DEPARTMENT OF MATHEMATICS

UNIVERSITY OF CENTRAL ARKANSAS

SIGNS OF MATHEMATICS AN ANNUAL NEWLETTER



Volume 8 January 2012

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FROM THE CHAIR...



The year 2011 was yet another productive year for the Department. Our nation wide search to hire two mathematics educators was a great success. As a result, we hired Dr. *Jason Martin* and Dr. *Jungeun Park* from a pool of 45 highly qualified mathematics educators. See the *Spotlight* section of this newsletter for more information on Drs. Martin and Park. Dr. *Linda Griffith*, is on loan to the Arkansas Department of Education for the 2011-13

academic years to help design and provide professional development materials and delivery related to the implementation of the Common Core Standards for K-12 Mathematics. Dr. Weijiu Liu, authored another text book, Introduction to Modeling Biological Cellular Control System, which was published by Springer in its series: Modeling, Simulation & Applications. Dr. Patrick Carmack has continued his research collaboration with the University of Texas Southwestern Medical Center in Dallas. Dr. R.B. Lenin received funding from the Center for Distance Health (CDH) at University of Arkansas for Medical Sciences (UAMS)UAMS. The Department of Mathematics and the UCA STEM Institute received a funding of \$105,312 from the Arkansas Department of Higher Education (ADHE) to create major comprehensive professional development workshops to help teachers make transition from the Arkansas Frameworks to the Common Core State Standards. Thirteen high school students from Conway, North Little Rock, Little Rock, and Perryville participated in our fourth annual summer program 2011 MSIT Academy @ UCA, funded by ASTA. The Mathematics Department continued to host the Arkansas Council of Teachers of Mathematics State Mathematics Competition in spring. Approximately 300 high school students from across the state took part in the competition. Last year, the Department offered 26 sections of the concurrent credit courses, through several high schools in central Arkansas, in College Algebra, Trigonometry, Pre-Calculus, Calculus and Elementary Statistics with an enrollment of 368 students. Overall, 2011 was another outstanding year and we expect to continue our progress in 2012. All the best wishes for the new year. Sincerely, Ramesh Garimella, Chair.

Mathematics NCATE Review



Recently, the mathematics education program was examined as part of the review of the UCA College of Education and its professional education programs. While all the BSE degrees were part of the review, it should be noted that the mathematics education program was among those nationally recognized by the National Council of Teachers of Mathematics (NCTM) and the accreditation association, the National Council for the

Accreditation of Teacher Education (NCATE). Thanks should go to the CNSM faculty who participated in the process of producing the report for the NCTM/ NCATE review. (Continued on page 4)

Faculty News

Brain Imaging Research

Dr. Patrick Carmack, Assistant Professor of Mathematics,



received a contract in the amount of \$39,639 from the University of Texas Southwestern Medical Center in Dallas for summer 2011, fall 2011 and spring 2012 semester to conduct research related to brain imaging. Dr. Carmack will perform voxel based morphometry (VBM) analyses of the

T2 image for both the Seabees (Construction Battalions of the United States Navy) and national samples. VBM is a neuroimaging analysis technique that allows investigation of focal differences in brain anatomy using a statistical approach. The first phase of Dr. Carmack's and his colleagues at UTSW work was published in the Journal of Radiology.

Research in Queuing Theory

In July 2011 Dr. R.B. Lenin, Assistant Professor of Mathematics, received a \$16,379 grant from the Center



for Distance Health (CDH) at University of Arkansas for Medical Sciences (UAMS) to identify an optimal scheduling policy for patients to reduce waiting time, test new ideas for system design or improvement before committing the time and resources

while optimizing healthcare resources. He plans to develop computer simulation models based on the data collected by CDH at UAMS.

Upward Bound

Clarence Burg, Assistant Dr. Mathematics, taught the Algebra II preparation class for the Upward Bound Summer Academy for the fourth time in as many in summer 2011. The years Upward Bound program focuses on high school students who have the potential be to





successful in college but probably would not attend college without this program. Upward Bound provides tutoring and mentoring throughout the school year, which culminates in the five-week summer program and an annual trip. Last summer, Dr. Burg taught 17 students in the Algebra II class, using the HP Tablet PCs and the DyKnow software. In the class, Dr. Burg focused on skill maintenance and improvement, going all the way back to fractions. He gave a pre-test on the first day of class and the same post-test on the last day of class. On the pre-test, the average student score was 4.5 out of 32, with a range of 0 to 13. On the post-test, the average student score was 21 out of 32, with a range of 8 to 30.5. It is expected that the students' skills on these algebra topics will prepare them for college algebra.

