In This Issue

- Visit to Johnson Space Center in Houston..................P. 1

- Steelman Attends International Rock Art Conference..........P. 2

- Dr. Patrick Desrochers Publishes Book Chapter.......P. 3

- Summer Program for High School Students...................P. 4

- Problem Solving Framworks:............P. 5

- Majors Fair........................................P. 6

- NSF Grant to Improve Calculus Teaching & Learning.....P. 7

- ACT Prep Classed Offered by The STEM Institute.....P. 8

- Chemistry Students Receives Awards.......................P.9

- UCA STEM Institute Open House.........................P. 10

And More!!!
Dr. Rahul Mehta, Professor of Astronomy & Physics, and his student Greg Sheffer, visited the Johnson Space Center in Houston in August. They were accompanied by faculty members Dr. Ali (UALR), Dr. Post (UALR), Dr. Chowdhury (IAMS), and 5 of their students (Zartasha Javid, Maliha Bhatti, Bukola Odeniyi, Kathrine Hart, and Charlotte M. Felton). The trip was supported by the Arkansas Space Grant Consortium’s RID grant. Mr. Sheffer reported, “Traveling to the Johnson Space Center was an incredible experience. The trip was both educational and inspirational. As we made our way through each lab I found myself eager to learn more about what I was hearing. There were two labs in particular, the immunology lab and the microbiology lab, which really peaked my interest. Discovering that the ability of the immune system is suppressed in microgravity conditions while the virulence of microorganisms is increased has made me especially interested in the subject and I find myself continuing to read up on the matter of immunology. The thing that stuck out most to me was the passion that each researcher had for what they are studying. It was clear that they love what they do and their excitement was contagious. I left the Johnson Space Center with a hunger for more knowledge and my only regret was that we did not have more time in each lab. The visit was an amazing experience and I am very grateful to have been able to be a part of it.”

The different labs visited and the overlapping interests are described below:

1. Space Radiation Dosimetry- The earth is protected from space radiation by a magnetic field. Certain areas on earth with magnetic anomaly and astronauts in crossing orbit do receive a greater dose of radiation. This monitors protection of astronauts and equipment on the orbiting spacecraft. The need for radiation badges on board with live readings is essential for quick actions.

2. Microbiology- The quality of the air, water, and food consumed by astronauts is studied by looking at the microbes that grow or don’t grow under the right conditions. When simulating microgravity conditions on earth for growing cells, all these aspects have to be looked into. NASA is developing tests and associated material for tests that can be used in space. Sending something into orbit is expensive, therefore, efficiency factors have to be considered.

3. Toxicology- The instruments for testing in space are being redesigned for minimal weight, good efficiency, and to ease usage. Rats breathing lunar dust are used here to see the toxic effect of space debris in the lungs. Large banks of batteries for mass spectrometry are being developed. These will provide power in case of a power failure.

4. Immunology- The human body and hormones behave differently under stressful conditions. The effects of microgravity on the immune system is studied here to understand human behavior under space conditions and provide means to reduce the effect – both behavior wise and physiologically. A new environmental Scanning Electron Microscope (SEM) is being used in analyzing samples of cells growing in microgravity conditions versus regular planetary gravity conditions.

5. Extra Vehicular Activity (EVA)- Astronauts should be able to work outside the space vehicle, but for how long and what effort possible? These questions are studied by making humans perform tasks under reduced gravity with and without bulky space suits. Next generation multipurpose module to be used on other planetary or lunar conditions is being developed. Their functionality are being tested and designed.

6. Cell Biology- Cells growing under simulated microgravity conditions are being studied using various rotating wall vessels (HARV). The differences in 3-D structure versus 2-D structure (under gravity condition) are seen and the cells’ behavior is altered. In this lab the ASGC project is very close to being done.

7. Cardiovascular- The effect of change in pressure is detrimental to the human body. This study is done to see how different parts of the body behave under changing pressure conditions. Space suits are being developed to alleviate some of the discomfort that would happen otherwise. Ultra sound based Doppler measurements are used to see the effect of pressure on blood flow.

8. Bones- Effect of microgravity on soft and hard tissue is being studied.
Visit to Archaeological Field School

During the last week of June, Dr. Karen Steelman, Department of Chemistry, and her research student Sergio Perez Bakovic, visited an archaeological field school in the Lower Pecos Canyonlands of southwest Texas. The 2013 Eagle Nest Canyon Field School was a joint collaboration between Texas State University and SHUMLA Archaeological Research & Education Center. Students studied excavation techniques with Dr. Steve Black and rock art recording with Dr. Carolyn Boyd. Sergio’s undergraduate research project and honor’s thesis topic explores how ancient artists in the region made paint recipes. He is using High Performance Liquid Chromatography (HPLC) to identify organic components in paint samples. In addition as a guest, Dr. Steelman gave a lecture to the archaeology field school students about radiocarbon dating.

