

# UNDERGRADUATE RESEARCH Highlights

**Fernando S, Correa J.** Quasinormal modes of Bardeen black hole: scalar perturbations. *Physical Review D*. 2012; 86: 064039-064052. (Northern Kentucky University)

The purpose of this paper is to study quasinormal modes (QNM) of the Bardeen black hole due to scalar perturbations. We have done a thorough analysis of the QNM frequencies by varying the charge  $Q$ , mass  $M$ , and the spherical harmonic index  $l$ . The unstable null geodesics are used to compute the QNM's in the eikonal limit. Furthermore, massive scalar field modes are also studied by varying the mass of the field. Comparisons are done with the QNM frequencies of the Reissner-Nordstrom black hole. Sharmanthie Fernando is an associate professor at Northern Kentucky University. Juan Correa is a physics major who participated in the research for credit in the year 2012. Juan is a senior at Northern Kentucky University and will graduate in May 2013.

**Cummins A, Briones L.** Contemporary Mexican American young adult books of the Texas borderlands. *English in Texas*. 2012; 42:1: 56-61. (University of Texas Pan American)

This synthesis of contemporary Mexican-American young adult literature underscores the importance of offering secondary students texts that portray real-life issues in settings that reveal the full diversity of United States society. The research highlights themes and styles in books written by Texas borderlands authors for middle-grade and high-school English language arts readers. The article shows methods for incorporating and discussing culturally relevant literature. Amy Cummins is assistant professor of English at the University of Texas Pan American in the Rio Grande Valley. Leslie Briones is a senior English major completing education work in preparation for certification as a secondary-level English teacher. The research was supported by an Undergraduate Research Initiative Grant from the Office of Undergraduate Research and Service Learning at the University of Texas Pan American.

**Bueno MTD, Reyes D, Valdes L, Saheba A, Urias E, Mendoza C, Fregoso OI, Llano M.** Poly (ADP-ribose) Polymerase-1 promotes transcriptional repression of integrated retroviruses. *Journal of Virology*. 2013; 87:5. (University of Texas at El Paso)

We have identified a novel mechanism of the cellular protein Poly (ADP-ribose) Polymerase-1 (PARP-1) in the preservation of the cellular genome. Retroviruses are viruses that replicate by inserting a copy of their genome into the host genome. This replication strategy alters the integrity of the cellular genome, leading to disease. We have discovered that PARP-1 counteracts the transcription of retroviral genomes that invade the cellular genome, thus limiting the phenotypic changes induced by retroviral infection. Dr. Manuel Llano is an assistant professor in the Biological Sciences Department. Crystal Mendoza and Adarsh Saheba are senior undergraduates. They have worked in Llano's lab for two years. Crystal is applying to graduate school and Adarsh to medical school. Eduardo Urias is a sophomore and has worked in Llano's lab since his freshman year. Eduardo presented a poster at the 2011 UTEP End-of-Summer Research Symposium. Crystal Mendoza was supported by the RISE program (NIGMS-5R25GM069621-09). Eduardo Urias was supported by a Research-Teaching Integration program grant (NSF-DUE-1140469). The research was funded by NIH grant 5SC1AI098238 to Dr. Llano.

**Handler P, Brabander D.** Increased incidence and altered risk demographics of childhood lead poisoning: Predicting the Impacts of the CDC's 5  $\mu\text{g}/\text{dL}$  Reference Value in Massachusetts (USA). *International Journal of Environmental Research and Public Health*. 2012; 9:11: 3934-3942. (Wellesley College)

The impacts of the CDC's new sliding scale lead poisoning reference value on the prevalence and demographic risk of childhood lead poisoning were examined for the Commonwealth of Massachusetts. We found that the new 5  $\mu\text{g}/\text{dL}$  benchmark will lead to a 1,470 percent increase in childhood lead poisoning cases among 9-to-47 month-olds in MA, with nearly 50 percent of the examined communities

experiencing an increased prevalence of lead poisoning. Further, the new highest-risk communities have significantly fewer foreign-born residents and significantly larger white populations than the former highest-risk communities. The new lead poisoning benchmark will drastically increase the number of children with elevated blood lead levels and alter the distribution and demographics of high-risk communities in the state. Daniel Brabander is an associate professor of geosciences and environmental studies at Wellesley College. This research was completed by Phoebe Handler, an environmental studies major in Wellesley College's class of 2012 as part of an honors senior thesis. Phoebe is currently studying nursing and is pursuing publication of other portions of her thesis work. The work was funded in part by a research stipend from the Frost Endowed Environmental Sciences/Studies Fund.

