under the mentorship of Dr. Michael Santana. Her project stems from a result in 1963, due to Corradi and Hajnal, that shows for all positive integers k, if a graph contains at least 3k vertices and has minimum degree at least 2k, then it contains k disjoint cycles. It is therefore natural to search for conditions on graphs that guarantee the existence of other special structures; such as, cycles, chorded cycles, theta graphs, etc. Maia's results extended previous research in this area, and she was able to determine minimum degree conditions on graphs that guarantee the existence of disjoint doubly chorded cycles; i.e., graphs that contain a spanning cycle and at least two additional edges. In the future, Maia hopes to attend graduate school to pursue a Ph.D. in mathematics. After that, she hopes to stay in academia.

Three Students Win CUR Math and Computer Science Poster Award at SIGCSE ‘19

Julia Pinedo, Anya Wallace (not pictured), and Anisha Kaul presented a poster, Benefits of Physical Interaction with Array Elements and Code Consolidation on Student Comprehension of Sorting Algorithms, based on research conducted at Harvey Mudd College. The 2019 SIGCSE (Special Interest Group on Computer Science Education) Conference was held in Minneapolis, MN, February 27th through March 2nd.

Their study, a quantitative analysis of introductory-level computer science students’ comprehension of sorting algorithms, was published in SIGCSE ’19: Proceedings of the 50th ACM Technical Symposium on Computer Science Education, pp. 1263-1264. Study results suggested that interaction with a sticky-note representation of an array consolidated multiple lines of code and facilitated student comprehension.
2019 Faculty Mentor Awards

Kenneth Berenhaut

Dr. Kenneth Berenhaut is a Professor in the Department of Mathematics and Statistics at Wake Forest University in Winston-Salem, NC. His research interests are broadly focused on areas related to applied probability, discrete dynamics, network science, convergence rates, mathematical inequalities and discrete structures. Influenced heavily by his interactions with valuable mentors during his years as a student, he took the opportunity to begin working closely with students. His first manuscripts co-authored with students appeared in 2005, and since then he has published over 60 papers with undergraduate and/or masters students (out of 77 total). Twenty-two of these papers have been with undergraduate co-authors (for 18 of these he was the sole faculty co-author). He appreciates the opportunity to involve undergraduates and beginning graduate students in joint work. In almost all cases his co-authored work is their first exposure to the process of publishing in scholarly journals, including manuscript preparation, responding to referees, and eventual publication.

In 2007, with support from Wake Forest, he founded Involve, A Journal of Mathematics, with the goal to provide a venue to highlight the results of quality collaborations between faculty and students at all levels. Papers published in Involve must have a minimum of 1/3 student authorship. To date the journal has published more than 50 issues (and in excess of 500 papers). The editorial board consists of mathematical scientists committed to nurturing student participation in research; the journal is published through the nonprofit Mathematical Sciences Publishers at the University of California, Berkeley. He has found great pleasure over the years encountering many young faculty who published their first papers in Involve, during their student years.

Pamela Harris

Dr. Pamela E. Harris is a Mexican-American Assistant Professor in the department of Mathematics and Statistics at Williams College. She received her B.S. from Marquette University, M.S. and Ph.D. in mathematics from the University of Wisconsin-Milwaukee, and was a Davies Fellow of the National Research Council with a dual appointment at the United States Military Academy and the Army Research Lab. Her research interests are in algebraic combinatorics, graph theory, and number theory. Since 2013, she has mentored 41 undergraduate research students at five institutions: six at West Point, 21 at Williams College, eight at SUNY Geneseo, and co-mentored five students from Youngstown State University and one student from Universidad de los Andes in Bogota, Colombia. This work has resulted in 14 publications coauthored with students. Dr. Harris works to develop learning communities that reinforce students’ self-identity as scientists, in particular for women, underrepresented students, and those who have not had many prior positive mathematical experiences. Her future goals as a mentor, are to continue to create opportunities for
students that provide positive mathematical experiences, and which help students discover that mathematics is a vibrant and lively field in which all can contribute in meaningful ways.

