



Good News from the Arkansas Science Fair Association

by Mark Bland - There is some very good news for fans of science fairs in Arkansas. After considerable diligence, the Arkansas Science Fair Association (ASFA) has been able to secure annual funding from the Arkansas Legislature in support of the Arkansas science fairs. This funding was approved during the 2011 legislative session. This funding, along with the generous support of SWN, will help to "raise the bar" for the State Fair competition. The ASFA executive board will also be able to help support the regional science fairs. It has become clear that funding for at least some regional fairs has been difficult to come by, so ASFA is pleased to now be in a position to help. *(continued)*

CNSM Rocks the 2011 Faculty Excellence Awards

The Faculty of the College of Natural Sciences & Mathematics made an unprecedented showing at the 2011 Faculty Excellence Awards. Five of the nine finalists were faculty from the CNSM. Most notably, all three of the Teaching Excellence Award finalists were from this college. Congratulations to Dr. Debra Burris finalist for the Public Service Award, Dr. Rahul Mehta finalist for the Research, Scholarship and Creative Activity Award, and Drs. Danny Arrigo, Melissa Kelley, and Balraj Menon the only finalists for the Teaching Excellence Award! Dr. Menon was the recipient of the 2011 Teaching Excellence Award.

The following text is from the insert to the 2011 Faculty Awards program and provides information about each of the finalists. *(continued)*

Save the Date!

Final Exams

May 2 - 6

Planetarium Show

Tuesday, May 3
7:00 – 8:00 p.m.

Spring Commencement

Saturday, May 7
CNSM – 1:00 p.m.

Grades Due By Noon

Tuesday, May 10

May Intersession Begins

Monday, May 16

Memorial Day

Campus Closed
Monday, May 30

Teaching Excellence Award Finalists



Photos by Mike Kemp

Dr. Balraj Menon, Assistant Professor of Physics was the recipient for the Teaching Excellence Award. Dr. Menon wants his students "to appreciate the beauty and excitement of scientific discovery." Menon's own passion for his field translates to the students, one of whom commented, "Many times I have visited his office to see him sitting at his desk with a large grin on his face scrawling on a piece of paper. I've come to recognize this face. It is when he has figured out a new, exciting, and innovative way of illustrating a difficult or misunderstood physics concept to his general education physics course." His enthusiasm to communicate the wonder of physics was evident to one faculty observer of his classes when Dr. Menon with much humor and happiness was willing to shock himself in a demonstration that introduced students to the idea of an electric field.

Through a combination of thoughtful strategies and innovative technologies, Dr. Menon enables students in his physics courses to make deep connections. He uses core questions to anchor his teaching. He pays attention to common misconceptions and guides students through problem solving to resolve them. A student called him "exceptional at taking very complex ideas and breaking them down into smaller understandable pieces." Dr. Menon embeds technology in his courses as a critical learning tool. The chair of his department commented, "It is no exaggeration to say that Dr. Menon brought technology-based experimentation to our department. Balraj has the ability to design activities that enhance learning. I frequently hear students talking about the ways in which Dr. Menon's labs

differ from others they have performed at UCA or elsewhere." Because Dr. Menon nurtures his student's curiosity and provides them with the intellectual tools to solve problems, the students respond. "The only complaint I ever get about Dr. Menon's classes is that seniors take all the slots," his chair reported. "Students will wait semester after semester to take his classes."



Dr. Danny Arrigo, Associate Professor of Mathematics was a finalist for the Teaching Excellence Award. Dr. Arrigo - "We all use math everyday – to predict weather, to tell time, to handle money. Math is more than formulas and equations; it's logic, it's rationality. It's using your mind to solve the greatest mysteries we know." This quote, from the TV show Numb3rs, is on the front of Dr. Danny Arrigo's Teaching Excellence Portfolio and foreshadows his teaching philosophy. Dr. Arrigo believes, "If the [math] problem is relevant to [the students'] lives or readily visible in their physical environments, it generates even more interest." To achieve this lofty goal of getting students to realize and appreciate the value and applicability of math to their lives and goals, he strives to create a stress-free classroom environment so that students are comfortable interacting with him and each other. Many student comments relay the significance of that environment, "Dr. Arrigo is a wonderful instructor. He teaches a challenging course with humor and meaningful discussion."

Another key element in Dr. Arrigo's teaching philosophy is to improve student content retention. Several years ago, he was distressed to find that students who had completed an upper-level math course could not recall many, if any, of (continued)

(Arkansas Science Fair continued) State Representative Linda Tyler authored this budget item and was instrumental in securing this funding. Act 1075, which appropriates funds to the Department of Education, contains an appropriation of \$75,000 for grants to AFSA to support the state and regional science fairs. Those in attendance at the 2010 Awards Banquet might recall that Representative Tyler was our event speaker for the evening. It would be greatly appreciate if you would send her a note, thanking her for her support of the Arkansas State Science Fair system (linda.tyler@arkansashouse.org).

