*After*Math

The Newsletter of the Department of Mathematics at Marshall University

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From the Chair by Alfred Akinsete

I would like to welcome you back to *After*Math after a long period of time! Our last edition of the newsletter was in spring 2008. Evidently many events had taken place between then and now. We will try to report the major events, particularly the most recent ones.

Dr. **Ralph Oberste-Vorth**, former Division Head and Department Chair for nine years left the department at the end of July 2011 to continue his career as Chair of the Department of Mathematics and Computer Science at Indiana State University, Terre Haute. The department will miss him greatly, and wishes him a successful career at Indiana State. I was appointed the acting chair for one year following Ralph's exit, and became the permanent Chair of the Department beginning July 2012.

The following faculty joined the department since fall 2008.

Anna Mummert joined the department as an assistant professor in fall 2008 from Alfred University. She earned her Ph.D. in 2006 from Penn State University. Her research interests are in the field of dynamical systems, and she is currently working in the field of mathematical biology.

Carl Mummert effectively joined the department as an assistant professor effectively in fall 2009 from the University of Michigan. He earned his Ph.D. in 2005 from Penn State University. His research is in mathematical logic, particularly reverse mathematics, second-order arithmetic, and computability theory.

Sanyal Suman joined the department as a visiting assistant professor in fall 2009 from Clarkson University. He earned his Ph.D. in 2008 from Missouri University of Science and Technology. His research is a combination of stochastic processes and dynamic equations on time scales.

Michael Schroeder joined the department as an assistant professor in fall 2011 from University of Wisconsin where he earned his Ph.D. His research is in combinatorics with emphasis on graph theory, linear algebra and matrix theory.

Elizabeth Niese joined the department as an assistant professor in fall 2011 from Virginia Polytechnic and State University. She earned her Ph.D. in 2010 from Penn State University. Her research is in algebraic combinatorics.

Avishek Mallick joined the department as an assistant professor in fall 2012 from the University of New Hampshire, Durham. He earned his Ph.D. in 2010 from the University of Louisiana at Lafayette. His research interest lies in the area of censored data analysis with special focus on Type I censored data from Normal and other related continuous distributions. He is also interested in Meta-analysis.

We also welcomed **JiYoon Jung**, a recent Ph.D. from the University of Kentucky, as a visiting assistant professor. JiYoon has already published in the Journal of Algebraic Combinatorics and in Advances in Applied Mathematics.

Congratulations to **Peter Saveliev** who was promoted to full professor!

The department recognized the valuable services of **John Drost** in Thesis and Comprehensive Oral Graduate Examination. He was presented a plaque and a *Kindle Fire* at the College of Science Graduate Hooding Ceremony in May, 2012.

Evelyn Pupplo-Cody has been appointed Associate Chair of the Department. **Peter Saveliev** has been named the Assistant Chair for Graduate Studies, and **Ariyadasa Aluthge** is Assistant Chair for Undergraduate Studies.

Recently we completed the self-studies of our degree programs and submitted 5-year program reviews for both the undergraduate and graduate programs. Our programs received excellent commendations from the Board of Governors. Added to our undergraduate programs are majors in statistics, mathematical statistics as area of emphasis, and a minor in statistics. Statistics as an area of emphasis is now offered in our graduate program.

The department continues to provide quality education with solid foundation to students, enabling our graduates to perform successfully in industry, business, government, and further studies. We are proud of the many graduates who pursue further graduate studies in reputable institutions.

It is my pleasure to present to you this edition of *After*Math which chronicles talented faculty, students, and other important news. And hopefully, we would not be out of touch this long.

Faculty Profile: Carl Mummert

Carl, how long have you been at Marshall?
Fall 2012 is my fourth fall at Marshall.

Tell us a bit about the journey that brought you to Marshall.
I grew up in Asheville, NC, and went to Western Carolina University for my BS. I decided to pursue a Ph.D. and went to Penn State. After getting that degree, I worked for one year at Appalachian State University and three years at the University of Michigan before coming to Marshall.

Why did you choose to come to Marshall?
Marshall has a perfect combination of size and location for me. I was looking for a smaller school, like Marshall, where I can interact with faculty and undergraduates. Marshall is similar to my undergraduate institution in this way. I was looking for a school that offers a balance between teaching and research, as Marshall does. I was also looking for a school close to the Appalachian Mountains.

What has favorably impressed you about Marshall?
At Marshall, I have been impressed both by the faculty and the students. The faculty are wonderful colleagues and work very hard to help the students. The students are friendly and hard-working; they make teaching a pleasure. Marshall University is getting stronger year by year, and it's nice to be part of that.

