

# AfterMath

The Newsletter of the Department of Mathematics at Marshall University

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Fall 2007

## From the Chair

by Ralph Oberste-Vorth

Welcome to the third year of *AfterMath*. The fall semester is quickly coming to a close. Students (and faculty) have used the Thanksgiving break to reenergize for the stretch run through finals week.

Bonita Lawrence was promoted to professor. She is on sabbatical leave for the academic year; she reports on the differential analyzer project in this issue. Yulia Dementieva was granted tenure. Congratulations to both!

Our graduate program continues to grow. We now have 13 full-time graduate assistants. This despite the fact that our budget was seriously reduced this year. We hope to maintain our growth in the future.

The annual faculty changes included the departures of Norah Esty, Tracy Marsh, David Mitra, and Wayne Tabor. We wish them well!

Xiangqian (Joe) Zhou is a new tenure-track assistant professor. Joe comes to us from the University of Mississippi. He earned his Ph.D. in 2003 from the Ohio State University. His research is in combinatorics, particularly matroid theory.

Duane Farnsworth, a recent Ph.D. from the University at Buffalo, State University of New York, is a visiting assistant professor. Greg Kuhn is a visiting instructor.

Evelyn Puppl-Cody has been appointed associate chair. As part of her duties, she has taken on the editorship of *AfterMath*.

## Faculty Profile: Peter Saveliev

Peter Saveliev has been at Marshall University for 5 years.

EPC: Peter, how do you balance teaching and research?

PS: *Doing applied/industrial math gives me totally new angles in teaching undergraduate courses, including calculus.*

EPC: What attracted you to your field of research? Are there other areas that interest you?

PS: *A couple of years ago I started in a new field, computational topology. What attracted me to the field is the fact that what was achieved in algebraic topology 50 or more years ago has not been used in applications to any serious extent. One field that really needs topology is digital image analysis and computer vision.*

EPC: You taught an honors class. What was the topic?

PS: *In 2006 I taught HON 396 Problem Solving in Sciences and Engineering. Especially interesting were these projects: Gravitropic Curvature of Pea Plant Stems and Geometric Study of the Pattern of Microscopic Hair Development on the Wings of the Mutated Drosophila. The*

*work involved cooperation with biology faculty. I am teaching this course again currently. These are the projects: JAVA Based Robotic Vision, Digital Image Analysis with Medical Images, Guitar Chord Calculator Prototype Using C++, and Development of a Phylogenetic Analysis Software for the Evaluation of Genetic Data Derived Using the Triangulation Identification for Genetic Evaluation of Risk (TIGER).*

EPC: The mathematics of the twentieth century was very impressive. Do you think that mathematics will continue to be as exciting and robust in this century?

PS: *Yes. The most exciting tendency I see and want to be a part of is the potential of pure math to go directly to applications.*



EPC: Do you have any hobbies?

PS: *I enjoy table tennis. I play 1-2 times a week, with students and faculty. I also have a table tennis robot in my basement. I also play semi-competitively. Just last week Andrew Gooding and I won West Virginia Open in doubles.*

EPC: Tell us a bit more about your research, Peter.

PS: *My research is centered currently on developing technology for analysis of digital images that is firmly grounded in mathematics. That requires bringing algebraic topology to the masses. I created my own image analysis software (Pixcavator), started a wiki (it's like a personal Wikipedia) and a blog.*

Computer Vision Wiki: *The wiki is devoted to computer vision, especially low level computer vision, digital image analysis, and applications. The exposition is geared towards software developers, especially beginners. The wiki contains discussions, mathematics, algorithms, code snippets, source code, and compiled software. After 2-3 months I have 41 content pages, with 187 illustrations.*

Blog: *Computer Vision for Dummies. I am a newcomer in the field; hence the name of the blog. I discuss issues of computer vision, image analysis, image search, etc from the point of view of mathematician. I also took part in a research grant for the Navy this summer at SITE. The project was autonomous maritime navigation.*

## ***Alumni Profile: Karen Suhaka***

Karen Suhaka, a former Yeager Scholar, earned a B.S. in physics and in applied mathematics as well as an M.A. in mathematics from Marshall University. She worked on her thesis under the direction of Dr. Judith Silver. Dr. Silver enjoyed having Karen in four of her classes and was impressed by her “extraordinary intelligence.”