Manda Riehl

Dr. Riehl is an associate professor of mathematics at Rose-Hulman Institute of Technology and was formerly an associate professor of mathematics at the University of Wisconsin – Eau Claire, after earning her PhD at UC San Diego and bachelor’s degree at MIT. She has research interests in discrete mathematics and biomathematics. Her specialties include prediction of RNA secondary structures, pattern avoidance in mathematical structures, and the use of generating functions. Dr. Riehl has a strong record of collaboration with undergraduates, having mentored over 35 students who have regularly given talks in national and international venues. Dr. Riehl and her students have jointly authored 13 papers, including many in top disciplinary journals. A number of these projects gave the students the opportunity to collaborate with other professional researchers from around the country and abroad. She also garnered significant grant funding as co-PI on a $300,000 grant from the National Science Foundation entitled “PUR: Partnership for Undergraduate Research: Enhancing the Undergraduate Curriculum”. Dr. Riehl believes in the transformative power of faculty-student mentoring relationships, not just professionally, but personally as well, having experienced it herself. In her nomination, one of her students wrote: “I attribute [my] successes in large part to the strong mathematical foundation in research and teaching that Manda provided me…and to the remarkable opportunities she has afforded me through her sustained advocacy throughout these years.” Another student wrote: “Without [Dr. Riehl’s] encouragement and confidence, I would not have had such an incredible opportunity… I was able to be a leader. Dr Riehl pushed us to accomplish more than we thought was possible… I hold the time with her as my research mentor very close to my heart.”

Just Published

A Mathematician's Practical Guide to Mentoring Undergraduate Research, jointly published by the AMS, MAA, and CUR, is a complete how-to manual on starting an undergraduate research program. Readers will find advice on setting appropriate problems, directing student progress, managing group dynamics, obtaining external funding, publishing student results, and a myriad of other relevant issues.

Written by Michael Dorff, Brigham Young University; Allison Henrich, Seattle University; and Lara Pudwell, Valparaiso University, here they have accumulated knowledge from their decades of experience that other mathematicians will find extremely useful. More details can be found online at https://bookstore.ams.org/clrm-63/.

CUR Councilor Elections

by Sherri Harms

CUR is governed by a body of councilors, who collaborate at the forefront of national policy on Undergraduate Research. The Mathematics and CS Division of CUR needs motivated and energetic members to serve as Councilors. We are especially interested in increasing our division’s diversity. This is an important leadership opportunity that will give you and your institution a voice at the national level. The decisions that you will help make as a Councilor will lead to new developments in the programs, meetings, and benefits that CUR offers. Please see the Councilor Handbook for more information about a Councilor’s role and responsibilities.

Please note, travel and registration fees are the responsibility of the councilor. (We have found
that administrators are often willing to defray the cost of attendance in recognition of this honor it represents for both the councilor and the institution as a whole.) We recommend that you ask your administration for a guarantee of support to attend our annual business meetings if you are elected councilor, and consider staying a few extra days for our biennial conferences. Each business meeting lasts 3 days and registration costs about $150. On conference years this is extended by 3 days, with recent registration costs of about $600. Registration costs may seem high but they include most pre-dinner meals and about half of the dinners. If you are interested in becoming a councilor, but you anticipate that the cost of attendance at the business meeting may be a barrier to your participation, please let the division Chair know.

The nominations submission is a self-nomination. If you would like to recommend someone to be considered, please send their contact information to the Sherri Harms, the Math/CS representative on the nominations committee, via email at harmssk@unk.edu. You can also find the information on how to submit nominations on the CUR website. Nominations are submitted through the nomination form, which is open October 1st through November 15th.

**CUR Announcements**

2020 Biennial Conference, June 27-30, 2020 at Purdue University (West Lafayette). Co-chairs are Mary Farwell and Ashley Hagler, and the theme of the conference is: “Inclusivity in Research: Scholarly Inquiry throughout the Undergraduate Experience.” More information about next year’s biennial conference will be provided at the 2019 ABM and the URP conference, and we anticipate that the call for submittals will be issued in the early fall. CUR’s executive board and general council meetings will immediately precede the biennial conference.

CUR’s first official “whitepaper”, “Undergraduate Research: A Road Map for Meeting Future National Needs and Competing in a World of Change”, authored by Joanne Altman, Tsu-Ming Chiang, Christian Hamann, Huda Makhluf, Virginia Peterson, and Sara Orel, was published on the CUR website. This resource was developed by the assessment task force within the last two years, and is an excellent summary of the evidence on undergraduate research’s positive impact.

**Call for Abstracts**

Does your student have research data from the spring, or from a summer research experience? Here is an undergraduate e-conference that would be a good reason to get that research project written up and presented.

The 2019 Electronic Undergraduate Statistics Research Conference is Friday Nov 1, 2019. Abstract submissions are due by Oct 23. And it’s free.

https://www.causeweb.org/usproc/eusrc/2019

Sponsored by American Statistical Association and the Consortium for the Advancement of Undergraduate Statistics Education.

