

UNDERGRADUATE RESEARCH Highlights

Traub LW, Biegner M. Experimental Evaluation of a Self-Contained Circulation-Control Wing. *Journal of Aircraft*. 2013; 50:3: 764-777. (Embry Riddle Aeronautical University (Prescott))

A low-speed experimental investigation detailing the implementation of a self-contained circulation-control wing is presented. The trailing-edge jet was produced using two internal impellers drawing air off the wing tips. Testing indicated that the circulation-control system could achieve a moderate zero-lift angle-of-attack shift; however, the primary effect of the jet was flow control at high incidence, in which stall was delayed significantly. Lance Traub is an associate professor of Aerospace Engineering. Matthew Biegner performed the experimental research at Embry Riddle Aeronautical University (Prescott) over the summer of 2011. The work was performed as part of a summer research project. Biegner is currently employed by Northrop-Grumman. The research was supported by the NASA space grant.

Garner, PW, Moses, LK, Waajid, B. Prospective Teachers' Awareness and Expression of Emotions: Associations with Proposed Strategies for Behavioral Management in the Classroom. *Psychology in the Schools*. 2013; 50:5: 471-488. (George Mason University)

This research examined whether prospective teachers' emotion regulation styles, empathy, and conceptions of student emotion were predictive of their attitudes about bullying and proposed responses to peer conflict. Participants perceived physical bullying as more serious than verbal and relational bullying. They also expressed higher levels of sympathy for student victims of physical bullying. Valuing emotional competence and the role of teachers in supporting its development were meaningfully associated with expressed support for victims and with proposed responses to the perpetrators of this type of classroom aggression. Interestingly, prospective teachers who reported higher levels of sympathy for victims also reported that

they would be more likely than their counterparts to intervene on their behalf. Pamela Garner is an associate professor of childhood studies at George Mason University. The data for this study were collected in the Fall of 2011. Moses is currently employed as a counselor at City-Year in Washington, D.C. The research was funded by the Center for Consciousness and Transformation at George Mason University, which provided an undergraduate research award to Laurence.

Koch, BLD, Panorska, AK. The Impact of Temperature on Major League Baseball. *AMS Journal: Weather, Climate, and Society*. 2013; 5:4. (University of Nevada Reno)

Major League Baseball is played every year, encompassing three meteorological seasons: spring, summer, and fall. The 30 teams play in cities across the United States and Canada in many types of weather. This work studies the impact of temperature on a Major League Baseball game by examining the association between temperature and several baseball statistics, including runs scored, batting average, slugging percentage, on-base percentage, home runs, walks, strikeouts, hit-batsmen, stolen bases, and errors. Home and away teams' performances were analyzed separately. The results of this study show that runs scored, batting average, slugging percentage, on-base percentage, and home runs significantly increase while walks significantly decrease in warm weather compared to cold weather. Anna K. Panorska is a professor in the Department of Mathematics and Statistics, University of NV, Reno. Brandon Lee Koch was a McNair scholar at UNR. This research was his project for the McNair scholarship. He worked on this project in 2012. Brandon graduated from UNR in May 2013 with BS in Mathematics with a concentration in Statistics and is now a PhD student in the Biostatistics program at the University of Minnesota in Minneapolis. This project was partially funded by the McNair Scholars program.

Menon R, Watson SE, Thomas LN, Allred CD, Dabney A, Azcarate-Peril MA, Sturino JM. Diet Complexity and Estrogen Receptor Beta-Status Affect the Composition of the Murine Intestinal Microbiota. *Applied and Environmental Microbiology*. 2013; 79:18: 5763-5773. (Texas A&M University)

Intestinal microbial dysbiosis contributes to the dysmetabolism of luminal factors, including steroid hormones that affect the development of chronic gastrointestinal inflammation and the incidence of sterone-responsive cancers of the breast, prostate, and colon. In this study, conventionally-raised female ER^{+/+} and ER^{-/-} C57BL/6J mice were used to test the hypothesis that ER status affects microbiota composition and determine if such compositionally-distinct microbiota respond differently to changes in diet complexity (8604 versus AIN-76). The results of these experiments suggest that sterone nucleoreceptor status and diet complexity may play important roles in microbiota maintenance. Joseph Sturino is an assistant professor of microbiology. Sara Watson participated in this research for independent study credit as a senior undergraduate student majoring in nutrition (2010-2011). Sara was awarded a Texas A&M University College of Agriculture and Life Sciences Senior Merit Award and Graduated Summa Cum Laude. Sara is currently attending medical school. NIH/NCI Biostatistics Training Program Grant CA090301-11, NIH P30 DK34987, American Institute for Cancer Research grant 07B080, and Texas A&M AgriLife Research provided funding for this research.

