

# Signs of Mathematics

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## Department of Mathematics

2008 Newsletter

University of Central Arkansas

Chair - Ramesh Garimella Ph.D.

MA Program Coordinator  
Donna Foss, Ed.D.

MS Program Coordinator  
David Peterson, Ph.D.

Assistants:  
Brenda Graham  
Jennie Welter

Send Comments to:  
Department of Mathematics  
UCA Box 4912  
201 Donaghey Avenue  
Conway AR 72305  
Ph. 501-450-3147  
FAX. 501-450-5662  
<http://www.uca.edu/math>

## Math Department received grants from HP, SEARK and ADE

### HP Grant

UCA was one of 42 two- and four-year colleges and universities in USA to receive a 2007 *Hewlett Packard* Technology Teaching grant, which is designed to transform teaching and improve learning in the classroom through innovative use of technology. The Department of Mathematics at UCA was the sole recipient of the HP grant in Arkansas. We received an award package of HP products (including 21 Tablet PCs) and a faculty stipends valued at \$74,000. The goal of the grant is to determine which capabilities of the Tablet PC improve student learning and how to incorporate this technology within course instruction most effectively. **Drs. Clarence Burg** and **Long Le** are using the tablet PC technology along with its graphical capabilities in multivariable calculus and differential equations courses. Since these math courses are highly visual and involve two and three-dimensional concepts, the graphing capabilities should allow for much greater student comprehension of these concepts. **Dr. Ramesh Garimella** is using

the interactive capabilities of tablet PC to enhance student understanding of the mathematical proofs in abstract algebra courses. **Dr. Jean McGehee** will lead the evaluation effort of the HP project.

### SEARK Grant

**Dr. Linda Griffith**, Professor of Mathematics, received a \$146,880 grant from *South East Arkansas Educational Services Cooperatives* for "Target Testing" during AY 2006-07. The grant was extended for 2007-08 with additional funding of \$69,950. Target Testing is a formative assessment project for mathematics and literacy in grades 3-11 that has been undertaken by 13 of the education service cooperatives in the state of Arkansas. The goal of this project is to assist schools in gathering formative assessment data that will allow them to monitor and modify curriculum and instruction, resulting in increased student achievement. There are over 150 school districts participating in the project. A web based system called *Traind* is being used to build item banks and

report data to districts.

### ADE Grant

**Dr. Steve Addison** (Chair of the Department of Physics), **Dr. Linda Griffith** (Professor of Mathematics), and **Dr. Charles Watson** (Associate Professor of Mathematics) received a \$139,140 grant in spring 2007 from ADE to train Math Coaches. The main objective of this grant is to support long term, intensive professional development for K-8 mathematics coaches. The project began with a week of professional development this past summer and has continued with monthly sessions. The sessions are held at seven locations throughout the state: Conway (AETN), Arkadelphia, Melbourne, Harrisburg, Walnut Ridge, Monticello, and Beebe. The sessions in AETN at Conway include distance learning sites at County Line, Harrison and Pine Bluff. The sessions at AETN are recorded and posted on the Arkansas Ideas website making them available to all teachers in Arkansas. More than 250 teachers are participating in this project.



## FROM THE CHAIR'S DESK.....

The year 2007 was another productive year for the Department of Mathematics. We are very proud to have received an HP Grant to enhance students learning in some upper level mathematics courses and a SEARK grant for Target Testing. Also, we are pleased to be a part of ADE grant for Math coaching. See the lead article on the first page for more details on the grants. The MS program in applied mathematics, which debuted in fall 06 with five students, has exceeded all expectations. The program now has 12 graduate teaching assistants and four other full-time students. Overall, the department has an all-time record of 25 full-time graduate students pursuing MA or MS degrees. Sixteen undergraduate students mentored by seven faculty members engaged in several research projects in 2007. Two undergraduate math majors, **Luis Suzo** and **Bode Sule**, published a research article with the help of their mentor **Dr. Danny Arrigo** in a top-tier publication, the *Journal of Mathematics Analysis and Applications*. In 2007, twenty four students graduated with a baccalaureate degree in mathematics or mathematics education and seven students with a master's degree in mathematics education. This spring there are 13 secondary mathematics interns in the department, which is a record. We are doing our part to alleviate the mathematics teacher-shortage in the state. As UCA continues to celebrate its 100th anniversary, the above are some excellent *Signs of Mathematics* at UCA. We will keep in touch. With best wishes, *Ramesh Garimella, Chair.*

## STUDENT NEWS

GTAS  
AWARDS

### Graduate Teaching Assistants (GTAS)

In fall 2007, the Department awarded 19 graduate teaching assistantships. **Tim Bennett, Ashley Embry, Taylor Erwin, Sam Green, Ethan Hereth, Philip Hern, Ching Chun Hsin, Beau Jones, Sydney Marks, Oyemolade Osibodu, Jason Torrence, David Watts, and Dane Womack** were awarded teaching assistantships in the new MS program whereas **Shasta Chandler, Susan Erwin, Courtney Franzen, Pamela Holt, Hong Khanh Phan, and Amber Strain** were given teaching assistantships in the MA program. The GTAS are provided with an IBM ThinkPad to facilitate their teaching.