Steelman Attends International Rock Art Conference

Dr. Karen Steelman attended the International Federation of Rock Art Organisations (IFRAO) Congress in Albuquerque, NM at the end of May. She was invited to present a talk entitled, “Chihuahuan Polychrome Rock Paintings in Southern New Mexico,” in the Rock Art of the Jornada Mogollon session, as well as a talk entitled, “Multi-sample Plasma Oxidation System for Radiocarbon Dating Rock Paintings,” in the Archaeology and the Science of Rock Art session. UCA student co-authors included Ashley McKinney, Kaleb Smithson, and Lennon Bates.

Chemistry Club Officers Retreat in Branson

To prepare for the up-coming year, the UCA Chapter Officers for the American Chemical Society held a retreat at the end of July in Branson, Missouri. The 2013-2014 Executive Council members are: Sergio Perez Bakovic, Johnathon Schmidt, Hoda Agrama, Jalyn Henderson, and Julio Castillo. Faculty advisors are: Drs. Faith Yarberry, Kristin Dooley, and Karen Steelman. Communication skills for the up-coming year were discussed, as well as planning service and social events. For fun, the group took a few hours time-out to ride go-karts!
Dr. Patrick Desrochers Publishes Book Chapter

The book, “NMR Spectroscopy in the Undergraduate Curriculum,” published in January 2013, contains a chapter written by Dr. Patrick Desrochers, Professor of Chemistry, entitled, “Beyond Undergraduate Experiences: Routine Measurements with Heteronuclear, Heterogeneous and Paramagnetic Samples.” The book is based on a symposium of the same name that was held at the Spring 2010, American Chemical Society (ACS) national meeting. Dr. Desrochers presented at the symposium and was later asked to contribute a chapter to the book. Examples cited in the chapter are primarily based on experiments conducted by Dr. Desrochers and his student collaborators. These experiments span his twenty years on the UCA faculty. Dr. Desrochers is a past recipient of both the University Teaching Excellence Award and the Research and Scholarly Activity Award.

UCA Undergraduate Student Receives the AAI Scholar Scholarship & Publishes Research Paper in Top Artificial Intelligence Conference

The Association for the Advancement of Artificial Intelligence (AAAI) is an international, nonprofit, scientific society devoted to advancing the scientific understanding of the mechanisms underlying thought and intelligent behavior and their embodiment in machines. The AAAI Conference is the top artificial intelligence and machine learning conference in the world. UCA’s computer science undergraduate student, Clifford A. Tawiah, conducts his research on artificial intelligence with Victor S. Sheng, Assistant Professor of Computer Science. Clifford’s paper entitled “Empirical Comparison of Multi-Label Classification Algorithms,” was selected to be presented and published in the Twenty-Seventh AAAI Conference held July 14–18, 2013 in Bellevue, Washington. Mr. Tawiah was also awarded the AAAI Student Scholar Scholarship. In addition, Kyle Eichelberger, who also conducts research with Dr. Sheng on artificial intelligence, had his research paper selected for presentation and publication in the conference proceedings.

In attendance at the conference were Masters and Ph.D students in artificial intelligence and machine learning, as well as top researchers in AI from across the world. Clifford and Kyle were the only two undergraduates, whose research was selected for presentation and publication in the conference proceedings. The conference symposium series affords participants an intimate setting where they can share ideas and learn from each other about artificial intelligence (AI) research. Leading industry companies like Google, Microsoft research, Facebook, NASA, US Defense for Advanced Research Projects Agency (DARPA), and many others, sponsored it. It was a great opportunity to showcase the University of Central Arkansas while learning and sharing ideas with notable figures in artificial intelligence.
Summer Program for High School Students Organized by The Department of Mathematics

The sixth annual Mathematics Science and Information Technology Academy, known as MSIT Academy at the University of Central Arkansas, was held during the week of July 15-19, 2013 in the Department of Mathematics at UCA. Participating in the academy were thirteen high school students from Benton, Conway, Rogers, Little Rock, and Vilonia. Two activities were presented this year at the week-long program. One was Cryptology: Coding and Decoding Secret Messages, and the other was Graphic Programming in Java Script. The Cryptology activity, which had five students, was presented by Drs. Ramesh Garimella and R.B. Lenin. The Graphic Programming activity, which had eight students, was presented by Dr. Clarence Burg. Lunch time activities included a visit to the UCA planetarium, a chemistry activity, an activity on robotics, and career opportunity in the STEM fields. The MSIT program is designed to stimulate and enhance high school students’ interest in mathematics and its applications to the physical, biological, and computer sciences. For information on future MSIT activities, contact Dr. Ramesh Garimella, Chair of the Department of Mathematics at rameshg@uca.edu.