After two years of post graduate studies in mathematics at the University of Colorado, Boulder, she was pleased to be able to begin doing statistical analysis for Halliburton Energy Services in Denver. Shortly thereafter she struck out on her own and founded Petro Data Source, Inc.

In 1994 Karen incorporated Petro Data Source, Inc. (PDS) in Denver. PDS started as a small company providing data entry and other database services to the local oil industry. She also gathered tax information and other publicly available data about oil wells in the Rocky Mountain region and made this data available in a variety of formats.

In 1999 PDS finished gathering data for the entire US - over 4.5 million wells! In this same year they launched their website and extended their customer base to oil companies and consulting firms around the world. With customers as big as Halliburton and Amoco and as small as one man geology shops, PDS had wide appeal and enjoyed much success within the industry.

During this period of growth PDS went from 2 employees to over 20 (including part time data entry folks). They moved offices, expanding several times, but always remaining in downtown Denver. PDS extended its product line to include a very popular series of maps and other innovative products that were embraced by the industry.

In 2003 while expanding the database to include Canadian data PDS encountered Calgary based Divestco, Inc. Divestco was interested in building a presence in the US and made Karen an offer she couldn't refuse. The deal was closed in April 2004 and Divestco bought out PDS, keeping all employees on board. However Karen gave up her position as President, and eventually left PDS.

Karen has moved on to form two new companies, one a website unrelated to oil that will launch in March 2007, and one a consulting firm which allows her to continue to serve the local Denver oil community and any company in need of database support.

She really enjoys that her job entails a wide variety of technical tasks such as managing a large database, designing and coding software, and statistical analysis, as well as other math related work such as presenting financial data graphically to stockholders and market analysis and sales projections. The best part of her job is matching customer needs and expectations to available technology and figuring out how to solve people's problems.

Karen has been a Girl Scout for 25 years and is actively involved in helping girls discover the joy of math, science, and technology.

## ***Lizzie Spreads the Word about Mechanical Integration***

By Bonnie Lawrence

After an exciting spring semester of travel to New Orleans in January for the Joint Meetings of the AMS and MAA and to Washington, D.C. in April for Posters on the Hill, the Marshall Differential Analyzer Team is now hard at work constructing the larger four integrator machine. Our work with the mini two integrator DA, known to all as Lizzie, has developed the team's understanding of mechanical integration, the importance and challenges of torque amplification, and the effects of gear ratios inherent to each individual machine.



**Senior Mathematics major and DA Team member, Saeed Keshavarzian describes the path of motion for Journalism major, Luke Williams, viewing Lizzie for the first time.**

Members of the team have showcased Lizzie for a variety of audiences in the past six months. In June a group of rising seniors from a local high school interested in degrees in science and mathematics visited the our campus. The first stop on the COS grand tour was the DA Lab (third floor of Old Main) for a look at Lizzie in action. Team members Saeed Keshavarzian, Richard Merritt and Keshav Pokhrel demonstrated for the group how the value of a function can be found knowing it's rate of change through mechanical integration. Also in June, Clayton Brooks, Bonnie Lawrence and Lizzie were invited by the History and Philosophy of Science and Technology Department of Victoria College at the University of Toronto to give a presentation about our project and a demonstration. The audience consisted of professors and students of engineering, computer science and history, including a young Ph.D. whose thesis chronicled the history of technology at the University of Toronto. Although a portion of his work addressed the differential analyzer, he had never seen one in motion.

The Team has completed the construction of four integrator carriages and is now in the process of creating a physical path for connection between the input and output of each integrator. The design for the torque amplifiers is in its final stages. Tim Robinson, the Team's mentor and technical advisor will visit us from California in January and advise the Team during the final stages of construction. Upon completion, there will be a grand opening of what we now call “the big machine” at which time the first problem will be run.

## Faculty News

**Ari Aluthge** gave an invited talk at the Fourth International Conference of Applied Mathematics and Computing, Plovdiv, Bulgaria, Aug 13, 18, 2007.

We had a new faculty member join our ranks this fall, **Dr. Xiangqian Zhou**, whom we call Dr. Joe. Joe is originally from China and obtained his Ph.D. from the Ohio State University in December 2003. Since graduation he has worked as a postdoctoral or visiting scholar at the University of Waterloo, Syracuse University, and the University of Mississippi as a postdoctoral or visiting scholar. Joe chose to come to Marshall University because of the extremely friendly environment and the opportunity to engage in both research and teaching.