Kudos to...

Dr. Weijiu Liu on receiving tenure and a promotion to Associate Professor in fall 2011

A textbook authored by Dr. Liu

Dr. Weijiu Liu, tenured Associate Professor of Mathematics at UCA, authored a text book titled *Introduction to Modeling Biological Cellular Control Systems*. The book, which is due for release in January 2012, is published by Springer in its series: *Modeling, Simulation & Applications*. The book offers a mathematical modeling of numerous cellular control systems such as glucose control system and intracellular calcium control system in living organisms. This book contains the essential knowledge in modeling, simulation, analysis, and applications when dealing with biological cellular control systems. It is self-contained and easy to read. Dr. Liu joined the Department of Mathematics at UCA in fall 2005. This is the second mathematical textbook published by Dr. Liu in the last three years. Springer also published his first book "Elementary Feedback Stabilization of the Linear Reaction-Convection-Diffusion Equation and the Wave Equation" in 2009.



More Faculty News

Intramural Grants

Dr. Long Le, Assistant Professor of Mathematics, received



two University Research Council grants to conduct 2011 summer research. One grant is in the amount of \$4.400 to conduct research with a graduate student on finding ways to gain information about solutions of diffusion equations with source terms through method of compatibility. The

other, in the amount of \$ 2,287, was a joint effort with Dr. Mark Smith of Computer Science Department to create an educational tool on the *iPad*.

Visiting Faculty

Dr. Xianping Li joined the Department as a Visiting Assistant Professor for the academic year 2011-12. Dr. Li received his Ph.D. in Applied Mathematics from the University of Kansas. Also, he graduated with a BA



and an MS in Petroleum Engineering from China University of Petroleum-Beijing. His research interests include numerical analysis, scientific computing, processing, mathematical image modeling and simulation. In his spare enjovs hiking, time. Li biking. computing, but mostly, playing with his

young son.

Jon Sumners joined the Mathematics Department as a Visiting Lecturer for the AY 2011-12. Jon received his undergraduate degree in Mathematics Education in



spring 2010 and a M.A. degree in Mathematics Education in summer 2011 from UCA. One of Jon's future goals is pursue a doctoral degree to in Mathematics Education. In his spare time, Jon enjoys classics such as the Beatles, Journey, Eric Clapton, and

Johnny Cash. A few of his current favorites are Keith Urban, O.A.R., and Taking Back Sunday. Also, he enjoys running, playing basketball, reading, hunting, and fishing.

UCA CCA Grant

In August 2011, the University of Central Arkansas was selected to become one of four univiersities from Arkansas to participate in a national project Complete College America (CCA). The grant

awarded \$1 million to Arkansas, which will be shared among four universities and seven community colleges across the state. The project, which originated through the Arkansas Department of Higher Education, proposes to transform remedial education for universities and



colleges and intends to explore more efficient options for providing remediation in literacy and mathematics for students allowed to enter the university having ACT scores below the required 19. The premise of the grant is that campuses – both two year and four year - across the state will seek to develop options for the required remediation while enrolled in credit-bearing courses. Dr. Charles Watson, Associate Professor of Mathematics, was selected by those attending to facilitate the discussion and to lead the development work of this committee. Representatives from the participating institutions met in December to begin the course design, which appears to follow the theme of Quantitative Literacy and contain much the same content as the course being piloted on the UCA Committee work is projected to be campus. completed in March when a draft document is to be submitted to the Higher Education Coordinating Board for review and approval.

On Loan to ADE

Dr. Linda Griffith, Professor of Mathematics, is on loan to the Arkansas Department of Education for the 2011-13 academic years to help design and provide professional development materials and delivery related to the implementation of the



Common Core Standards (CCSS) for K-12 Mathematics. This puts UCA at the leading edge of the projects and grants related to CCSS.

