

UNDERGRADUATE RESEARCH Highlights

Grindle M, Games KE, Eberman LE, Kahanov L.
Appropriate Disinfection Techniques for Playing Surfaces
to Prevent the Transmission of Bloodborne Pathogens.
International Journal of Athletic Therapy and Training. 2014;
19. (Indiana State University)

This research provides a review of appropriate disinfection techniques for multiple playing surfaces. The significance of this work is that it provides athletic trainers and personnel involved in sports medicine with directions about how to prevent the spread of pathogens such as Methicillin-resistant *Staphylococcus aureus* (MRSA) via contact with infected playing surfaces, including field turf, ice, and water in swimming pools. Kenneth Games is assistant professor of applied medicine and rehabilitation and director of clinical education in post-professional athletic training. Lindsey Eberman is associate professor of applied medicine and rehabilitation and program director of the post-professional athletic training program. Mikayla Grindle is currently a senior in the professional athletic training program. The research took place during her junior year (2013-2014). The opportunity to complete the research was based on her own ambition and curiosity growing out of a clinical (practicum) experience and was not associated with any curricular or co-curricular program.

Morreale P, Goncalves A, Church D, Holtz S, Lisojo J, Lozano N, Silva C, Bonafide J. Visual and Spatial Data Integration in Mobile Application Design. *Learning and Collaboration Technologies. Technology-Rich Environments for Learning and Collaboration, Lecture Notes in Computer Science*. 2014; 8524:173-181. (Kean University)

Visual and spatial data for a 3-D implementation of a historical site was researched and designed, providing users with a virtual experience of visiting the site via a mobile application. Database information was integrated with visual and spatial information. The case study presented included database conversion for search support, design integration with mobility features, and the inclusion of an image gallery, resulting in the mobile delivery of a virtual replica of an actual visit to the historical site. Patricia Morreale is an associate professor in computer science. A team of seven undergraduates designed and built two mobile apps for the historical site. This year-long software-engineering research included software requirements and specifications, with usability and functional testing. The conclusion of the research saw the placement of the resulting products in the Apple and Android mobile app stores. All student authors graduated with majors in computer science.

Three students immediately enrolled in graduate computer science programs, with the remaining students working professionally in the computer field.

Dhar P, Chan PY, Cohen D, Khawam F, Gibbons S, Snyder-Leiby T, Dickstein, E, Rai PK and Watal G. Synthesis, Antimicrobial Evaluation and Structure-Activity Relationship of alpha Pinene Derivatives. *Journal of Agricultural and Food Chemistry*. 2014;62:16:3548-3552. (SUNY New Paltz)

Using bioautographic assays, we synthesized several (+) and (-) alpha pinene derivatives and evaluated their antimicrobial activity toward the gram-positive bacteria *Micrococcus luteus* and *Staphylococcus aureus*; gram-negative bacterium *Escherichia coli*; and the unicellular fungus *Candida albicans*. Preeti Dhar is an associate professor of chemistry at the State University of New York New Paltz. Pui Yee Chan received her PhD from University of Rochester Medical Center and is currently a post-doctoral fellow at Massachusetts General Hospital. Research funding was provided by SURE, AYURE and Research and Creative grants, SUNY New Paltz.

Smith AJ. Aerial Deployed Unfolding Autonomous Glider System. 2014 American Institute of Aeronautics and Astronautics (AIAA) Region VI Student Conference, Sacramento, California, March 1-2, 2014. (University of Nevada, Reno)

This paper described the development and experimental testing of an aerially deployed unmanned aerial vehicle (UAV). The developed system decreases response time and increases the range over traditional UAVs, which can aid in emergency situations. Advisor Eric Wang is an associate professor of mechanical engineering. Currently, Smith is a graduate student in mechanical engineering. This research was supported by the Nevada NASA Space Grant Consortium.