What research are you currently working on?
My work in mathematical logic is in an area called "reverse mathematics." My most recent published papers are about constructive mathematics and about the reverse mathematics of the axiom of choice. I have also signed a contract to publish a graduate-level book on reverse mathematics, which will be published in 2014.

What is your favorite class to teach? And why is it your favorite?
At Marshall, my favorite class so far has been Math 300. It's the first course in which the students are asked to think like mathematicians. I have developed a "writing-intensive" version, which also helps students get credit towards their general education requirements.

Why were you attracted to mathematics in general, and logic in particular?
My undergraduate studies were in mathematics and computer science, and I was very interested in theoretical computability. As I learned more about the close relationships between computability and mathematics, I decide to pursue my research in these areas.

How would you explain your area of mathematics to a non-mathematician?
When a mathematician proves a theorem, she uses various axioms along the way to make the proof. This leads to the question whether all the axioms that were used were necessary: could there be another proof that uses fewer axioms? In reverse mathematics, we have a way to give concrete answers to these questions by showing that certain axioms are actually required to prove certain theorems. It turns out that there are deep connections between this question, computability, and constructive mathematics. These connections make the area fascinating to study.

What students have you worked with? Have you presented any joint papers with your students? If so, where did you present the results?
The ability to work with students on research is particularly important to me, and was one of the reasons I chose Marshall. So far I have had the opportunity to work with several students on a diverse set of projects. One student, **Tyson Lipscomb**, wrote an undergraduate capstone in 2010 on a topic related to logic. I helped him improve the paper, which was published in the Rose-Hullman Undergraduate Research Journal. In spring 2011, I worked intensively with a master's student, **Tom Cuchta**, who wrote a thesis that combines logic and real analysis. Later I advised a mathematics capstone project by **Sean Sovine** on logic, which he presented at the Research Day at the Capitol. Sean's work was extended by a graduate student, **Alaeddine Saadaoui**, whom I mentored. Alaeddine and I plan to write a paper on this work and submit if for publication in a research journal. In summer 2011 and summer 2012, I mentored four students in the Marshall REU (Research Experience for Undergraduates) as they conducted research on latin squares. This research produced a five-author paper with several new results, which we will submit to a combinatorics conference in spring 2013. In the fall of 2012 I am mentoring two students in their computer science senior capstone.

What outreach activities have you been involved in?
I have helped with Math Field Day, SCORES, and the Marshall Mathematics Competition.

What do you do when you are not doing mathematics?
I enjoy hiking, biking, backpacking, and other outdoor actives. This is another reason West Virginia is an ideal location for me.

Which countries other than the US have you visited? Which of these do you like most, and why?
I have visited Canada, England, Finland, Germany, and Japan. I thought that Finland and Japan were particularly interesting because they are so different from the United States.

What awards have you received for your work in mathematics?
In 2010, I received a Distinguished Alumni Award from the College of Science at Western Carolina University.

What are your views concerning mathematics education in the next decade?
I think that the communication made possible by the internet is going to have a major influence the way that we structure our classes. At the same time, there is no substitute for personal interaction. I think that we will see some details of the curriculum change, but the overall goal to teach students to think like mathematicians will stay the same.

Alumni Profile: Craig and Kim Wood

Craig and Kim met in Dr. Aluthge's Advanced Calculus class in the fall of 1994. Craig graduated with his undergraduate degree in the summer of 1995 and Kim graduated with her undergraduate degree in the fall of 1995 followed by her graduate degree in the spring of 1997. They were married in 1996 and were so happy that Dr. Aluthge was able to attend the wedding. They have three children: Austin – 14, Ethan – 9, and Brooke – 8.

Craig was immediately hired after graduation by Stagg Resource Consultants, a consulting firm to the natural resource industry located in Cross Lanes, West Virginia. He worked his way up through the firm and is currently Vice President and Chief Financial Officer as well as his consulting role as Principal Economic Analyst. His consulting work has included projects involving zinc, copper, gold, silver, lead, coal, oil, natural gas, phosphate, potash, salt, crushed stone, or sand and gravel properties and/or operations located in almost every state in the U.S., as well as Canada, Colombia, Eritrea, and China. Kim taught at Ripley High School for one year and then started working with Dr. Matt Carlton at American Benefit Corporation in Huntington. She currently serves as Chief Compliance Officer and works as both an actuary and consultant. She became an enrolled actuary in 2009. She has also enjoyed being able to return to Marshall University and the Math Department and teach a few of her own classes. Between the kids and her career she has not had enough time to do this lately, but hopes to again in the future. Craig is also an associate member of the American Institute of Minerals Appraisers. He has taken numerous specialized short courses to further both his career and education, participated as a workshop instructor for the preparation of discounted cash flow models, and presented papers during the 2006 and 2011 annual meetings of the Society of Mining, Metallurgy, and Exploration in St. Louis and Denver.

