

# Undergraduate Research Highlights

Rufin MA, Ngo BKD, Barry ME, Page VM, Hawkins ML, Stafslie SJ, Grunlan MA. Antifouling Silicones Based on Surface-Modifying Additive Amphiphiles. *Green Materials*. 2017; 5:1: 4–13. doi: 10.1680/jgrma.16.00013 (Texas A&M University)

Biomedical devices implanted in the human body need coatings that prevent the formation of blood clots from forming on their surfaces. This research evaluated the importance of structure on the surface longevity of oligomeric additives. Three types of structures were tested to see the effect of long-term submersion on hydrophilicity as well as the prevalence of leaching. It was found that a triblock structure (groups on both ends) was no more effective than the diblock (groups on one end) but had a higher risk of leaching. This showed that diblock structures are more efficient, requiring less material to produce the same benefits, lowering the cost of large-scale production for materials that are modified with our additives. Melissa Grunlan is an associate professor of biomedical engineering at Texas A&M University (TAMU). Marc Rufin is Stent R&D Design Engineer at Medtronic Minimally Invasive Therapies Group. Bryan Khai Ngo is a PhD candidate at TAMU. Melissa Hawkins is a member of the Grunlan Research Group at TAMU, and Shane J. Stafslie is a senior research specialist at the Center for Nanoscale Science and Engineering at North Dakota State University. Mikayla Barry and Vanessa Page, both senior biomedical engineering majors, participated in the research for course credit. As an undergraduate, Barry was an Arnold and Mabel Beckman Scholar and an Astronaut Scholarship Foundation Scholar. She is currently pursuing a PhD in materials science and engineering at the University of California, Santa Barbara as a NSF Graduate Research Fellow. Page plans to attend graduate school in Germany. Barry and Page also served as Undergraduate Research Ambassadors for the LAUNCH: Undergraduate Research office at TAMU. This research was supported by the Texas Engineering and Experiment Station (Grunlan), the National Institutes of Health (Rufin), and the Office of Naval Research (Stafslie).

Kerr MM, Frese KM. Reading to Learn or Learning to Read? Engaging College Students in Course Readings. *College Teaching*. 2017; 65:1:28–31. doi: 10.1080/87567555.2016.1222577. (University of Pittsburgh)

Despite instructors' belief that class readings are integral to the learning process, only 20-30 percent of undergraduate students complete required readings. Failure to complete course reading has been associated with declines in exam

and research performance. This paper first offers a brief review of the literature on why students do not complete course readings: (1) unpreparedness, (2) lack of motivation, (3) time constraints, and (4) an underestimation of reading importance. We then identify approaches that encourage students to read, enjoy reading, and develop metacognitive knowledge, shown to improve learning. Mary Margaret Kerr is professor of psychology in education. Kristen M. Frese completed this work as a project during summer 2016. She is now in a doctoral program at the University of Maryland.

Werner RJ, Schultz BM, Huhn JM, Jelinek J, Madzo J, Engel N. Sex Chromosomes Drive Gene Expression and Regulatory Dimorphisms in Mouse Embryonic Stem Cells. *Biology of Sex Differences*. 2017; 8:28. doi: 10.1186/s13293-017-0150-x. (Temple University)

This article investigates the sexual dimorphisms observed in pre-implantation embryos to determine whether these differences reflect sex-biased expression patterns. To do this, transcriptome profiles for six 40 XX, six 40 XY, and two 39 X mouse embryonic stem (ES) cells were generated by RNA sequencing. We found hundreds of coding and noncoding RNAs that were differentially expressed between male and female cells. Overall, our results support the role of the sex chromosomes in establishing sex-specific networks early in embryonic development and provide insights into effects of sex chromosome aneuploidies originating at those stages. All authors work at Temple University's Fels Institute for Cancer Research and Molecular Biology. Nora Engel and Jaroslav Jelinek are associate professors at the Lewis Katz School of Medicine, and Rachael Werner is an MD/PhD candidate at the Lewis Katz School of Medicine. Jacklyn Huhn participated in this project as an undergraduate student beginning in summer 2015 through the Undergraduate Research Program at Temple University. After the program concluded, Huhn continued to work in the lab as a volunteer and eventually carried out her senior research project for distinction in the biology major in the lab. Huhn graduated in May 2016 as a double major in biology and chemistry, and has continued to work in the lab as a research technician. This research was supported by the National Institutes of Health [R01 GM093066] and by a Temple University Bridge Grant.