Joe met his wife at the Ohio State University while they were taking the same class. They have a three year old son. Welcome to Marshall!

**Karen Mitchell, Judy Silver, Yulia Dementieva, and Evelyn Pupplo-Cody** spent a weekend at a conference in Charleston, West Virginia, as members of the Curriculum, Instruction, and Assessment Task Force for Mathematics in West Virginia. This took place the week after Karen Mitchell hosted the third annual conference for the Appalachian Association of Mathematics Teacher Educators. The keynote speaker at the AAMTE program was Skip Fennell, the president of the National Council of Teacher of Mathematics. Judy Silver was also involved with several grants: Project ADVANCE –an NSF program to try to hire more female faculty in the STEM fields. Judy is chair of the recruitment committee; RESA II Math Partnership Grant – this is Judy's fourth year working with this grant. This year she is serving as a math content advisor for the six county area and the Appalachian Math Science Partnership (AMSP) – a new partnership grant in conjunction with the surrounding Appalachian states. She is currently developing math modules that use GPS technology in grades 7-12.

## Faculty Publications

**Yulia Dementieva** published *Helicobacter Pylori Infection Rate in Symptomatic Children: A Retrospective Analysis of 13 Years (1993 - 2005) from a Gastroenterology Clinic in West Virginia* with Y. Elitsur, M. Rewalt, and Z. Lawrence in the *Journal of Clinical Gastroenterology*.

**Basant Karna** and **Bonita Lawrence** published a paper together, *Existence of Positive Solutions for Multi-Point Boundary Value Problems* in the *Electronic Journal of Qualitative Theory of Differential Equations*.

**Judy Silver** published *A Great Circle Metric* in *West Virginia Academy of Science* with Erik Stokes, a Marshall University alumnus currently studying at the University of Kentucky.

## Student News

In the start of their 2<sup>nd</sup> year as full-time temporary instructors, **Shannon Miller** and **Rob-Roy Mace** have been pretty busy. At the end of September, they escorted the mathematical honorary society Pi Mu Epsilon to the an-

nual PME Student Conference, where two of the students, **Tue Ly** and **Michael Otunuga**, of nine attending presented graduate work. In October, they continued on their journey for mathematical enlightenment, traveling around the region, attending a conference held by the Mathematical Association of America at Wittenburg University in Springfield, OH. This was an especially fulfilling excursion, since the Ohio Project NExT was being held in conjunction. It was not all papers and presentations at this conference, however, due to the fact that Rob-Roy is an active member of the CONCUR committee, evaluating and analyzing the curriculum of regional mathematics departments. In their most recent pursuit of professional development, the pair of Marshall graduates attended the Appalachian Association of Mathematics Teacher Educators Conference at Marshall University. The conference, held on November 2-3, gave them the opportunity to meet many teachers in the area and converse with them about issues facing educators today.

**Alfred Akinsete** led 8 graduate and 1 undergraduate students to the 2007 MAA Ohio Section. The meeting was held in October 26 and 27, at Wittenberg University, Springfield, Ohio. While in attendance, Dr. Akinsete and Charles Lowe presented a joint paper titled, "The beta-Rayleigh distribution in reliability measure." Charles is an undergraduate student majoring in mathematics and chemistry. Both have been working together on research since summer 2006.



**2007 MAA Ohio Section at Wittenberg University**  
Top from left, Mike Smith, Michael Otunuga, Sun Xun, Charles Lowe; Middle from left, Issa Traore, Keshav Pokhrel, Michael Morrison, Dr. David Cusick; Bottom from left, Stacy Scudder, Grace Amusan and Dr. Alfred Akinsete.

## Contact Us

- voice: (304) 696-6482 or
- fax: (304) 696-4646 or
- e-mail: [aftermath@marshall.edu](mailto:aftermath@marshall.edu) or
- mail: AfterMath, Department of Mathematics, Marshall University, One John Marshall Drive, Huntington, WV 25755.



*AfterMath*  
Department of Mathematics  
Marshall University  
One John Marshall Drive  
Huntington, WV 25755

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