**Harper-Leatherman AS, Iftikhar M, Ndoi A, Scappaticci SJ, Lisi GP, Buzard KL, Garvey EM.** Simplified procedure for encapsulating cytochrome c in silica aerogel nanoarchitectures while retaining gas-phase bioactivity. *Langmuir*. 2012; 28: 14756-14765. (Fairfield University)

This paper describes a convenient synthesis of nanostructured aerogels that encapsulate the functional protein, cytochrome c, without the previously required need for gold nanoparticles. The method greatly simplifies the bioaerogel synthesis and takes out the need for time-consuming and expensive synthesis or purchase of metal nanoparticles. There have been few reports on encapsulating proteins in aerogels, so this work is a significant step towards finding a more general procedure for encapsulating other proteins in aerogels for potential future bioanalytical devices. Amanda S. Harper-Leatherman is an assistant professor of chemistry. Mariam Iftikhar, Adela Ndoi, Steven Scappaticci, and Elizabeth Garvey each contributed to this research during the summer of each of their sophomore years. Kaitlyn Buzard contributed during the summer of her junior year. George Lisi contributed during his senior year for academic credit. Mariam is a PhD. student at UC San Diego, Adela is employed at New Brunswick Scientific, Steven completed his master's degree at Georgia Tech, George is a PhD. student at Dartmouth, Kaitlyn is applying to medical school, and Elizabeth is completing her senior year at Fairfield University. Support

was provided by a Cottrell College Science Award from the Research Corporation for Science Advancement and Fairfield University's College of Arts & Sciences and Chemistry & Biochemistry Department.

**Klempel N, Wilson M, Kim S-K, Annunziato R.** A measure of family eating habits: Initial psychometric properties using the Profile Pattern Approach (PPA). *Eating Behaviors*. 2013; 14:1: 41467. (Fordham University)

Although it seems likely that family characteristics and eating habits are a major factor in the development of eating behaviors, there are no self-report measures that examine how individuals view their family's eating habits. Therefore, drawing from social learning theory, the purpose of the present study is to develop a measure, the Family Eating Habits Questionnaire (FEHQ), of familial eating patterns from the offspring's perspective. Internal consistency and test-retest reliability of the FEHQ was established. Significant associations were found between the FEHQ and the Eating Inventory, indicating convergent validity for the FEHQ. Further validation was conducted using a novel statistical technique, the profile pattern approach (PPA). Rachel Annunziato is an assistant professor of psychology. Se-Kang Kim is an associate professor of psychology. Natalie Klempel initiated this research for her senior honors thesis in psychology. She is currently in a doctoral program at Hofstra University.

**Kim CS, Stack DH, Rytuba JJ.** Fluvial transport and surface enrichment of arsenic in semi-arid mining regions: examples from the Mojave Desert, California. *Journal of Environmental Monitoring*. 2012; 14: 1798-1813. (Chapman University)

Arsenic enrichment in mine tailings, and the dispersion of tailings through natural weathering mechanisms, is a persistent environmental concern in abandoned mine lands throughout the western United States. This study characterizes the fluvial transport of arsenic through field sampling, chemical analysis, and geospatial mapping of dry streambed sediments, tailings piles, and alluvial fans at multiple mine sites. The result is a conceptual model in which episodic precipitation events mobilize mine wastes

downstream and downslope as a series of discrete overlapping sediment pulses, with arsenic concentrations declining exponentially as distance from the source increases. Such a model is transferable to other abandoned mine lands in similar settings as a predictive tool for the fate and transport of arsenic and similar contaminants. Christopher Kim is an associate professor of earth and environmental sciences. David Stack completed an MS degree in hazards and global environmental change and is currently applying to PhD. programs. His work was conducted in 2011-2012 for credit as an undergraduate student researcher in Kim's Environmental geochemistry lab. This work was supported by USGS-MRERP (USGS award number 06HQGR0181) and NSF-CAREER (Award ID 0847811) grants.

