

UNDERGRADUATE RESEARCH Highlights

Sutter M, Roberts EW, Gonzales RC, Bates C, Dawoud S, Landry K, Cannon GC, Heinhorst S, Kerfeld CA. Structural Characterization of a Newly Identified Component of α -carboxysomes: The AAA+ domain protein CsoCbbQ. *Nature Scientific Reports*. 2015; 5:16243. (Michigan State University, The University of Southern Mississippi, Lawrence Berkeley National Laboratory, UC Berkeley)

In this collaborative study, a new component of the carboxysome, the carbon dioxide fixing organelle of many autotrophic bacteria, was discovered and its structure elucidated. CsoCbbQ is assumed to be an activase of the CO₂ fixing enzyme, RubisCO. CsoCbbQ is a member of the AAA+ ATPase protein family and in this study the protein was found to be a hexamer and ATP hydrolysis was confirmed. This provides the the first example of an ATPase activity associated with the carboxysome. Sabine Heinhorst and Gordon C. Cannon are the T.W. Bennett Professors in Chemistry and Biochemistry at the University of Southern Mississippi. Cheryl A. Kerfeld is the Hannah Distinguished Professor in Biochemistry and Molecular Biology at Michigan State University. Louisiana College undergraduate Kimberly Landry participated in the 2013 summer undergraduate research program of the Department of Chemistry and Biochemistry at Southern Mississippi; she is now a medical student at the Louisiana State University School of Medicine. Salma Dawoud, a former chemistry major at Southern Mississippi, performed this work in 2012 and 2013 as part of her senior honors thesis. She is now a medical student at the University of Mississippi Medical Center. The work of both undergraduates was supported by NSF grant MCB-1244534 (to SH and GCC). 

Knapper E, McIlwain H. Predicting Wins and Losses: A Volleyball Case Study. *The College Mathematics Journal*. 2015; 46:5:352-358. (Mercer University)

For a sports fan, predicting whether a favored team will win or lose can be an enticing pastime. Using the mathematical ranking system known as the Massey method, we used data from volleyball matches to rate and rank teams. We then used our rankings to predict the outcome of future matches. As an example, we applied these methods to the 2013 women's indoor volleyball season in the Atlantic Sun Conference. Hope McIlwain is a professor of mathematics. Elizabeth Knapper worked on this independent study project during her undergraduate years as a mathematics major and volleyball player at Mercer University. After graduation she was a Woodrow Wilson Fellow at Ohio State University,

where she earned a master's degree in education. Currently she teaches high-school mathematics in Ohio. 

McCormick JC, Ude G, Das A. DNA Barcodes of Species of the Genus *Dioscorea* in Nigeria for Yam Flour Import Protection in the United States. Poster presentation at University of North Carolina at Asheville. 2016. (Bowie State University, Godfrey Okoye University)

The aim of this study was to characterize the diverse accessions of yam species in the genus *Dioscorea* in southeastern Nigeria by the use of taxonomical DNA barcoding techniques. Our team was able to identify unique single nucleotide polymorphisms that clearly differentiated among the species of yam studied, giving insight to the speciation of the genus. This study also aimed to assist in increased transparency between food producers and consumers. George Ude is an associate professor in the natural sciences department at Bowie State University. Aditi Das is a research associate and lab coordinator in the same department. Julian C. McCormick participated in the research as part of a 2015 summer undergraduate research institute; he has since graduated and has applied to Hampton University's master's in medical science program. The research was supported by the National Science Foundation (NSF), the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP), and Bowie State University's Summer Undergraduate Research Institute. 

Gordon MP, Lloyd LT, Boucher DS. Poly(3-hexylthiophene) Films Prepared Using Binary Solvent Mixtures. *Journal of Polymer Science Part B: Polymer Physics*. 2016; 54:6:624-638. (College of Charleston)

Binary solvent mixtures can be exploited to induce the hierarchical assembly of poly(3-hexylthiophene) (P3HT) in the liquid phase, but, to date, the impact that the attributes of liquid phase P3HT aggregates and solvent mixtures have on the morphology of P3HT films have only been partially scrutinized. A detailed study of the assembly of P3HT in three different binary solvent mixtures using absorbance spectroscopy and dynamic light scattering was conducted. Complimentary optical and atomic force microscopic techniques revealed an array of distinct morphologies in films cast from the P3HT dispersions under different solvent evaporation conditions. David Boucher is an assistant professor of physical chemistry. Madeleine Gordon undertook this work as her senior independent research project. She is currently

an intern at the molecular foundry at Lawrence Berkeley National Laboratory and is applying to graduate programs. Lawson Lloyd worked on the project as the topic of his senior thesis and is currently pursuing his PhD in chemistry at the University of Chicago. The research was supported by the College of Charleston's Office of Undergraduate Research and Creative Activities and the Howard Hughes Medical Institute's Pre-College and Undergraduate Science Education Program. 