Publications by Chemistry Faculty Dr. Lori Isom

Dr. Lori Isom published two research articles during the summer of 2013. The first, entitled, "DNA Phosphate Crowding Correlates with Protein Cationic Side Chain Density and Helical Curvature in Protein-DNA Crystal Structures," was published in Nucleic Acids Research. The second article was published in PLoS ONE with the title of "Cations Form Sequence Selective Motifs Within DNA Grooves Via a Combination of Cation-Pi and Ion-Dipole/Hydrogen Bond Interactions." Both research publications had undergraduate research students as co-authors. Congratulations, Dr. Isom!


Problem Solving Frameworks: High School & College Studies
Presented in AAPT 2013 in Portland

This summer Dr. Andrew Mason, Assistant Professor in the
Department of Astronomy & Physics, attended the 2013
American Association of Physics Teachers (AAPT) Summer Meeting
and the Physics Education
Research Conference (PERC) in
Portland, Oregon. He presided
over the meeting for the Area
Committee for Graduate
Education. Dr. Mason is currently
Vice Chair of this area committee
and has been named the Chair of
the area committee for a one-year
term, effective at the end of the
2014 winter meeting in Orlando,
FL. The meeting agenda items
included scheduling activities for
the 2014 winter meeting, as well
as the 2014 summer meeting in
Minneapolis, MN.

From the events of the committee
meetings, Dr. Mason is also now in
charge of organizing a session for
next summer’s meeting, which he
has previously organized for the
2013 winter meeting in New
Orleans. This session is called,
“Confessions of a First Year
Faculty,” and will feature a
discussion panel session of
recently hired faculty members
who will field questions, discuss
their previous experiences, and
generally offer advice to graduate
students and postdoctoral
researchers considering a career
in academia.

While at the AAPT/PERC meeting,
Dr. Andrew Mason presented a
talk and two posters. During the
PERC portion of the conference, he
presented a poster on behalf of
Mishal Benson, his student
researcher. The poster was
titled, “Coaching A Problem-
Solving Framework: Evaluation
from High School Physics
Teachers.” The poster highlighted
the work Mishal has been doing as
a student researcher in terms of
using computer modules designed
for university-level physics to high
school teachers with the
possibility of overlap in that
setting. The modules are designed
to coach students in a problem
solving framework used for
introductory physics. The talk,
presented during the AAPT
portion of the conference, was
linked to this poster and entitled,
“Asking Teachers: Utility of
Expert-Like Problem Solving
Framework in High School
Physics.”

The specific work highlighted by
the talk and poster dealt with a
project Mishal and Dr. Mason did
during June 2013, in which we had
four area high school physics
teachers attend a one-day
workshop where they were
introduced to the modules and
asked to provide written and
audiovisual feedback on how these
modules might be edited to work
properly in a high school
classroom, and whether they
might be effective to help physics
teachers themselves from a
training standpoint. The teachers
had positive remarks and very
helpful suggestions.

The other poster, presented at
both the AAPT and PERC portions
of the conference, was entitled,
“Problem Solving Reflection in
Second-Semester Physics: A Pilot
Analysis.” This poster describes
preliminary work done towards
introducing explicit metacognitive
reflection to students in an
algebra-based physics setting.
Majors Fair

The 16th Annual Majors Fair was held Thursday, October 3, 2013 in the Student Center Ballroom. Approximately 1,087 individuals attended the fair, which was a 35% increase from last year’s attendance of 708 students. In addition to the outcome of attendance, the Department of Biology received 3rd place recognition for their display.
NSF Grant to Improve Calculus Teaching & Learning at UCA

Dr. Jason Martin, Assistant Professor of Mathematics, and his collaborator Dr. Michael Oehrtman of the University of Northern Colorado, received a three year $137,259 NSF grant for their Project CLEAR Calculus in the Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics (TUES) program. Project CLEAR Calculus is a research based effort to make calculus conceptually accessible to more students while simultaneously increasing the coherence and rigor of the courses. The objectives of Project Clear Calculus are to (a) refine and disseminate 36 labs spanning the content of a standard introductory sequence in differential, integral, and multivariable calculus with supporting materials and interactive technology for students; (b) refine and pilot faculty development in the form of summer workshops, weekly video conferences, classroom video, and instructor notes to support successful implementation of the labs; and, (c) assess the impact of the labs on student conceptual development of the central ideas in calculus. Dr. Martin joined UCA in August 2011 as a tenure-track faculty member after completing his post doctoral fellowship at the Arizona State University.