Gozenman F, Tanoue RT, Metoyer T, Berryhill ME. Invalid Retro-Cues Can Eliminate the Retro-Cue Benefit: Evidence for a Hybridized Account. *Journal of Experimental Psychology: Human Perception and Performance*. 2014. (University of Nevada, Reno)

Visual working memory (VWM) describes a mental workspace that maintains information for immediate use. VWM is limited in that we can only hold on to ~4 items at a time. Because VWM is essential for many cognitive tasks, there is interest in maximizing and improving VWM performance. For example, when we are cued to remember a certain item, our working memory is improved for that item—even if the

cue comes after the items are no longer visible. This type of retrospective cueing (retro-cues) effectively improves VWM compared to conditions in which a neutral cue is provided, but the full mechanism of how this works is not known. Here we asked whether inaccurate retro-cues would eliminate the benefit of accurate retro-cues. Our results showed that the retro-cue benefit remained consistent in magnitude regardless of whether some of the retro-cues were inaccurate. However, inaccurate retro-cue trials showed that VWM for the cued item was less accurate and showed significant decay. These results help us to understand how internal attention mechanisms interact with VWM. These data summarize a series of experiments conducted over several years involving graduate and undergraduate students. This work was conducted in the Memory and Brain Laboratory directed by Marian E. Berryhill, assistant professor of psychology at the University of Nevada, Reno. Gozenman, currently a graduate student, and Tanoë, a former graduate student, conducted this research. UNR alumna Metoyer collected these data in the Memory and Brain Laboratory between 2011 and 2012 as an undergraduate research assistant for the Undergraduate Research course. This research was supported by start-up funds provided by the university and by Berryhill's grant funding from the National Institutes of Health.

France CAM, Thomas DB, Doney C, and Madden O. FT-Raman Spectroscopy as a Method for Screening collagen diagenesis in Bone. *Journal of Archaeological Science*. 2014;42:346-355. (Smithsonian Museum Conservation Institute)

This study explored the use of Fourier transform Raman spectroscopy as a non-destructive method to evaluate collagen preservation in bones. Statistical analyses were used to determine a specific peak height ratio indicative of collagen preservation with >95 percent accuracy from freshly cut or broken bone surfaces and >65 percent accuracy from exposed outer surfaces. This technique can now be used to pre-screen finite and irreplaceable archaeological and paleontological bones prior to destructive analyses, such as carbon dating or stable isotope analysis, that require well-preserved collagen for viable results. Christine France and Odile Madden are research scientists at the Smithsonian Museum Conservation Institute; Daniel Thomas is a lecturer at Massey University. Charlotte Doney was a senior archaeology major at George Washington University and undertook this research as part of a Research Experiences for Undergraduates program in 2012. She is currently pursuing graduate studies in appraisal and historical archaeology. This research was supported by an NSF REU grant and the Smithsonian Museum Conservation Institute.

Marnocha SK, Marnocha MR, Mason M. Communication Quality Improvement in Student Nursing Clinicals. *Journal of Nursing Education and Practice*. 2014;4:9: 44-48. (University of Wisconsin, Oshkosh)

Little previous research has examined attempts to improve the quality of communication among nursing clinical students, unit-based educators, and academic educators. The current study utilized focus groups and needs assessments to identify communication concerns of both academic and unit-based clinical educators in several inpatient settings. Suzanne Marnocha is a professor of nursing and the assistant dean in the College of Nursing. Mark Marnocha is a clinical psychologist and clinical associate professor in the Department of Medicine and Public Health at the University of Wisconsin- Madison, and Michael Mason was a McNair Scholar and full-time nursing student in the undergraduate nursing program at UW-Oshkosh. From Mason's junior year (2012) and after graduation (2013), he participated as a research team member and assisted in writing the article that was published. Mason is currently a staff RN in the intensive care unit at St Elizabeth's Medical Center in Appleton, Wisconsin, where he was completing mandatory clinical before applying to a certified nurse anesthetist masters program. The research was funded by SK and MR Marnocha.

Ayyash M, Algahmi A, Gillespie J, Oelkers P. Characterization of a lysophospholipid acyltransferase involved in membrane remodeling in *Candida albicans*. *Biochimica et Biophysica Acta*. 2014;1841:505-513. (University of Michigan-Dearborn)

Phospholipid remodeling requires a lysophospholipid acyltransferase (LPLAT). We identified the major LPLAT, Lpt1, in the opportunistic fungal pathogen, *Candida albicans*. In vitro LPLAT assays showed that Lpt1 prefers acyl-CoA species with odd-numbers of double bonds. Novel, pulse-chase, mass spectrometric assays performed in wild type and lpt1 *C. albicans* support that loss of Lpt1 slows phospholipid remodeling. Mariam Ayyash graduated in April, 2013 with BS degrees in biochemistry and chemistry. She worked during her junior and senior year as an independent study student and as a volunteer. In August, 2014, she began a medical doctorate program at the University of Michigan-Ann Arbor. Amal Algahmi also graduated from UM-Dearborn in April, 2013 with a BS in biochemistry and BA in psychology. She worked on this project during her junior and senior years as an independent study student, had a summer fellowship, and also as a volunteer. In August, 2014, Algahmi began a medical doctorate program at Michigan State University. Funding for the study was provided by the UM-Dearborn Office of Research and Sponsored Programs. Peter Oelkers is an assistant professor in the Department of Natural Sciences at UM-Dearborn.