Kudos to... **Dr. Danny Arrigo** for being promoted to full professor in fall 2011

Math NCATE Review (continued from page 1)

At the site visit in September 2011, approximately 200 people attended the Sunday session with the Board of Examiners (BOE) who perused the program posters and interviewed faculty, partner-school administrators and teachers, and current and former teacher candidates. The BOE stated that they had never seen such strong support from a university's professional and community partners in all their years of serving as reviewers. In the College of Natural Sciences, congratulations go to *Dr. Donna Foss* and mathematics and science education faculty members; and in the College of Education congratulations go to Dean Diana Pounder, Dr. Lisa Daniels, Ms. Debbie Barnes, and all the Professional Education Unit. As a result, the teacher education program is accredited for seven years.



Dr. Martin received his Ph.D. from the University of Oklahoma at Norman in August 2009. For the 2009- 2011 academic years, he held a postdoctoral position in the Center for Research and Innovation in Mathematics and Science Education at Arizona State University. Dr. Martin also holds an M.A. in Mathematics from the University of Oklahoma and a B.S. in Mathematics and Computer Science from the Southeastern Oklahoma State University. Dr. Martin's research interests include how students come to understand formal limit definitions within and across contexts, expert and novice understandings of

the concept of convergence of Taylor series, metaphorical reasoning in reducing cognitive load when reasoning about complicated mathematical topics, and the effects of dynamic images on student understanding.

Dr. Jungeun Park joined the Department as a tenure-track Assistant Professor in fall 2011. She was

selected to fill one of the two mathematics education positions in the Department . A native of South Korea, Dr. Park received her Ph. D. in Mathematics Education from Michigan State University in May 2011. She also holds an M.S. in Mathematics from Michigan State, and an M.A. in Mathematics Education and a B.S. in Mathematics from Korean University in Seoul. Dr. Park's primary research focuses on improving undergraduate student learning opportunities in mathematics in the classroom. Also, she is interested in teacher education of prospective mathematics teachers.

Silent Contributors

A large organization like the Department of Mathematics is successful because of many silent contributors who go beyond the call of duty to make things happen. We convey our thanks to Dr. Donna Foss for her selfless contributions to the Mathematics and Science program during the last years' arduous NCATE Review. Also, many thanks to Mrs. Brenda Graham for her unwavering support to the Department, and Dr. Steve Butcher for his work with the Advising Center.



Dr. Charles Watson on receiving tenured appointment in fall 2011







Student News



O.L. Hughs Award

Jackson Fliss, a math major is the recipient of the 2011 O.L Hughes Award. The award is presented every spring to a senior in mathematics who has an exemplary academic record. Jackson has a perfect 4.0 GPA The award is given in the memory of late O.L *Hughes*, who was the Chair of the Math Department in late 70's to mid 80's.



Dorothy Long Award

Rachel Taylor, a junior mathematics education major, is the 2011 recipient of the *Dorothy Long Award*, presented to an outstanding female junior mathematics major. The award is co-sponsored by the *Delta Zeta Sorority* and is given in the honor of late *Dorothy Long*, who was a mathematics faculty member and the Dean of Women at UCA in 60's.



2011 Outstanding GTA

Jonathan Taylor, a second year MS student in applied mathematics, is the recipient of this year's outstanding graduate student award. Jonathan received a BS degree in applied mathematics from UCA in 2010. This award carries a citation plaque and a check for \$100 from the Mathematics Department.



2011 Summer MA & MS Graduates



2011 Alumni

B.A. /B.S. Mathematics

Cody Bray Jacob Fenske Jackson Fliss James Gearhart Shanece Hill Kali McGhehey Aaron McMoran Bo Sing Ng Tabitha Steinbarger Matthew Stevener Timothy Tate Kirsten Steiner Ryan Stovall

B.S.E Math Education

Odes Choate Chris Counts Tamara Homeyer Sara LeMaster Tamara Junsford Phillip Pruss Cassie Sweeny Lindsey Watts Megan White

M.A. Math Education

Pam Cook David Griffith Alexandria Hook Brandi Jones Kim Kullander Elisha Lowrey John Summner Laura Tinsley Jennifer Tracey Scott Warrior

M.S. Applied Mathematics

Yuee Chen David Ekrut Rachel Layman Sang Lee Brady Sharp Eric Sellers

2011 Spring Math Interns



Math Outreach activities

UCA MATH EDUCATORS TAKE LEAD IN THE NEW COMMON CORE STATE STANDARDS

The Department of Mathematics at UCA has worked closely with the UCA STEM Institute to develop materials and deliver summer professional development workshops for Algebra I teachers in the Conway area and in Southwest Arkansas. UCA provided two of the eleven Algebra I workshops offered summer 2011 in the state.