Annual GTA Orientation

The annual orientation meetings for the Graduate Teaching Assistants in the Department of Mathematics was held on August 15 and 16, 2013. The sessions were focused on lesson planning, teaching resources and support documents, assessing student progress, and sexual harassment. Dr. Charles Watson, Math GTA Supervisor, organized the meetings. As an integral part of the orientation meeting, training session were conducted on using the mathematical software MyMathLab, Smartboards, graphing calculators, and UCA Blackboard. For the academic year 2013-14, the Math Department recruited 17 GTAs who were scheduled to teach sections of College Algebra, Business Calculus, and Quantitative Literacy courses in fall 2013. In addition to the orientation, Dr. Watson will hold weekly meetings with GTAs throughout the fall semester to provide mentoring and discuss teaching strategies to become effective teachers.

ACTM State Math Contest Held at UCA

In April 2013, the Department of Mathematics hosted the State Mathematics Contest, which was sponsored by the Arkansas Council of Teachers of Mathematics (ACTM). Approximately 350 students from private and public secondary schools throughout Arkansas were selected to participate in the State Contest as a result of their performance in one of the 16 regional contests. The contest included exams in Algebra I, Algebra II, Geometry, Trig/PreCalculus, Calculus, and Statistics. Dr. Charles Watson, UCA Associate Professor of Mathematics, was the state contest director. He was responsible for organization of the contest and assuring that the exams were appropriate and based on the Curriculum Frameworks adopted by the Arkansas Department of Education. Dr. Carolyn Pinchback, Loi Booher, and Jon Sumners of the UCA Mathematics Department faculty assisted Dr. Watson. UCA also hosted one of the regional competitions last March. Dr. Pinchback, Ms. Booher, and Mr. Sumners coordinated the regional event. The Department of Mathematics is pleased to bring outstanding students from across Arkansas to the UCA campus to engage in an academic contest.
Dr. McGehee Offered Geometry Institute in Summer 2013

Dr. Jean McGehee, Associate Professor of Mathematics, received a $63,679 grant from the Arkansas Department of Higher Education, for her project Geometry and the implementation of the Common Core Standards in Spring 2013. As a part of the project, Dr. McGehee conducted two 4-day summer workshops on the UCA Campus for 25 geometry teachers during the month of July 2013. The focus of the workshop was on major mathematical ideas such as variables, functions, geometric construction, transformations, reasoning, and proof. About 20 mathematics teachers from several school districts, which included Conway, Greenbrier, Hope, Little Rock, North Little Rock, Springdale, Vilonia, and Wynne, attended the summer institute.

ACT Prep Class Offered by The STEM Institute

The UCA STEM Institute offered a two-week course called Preparing for College and Career Program. The Institute began offering this course in the summer of 2012 as a five-week class. This summer the program was redesigned as a two-week ACT (American College Test) preparation course to help high school students prepare for the ACT. This course provided an in-depth study review of ACT and offers techniques for coping with test anxiety and test taking. The strategies and training were targeted to assist high school sophomores and juniors in central Arkansas regions. In addition to the two-week session, an additional review session was offered the Saturday before the ACT test was taken.

Funding to support the ACT Prep Program came from the students registration fees, the UCA STEM Institute, Sponsored Programs, and the Provost office.
Another Successful Year of Funding for The STEM Institute

The UCA STEM Institute received external funding of $476,780 from four sources. These sources include: the Connecting Core Instructions (CCI-5-7 grades), which is a three year Title II Part B Math and Science Partnership grant that is funded through the Arkansas Department of Education. This project focuses on the improvement of mathematics and science instruction in grades 5-7. The goal is to develop a team of teachers to integrated science, mathematics, literacy, and technology initiatives to enhance teacher content knowledge and teaching skills that prepare students for success in the CCSS and NGSS. The CCI 5-7 project will provide long-term professional development opportunities.

The Math Core Team grant offers math sessions to teachers for grades 3-5 from four school districts. The topics addressed are non-geometric measurements, geometry and data collection, display, and analysis.

The Science in Action II & III Commitment to Excellence Grant from the AR STEM Coalition is for promoting STEM education in Arkansas classrooms. The funds support elementary schools in need of science equipment and related professional development for teachers in grades 3 through 6. Each school received approximately $3,000 worth of science equipment based on the needs of the students and teachers. The students will use the equipment to develop understanding of science concepts in physical science.