Redmond MN, Goodrich B., Schaefer M. Cultural Stereotypes of Disabled and Non-disabled Men and Women: Consensus for Global Category Representations and Diagnostic Domains. *British Journal of Social Psychology*. 2010; 49:471-488. (Hiram College)

The study examined the stereotypes disabled people face in society through administration of a questionnaire asking several disabled individuals about their daily experiences of being stereotyped by people around them. Several recurring themes were found in the responses, with most members of society viewing the disabled individuals as dependent, asexual, unattractive, weak, and incompetent. Michelle Nario-Redmond is an associate professor of psychology. Brianne Goodrich, a senior biomedical humanities major, and Megan Schaefer, a junior biomedical humanities major, participated in the study for independent research internship credit. Goodrich plans to attend graduate school in a healthcare field, and Schaefer is a senior and plans to continue to work with individuals with developmental disabilities. This research was supported by Redmond and the Hiram College Department of Biomedical Humanities and the Department of Psychology. 

Graham, S, Rogers RP, Alper, RH. An Automated Method to Assay Locomotor Activity in Third Instar *Drosophila melanogaster* larvae. *Journal of Pharmacological and Toxicological Methods*. 2016; 77:76-80. (University of Saint Joseph)

The present study applied an automated activity-tracking system to assess the locomotor activity of 3rd instar *Drosophila melanogaster* larvae. Wild-type and a mutant containing a single point mutation in the picrotoxin binding site of the GABA-A receptor were treated with picrotoxin (PTX) or its vehicle. Consistent with a previous report, it was found that PTX decreased activity in third instar *Drosophila* larvae due to selective blockade of GABA-A receptors. By using automated data acquisition, we have refined and enhanced an *in vivo*, high-throughput screen for anti-seizure compounds. Richard Alper is an associate professor of pharmaceutical sciences. Stephanie Graham conducted most of the experiments and wrote the initial draft of the manuscript in partial fulfillment

of her B.S. in biology at the University of Saint Joseph. Ryan P. Rogers, a post-doctoral fellow, contributed her knowledge of fruit-fly husbandry and genetics and played a major role in editing the manuscript during and after an adjunct appointment in the biology department at the University of Saint Joseph. The research was completed during the summer and fall of 2015. Graham is currently working as a patient care technician in a hospital in Florida. Rogers is currently an assistant professor at the Wentworth Institute of Technology in Boston. The research was supported by funds provided to Graham and Alper from the University of Saint Joseph. 

Omasta M, Brandley AT. Student Perceptions of High School Theatre Programs: An Investigation of Social Issues and Call for Replication. *Youth Theatre Journal*. 2016; 30:1:50-67. (Utah State University)

This study investigates students' perceptions of high-school theatre programs. Students were asked whether they believed theatre productions could influence audience members' perspectives and opinions and, through an open-ended qualitative questionnaire, shared their views on whether their school should specifically address (or avoid addressing) myriad social issues. The study analyzes demographic and other factors that appear to have influenced participants' responses. This study serves as a template for replication studies, which are seriously lacking in the education field (and in theatre education in particular), and calls for similar studies to seek the views of students in diverse communities throughout the country. Matthew Omasta is an assistant professor and director of the theatre-education program at Utah State University. Andrea Thomas Brandley, a senior with a dual major in theatre arts and mathematics education, participated in the research project and co-authored the article as her honors thesis. She has accepted a position to teach both math and theatre at a Utah high school. No funding was required for this research. 