Physics Professor Presents Moon Talk

As a part of the Arkansas Master Naturalists training and because she is an Astrophysics professor at UCA, Dr. Debra Burris was asked to present the Super Moon program at Lake Dardanelle State park on March 19th. There was a short presentation on moon phases, viewing with both telescopes and binoculars and then general questions from the audience of about 50. The programs are provided as a free service to campers at the park and also to the surrounding community as a part of the Arkansas State Parks educational outreach.

(Service Awards continued) the techniques or principles from that course in subsequent semesters. After some personal reflection, Dr. Arrigo implemented group problem solving and research into his Partial-Differential Equations class. As a result, students are more engaged in the material and see the relevance of what they are learning to real-world problems. Dr. Arrigo also values involving students in undergraduate research and sees this involvement as an extension of his teaching. He says, "I thrive when introducing a student to a new world - the world of applied mathematics." For all of us who have ever taken a math class and wondered, "When am I ever going to use this?" Dr. Arrigo is the teacher we wish we had. His students realize their good fortune to be in his classroom, value their time with him, and wish for more, saying, "Professor Arrigo is the first math teacher to be able to make me understand....I plan to take Dr. Arrigo as much as possible....Why aren't you teaching Cal III?" Dr. Arrigo is an accomplished mathematician and a productive researcher; however, above all else, he is a teacher. He sums up this role saying, "...all teachers must take our roles very seriously. We should never minimize the role we play in influencing students' lives, sometimes even changing the course of their lives."

Dr. Melissa Kelley, Associate Professor of Chemistry, was a finalist for the Teaching Excellence Award. Dr. Kelley writes in her teaching philosophy that she wants to help students gain an appreciation for "the chemical masterpieces all



around them" and appreciate that even actions often taken for granted such as breathing are "elaborate and beautiful" from a biochemical perspective. Dr. Kelley's teaching is "built upon the firm foundation of enthusiasm and industriousness." One former student wrote "she taught me how to overcome the impossible and guided me to success." Another wrote "her passion, professionalism, and diligent dedication to her students' success, among many other astounding qualities, make her the brilliant educator that she is today and will continue to change students for the better for many years to come." A former student who is now in graduate school wrote "in hindsight, what I deemed as torture in her class actually gave me invaluable experience and skills to bring to graduate school."

Dr. Kelley uses a number of innovative assignments in her classes. In her Biochemistry I classes, students are required to write a mini-review" article on a noteworthy enzyme. According to *(continued)*

(Service Awards continued) Dr. Kelley, "the goal of this assignment is for the students to acquire critical thinking skills by reading, analyzing, and summarizing biochemical literature." Students in her General Chemistry for Health Sciences course complete "Cool Compound Assignments" in which they apply concepts learned in class to biologically important compounds such as vitamins. A student in this course commented, "I love how these questions will make you think and then apply what you know to get through the problem." Faculty observers of her class noted her outstanding rapport with the students and her masterful explanation of complex biochemical pathways.

Research, Scholarship and Creative Activity Award Finalist



Dr. Rahul Mehta, Professor of Physics was a finalist for the Research, Scholarship, and Creative Activity Award. Dr. Mehta, has seen his research evolve in recent years from the study of collisions of accelerated ion beams with atoms of the samples to how the skeletal system responds and adapts to mechanical perturbations induced by microgravity. His current research concerns astronaut bone weakening while in microgravity, and impacts NASA's biomedical research and countermeasures program. His work has been funded by several grants in recent years from the Arkansas Space Grant Consortium, and he has collaborated with numerous other scholars worldwide. Of particular interest to the award committee was Professor Mehta's passion to mentor students and to produce, in his words, "successful scientists, engineers, and teachers." Notably, while Professor Mehta has himself published five papers since 2008, his

undergraduate mentees have presented over 25 times in the same period.

Public Service Award Finalist



Dr. Debra Burris, Assistant Professor of Physics and Astronomy was a finalist for the Public Service Award. Dr. Burris has been active professionally and in community-focused activities for several years. A graduate of Atkins Public Schools, she has worked to assist the Atkins community following several economic setbacks including a plant closing, loss of poultry contracts, and a devastating tornado. Dr. Burris has given her time and supplied educational material on renewable energy to Gifted and Talented students. One program she has developed for the Atkins students is a geocaching series, allowing the students to learn about their town and the geology of the region. Her love of science leads her to participate in events that highlight the natural history of Arkansas. Dr. Burris is a participant in the Arkansas Master Naturalists program and serves as an ambassador of natural history.