When asked how mathematics has helped shape their careers, Kim responded that, "Mathematics is my career. I started my career in math education in hopes of being able to communicate my understanding and love of the subject to other people. Ultimately, mathematics and my education at Marshall led me to a career where I can positively impact the lives of many people, by working for health and pension plans. This work involves using mathematics to calculate the value of retirement and health benefits and the resulting liabilities of the plans. We perform many studies involving projections and forecasting based on both experience and trends. I often have the privilege of presenting our actuarial reports, and am also involved with the consulting side of American Benefit Corporation. I believe I am fortunate enough to have found a career that allows me to blend both my mathematics and educational training."
Craig said, "There is not a day at work where I do not use math in some form or fashion. In my position as CFO, I have overseen the firm's accounting, corporate administration, human resource, and information technology operations, so at a minimum I deal with the financial situation of the company. However, in my consulting role as Principal Economic Analyst, I am involved in a wide variety of economic feasibility and market studies, mineral appraisals, economic due diligence, and litigation support. In this capacity, my responsibilities include project management; executing appraisal assignments; performing property inspections; developing complex and highly detailed costing, pricing, tax, and discounted cash flow models; analyzing historic performance data of companies ranging from small mining operations to multi-billion dollar entities; developing forecasts of performance, pricing, and discount rates; report preparation; and critiquing opposing expert work. Much of this work involves spreadsheet modeling with formulas incorporating multiple variables and parameters

along with the ability to visualize both the "big picture" and the analysis of the little details. I believe the diverse math education that I received at Marshall—ranging from applied classes such as linear algebra to more theoretical classes such as topology and advanced calculus—helped to prepare me for the different aspects of this career."
Both Craig and Kim enjoy movies, soccer, travel, and spending time with their children.

Mathematics and Art by Judy Silver

My side trip into art and mathematics started in January 2000, at the Joint Math Meetings in Washington D.C. I saw a flyer advertising a summer NSF sponsored workshop called *Viewpoints: Mathematics and Art.* "Wow," I thought. "I love both of those. I wonder what it would be like to do them both together." The next summer I found myself at Franklin & Marshall College in Lancaster PA, studying with Annalisa Crannell and Mark Frantz. I was soon hooked on the subject, and managed to later attend two more workshops by Crannell and Frantz as well as make some presentations of my own.

What started out as a hobby turned into subject matter that enhanced my projective geometry classes and formed the basis for several standalone courses: an integrated science course, two courses for the Governor's Honors Academy, an honors course, and Yeager Seminar II.

In this article, I mainly want to tell you about HON 291, the Yeager Seminar. Its official title is *Math & Art: Investigation of a Love/Hate Relationship*, and I team teach it with art professor Jonathan Cox. Jonathan is a sculptor, a perfect partner to complement my interest in 3-dimensional mathematics (partial differential equations and spherical geometry). Together we came up with a syllabus that covers perspective, symmetry, mathematical themes in art, and studio skills.

The major HON 291 instructional time is spent on perspective, from 1-point to 6-point. The mathematics I teach comes mainly from a book by Crannell and Frantz entitled *Viewpoints, Mathematical Perspective and Fractal Geometry in Art*. It uses an amazing amount of geometry! For instance, did you know that clues in a realistic painting or photograph can allow you to determine where the artist or photographer was standing? (See Figure 1) And did you know that 6-point perspective (east, west, north, south, in, and out) allows you to paint pictures on a sphere that are more realistic than pictures painted on a flat surface? Paintings formed in this fashion are called *termespheres*; named for Dick Termes, the man who developed the technique. And every year our class has the opportunity to travel to Spearfish, South Dakota, to study with Mr. Termes and to enjoy the Black Hills area. (See Figure 2).

Although not all of the Yeager scholars are math lovers, they all enjoy the studio portion of the course where they make mobiles, linear pieces, planar pieces, and *termespheres*. I myself have appreciated the opportunity to learn principles of art, welding, and woodworking. In one of the assignments last spring, we used bendable wire to make logarithmic spirals which we welded together to create sculptures. The piece I made was selected for the Bridges Mathematical Art Exhibit at the 2012 Joint Mathematics Meetings in Boston. (See Figure 3)

If you want to learn more, feel free to visit the class. It will be taught every spring, through 2014.

