Undergraduate Research Highlights

Cobbs J, Martinez del Campo del Castillo D, Tyler BD, Ditter J. Regional Variation in Rivalry: Canadians Really Are Friendlier. *Journal of International Consumer Marketing*. 2018; 30: 4. doi: 10.1080/08961530.2018.1531364 (Northern Kentucky University)

Spectator sports embody social group conflict, where consumers periodically interact with opposing fans, thereby providing outlets for negative brand affect in the form of acrimony toward rivals. To assess the regional nature of sport rivalry, this study compared survey responses from 5,145 sports consumers across the four United States Census regions and Canada, including five professional leagues. Consistent with regional personality clustering, fans of Canadian teams harbor less acrimony toward rivals, and fans of teams in the Northeastern US generally exhibit the most acrimony. We measured acrimony toward rival fans using indicators of prejudice and discrimination adapted from research on racial and ethnic bias. This work on acrimony in sports rivalries is significant because sports marketers and event managers must accurately assess the propensity for violence or other antisocial fan behavior when developing event promotions and security protocol. Joe Cobbs is associate professor of sports business and construction management in the Department of Marketing at Northern Kentucky University (NKU), and B. David Tyler is associate professor, sports management, at Western Carolina University. Diego Martinez del Campo graduated from NKU in May 2018 and was recognized as the outstanding student of the year in the Haile/US Bank College of Business. He is a full-time operations assistant for the FC Cincinnati soccer team. Martinez del Campo undertook work on the project as the focus of an independent study with Cobbs in spring 2018. Jeremy Ditter graduated from NKU in 2016. He is the digital marketing analyst for Peterson Automotive Collection. Ditter started the project as a student in the capstone course for Sports Business & Event Management in spring 2016. Both students conducted the work as part of their fourth-year studies at NKU. The work was funded through a university faculty summer research fellowship courtesy of NKU.

Negron-Gonzalez F, Duprey-Rivera J, Roig-Lopez JL, Malave-Llamas K. Assessment of Halophilic Bacteria in the Salt Flats and Wildlife Refuge in Cabo Rojo, Puerto Rico and Their Antibiotic Resistance Pattern. *EC Microbiology*. 2018; 14: 10: 707–714. (Universidad del Este, Ana G. Méndez University System, Puerto Rico)

Antibiotic resistance in clinical and environmental samples is an emerging global threat that endanger more human population every day. Horizontal gene transfer of antibiotic resistance genes is phenomena already known to occur in the environment but is less characterized in microbial communities associated with extreme environments such as extreme halophiles. With this research we try to answer the question: is antibiotic resistance pervasive in extreme environments? The Salterns of Cabo Rojo are composed of an estuary with a diversity of ecosystem with a salt concentration that could reach to 30 percent. We took five (5) water samples from different salter's ponds with pH ranging from 7.3 to 8.4. Samples were processed and incubate at 39ºC on MGM and Hv-YPC for 3–5 days. We isolated 802 CFU, 129 CFU, and 963 CFU. Three (3) presumptive species of bacteria were identified using the BIOLOG Gen-III System; *Acidovorax facilis, Bacillus cecembensis* and *Virgibacillus necropolis*. The Kirby-Bauer Method was used to assess the isolates antibiotic resistance patterns to 10 antibiotics, which showed resistance to chloramphenicol, kanamycin, gentamicin, neomycin, and rifampin. Antibiotic resistance on the Cabo Rojo Salterns will indicate anthropogenic impact on the environment. Karlo Malave-Llamas is an assistant professor in the School of Science and Technology of Universidad del Este and the principal investigator of the URGREAT-MBRS-RISE Project at Universidad del Este. Jose L. Roig-Lopez is laboratory manager at Molecular & Cellular Analysis Core, University of Alabama at Birmingham. Undergraduate microbiology students Franco Negron-Gonzalez and Jayleen Duprey-Rivera worked on the project from summer 2015 to summer 2017, have graduated, and are now pursuing graduate studies. The students were sponsored by NIH-MBRS-RISE at Universidad del Este.

Kahane LH, Sannicandro P. The Impact of 1998 Massachusetts Gun Laws on Suicide: A Synthetic Control Approach. *Economics Letters*. 2019; 174: 104–108. doi: org/10.1016/j.econlet.2018.11.004 (Providence College)

In 1998, Massachusetts enacted nearly two dozen gun laws. Using the synthetic control method, we find evidence that these laws led to reduced overall suicide rates for several years and a sustained reduction in suicides carried out with a firearm. Leo H. Kahane is the Michael A. Ruane Distinguished Chair in Economics at Providence College. Peter Sannicandro worked on the project as an undergraduate research assistant and graduated in 2018 with a double major in quantitative economics and mathematics. He is currently employed. The research was supported by the Fund for a Safer Future (as part of the New Venture Fund).