Hyre T, Larson M, Chen S. Perceptions Concerning Obstacles, Stereotypes, and Discrimination Faced by Female Sports Reporters and Other Female Sports Professionals. *Athens Journal of Sports*. 2017; 4:3: 213–230. (Shepherd University)

This study contained two components that addressed perceived obstacles, stereotypes, and discrimination faced by female sports reporters and various trends of studies related to gender inequality. The results of the meta-analysis indicated that inappropriate representation of female professionals' and athletes' image and persona is the most relevant and emergent issue today. The perceptions of 157 survey respondents from a university in the Appalachian Region supported the findings of past studies, which indicated stereotypical portrayals of female reporters. Respondents also showed their preferences toward men's sports and had more respect and faith in male sports journalists. Recommendations and suggestions are given to raise the awareness for gender inequality and empower future female sports reporters. Steve Chen is a professor of sport management at Morehead State University. Monica Larson is associate professor of communication at Shepherd University. Tess Hyre was a senior student of communication at Shepherd University at the time of the research and has graduated.

**Romero IE, Toorabally N, Burchett D, Tarescavage AM, Glassmire DM.** Mapping the MMPI-2-RF Substantive Scales onto Internalizing, Externalizing, and Thought Dysfunction Dimensions in a Forensic Inpatient Setting. *Journal of Personality Assessment*. 2017; 4: 351–362. doi: 10.1080/00223891.2016.1223681. (California State University, Monterey Bay)

This study examined the associations between scores on scales of the Minnesota Multiphasic Personality Inventory-2 Restructured Form (MMPI-2-RF) and the presence of diagnoses in three domains of psychopathology—internalizing, externalizing, and thought dysfunction. Using test results and diagnostic information from a large sample of forensic inpatients, we found that MMPI-2-RF scales were associated with the diagnostic domains they were designed to measure, providing support for clinical use of the MMPI-2-RF in this setting. Danielle Burchett is an assistant professor of psychology at CSUMB. Collaborators David Glassmire and Anthony Tarescavage are psychology training director at Patton State Hospital and assistant professor of psychology at John Carroll University, respectively. Isabella Romero and Nasreen (Naz) Toorabally worked on this project as undergraduates. Romero is currently in a doctoral program in clinical psychology at Palo Alto University, and Toorabally is in a master's program in health psychology at University College London. The research was supported by the McNair Scholars Program and the Undergraduate Research Opportunities Center at California State University, Monterey Bay, and the University of Minnesota Press, Test Division.

**Tomberlin M, Tahai L, Pietroszek K.** Gauntlet: Travel Technique for Immersive Environments using Non-Dominant Hand.

*Proceedings of 2017 IEEE Virtual Reality*. 2017; 1. doi: 10.1109/VR.2017.7892295 (California State University, Monterey Bay)

Gauntlet is a novel technique for traveling in immersive virtual environments. It uses tracking of the user's non-dominant hand and recognizes a fist gesture to translate and rotate the viewport. This technique allows for the simultaneous use of the user's dominant for other uses. Gauntlet has various applications and was released as an open-source project. Krzysztof Pietroszek is an assistant professor in the School of Computing & Design at California State University, Monterey Bay. Liudmila Tahai is an MSc student in the IDEA Lab at University of Waterloo. Daniel Kharlamov is a computer science major with a game development specialization at CSUMB. This research was supported by the Undergraduate Research Opportunities Center at CSUMB.

**Johnson M, Humer I, Zimmerman B, Shallow J, Tahai L, Pietroszek K.** Low-Cost Latency Compensation in Motion Tracking for Smartphone-Based Head Mounted Display. *Proceedings of the International Working Conference on Advanced Visual Interfaces (ACM)*. 2016; 1: 316–317. doi: 10.1145/2909132.2926076. (California State University, Monterey Bay)

A smartphone-based head mounted display paired with a motion tracking device provides an affordable virtual reality system but has high latency. Low-cost motion trajectory prediction techniques were evaluated, and it was found that latency compensation can be achieved for this system without using a lot of the phone's computational resources. This novel technique was to reduce motion tracking latency and was applied in a smartphone-based, virtual reality, lightsaber fighting game. Krzysztof Pietroszek is an assistant professor in the School of Computing & Design at California State University, Monterey Bay (CSUMB). Irene Humer is a lecturer in the School of Computing & Design at CSUMB. Liudmila Tahai is an MSc student in the IDEA Lab at University of Waterloo. Matthew Johnson, Brian Zimmerman, and Joshua Shallow worked together on this project while enrolled at CSUMB. They have all graduated.