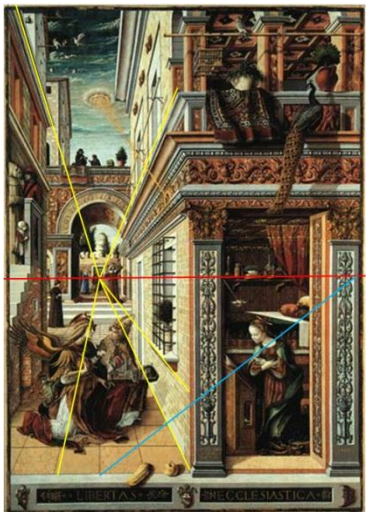


Figure 1: *Annunciation* by Carlo Crivelli (1486), with lines added. The vanishing point is determined by the yellow lines, the horizon is the red line, and the blue line is a diagonal across a square floor tile. The intersection of the blue line with the horizon determines the correct viewing distance, the distance at which the picture has the most realistic appearance.

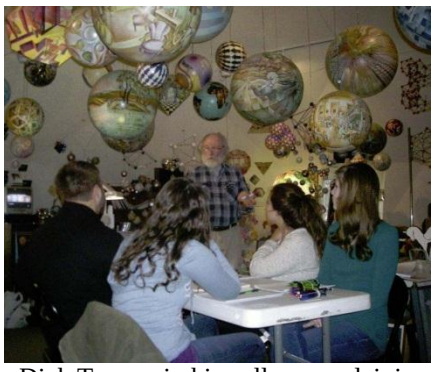


Figure 2: Dick Termes in his gallery, explaining 6-point perspective to four of the Yeager Scholars.

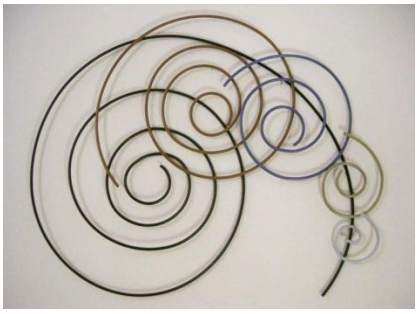


Figure 3: *Logarithmic Dream* by Judy Silver (2011).

Summer Bridge Program

by Laura Stapleton

Marshall University Academic Affairs, in conjunction with the Mathematics and English departments, hosted the first Summer Bridge program specifically designed to strengthen incoming freshmen in deficiencies in Mathematics and English. Two sessions were held to accommodate the interested students. These sessions were free of charge and approximately 150 students from all over the country participated. **Laura Stapleton**, **Shannon Miller**, **Mary Crytzer**, **Devon Tivener**, **Tracy Marsh** and **Kim Schroeder** from the Mathematics Department created the learning content and were the mathematics instructors for the camps.

A module approach was used in the design of the mathematics instruction. Topics, such as factoring, exponent properties, operations on rational expression, slope, etc., were identified as those needing attention. Students were taught properties and content and then immediately given an activity that gave them practical experience with the material. The camp ended with an on-line scavenger hunt as a review of the two week's instruction where students solved problems and then entered the correct answer into a URL to find the next clue.

To measure outcomes, students took a mathematics test at the beginning and end of the camp. The feedback and results were impressive as many students were able to test out of the developmental program upon completion of the camp. The University was pleased with the results and is making plans to offer the Summer Bridge program next summer.

PME Activities Spring & Fall 2012

The Beta Chapter of Pi Mu Epsilon, here at Marshall University, strives to engage in many opportunities for student involvement on campus. The club also focuses on broadening members' experiences by attending conferences around the region. Near the middle of the Spring 2012 semester, club members wanted to celebrate a very special day, March 14th , on campus by hosting the first annual "Pi Day Extravaganza!" on Buskirk lawn. The members brought their celebration to all students on campus by offering snacks and drinks (including Pi-shaped cookies), information about the math club, lots of different math crafts and puzzles, and an event where students could "Pi" their math professors with cool whip cream pies—as long as they could correctly answer a math problem posed by the instructor!

Here you can see the PME Faculty Advisor Shannon Miller-Mace (picture right) reaping the benefits of her students' knowledge!

It's possible, though, that Dr. Alan Horwitz (picture left) had the most fun during this event by taunting students and dressing up as a very appropriate target for Marshall students – a WVU fan!

Later in the semester, a group of PME members, along with their advisor Shannon Miller-Mace, attended the Ohio Section of the MAA at Xavier University in the spring of 2012. At the foot of Xavier's premiere statue, from left, undergraduates George Chappell, Stephen Deterding, Ayo Akinsete, and graduate Kayode Olumoyin enjoyed many student talks during the two day conference.