Alber JM, Cohen C, Nguyen GT, Ghazvini S, Tolentino BT. Exploring Communication Strategies for Promoting Hepatitis B Prevention among Young Asian American Adults. *Journal of Health Communication*. 2018; 23: 12: 977–983. doi: 10.1080/10810730.2018.1534904 (California Polytechnic State University)

In the United States, Asian Americans account for 50–60 percent of hepatitis B virus infections, leading to higher rates of liver cancer in this population. While some city-wide data have reported hepatitis B infection rates among young adults as high as 10–20 percent, little research has examined factors that impact hepatitis B beliefs, or the most effective strategies for reaching this particular population to promote hepatitis B awareness. An online survey was conducted with young Asian American adults (n = 418), aged 18–29 years old, to better understand their health information seeking, social media usage, and hepatitis B-related behaviors and beliefs. Results indicated that doctors and health organizations were the most trusted sources of health information, while the Internet was the most common source of health information. The majority of participants (99.8 percent) reported using social media and indicated they engaged in health-related behaviors on social media. Several factors, including non-receipt of hepatitis B vaccine, engaging in more health-related social media activities, and a higher mean score for difficulty with health information seeking, were significantly related to higher perceived susceptibility to hepatitis B. Future research should explore the effectiveness of using social media to reach young Asian American adults to promote hepatitis B awareness. Julia M. Alber is assistant professor, Department of Kinesiology and Public Health, at Cal Poly; Chari Cohen is vice president, Public Health and Programs, at the Hepatitis B Foundation; and Giang T. Nguyen is executive director of the Student Health Service at the University of Pennsylvania. Sanam Ghazvini and Brenda Tolentino are undergraduate kinesiology students at Cal Poly who helped with analyzing the data and preparing the manuscript. Both completed independent study and received Frost Undergraduate Research Awards in winter 2018 to work on the project.

Turner AN, Andersen RS, Bookout IE, Brashear LN, Davis JC, Gahan DM, Gotham JP, et al. Analysis of Novel Domain-Specific Mutations in the Zebrafish *ndr2*/*cyclopsgene* Generated Using CRISPR-Cas9 RNPs. *Journal of Genetics*. 2018; 97: 5: 1315-1325, doi: 10.1007/s12041-018-1033-6 (University of Alabama at Birmingham)

Nodal-related protein (*ndr2*) is a member of the transforming growth factor type β superfamily of factors and is required for ventral midline patterning of the embryonic central nervous system in zebrafish. In humans, mutations in the gene encoding nodal cause holoprosencephaly and heterotaxy. Mutations in the *ndr2* gene in the zebrafish (*Danio rerio*) lead to similar phenotypes, including loss of the medial floor plate, severe deficits in ventral forebrain development and cyclopia. Alleles of the *ndr2* gene have been useful in studying patterning of ventral structures of the central nervous system. Fifteen different *ndr2* alleles have been reported in zebrafish, of which eight were generated using chemical mutagenesis, four were radiation-induced, and the remaining alleles were obtained via random insertion, gene targeting (TALEN) or unknown methods. Therefore, most mutation sites were random and could not be predicted *a priori*. Using the CRISPR-Cas9 system from *Streptococcus pyogenes*, we targeted distinct regions in all three exons of zebrafish *ndr2* and observed cyclopia in the injected (G_0) embryos. We show that the use of sgRNA-Cas9 ribonucleoprotein (RNP) complexes can cause penetrant cyclopic phenotypes in injected (G_0) embryos. Targeted polymerase chain reaction amplicon analysis using Sanger sequencing showed that most of the alleles had small indels resulting in frameshifts. The sequence information correlates with the loss of *ndr2* activity. In this study, we validate multiple CRISPR targets using an *in vitro* nuclease assay and *in vivo* analysis using embryos. We describe one specific mutant allele resulting in the loss of conserved terminal cysteine-coding sequences. This study is another demonstration of the utility of the CRISPR-Cas9 system in generating domain-specific mutations and provides further insights into the structure–function of the *ndr2* gene. This study was part of a course-based undergraduate research experience (CURE) for first-year undergraduate students in the Science and Technology Honors (STH) Program at UAB in spring 2017. The CURE (STH 201 Research Approaches: Molecular Genetics) introduces first-year students to the world of genome engineering using the CRISPR-Cas9 system. All undergraduate students were enrolled in STH 201 during spring 2017 semester and contributed equally to the CURE and the project. These undergraduate students are still enrolled and working toward degrees at UAB. Graduate teaching assistant (TA) Ashley N. Turner served as the project leader, and two undergraduate TAs who had completed STH 201 served as research assistants. These TAs have graduated with degrees from UAB and are continuing research/academic pursuits. This work was supported by a Teaching Innovation Grant to AKC by the Quality Enhancement Program (QEP) in the Center for Teaching & Learning, and the Department of Genetics, UAB. The STH Program provided support for materials and reagents.