Cummins A, Cano T Magical Realist Moments in Malín Alegría's *Border Town* Series. *Bookbird, A Journal of International Children's Literature*. 2014;52:3:43-52. (University of Texas Pan American- Rio Grande Valley)

In Malín Alegría's *Border Town* (Scholastic 2012), the first young-adult fiction series set on the Mexico-United States border, magical-realist moments subvert power relations and reveal that popular beliefs are legitimate forms of knowledge. Magical-realist occurrences demonstrate the importance of knowing about Mexican-American folklore and folk saints such as *bailando con el diablo* (dancing with the devil), *las lechuzas* (bewitched owls), *la Llorona* (the weeping woman), and *la Santa Muerte* (saint death). Amy Cummins is an associate professor of English. Cano is a senior English major at the University of Texas Pan American-Rio Grande Valley.

Paust NEQP, Wilson D, van Belle G. Reinvestigating the Clusters Kopusov 1 and 2. *The Astronomical Journal*. 2014;148:1:19. (Whitman College, Lowell Observatory)

We determined that two star clusters were not old globular clusters belonging to the Milky Way, as previous authors suggested. Instead, both of the clusters are younger open clusters that joined the Milky Way when it cannibalized a smaller galaxy a few billion years ago. Nathaniel Paust is an assistant professor of astronomy at Whitman College. Gerard van Belle is an astronomer at Lowell Observatory. Danielle Wilson undertook this work as an independent study project during the 2012-2013 academic year. She is currently working for Key Technology in an optical engineering position. This project was funded through faculty startup funds to Paust.

Juhasz MA, Juers DH, Dwulet GE, Rosenbaum AJ. Tetraethylammonium 7,12-Dicyano-1-Carba-closo-Dodecaborate *Acta Crystallographica* 2014; E70: o411-o412. (Whitman College)

Carboranes are clusters of boron and carbon that have a variety of potential uses, including as pharmaceuticals, advanced materials, and catalysts for industrial-scale chemical reactions. In the study, a novel carborane cluster bearing two cyano (CN) groups was prepared and characterized by single crystal X-ray diffraction. Marcus Juhasz is an assistant professor of chemistry, and Douglas Juers is an associate professor of physics. Gregory Dwulet and Aaron Rosenbaum carried out this research as part of their senior thesis projects. The research was supported by a Louis B. Perry Award from Whitman College awarded to Juhasz and Rosenbaum; a New Faculty Start-Up Award from the M. J. Murdock Charitable Trust; and funds from the National Science Foundation (Grant CHE-0922775). Dwulet is currently applying to graduate programs while he completes his senior year at

Whitman College. Rosenbaum is currently employed as a science teacher and is applying to medical school.

Matzner SL, Rettedal DD, Harmon DA, Beukelman MR. Constraints to Hydraulic Acclimation Under Reduced Light in Two Contrasting *Phaseolus vulgaris* cultivars. *Journal of Experimental Botany*. 2014;65:15: 4409-18. (Augustana College, Sioux Falls, SD)

Two cultivars of pinto beans were grown under three light levels to determine if the plant's hydraulic system adjusted to different light regimes and whether intraspecific tradeoffs constrained adjustment. Reduced light resulted in a lower density of the stem material (weaker stems), decreased xylem cavitation resistance (a measure of drought tolerance), but an increased hydraulic capacity (per unit leaf area) to conduct water to the canopy. Coordinated changes in these three traits were consistent with tradeoffs constraining plasticity. Distinct hydraulic strategies were observed with the cultivar adapted to irrigated conditions having higher transpiration and stem flow rates. The cultivar that was adapted to rain-fed conditions had higher leaf area and greater cavitation resistance. Steven Matzner is a professor of biology at Augustana College (Sioux Falls, SD) and mentored three undergraduates in ten-week summer research over two years on this research. David Rettedal recently finished a program in podiatric medicine at Des Moines University. MacKenzie Beukelman is a medical student at the Sanford School of Medicine at the University of South Dakota. Derek Harmon is enrolled in a physician-assistant program at the University of South Dakota. The research was supported through a National Research Initiative Competitive Grant from the USDA Cooperative State Research, Education, and Extension Service.