Dr. Burris is an avid equestrian, and she is part of an equestrian community that is volunteer-minded. She has organized equestrian exhibits and shows that benefit several worthwhile nonprofit organizations such as Arkansas Hospice, and a therapeutic riding facility in Pope County.

Dr. Burris regards community service as a chance to "instill a curiosity about science that will lead to eagerness for learning and a love for community," she views the opportunity for volunteerism as a "privilege of her position."

Enrichment Day for Carl Stuart Students

The UCA STEM Institute organized an enrichment morning for Ms. Kaye Clanton's GT classes from Carl Stuart middle school. On April 11th sixty 8th grade physical science students participated in this program. There were three activities for these students with groups of twenty participating in three groups. The three activities included a demonstration of the Scanning Electron Microscope with Dr. Rahul Mehta and Mr. Jerry Mimms, DNA-Extraction from Strawberries and demonstrations of Newton's Laws of Motion. The last two activities took place at the UCA STEM Institute in Main Hall and were supported by Ms. Leah Horton and students from the STEM Residential College in Arkansas Hall. The morning was capped off by a visit to the UCA Planetarium with Dr. Scott Austin. Ms. Minnietta Ready, Science Specialist at the Institute organized this trip. This is a very important part of the outreach of the Institute. It is at the age when many students turn away from the study of science and mathematics. A visit to UCA and some hands-on activities may be what inspires a young person to pursue a career in the sciences.



Video Compression Paper Published

Yimin Zhou, Yu Sun, Zhidan Feng and Shixin Sun, "PID-Based Bit Allocation Strategy for H.264/AVC Rate Control," IEEE Transactions on Circuits and System II, VOL. 58, No. 3, pp. 184 – 188, March 2011.



Yimin Zhou

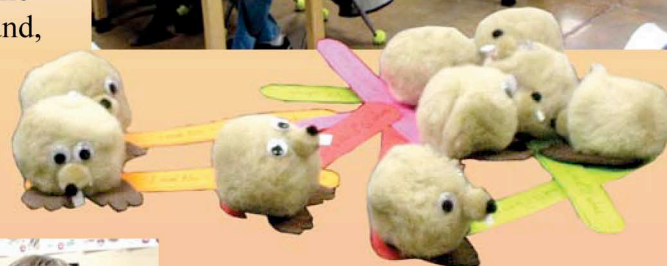


Dr. Yu Sun

In March 2011, Dr. Yu Sun from Computer Science Department published a journal paper in IEEE Transactions on Circuits and System II, a leading journal in the field of Hardware and Architecture. Fully sponsored by Chinese Scholarship Council (CSC), the co-author Dr. Yimin Zhou, had been a visiting scholar in the Computer Science department at UCA from December 2007 to May, 2009. He conducted advanced research in the area of multimedia computing with Dr. Sun. In this study, based on the PID control theory, they proposed a novel and robust bit allocation scheme for H.264/Advanced Video Compression (H.264/AVC). Experimental results demonstrate that the proposed scheme outperforms the approach adopted in H.264/AVC standard by providing accurate rate regulation, precise buffer control and coding quality improvement up to 1.17 dB.

A Mole Day at Hector High School

Drs. Umadevi Garimella and Faith Yarberry traveled to Hector High School to pilot a new teaching module titled "The Power of the Mole". The hands-on activity, designed by Dr. Yarberry, helps students to understand the meaning of the term mole, the relationship between moles and the molar mass of a compound, the importance of moles in balancing chemical equations via manipulation, and finally how these items are connected to stoichiometric calculations. Several mole models built by UCA undergraduate chemistry students were used in the demonstrations.



Stellar Nucleosynthesis Article Published

Jeremy A. Lusk and Debra L. Burris, “Error Analysis of Light n -Capture Element Abundances in the Metal-Poor Halo Star HD74462”, Publications of the Astronomical Society of the Pacific, Vol. 123, pp. 253-258, No. 901, March 2011.