**ASA Fall Data Challenge**

Would you be willing to organize and guide a group of 2-5 undergraduate students use data to address homelessness? The American Statistical Association’s Fall Data Challenge will this year invite students to analyze U.S. Department of Housing and Urban Development data to develop insights that will guide officials towards making evidence-based decisions on how to help solve the homelessness crisis.

Teams will submit a short essay describing the team’s process and presenting their analysis and recommendations via a 10-slide PowerPoint presentation. Awards will be given in three categories (1) Best Overall Analysis, (2) Best Visualization, and (3) Best Use of External Data. Teachers, get your class involved by visiting the Fall Data Challenge Educator Resource Page. Submissions are due by October 28, 2019.
Division Plans Summer 2020 Pre-Conference Data Science Workshop

Our division has tentatively scheduled a workshop on the afternoon following our next ABM just as the Biennial Conference begins. Both will be held at Purdue University, West Lafayette Indiana in late June 2020. Precise details to follow but hopefully this piques your interest:

*Learning from Data: Image Classification Experiments in Undergraduate Research*

Machine learning is a hot field, but without some training it is difficult to distinguish significant results from artifacts of bad design. In this three-hour long workshop, participants will be led through a syllabus of experiments on a tagged animal image database intended to facilitate mentoring undergraduate students in the design, implementation, and assessment of their own machine learning research projects utilizing the OpenCV and Scikit-Learn libraries. Data preparation, including dimension reduction, will be discussed. Common machine learning methods will be illustrated, including examples of missteps, and the selection of appropriate performance metrics will be covered. Attendees are welcome from all disciplines, but for full benefit you should bring a Wi-Fi enabled laptop and possess a modest knowledge of Python scripting.

Anthony Kapolka and Sofya Chepushtanova from Wilkes University are the facilitators.

**Funding for Academic Year Research Groups in Mathematics through CURM**

The Center for Undergraduate Research in Mathematics (CURM) calls for minigrant applications from faculty by November 15. Minigrants provide support for pairs of research groups from two institutions in a nearby geographic region (preferably institutions of different type) to mentor academic year student research. Each research group will consist of 3-5 undergraduate students and a faculty mentor. Each group will receive:

- a $3000 stipend or course credit for students
- a $5000 stipend for each faculty member
- funding for supplies
- funding provided for professors to attend a summer workshop on best practices for research mentoring
- funding for travel to a regional meeting in spring

For more information, please visit [curm.urmath.org](http://curm.urmath.org).

**What has CUR done for you and is still doing for you?**

1. Addressing future trends in UR: assessment, UR in curriculum, big collaborations in UR, etc.
2. Access to CUR programs: POH (Posters on the Hill), NCUR, Institutes, Biennial Conference, etc.
3. Networking with and learning about effective practices used in other disciplines.
4. Access to CUR publications that address issues not addressed by the MAA (e.g., assessing the effectiveness of UR).
5. Advocacy for UR: NSF REUs resulted from CUR advocacy, the Goldwater/CUR award, the founding of the MAA SIGMAA on UR, etc.
6. Help in instituting activities that promote UR at your college or university (e.g., teaching credit for faculty who are doing UR, UR being valued in promotion and tenure, etc.). Organizations like CUR that have members from multiple disciplines and administrators are more effective than disciplinary organizations.
Our Division on Social Media
by Anthony Kapolka

In his President’s Report, submitted at the 2019 ABM, Iain Crawford lauded innovative use of social media by the Arts and Humanities Division (a blog) and Chemistry (a podcast). These efforts, he said, helps CUR “be the vibrant, dynamic, multi-faceted voice of and for undergraduate research that has brought us to be so involved in it.” CUR itself can be found on Twitter @CURinAction, LinkedIn, and Facebook. In response, our division has rolled out two social media initiatives.

Taking lead on technical aspects of our social media presence, Kristin Lassonde has started a Twitter feed @curmcs (and we encourage use of a similar hashtag #curmcs along with the more general #CURinAction).

Webmaster Lassonde has also employed Wordpress to extend our division website to include a blog at where you can read our inaugural article ‘How I Learned to Help Undergraduate Students Write Collaboratively.’ Discipline editors include (chief editor) Allison Henrich (henricha@seattleu.edu) for Mathematics, Bruce Blaine (bblaine@sjfc.edu) for Statistics, and Tony Kapolka (kapolka@wilkes.edu) for Computer Science. We’ve queued up articles such as ‘A Simple Model for Undergraduate Statistics Capstone Research Projects,’ ‘Undergraduate Research at an R1 Institution,’ and an article with advice for running an NSF Research Experience for Undergraduates (REU) to appear in the coming months. Content is always welcome; to pitch a future essay (of about 500-1000 words), please contact the appropriate discipline editor.