### Awards for Majors

At the Honors Convocation, held in April 2007, **Kimberly Yancey King** received the *Dorothy Long Award*, presented to an outstanding female upper classman in mathematics, and **Ethan Hereth** received the *O.L. Hughes Award*, presented to outstanding senior mathematics major. Freshman Mathematics major, **Hayley Sebourn** received the *O.L. Hughes Scholarship* for AY 2007-08.

### Curriculum Change

At the request of the Biology Department, a four credit hour course called *Applied Calculus for Life Sciences* (Math 1491) was added to the Math Curriculum and is being offered for the first time in spring 08. To ease transition from calculus to upper level mathematics courses, the department developed a course titled *Transition to Advanced Mathematics* which debuted in spring 08.

### Math Club

The Math Club continues to be active under the leadership of the students **Bradley Strouts, Shane and Beau Jones**, and faculty advisor **Dr. Le**. All mathematics majors are encouraged to become active members of the Math Club and attend its monthly meetings. More information about the Math Club is posted on the bulletin board near the Mathematics Office Suite.

### Technology in Classrooms

Several classrooms are now equipped with SMART Boards, Symposiums, Document Cameras, and TI Navigator System. This technology will be of great help, particularly to the students in mathematics education programs.

### New Summer opportunity for High School students

Drs. **Ramesh Garimella** and **Uma Garimella** (Department of

of Biology) received a UCA foundation grant to initiate a summer program in Mathematics and Sciences known as MSI'08: Mathematics and Science Investigators Program for summer 2008, for promising 9th and 10th grade students in central Arkansas. For more information on this program, contact 450-3147.

### Outreach Activities

Drs. Ramesh Garimella and Charles Watson collaborated with the Office of Academic Outreach to offer concurrent credit with several high schools which include Conway, Greenbrier, and Morrilton. Currently, we are offering concurrent credit courses in college algebra, pre-calculus, trigonometry, and calculus. Last year there were 281 high school students enrolled in these courses.

## RESEARCH

- ◆ Dr. Danny Arrigo and his research student **David Ekurt** received a SURF Award from the *Arkansas Department of Higher Education* to work on a research project in symmetry analysis in summer 08.
- ◆ Dr. Clarence Burg and his research students Dane Womack and Ethan Hereth (both MS applied math students) received a grant from the *Arkansas Space Grant Consortium* to work on an interactive computational sciences website in summer 08.
- ◆ **Dr. Weijiu Liu** helped his undergraduate research students **Luis Jimenez** and **Christopher Pickens** publish a paper, *Mathematical Determination of Competitive Feedback Inhibition Rates in Branched Metabolic Pathways* in the *Journal of Mathematics, Statistics and Allied Fields*.

## SPOTLIGHT



In this issue we turn the research spotlight on mathematical modeling of mass flows such as volcanic eruptions and landslides. Particularly we focus on the research of **Dr. Long Le**, who joined the Department of Mathematics at UCA in fall 2006 after receiving his Ph.D. from the University of Buffalo.

The risk of volcanic eruption is one that public safety officials throughout the world face several times each year. The dangers to life posed by volcanic activity are not only from red-hot lava from the crater, but also from consequential geophysical mass flows such as volcanic avalanches and landslides. In 1985, Nevado del Ruiz, a volcano in Columbia erupted and melted the ice and snow on its top. It produced mud-flows which reached the town of Armero and killed more than 23,000 people. In the US, there had been many small scale landslides for the first five months of 2006 that caused blocked traffic, closed highways and necessitated residential evacuation. Dr. Le says, "the great loss of

lives in those disasters is the reason why we study the properties of mass flows in order to be able to predict their behavior. If the path of a potential land-slide could hit a town, an evacuation plan could be implemented in advance and therefore could save many lives. To be able to accomplish this, a multi-disciplinary effort is needed. First of all, a model, or to be more precise, a set of equations that describes mass flow must be provided. Granular flow is a common concept in studying geophysical mass laws and usually used to model mass flow. The conditions of the environment which might trigger the landslide can be given by geologists. Based on these conditions, an approximate solution can be computed. Finally, visualization of the approximate solution can be done by a computer scientist, so the path of the landslide is predictable."