Blado G, Herrera F, Erwin J. Entanglement and the Generalized Uncertainty Principle. *Physics Essays*. 2018, 31: 4: 397-402. doi: 10.4006/0836-1398-31.4.397 (Houston Baptist University)

We propose that gravity when formulated in the quantum level can make quantum effects more pronounced. This is

demonstrated by considering the effect of the generalized uncertainty principle or GUP (a consequence of quantum gravity theories) on entanglement (a quantum effect). We apply the GUP to continuous-variable systems. In particular, we study the following cases: the modified uncertainty relation of two identical entangled particles (Rigolin 2002) and the inseparability conditions for entangled particles in the bipartite (Duan, Giedke, Cirac, and Zoller 2000) and tripartite (van Loock and Furusawa 2003) cases. Rigolin showed a decrease in the lower bound of the product of the uncertainties of the position and momentum for two identical entangled particles while Duan and van Loock derived inseparability conditions for Einstein-Podolsky-Rosen-like (EPR-like) operators. In all three cases, the GUP correction resulted in a higher value of the bounds: a higher lower bound for the Rigolin's result and a higher upper bound for the inseparability condition in Duan and van Loock's relations. In Rigolin's case, the GUP correction decreased the disagreement with the Heisenberg uncertainty relation while in Duan's and Loock's case, the inseparability and entanglement conditions are enhanced. Interestingly, the GUP corrections tend to boost quantum mechanical effects. Gardo Blado is a professor of physics, Francisco Herrera is an undergraduate physics major, and Joshuah Erwin was an undergraduate physics major at Houston Baptist University. Herrera and Erwin started the research problem in fall 2015 and completed its solution in spring 2017. The research project was undertaken to fulfill the required research portion of the upper-level physics classes in which they were enrolled during the previously mentioned period. After fulfilling the requirements for a BS in mathematics, Herrera will also complete his BS in physics major in fall 2019 and plans to pursue graduate study in quantum information science. Erwin finished a BS in physics degree in fall 2016 and is now a satellite systems engineer at Leidos where he works on NASA projects.

Nikolayenko O, DeCasper M. Why Women Protest: Insights from Ukraine's EuroMaidan. *Slavic Review.* 2018; 77: 3: 726–751. doi: 10.1017/slr.2018.207 (Fordham University)

This article examines why Ukrainian women participated in the 2013–2014 antigovernment protests, widely known as the EuroMaidan. Based upon in-depth interviews with female protesters, the study uncovers a wide range of motivations for women's engagement in the revolution, including dissatisfaction with the government, solidarity with protesters, motherhood, civic duty, and professional service. Political discontent was the most cited reason for protesting. Solidarity with protesters was another major catalyst for political engagement. In addition, women who were mothers invoked the notion of mothering to provide a rationale for activism. The study contributes to the growing literature on women's participation in contentious politics in nondemocracies. Olena Nikolayenko is associate professor in the Department of Political Science at Fordham University. Maria DeCasper received a bachelor's degree in philosophy and French language and literature from Fordham University in 2017. As a third-year student, she conducted an independent study project and presented the findings from this project at the 2016 National Conference on Undergraduate Research. DeCasper currently works as a public relations consultant and volunteers for the Kyiv-based nonprofit organization New Generation of Women Leaders in Ukraine. This research was supported by the Fordham College at Rose Hill.

Gillard K, Miller HB, Blackledge M. Tricyclic Amine Antidepressants Suppress β-lactam Resistance in Methicillin-Resistant *Staphylococcus aureus* (MRSA) by Repressing mRNA Levels of Key Resistance Genes. *Chemical Biology & Drug Design*. 2018; 92: 5: 1822–1829. doi: 10.1111/cbdd.13361 (High Point University)

Methicillin-resistant *Staphylococcus aureus* (MRSA) is the leading cause of recurrent infections in humans including endocarditis, pneumonia, and toxic shock syndrome. Novel therapeutics to treat MRSA and other resistant bacteria are urgently needed. Adjuvant therapy, which uses a non-toxic compound to repotentiate the toxic effects of an existing antibiotic, is an attractive response to the growing resistance crisis. Herein, we describe the evaluation of structurally related, FDA-approved tricyclic amine antidepressants that selectively repotentiate MRSA to β -lactam antibiotics. Our results identify important structural features of the tricyclic amine class for β-lactam adjuvant activity. Furthermore, we describe the mechanism of action for our lead compound, amoxapine, and illustrate that it represses the mRNA levels of key β-lactam resistance genes in response to β-lactam treatment. This work is novel in that it highlights an important class of small molecules with the ability to simultaneously inhibit production of both β-lactamase and penicillin binding protein 2a. Heather Miller and Meghan Blackledge are assistant professors of chemistry at High Point University. Undergraduate Kyra Gillard undertook this work from June 2016 until July 2018 at the university. In June 2016 her work was supported through the university's Summer Undergraduate Research Program in the Sciences; later, she continued her work through independent studies. Gillard graduated in May 2018 with a BS degree in biological chemistry with honors. Enrolled in a postbaccalaureate program at University of California at San Diego, she plans to attend medical school.