The project has been funded by the Arkansas Department of Higher Education (ADHE) to create major comprehensive professional development workshops that will help teachers make the transition from the Arkansas Frameworks to the Common Core State Standards (CCSS). Dr. Umadevi Garimella, Director of UCA STEM Institute, and Dr. Ramesh Garimella, Chair of the Department of Mathematics, received a funding of \$105,312 for this project. UCA mathematics faculty members Dr. Linda Griffith and Dr. Jean McGehee are taking the lead roles in providing professional development for the teachers participating in the project. Ms. Belinda Roberts of the UCA STEM Institute is a facilitator for the project. Arkansas is one of twenty-four

states, that has joined the Partnership for Assessment of Readiness for College and Career (PARCC). The goal of PARCC is to create an assessment system and supporting tools that will help states dramatically increase the number of high school graduates ready for college and careers. The CCSS will be implemented in Arkansas for grades K-2 this school year, Grades 3-8 in 2012-13 school year, and 9-12 in 2013-14. The first year for PARCC assessments is 2014-15. Before PARCC, Arkansas participated in the American Diploma Project (ADP) with the End of Course Exam in Algebra II. ADP was one of the first efforts to develop a more rigorous national curriculum. PARCC expands ADP to create a challenging national curriculum across all grades. The new standards narrow the content taught at each grade but calls for greater depth. Mathematics educators in our state immediately noted that one of the challenges would be

centered around Algebra I. While the Arkansas Frameworks included a strong introduction to linear functions in the 7th and 8th grades, the CCSS calls for basic mastery of linear functions in these grades. In Algebra I, CCSS requires the value-added topic of comparing and contrasting linear and exponential functions and in-depth exploration of quadratic functions. Some of this material had been in Algebra II. With these changes in mind, Dr. Suzanne Mitchell of ADHE organized the multiple grants under one professional development project for the After the grants were awarded, Dr. Ramesh state. Garimella, Dr. Linda Griffith and Dr. Jean McGehee met last spring with other grant recipients in the state to plan



the organization and writing of modules for the professional development. Drs. R. Garimella, Griffith and McGehee wrote five of the twenty modules and presented their work with other educators at a 3-day meeting in Little Rock in May. As a part of the Algebra I – Implementation of CCSS Project, UCA offered two sets of workshops. One workshop was conducted on the UCA campus and the other one in the Nashville, AR School District. Thirty six Algebra I teachers in central Arkansas attended the workshop on UCA campus, which was held from July 25-29. Nineteen teachers attended the workshop in the Nashville School District, which was held from August 1-5. Feedback data indicated that the participants were very positive about the material, and they had many "aha" moments. Teachers especially saw the advantage of enhancing understanding of linear functions by comparing them to exponential functions and using arithmetic and geometric sequences as a starting comparison. Dr. *George Bratton*, a mathematics faculty member at UCA, is leading the team that will evaluate the different sites for the project and will assess participants' progress throughout the workshops. The Department of Mathematics at UCA will continue to play a very important role as Arkansas makes the transition from the State Frameworks to the CCSS.

2011 MSIT Academy @UCA

Thirteen high school students from Conway, North Little Rock, Little Rock, and Perryville participated in 2011 MSIT Academy @ UCA during the week of July 18-22. Dr. Ramesh Garimella, Chair, Department of Mathematics and Dr. Umadevi Garimella, Director of UCA STEM Institute received a \$10,000 grant from

the Arkansas Science. Two independent actvities, one in Cryptology and the other in Computational Revolution, were offered to the participants, The Cryptology activity was presented by Drs. Ramesh Garimella and R.B. Lenin. Math graduate students Ryan Stovall and Martha Watkins provided support to the activity. A great deal of modern cryptography depends upon the basic number theory especially clever manipulations of large integers, modular arithmetic, and use of software such as Excel and Maple. In this program, students were introduced to essentials of theory and cryptography. number Participants learnt several types of



encryptions and decryptions methods such as Caesar cipher, affine cipher, multiplicative cipher and RSA On the last day, students were divided into two groups and each group sent several Encryption. encrypted e-mail messages to the other group to decipher using the techniques that they had learned in the previous days.