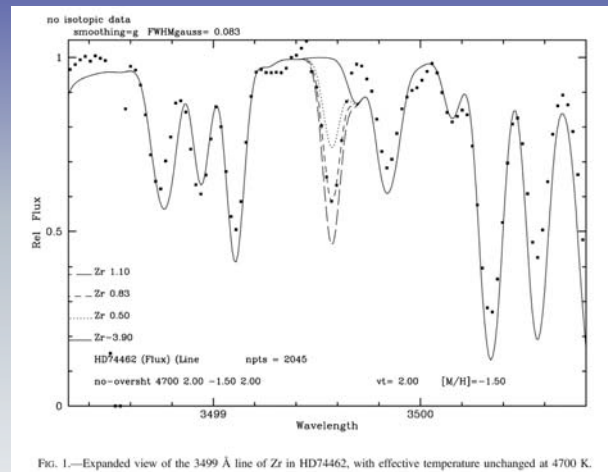


FIG. 1.—Expanded view of the 3499 Å line of Zr in HD74462, with effective temperature unchanged at 4700 K.

Chris Kelly, a student at Little Rock Central High School, was named the 2011 recipient of the Griffin Award. The Griffin Award is presented to the student who has exhibited the greatest creativity in the Life Sciences at the Arkansas State Science Fair. The award is \$100 and is funded by an endowment in the UCA Foundation. Chris’s project was titled “DNA:Nano Chicken Wire.” He studied the possibility of designing proteins that could self assemble into chicken wire-like defenses for a living organism. Some of this work was done in collaboration with researchers at the National Center for Toxicological Research in Jefferson, Arkansas. Chris is putting the awards into his college fund.

Griffin Award

Dr. Mary McDonald, featured speaker, “Warbler Deviants and Devils – Tall Stories About Little Birds”

Article from the Roger Tory Peterson Institute of Natural History

Dr. Mary McDonald will be one of the featured speakers at the Third Annual Roger Tory Peterson Festival, June 9 – 12, 2011 at the Jamestown Community College in Jamestown, New York. This year’s festival will include many new events designed to appeal to novice birders and to those who simply wish to enjoy and learn more about nature with like-minded folk. Dr. McDonald’s

featured talk is Saturday, June 11 at 1:00 PM.

You all know what a warbler is, right? Small, brightly-colored, insectivorous birds. They sing warblely songs from perches during the daylight hours, are neotropical migrants, and mate monogamously with both parents dutifully caring for young. Well, not all warblers fit this prototype. Most – both males and females – sneak out the back door for a frolic in the bushes with a neighbor of the opposite sex whenever they get a chance. *(continued)*

(Warbler Article continued) Some swim, or at least their young do so. Others eat waxy fruit. Many sing flight songs, and some also sing at night. Tennessee Warblers never, ever are found breeding in Tennessee. I've seen a warbler chase a bear off its territory (no kidding!). Twice curious warblers have walked up to me once when I was sitting quietly on the ground, and I've caught them by hand. And, especially well-known to those of us who study these critters for a living, they do have individual personalities, including a perchance to torment humans set upon finding and observing them (hence the "Devils" in the program title). Perhaps you too have your own warbler stories and factoids to relate. This talk will describe some atypical warblers and their behavior, habits and habitats, with an emphasis on my research specialty, the Kentucky Warbler (*Oporornis formosus*). A tip of the hat goes to Gene Morton, who got me going in WarblerVille, and John Rappole, who has always been an inspiration when it comes to executing quality research. And yes, there will be a bear of a story.



Mary Victoria McDonald was born at an early age in Winchester, Virginia, and lived in West Virginia and South Carolina prior to attending Wake Forest University, where she obtained her B. A. degree in 1975. Two years later she received her M.S. degree in Fisheries and Wildlife from Virginia Polytechnic Institute and State University. She taught for several years at Southwest Missouri State University, and then resumed graduate work in Zoology at the University of Florida. Her research was on the ecology and behavior of the Seaside Sparrow. After completing her Ph.D. in 1986, she did contract work for the U.S. Fish and Wildlife Service and taught for one year at the University of Redlands. A two-year stint as a Postdoctoral Fellow of the Smithsonian Institution under Gene Morton followed, during which time she worked on Kentucky Warblers at a research site in the Blue Ridge mountains of Virginia, where she was fortunate to have John Rappole as a colleague. McDonald joined the University of Central Arkansas Biology Department in the fall of 1990, where she continues, teaching Evolution, Animal Behavior, and Vertebrate Zoology, Mammalogy, and Ornithology. She is a Fellow and former Secretary and Vice President of the American Ornithologists' Union. She has served

on the Board of Directors, and as Secretary of the Neotropical Ornithological Society, and is currently serving on the Council of the Association of Field Ornithologists. Although her permanent home is in Arkansas, beginning in 1991 and continuing, she has migrated annually between UCA and Virginia in order to continue her summer field research on Kentucky Warblers. Recent research species also include Purple Martins, Eastern Bluebirds, and grassland birds. Her hobby is running marathons, having now completed at least one in every state plus DC, and three continents, including Antarctica last year.