**Pietroszek K, Kharlamov D.** TickTockRay: Smartwatch Ray-casting for Mobile HMDs. *Proceedings of the 2016 Symposium on Spatial User Interaction (ACM)*. 2016; 1: 181. doi: 10.1145/2983310.2989184. (California State University, Monterey Bay)

TickTockRay uses an off-the-shelf Android smartwatch as a controller for smartphone-based virtual reality. It is a feasible alternative for specialized input devices. TickTockRay

was released as an open-source plugin for the Unity game engine with an example application that implements TickTockRay as a controller in a VR Minecraft clone. Krzysztof Pietroszek is an assistant professor in the School of Computing & Design at California State University, Monterey Bay (CSUMB). Daniel Kharlamov is currently a computer science major with a game development specialization at CSUMB. This research was supported by the Undergraduate Research Opportunities Center at CSUMB.

**Kharlamov D, Pietroszek K, Tahai L.** Ticktockray Demo: Smart-watch Raycasting for Mobile HMDs. *Proceedings of the 2016 Symposium on Spatial User Interaction (ACM)*. 2016; 1: 169. doi: 10.1145/2983310.2989206. (California State University, Monterey Bay)

TickTockRay uses an off-the-shelf Android smartwatch as a controller for smartphone-based virtual reality. It is a feasible alternative for specialized input devices. TickTockRay was released as an open-source plugin for the Unity game engine with an example application that implements TickTockRay as a controller in a VR Minecraft clone. Krzysztof Pietroszek is an assistant professor in the School of Computing & Design at California State University, Monterey Bay (CSUMB). Liudmila Tahai is an MSc student in the IDEA Lab at University of Waterloo. Daniel Kharlamov is currently a computer science major with a game development specialization at CSUMB. This research was supported by the Undergraduate Research Opportunities Center at CSUMB.

**D'Angelo W, Gurung C, Acharya D, Chen B, Ortolano N, Gama V, Bai F, Guo YL.** The Molecular Basis for the Lack of Inflammatory Responses in Mouse Embryonic Stem Cells and Their Differentiated Cells. *Journal of Immunology*. 2017; 198: 2147–2155. doi: 10.4049/jimmunol.1601068. (University of Southern Mississippi)

The findings described in this article demonstrate that embryonic stem cells are fundamentally different from differentiated somatic cells in their innate immunity, which may have important implications in developmental biology, immunology, and embryonic stem cell-based regenerative medicine. Vivian Gama is an assistant professor in the Department of Cell and Developmental Biology at Vanderbilt University School of Medicine. Yan-Lin Guo is a professor and Fengwei Bai is an associate professor in the Department of Biological Sciences sciences at University of Southern Mississippi (USM). William D'Angelo, Chandan Gurung, Dhiraj Acharya, and Bohan Chen are graduate students at USM. Natalya Ortolano was an undergraduate researcher in Guo's lab from 2013 to 2015. She received a grant from the USM Drapeau Center for Undergraduate Research and won first place for her work at the annual USM

Undergraduate Research Symposium in the molecular/cellular biology division. Ortolano is now a PhD candidate at Vanderbilt University. The research was supported by an NIH grant awarded to Guo.

**Moravec M, Bolton E, Hawkins K, Heggan S, Rao J, Smalley H.** The Great War through Women's Eyes. *Pennsylvania History: A Journal of Mid-Atlantic Studies*. 2017; 84:4: 452–461. (Rosemont College)

The present study examined women's experiences of World War I as seen through scrapbooks that commemorate their service with American Expeditionary Services in France. Focusing on visual narratives of two Army Nurse Corps members and an American Red Cross auxiliary nurse, these accounts provide examples of women's efforts to frame historical narratives of a war from which they are too often excluded. Michelle Moravec is an associate professor of history and women's and gender studies at Rosemont College. Elizabeth Bolton, Kyah Hawkins, Sabrina Heggan, Jeel Rao, and Hope Smalley—undergraduate students enrolled in the Rosemont honors course Gender, War, and Peace—conducted this research during spring 2017. Bolton is now a student in the master's of social work program at Bryn Mawr College.