The second activity, the Computation Revolution, was presented by Dr. Clarence Burg, assisted by undergraduate students Brandon McVay and Vinh Lu. The participants were shown how to build 2D and 3D geometries, generate computational grids around these geometries and flow calculate the around these geometries using UCA's Callisto Cluster. The students built simple geometries such as spheres and cubes as well as realistic geometries such as wings, rockets, downtown city buildings and homes. Using the 64 processor cluster, they calculated the air flow around these structures at various wind noticing speeds. how the wind accelerates in certain areas and



decelerates in other areas. Finally, on the subsonic and supersonic wings, they ran the simulations at different angles of attack, in order to determine the relationship between the lift and drag coefficients at different angles of attack, just as an aerospace engineering would analyze these geometries for their flight characteristics. Each day of MSIT started at 9:30 AM and ended at 4:30 PM. The lunch time activities included a visit to the UCA Planetarium, a physics lab, and a presentation by the College Program Coordinator on the mathematics and science programs in the College of Natural Sciences and Mathematics. For more information on the future MSIT Academy @ UCA, contact <u>rameshg@uca.edu</u> or call 501-450-3147.

PD workshop Concurrent Teachers in Mathematics

Ten mathematics teachers from Oak Grove, Central Arkansas Christian, Vilonia, Parkview, Guy, Catholic and Academic Plus Charter High Schools, who were approved to teach concurrent courses for UCA for the coming academic year 2011-12, attended PD workshops held in the Department of Mathematics on August 3, 2011.



The teachers took part in Calculus, Algebra, Statistics, and Trigonometry workshops. *Drs. Clarence Burg and Ramesh Garimella* worked with the calculus teachers, *Drs. Patrick Carmack and R.B. Lenin* worked with statistics teachers, and *Dr. Charles Watson* worked with algebra and trigonometry teachers. A joint luncheon for all concurrent teachers and faculty mentors was arranged by the UCA's Outreach and Community Engagement Office. At the luncheon, Drs. Garimella and Watson briefed the teachers about the National Alliance Concurrent Enrollment Partership (NACEP) guidelines and standards. The Department of Mathematics at UCA continues to have the largest concurrent enrollment program in the College of the Natural Sciences and Mathematics. Last year, the

Department offered 26 sections of the concurrent credit courses in Math 1390, Math 1392, Math 1580, Math 1591, and Math 2311 with an enrollment of 368 students.

ACTM State Mathematics Contest

On April 30, 2011, approximately 300 high school students from across the state took part, by invitation only, in the Arkansas Council of Teachers of Mathematics State Contest held on the UCA campus. Competition was held in Algebra I, Algebra II, Geometry, Precaclculus and Trigonometry, Calculus, and Statistics. Dr. *Charles*

Watson, Associate Professor of Mathematics and Director of the ACTM State Contest, and Dr. Tracy Watson, president of the ACTM, presented scholarships and trophies three finishers to top and certificates the honorable to mentions. Dr. Ramesh Garimella, Dr. Carolvn Pinchback (Professor of Mathematics), Mrs. Loi Booher (Lecturer of Mathematics) and Jon Sumner (a GTA in Mathematics) assisted in organizing the contest and the award ceremony.



UCA Math Alumnus joins FSU for doctoral studies in Mathematical Biology

David Ekrut, who obtained his MS in applied mathematics from UCA at the 2011 spring commencement, has received an assistantship in the amount of \$18,000 plus tuition and fee waiver to purse a Ph.D. degree in Mathematical Biology at the Florida State University in Tallahassee starting last fall. During the 2011 spring break, David was invited to visit FSU, with all expenses paid by the university, for an on campus interview. As a graduate student David coauthored a research paper in the area of partial differential equations with Drs. *Danny Arrigo* and *Long Le* that appeared in *the Journal of*



Mathematical Analysis and Applications, a top tier journal in mathematics. David received a BS degree in applied mathematics from UCA in 2008.