## GRADUATES IN 2007

### Bachelor of Science in Mathematics

Robert Burgess  
Brittany Culberson  
Samuel Elsinger  
Asher Fason  
Christa Fisher  
Ethan Hereth  
Jonathan Johnson  
Kimberly Layman  
Hong Khank Phan  
Katie Reynolds  
Everett Robbins  
Dennis Show  
Fitsum Tilahun  
Joseph Walker  
William Womack  
Justin Warner

### Bachelor of Arts in Mathematics

Amber Strain  
Joel Terwilliger

### Bachelor of Science in Mathematics Education

Emily Johnson  
Elisha Lowry  
Latasha Mullins  
Michael Shook  
Dennis Show  
Heather Gray  
Justin Warner

### MA in Mathematics Education

Cara Cates  
Marcel Carcea  
Mary Foster  
Gary Hardin  
Candice Henderson  
Cailin Noble  
Susie Young

### *Did you know?*

Each graduate teaching assistant in our masters' programs receives a \$14,000 financial-assistance package per academic year, which includes a 10-month \$9,000 stipend and \$5,000 tuition scholarship. Additional support in summer may also be available. For more information about our programs and what you must do to apply, contact (501)-450-3147 or e-mail [rameshg@uca.edu](mailto:rameshg@uca.edu)

## **PUBLICATIONS**

**Arrigo, D., Suazo, L., and Sule, B.,** A Symmetry Analysis of the Two-dimensional Diffusion Equation with a Source Term , *Journal of Mathematical Analysis and Applications* no. 333, 2007, 52-67 .

**Burg, C. O. E., and Erwin, T.,** Application of Richardson Extrapolation to the Numerical Solution of Partial Differential Equations, to appear in *Numerical Methods for Partial Differential Equations*.

**Garimella, R., Garimella, U., and Liu, W.,** A Theoretic Control Approach in a Signal-controlled Metabolic Pathway, *Mathematical Biosciences and Engineering*, Vol. 4, no.3, (2007), 471-488.

**Liu, W. and Krstic, M.,** Boundary Feedback Stabilization of Homogeneous Equilibriums in Unstable Fluid Mixtures, *International Journal of Control*, Vol. 8, no. 6, 2007, 1-8.

## **GRANTS**

**Addison, S., Griffith, L. , and Watson, C.,** Training Math Coaches, funded by *Arkansas Department of Education*, \$139,140 , spring 2007.

**Burg, C.O.E., Garimella, R., and Le, L.,** Using Tablet PC Technology to Enhance Learning in Upper Division Mathematics Courses, funded by *Hewlett Packard* , \$74,000 ( including 21 tablet PCs), spring 07.

**Burg , C.O.E.,** Improving the predictive ability of NASA Langley's computational simulation package FUN3D, funded by Arkansas Space Grant Consortium, \$7,478, summer 2007.

**Burg , C.O.E.,** Space-Time Finite Volume Methods for Computational Simulation Involving Moving Surfaces, the *University Research Council Grant*, \$3,840, summer 2007.

**Garimella, R., and Garimella, U.,** Mathematics and Science Investigation for Summer 2008 , UCA Foundation Grant, \$2,400, fall 2007.

**Griffith, L.,** Target Testing, funded by *South East Arkansas Educational Services Cooperatives*, \$69,950, fall 07.

**Le, L.,** Stability of Granular-Fluid Mixture, the *University Research Council Grant*, \$2,600, summer 2007.

**Liu, L.,** Hybrid distributed parameter models for regulatory network of bold glucose, the *University Research Council Grant*, \$3,740, summer 2007.

**Watson C.,** A strategy to integrate EAST concepts into STEM education curriculum, funded by *Arkansas Science and Technology Authority*, \$20,000, spring 2007.

## **MORE NEWS**

After 31 years of dedicated service to the department, **Dr. David Peterson** entered phased retirement. He will be teaching half -time during 2007-09 academic years and will retire at the end of spring 2009. For 2007-08 academic year, **Mrs. Loi Booher** was hired as a full-time instructor. Mrs. Booher received her BS and MA degrees in mathematics from UCA.

The Regional ACTM Math Contest for 2008, organized by **Dr. Carolyn Pinchback**, will be held on March 8 and the State ACTM Math Contest will be held on April 26. Dr. Charles Watson is the director for the State Contest. For more information on theses contests , call (501)450-3147 or e-mail [charlesw@uca.edu](mailto:charlesw@uca.edu).

**Drs. George Bratton, Donna Foss, Jean McGehee, Fred Hickling, and Carolyn Pinchback** served as mentors, teachers, or evaluators in MSP grants in collaboration with the UCA College of Education.

## **MATH FUND**

Did you know that the Department of Mathematics has a Development Fund with the UCA Foundation? This fund is used to pay for expenses relating to plaques and monetary awards given to the recipients of the O.L. Hughes and Dorothy Long Awards in mathematics. If you wish to contribute to the Mathematics Development Fund, please call (501) 450-3147 for more details.