**Oprisan SA, Austin DI.** A Generalized Phase Resetting Method for Phase-Locked Modes Prediction. *PLoS ONE*. 2017; 12: 3: e0174304. (College of Charleston)

We developed a novel theoretical and computational approach to predicting phase-locked modes in neural networks. Existing theoretical/computational approaches have been only used for predicting activity in neural networks when each neuron receives only one input per firing cycle. At the same time, it has been known that on average each neuron receives hundreds of inputs during every firing cycle. We successfully implemented a new approach that correctly predicted the phase-locked modes observed in real biological networks. Sorinel Oprisan is a professor in the Department of Physics and Astronomy at the College of Charleston. Dave Austin is a physics undergraduate who carried out two years of research in the computational neuroscience lab. Austin will graduate from the College of Charleston in spring 2018. His research was supported by NSF CAREER IOS-1054914 grant to Oprisan and by a grant from the Howard Hughes Medical Institute to the College of Charleston as part of its 2012 Undergraduate Science Education Competition.

**Oprisan SA, Imperatore J, Helms J, Tompa T, Lavin A.** Reconstructed Attractors from Optogenetics Experiments. *BMC Neuroscience*. 2017; 18:1: 145. (College of Charleston)

Neural activity of the prefrontal cortex involves thousands of neurons that belong to a large number of interconnected subnetworks. We recorded in vivo extracellular local field potentials of the medial prefrontal cortex when optogenetically stimulated with a brief laser pulse. The time series analysis revealed that the dynamics is low dimensional and could be mathematically modeled by a set of three differential equations. Sorinel Oprisan is a professor in the Department of Physics and Astronomy at College of Charleston. Antonietta Lavin is a professor in the Department of Neuroscience at the Medical University of South

Carolina. Tamas Tompa is a professor in the Department of Preventive Medicine, Faculty of Healthcare, at the University of Miskolc in Miskolc, Hungary. Julia Imperatore graduated with a BS in physics and a concentration in computational neuroscience from the College of Charleston in May 2017. She is currently a research specialist in the Department of Psychiatry and Behavioral Sciences at Medical University of South Carolina. Jessica Helms is a physics undergraduate with a concentration in computational neuroscience. This research was supported by NSF CAREER IOS-1054914 grant to Oprisan.

## **BIG**Data & UNDERGRADUATE RESEARCH

### CFP: "Big Data as a Tool to Promote Undergraduate Research"

*Editor-in-Chief: James LaPlant*

*Issue Editors: Laurie Gould and Janice DeCosmo*

The theme of the spring and summer 2019 issues of *SPUR: Scholarship and Practice of Undergraduate Research* will focus on big data as a tool to promote undergraduate research. Five to six articles from a wide range of disciplines are sought that explore how the applications and use of big data serve to facilitate undergraduate research in a variety of educational and professional contexts. In addition, vignettes (maximum 300 words) are welcomed that offer concrete, creative suggestions with regard to the connections between big data and undergraduate research. Examples of topics of interest include the following:

- Assessment of the impact of undergraduate research projects involving big data
- Promotion of undergraduate research through big-data projects across institutions
- Interdisciplinary or multidisciplinary applications of big data in the context of undergraduate research.
- Ways that big data (or publicly available large datasets) have been leveraged for course-based research projects or for undergraduate research in online learning
- Technological applications in the use of big data to promote undergraduate research.
- Applied research or community-based research using big data in the context of undergraduate research.

In addition, the editors will consider articles or vignettes on undergraduate research that fall outside the theme.

#### **Deadlines:**

**June 1, 2018:** Submission deadline for short (300–500 words) prospectuses of proposed articles or vignettes; submit at the SPUR website ([spur.msubmit.net](http://spur.msubmit.net))

**June 18, 2018:** Acceptance notifications issued

**September 1, 2018:** Submission deadline for final articles (2,000–3,500 words)

**Questions?** Contact the editors ([spur@cur.org](mailto:spur@cur.org))

*The editors encourage the sharing of this CFP with colleagues. They are equally interested in articles pertaining to any aspect of undergraduate research that may not relate to the theme. Such manuscripts may be submitted at any time through the SPUR online system.*