The renewal of the STEM Center Math and Science Specialists Competitive Grant supports the two specialist positions within the STEM Institute. The specialists are experienced in designing and providing quality professional development and technical assistance to Arkansas schools and districts. They also implement ADE projects statewide and play an active role in supporting UCA students, both pre-service and STEMteach.

Chemistry Students Receive Awards

Under the direction of Dr. Pat Desrochers, two chemistry students won awards at the INBRE meeting in Fayetteville on October 19, 2013. Julie Davis’s oral presentation, entitled "Evaluating the Effectiveness of Supported Nickel Scorpionates to Select for Specific Amino Acids," earned first place and Ryan Rogers’ poster presentation entitled, "Computational Investigation of Polymerization by Rhodium Scorpionates" was recognized with an honorable mention.
UCA STEM Institute Open House

On Thursday, September 25, 2013, UCA STEM Institute hosted an open house for all educators. A number of UCA professors including UCA President Tom Courtway, provost Steve Runge, and Deans of various colleges visited the STEM institute. State Representative David Meeks and representatives from Congressman Tim Griffin’s office were invited to show the program’s strengths in an effort to lobby for funding. Charlotte Green the Gifted and Talented/Advanced Placement supervisor of Conway Public Schools was also present.

The institute is run by a tight-knit group of education specialists. The institute focuses on P-16 STEM education that addresses all levels of education from early childhood to postsecondary, including certification programs, colleges, and universities. Located on UCA’s campus, the STEM Institute has access to expertise, educational research, and teaching resources.

UCA’s President Tom Courtway stated that the STEM Institute is very important to the future of our state and our country. “It’s critical,” he said.

Representative Meeks said he came to learn more about the STEM Institute because he sees a problem with remedial education in the state of Arkansas.

Within the STEM Institute there are two rooms, one for science and one for math with teaching resources for K12 teachers to utilize in their classrooms.

Green said the institute has been a major asset for Conway Public Schools because of the materials available for teachers to use in their classrooms.

Alicia Cotabish, Assistant Professor in the College of Education, said the STEM Institute has been a huge asset to her and her graduate students. “Uma has been very good to me and our department working with our graduate students, and allowing them to have access to technology and curriculum resources. Your door is always open and you’re always welcoming,” she said.

In five years, the institute has brought in $2.7 million in grant funding, in which more than 50 percent of these funds go to teachers.

The STEM Institute is located on the second floor of Main Hall in room 212 on the UCA’s campus. The institute can be reached by phone at 501-450-3426, and found on the web at uca.edu/steminstitute.
UCA STEM Institute Collaborates with Lawrence of Sciences, University of California, Berkeley

The UCA STEM Institute collaborates with Lawrence Hall of Sciences, University of California, Berkeley, to incorporate the new “Seeds of Science and Roots of Reading” (SSRR) curricula. The SSRR curricula uses the Do-it, Talk-it, Read-it, and Write-it approach for elementary and middle grade to engage students in learning science concepts in depth. Seeds of Science/Roots of Reading units allow teachers to teach science and literacy together.

On Saturday, September 28, two presenters: Kevin Beals and Rebecca Abbott, conducted a one-day professional development session. The presenters gave an overview of the UCA Berkeley Communicating Science course. Using the Models of Matter unit, the professional development session provided participants with a fundamental understanding of the features of the curriculum and the benefits of integrating science and literacy instruction.

The professional development session is part of the Math and Science Partnership - Connecting Core Instruction 5-7 grant. The professional development for UCA faculty and instructors was supported by this grant.
Teachers Learn About Cancer and Skin from UAMS Faculty

Dr. Robert Burns visited the UCA STEM Institute to help teachers better understand the dangers of cancer. Dr. Burns, a professor in the Department of Neurobiology & Developmental Biology and the director of the UAMS Partners in Health Sciences Program (outreach to PreK-12 teachers), presented human biological displays, including the heart, lungs, and brain.

During the session teachers learned grade-appropriate methods for teaching about the dangers of cancer and ultraviolet (UV) radiation in addition to the normal functions of the skin. Dr. Burns used a variety of hands-on materials and demonstrations to illustrate how skin pigment changes when exposed to UV radiation, among many other activities.

Teachers received a resource guide and take-home sacks filled with several teaching demonstrations and kits to help relay the information they learned, including a set of plastic skin models and posters to show the dangers of tanning beds.

This activity is part of the No Child Left Behind Improving Teacher Quality grant from ADHE.