**Michalak Z, Fartash D, Haque N, Lee, S.** Tunable crystallization via osmosis-driven transport across a droplet interface bilayer. *CrystEngComm*. 2012; 14: 7865-7868. (Iona College)

This work is significant for future applications of droplet technology in crystallizing targets such as proteins, where the availability of ever-newer methods for inducing crystal formation are consistently in demand. In addition, it is expected that the interaction of ions and lipids in a monolayer and bilayer should be manifested in the permeability of species across the bilayer, providing an intriguing tool to study controlled crystallization, in areas of sustained interest such as biomineralization and protein crystallization. Sunghee Lee is an associate professor and chair of chemistry. All three coauthors, Zuzanna, Darius, and Nousin, are currently seniors enrolled in the chemistry/biochemistry program at Iona College, New Rochelle, NY. The authors would like to acknowledge the financial support from the National Science Foundation. NH thanks the Patrick J. Martin Foundation for Scholarship.

**Bleske-Rechek A, Somers E, Micke C, Erickson L, Matteson L, Stocco C, Schumacher B, Ritchie L.** Benefit or burden? Attraction in cross-sex friendship. *Journal of Social and Personal Relationships*. 2012; 29:5: 569-596. (University of Wisconsin-Eau Claire)

We propose that, because cross-sex friendships are a historically recent phenomenon, men's and women's evolved mating strategies impinge on their friendship experiences. In our first study involving pairs of friends, emerging adult males reported more attraction to their friend than emerging adult females did, regardless of their own or their friend's current relationship status. In our second study, both emerging and middle-aged adult males and females nominated attraction to their cross-sex friend as a cost more often than as a benefit. Our findings implicate attraction in cross-sex friendship as both common and of potential negative consequence for individuals' long-term mateships. April Bleske-Rechek is an associate professor of psychology. Somers, Micke, Erickson, and Ritchie participated in the research as an ongoing faculty/student collaborative project. Matteson, Stocco, and Schumacher participated as part of the UWEC McNair Scholars program, which helps eligible students prepare for and enter graduate programs leading to the PhD. All the students are either pursuing graduate degrees or are in the workforce. Partial support was provided by UWEC's Office of Research and Sponsored Programs.

**Stevens SK, Strehle AP, Miller RL, Gammons SH, Hoffman KJ, McCarty JT, Miller ME, Stultz LK, Hanson PK.** The anticancer ruthenium complex KP1019 induces DNA damage, leading to cell cycle delay and cell death in *Saccharomyces cerevisiae*. *Mol Pharmacol.* 2013; 83:1: 225-34. (Birmingham-Southern College and Rhodes College)

This study established that the budding yeast *Saccharomyces cerevisiae* is an appropriate model system for examining the effect of the anticancer ruthenium complex, KP1019, on cell physiology. Similar to what has been seen in cancer cells, KP1019 inhibits yeast growth, damages DNA, and remains effective against cell types that are resistant to other chemotherapy drugs. Novel findings include the identification of translesion synthesis as the major contributor to KP1019-induced mutations. Pamela Hanson is an associate professor of biology at BSC. Laura Stultz is a professor of chemistry at BSC. Mary Miller is an associate professor of biology at Rhodes College. Shannon Stevens worked on this project as part of her 2007 senior thesis; she is now an intellectual property lawyer. Amy Strehle worked on this project as part of her 2010 senior thesis. Rebecca Miller's contribution was made through a 2011 independent study project; she is now a graduate student at the Scripps Research Institute. Sarah Gammons worked on this project as part of her 2007 senior thesis; she is currently in medical school at University of Alabama at Birmingham. Kyle Hoffman contributed to this project during the summer of 2012 and is currently a sophomore at BSC. John McCarty worked on this project as part of his 2007 senior thesis; he is currently in medical school at Kansas City University of Medicine and Biosciences. This project has been supported by the AAAS-Merck Undergraduate Science Research Program and the Associated Colleges of the South Faculty Renewal Program, as well as by BSC and Rhodes.