Retzler A, Wilson MA, and Avni, Y. Chondrichthyans from the Menuha Formation (Late Cretaceous: Santonian–Early Campanian) of the Makhtesh Ramon region, southern Israel. *Cretaceous Research*. 2013; 40:81–89. (The College of Wooster)

Exposures of the Menuha Formation (Santonian, Early Campanian, Mount Scopus Group) in the Makhtesh Ramon region of the southern Negev have produced numerous chondrichthyan teeth from at least ten different species. With little to no published material describing the chondrichthyan fauna of the Menuha Formation, these data improve interpretations of its paleoenvironment, which is

important for understanding the larger stratigraphic/tectonic framework of the Ramon monocline region of southern Israel and global chondrichthyan paleobiogeography. Mark A. Wilson is a professor of geology. Andrew Retzler (class of 2011) completed this work in 2010-2011 as an undergraduate geology major and, after obtaining his master's degree, is now a geologist with the Minnesota Geological Survey. This study was made possible by the College of Wooster Wooster Wengert Funds.

Chamberlain JL, Ness G, Small CJ, Bonner SJ, Hiebert EB. Modeling Below-Ground Biomass to Improve Sustainable Management of *Actaea racemosa*, a Globally Important Medicinal Forest Product. *Forest Ecology and Management*. 2013; 293: 41282. (Radford University and USDA Forest Service)

Black cohosh (*Actaea racemosa*) rhizomes are harvested extensively from Appalachian forests for medicinal use. Data from long-term experimental harvest studies of black cohosh were used to develop a predictive model of below-ground biomass based on above-ground measures. Plant height, leaf canopy, and rhizome biomass data were collected from > 1,100 central Appalachian black cohosh plants and used in model development. We evaluated the effectiveness of our model in predicting rhizome biomass using 550 plants from neighboring sites. Similar relationships for model-development and validation study sites support the effectiveness of our model. This model will serve as a valuable tool for inventorying forest resources and aid in the development of sustainable management strategies for this and other wild-harvested medicinal plants. James Chamberlain is a forest products research scientist. Christine Small is an associate professor of biology. Simon Bonner is an assistant professor of statistics. Gabrielle Ness worked on this project as an undergraduate research student at Radford University from 2009-2011. She continued this research through an internship with the USDA Forest Service in 2012. She is currently a master's student in statistics at the University of Kentucky. This research was funded by grants to Radford University from the USDA Forest Service Southern Research Station and by internship funding to Gabrielle Ness from the USDA Forest Service.

Malik M, Simpson JF, Parikh I, Wilfred BR, Fardo, DW, Nelson PT, and Estus S. CD33 Alzheimer's risk-altering polymorphism, CD33 expression and exon 2 splicing. *Journal of Neuroscience*. 2013; 33:33: 13320-5. (University of Kentucky)

Genome wide studies have identified novel Alzheimer's disease (AD) risk factors. We elucidated the mechanism of action of the AD-associated single nucleotide polymorphism (SNP) rs3865444 in the CD33 promoter. Analysis of CD33 expression in human brain identified a common isoform lacking exon 2 (D2-CD33). The proportion of CD33 expressed as D2-CD33 correlated robustly with rs3865444. Sequencing established rs12459419 in exon 2 is co-inherited with rs3865444. Minigene RNA splicing studies established that rs12459419 is a functional SNP that modulates exon 2 splicing. In summary, these results suggest a novel model wherein SNP-modulated RNA splicing modulates CD33 function and, thereby, AD risk. David Fardo is an assistant professor in the Department of Biostatistics. Peter Nelson is a Professor in the Department of Pathology. Steven Estus is a professor in the Department of Physiology. Manasi Malik is an undergraduate at the University of Kentucky, majoring in biology. James Simpson is a research associate at the University of Kentucky. Ishita Parikh is a graduate student at the University of Kentucky. Bernard R. Wilfred is a post-doctoral scholar at the University of Kentucky. This work was made possible by funding from NIH (P01-AGO30128 (SE), P30-AG028383 (DWF, PTN), P20-GM103436 (DWF)) and the UK Bucks for Brains program (MM).

Chartas G, Kulkarni VP, and Asper A. A Mini X-Ray Survey of Sub-DLAs; Searching for AGNs Formed in Protogalaxies. *Astrophysical Journal*. 2013; 774:2. (College of Charleston)

We investigated whether protogalaxies harbor active galactic nuclei (AGN) by performing a mini-survey of 21 quasars known to contain sub-damped Lyman-alpha (sub-DLA) absorption systems in their spectra. The observations were performed with the Chandra X-ray Observatory. In six cases we find possible X-ray emission within ~ 1 arcsec of the background quasar consistent with the presence of a nearby X-ray source. If these nearby X-ray sources are

at the redshifts of the sub-DLAs, their estimated X-ray luminosities suggest that the emission originates in a galactic nucleus near the center of a protogalaxy. The projected distances of these possible nearby X-ray sources from the background quasars are consistent with our hypothesis that they represent AGNs centered on the sub-DLAs. George Chartas is an assistant professor of physics and astronomy at the College of Charleston. Abigail Asper is an astrophysics major, and participated in the research for independent study credit during her freshman year. The research was supported by NASA via the Smithsonian Institution Grant SAO AR0-11019X.