Kruse S, Hurst S. Rapid One-pot Synthesis of Cycloheptatriene-phosphonium Derivatives. *Tetrahedron Letters*. 2015; 56:46:6319-6322. (Northern Arizona University)

The research was focused on making a series of bi-dentate phosphonium complexes. Three were synthesized successfully using different bridged phosphines, which were reacted with tropylium to form a bidentate system. These reactions were all easy to perform and had high yield. With these complexes already made, future research can be focused on making palladium-based derivatives to be used in catalysis. Stephanie Hurst is an associate professor of inorganic chemistry. Samantha Kruse recently graduated with a B.S. in chemistry and is applying to graduate programs. This research

was supported by the American Chemical Society Petroleum Research Fund (ACS-PRF Grant # 51546-UR3). 

Browne S, Glass C, Holyoak G. Institutional Constraints Limiting Social Services for Immigrants. *Journal of Immigrant and Refugee Studies*. 2016; 14:2:156-176. (Utah State University)

The study identifies the factors that constrain social-service agencies' provision of resources for immigrants in Utah. Drawing on twenty-five in-depth interviews with the state's social service providers, we found that despite providers' commitment to serving immigrants, the organizations face many hurdles due primarily to restrictive state laws and increasing competition for limited funding. Christy Glass is a professor of sociology, and Shannon Browne is an assistant professor of social work. Grant Holyoak was a junior majoring in sociology and economics when he participated in the project as an undergraduate research fellow. He is currently employed by a social-service agency in Utah and plans to attend graduate school in 2017. 

Herbranson WT, Davis, ET. The Effect of Display Timing on Change Blindness in Pigeons (*Columba livia*). *Journal of the Experimental Analysis of Behavior*. 2016; 105:1:85-99. (Whitman College)

Change blindness is a phenomenon in which even obvious changes in a visual scene may go unnoticed. Recent research has indicated that this phenomenon may not be exclusive to humans. Two experiments investigated blindness to visual changes in pigeons, using a variant of the widely used flicker task to investigate the influence of display timing on change blindness. Results indicate that the duration of time during which a stimulus display is visible influences the accuracy of detection of changes, with the effect due to additional search time. The results emphasize the value of comparative cognition and cross-species investigations of behavior. Walter Herbranson is a professor of psychology and holds the Ladley Endowed Chair of Cognitive Science. Eva Davis completed this research as part of summer 2014 research. The project was funded by a Louis B. Perry research award from Whitman College. 

Basch, CH, Kecojevic A, Menafro, A. Provision of Information Regarding Electronic Cigarettes from Shop Employees in New York City. *Public Health*. 2016; 1:1-3. (William Paterson University)

The study assessed the knowledge of shop employees in New York City regarding electronic cigarettes. Shops were found through various search engines and organized by shop title, phone number, and borough. The project surveyed employ-

ees' knowledge of the long-term effects of electronic cigarettes and their relative safety overall and compared to traditional cigarettes. The findings revealed that shop employees may influence the sales of electronic cigarettes by downplaying potential hazards due to limited research on electronic cigarettes. Corey Basch is a professor of the Department of Public Health. In 2015-16 Anthony Menafro assisted Basch with the research as an undergraduate, through funds provided by William Paterson University's Department of Public Health. Menafro graduated from William Paterson in May 2016 and holds a bachelor's of science in public health and a bachelor of arts in psychology. 

Cripsell G, Budachetri K, Karim S. Rjickettsia parkeri Colonization in *Amblyomma maculatum*: The Role of superoxide dismutases. *Parasites and Vectors*. 2016; 9:291 (open access). (University of Southern Mississippi)

The Gulf Coast tick (*Amblyomma maculatum*) is an arthropod vector of *Rickettsia parkeri*, the causative agent of American boutonneuse fever and an infectious agent of public health significance. Using an RNA interference approach, the study evaluated the biological significance of the superoxide dismutases (SODs) of *A. maculatum* in hematophagy and *R. parkeri* colonization within the tick host, since the enzymes play an important function in the regulation of bacterial communities associated with tick vectors and also in the defense mechanisms against the damage caused by reactive oxygen species. Knockdown experiments increased the levels of total oxidative stress in ticks, revealing the interplay between SOD isozymes that results in the transcriptional regulation of tick antioxidants. Shahid Karim is an associate professor in the Department of Biological Sciences. Gary Crispell worked on this project in summer 2014 in Karim's laboratory as an undergraduate research fellow. He is currently a graduate student at USM working on the role of tick saliva in red meat allergy. He was supported by the Mississippi-INBRE (NIH NIGMS award# P20GM103476) summer undergraduate research fellowship. 