Garant D, Lu, W. Mining Botnet Behaviors on the Large-scale Web Application Community. *Proceedings of the 2013 IEEE 27th International Conference on Advanced Information Networking and Applications*. 2013; 1:185-190. (Keene State College, University System of New Hampshire)

Recognized as one of the most serious security threats on current Internet infrastructure, botnets are often hidden in existing applications, e.g. IRC, HTTP, or peer-to-peer, which makes botnet detection a challenging problem. In this work a new, centralized, fully-encrypted, botnet system called Weasel is proposed, including a set of signatures for differentiating the behaviors of Weasel and normal web applications, and a set of data mining techniques for detecting the web based botnet behaviors. The proposed approach was evaluated with over 400 thousand flows collected over seven consecutive days on a large scale network and results show the proposed approach successfully detects the botnet flows with a high detection rate and an acceptably low false alarm rate. Wei Lu is an assistant professor of computer science. Dan Garant is currently in a doctoral program in computer science at the University of Massachusetts Amherst.

Franz SE, Watkins RR, Wright LA, Weaver BA, Hartage RC, Ghiviriga I, Gumina G, Feske BD. Synthetic Strategy toward γ -Keto Nitriles and Their Biocatalytic Conversion to Asymmetric γ -Lactones. *Synthesis*. 2013; 45:2171-2178. (Armstrong Atlantic State University)

Lactones are important molecules because they are the active ingredient in many pharmaceuticals and perfumes. In addition, they are most commonly known as pheromones, which are chemicals that insects use to communicate. This research has demonstrated a “green chemistry” approach to a variety of lactones using enzymes for the key chemical step. Brent Feske is an assistant professor of chemistry at Armstrong Atlantic State University. Five undergraduate students contributed to this research project. Three of the upper level students were funded through an NSF-RUI grant (Franz, Watkins, and Wright) and one underclassman was funded through the NSF-STEP program (Blair Weaver). The fifth student contributed to this research through an Independent study research course (Hartage). Richard Watkins is currently in graduate school at UNC Chapel Hill, Sarah Franz is currently in graduate school at the University of Florida, Laura Wright is currently applying to graduate programs, Blair Weaver is still at AASU, and Ramon Hartage is in medical school at Morehouse College. Supported by NSF-RUI grant CHE-0848708 from the Organic and Macromolecular Chemistry Program and NSF-MRI CHE-0923153. Additional student support provided by the National Science Foundation’s STEP Program under Award DUE-0856593.

Tingle JK, Cooney C, Asbury SE, Tate S. Developing a Student Employee Leadership Program: The Importance of Evaluating Effectiveness. *Recreational Sports Journal*. 2013; 37:1:41318. (Trinity University)

This study examined the effectiveness of a leadership development program using a quasi-experimental design. Data were collected in two phases and measured the growth of each student’s leadership capabilities as reported using the Student Leadership Practices Inventory. Results revealed that the level of intervention significantly affected growth in the student’s leadership capacity. As campus recreation programs are increasingly required to quantify their impact,

the results of this study can be useful for both practitioners and researchers. Specifically, the findings indicate that meaningful growth transpires only when leadership lessons are imparted using a long-term approach. Jacob K. Tingle is an assistant professor of the practice in the school of business and the director of the sport management minor. Seth E. Asbury is an associate athletic director at Trinity and Sheldon. Tate is an assistant director of campus recreation. Christina Cooney was a student researcher for two years with Jacob Tingle in her role as a McNair Scholar at Trinity. She graduated in May 2013 and is currently pursuing an MBA in management at Metropolitan University in Denver, Colorado.

Kahan TA, Oldak VA, Lichtman AS. Working Memory Loads affect Location-based Negative Priming Differently than Inhibition of Return. *Journal of Cognitive Psychology*. 2013; 25:4: 473-492. (Bates College)

People respond more slowly to information when it is presented in a location that was previously ignored (an effect called location-based negative priming) or attended (an effect called inhibition of return). This research clearly shows that these two effects, though similar, are dissociable from one another. Todd Kahan is a professor and chair of the psychology department at Bates College. Victoria Oldak and Andrea Lichtman worked on this research while they were undergraduates at Bates College.