You can also see George - participating in the event that the students said they liked the most – a musical mathematical drama production entitled "Calculus the Musical".

Let's not forget the final event for the club during any semester is always the induction ceremony. The group welcomed two new members in the spring, one undergraduate student Spiro Stilianoudakis, and one graduate student Kayode Olumoyin.

Here are the new members, Kayode (middle left) and Spiro (middle right), along with Vice President Stephen Deterding (far left) and President Sam Skelley (far right) at the induction ceremony last spring.

And the club would also like to mention the fall 2011 inductee Andrew Wendt, an environmental science major, who earned a minor in mathematics, pictured here with faculty advisor Shannon Miller-Mace.

The group was excited to start the fall 2012 semester by attending a conference focused on 'Statistics in Sports'. Undergraduates Ayo Akinsete and Jamie Rust, along with graduate Kayode Olumoyin (seen here on the left seated together before a contributed talk on the first day of the conference and on the right exploring the lovely campus at Miami the next day), and faculty advisor Shannon Miller-Mace attended the topic specific conference.

Each was excited to see Kayode present some of his most recently developed research on Marshall University's Differential Analyzer. A lot of attendees to his talk were impressed with the direction of his thesis and clarity of presentation. Kayode plans to present a more thorough (part II) of his findings early in the spring 2013 conferences to continue to prepare for his full thesis defense.

Also this fall, the newly elected President George Chappell, along with Student Activities Coordinator Mary Crytzer, worked hard to create a design for a t-shirt to show our club spirit to everyone on our campus and at other colleges when we travel. The design clearly labeled Marshall University Mathematics in green and white and touted 'PME – where it's hip to be square!' in purple, one of our club colors. Many members of the club and some faculty members in the Mathematics Department were very excited to participate! These shirts will be available for anyone to purchase in spring 2013.

And as always, the last meeting of the semester concludes with the induction ceremony of the newest applicants – from left to right, Faculty Advisor Shannon Miller-Mace, graduate student Yu Xi, undergraduate student Amanda Sellers (the newly elected Secretary), graduate student Alaa Elkadry, and current President George Chappell.

Pi Mu Epsilon welcomes all students, faculty, and alumni to our meetings for fun, food, and math! Check us out in the spring! Please contact Shannon Miller-Mace (miller207@marshall.edu) for more information.

Holiday Party!!!

Once again Judy and Don Silver hosted the annual holiday party in their beautiful home. Faculty members, staff, graduate students, and their families shared good food and good times. It was a welcome diversion from the hectic end of the semester activities. The guest of honor was our hard-working department secretary, Stacy Good, whom we thanked for her herculean efforts on our behalf throughout the year.

Faculty Activities

In a 15-minute talk, **David Cusick** presented, ***"No Matter How You Slice It ..."*** at the spring meeting of the Ohio Section of the Mathematical Association of America, March 25-26, 2010, Youngstown State University. "An ordinary, Egyptian-type, pyramid with a square base provides several (5) opportunities to create integrals which calculate its volume."

David has also attended meetings of the Ohio Section of the Mathematical Association of America:

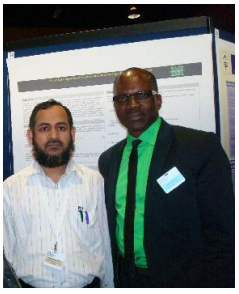
- Fall 2011 Meeting, October 21-22, University of Findlay
- Fall 2010 Meeting, Oct. 22-23, Ursuline College
- Spring 2010 Meeting, April 16-17, Kent State University
- Fall 2009 Meeting, Oct. 30-31, Kenyon College
- Spring 2009 Meeting, April 3-4, Bowling Green State University
- Fall 2008 Meeting, October 24-25, Capital University

He was an invited attendee at the workshop, "Engaging Students and Ensuring Success in Today's Math Courses," with his travel sponsored by John Wiley & Sons, Inc., San Francisco, CA, February 25, 2011 and at the Legacy of R.L. Moore conference, June 2-4, 2011 Washington, DC, with his travel sponsored by the MAA and The Educational Advancement Foundation. David gave an impromptu 5-minute mini-talk.

He also attended the AAMTE meeting (Karen Mitchell organized it and others attended too), Nov 4 - 5, 2011.

Dr. David Cusick was honored by **Governor Tomblin** for 40 years of public service to West Virginia in Charleston, WV, on September 14, 2011.

Alfred Akinsete attended the annual international conference organized by the Royal Statistical Association, which was held in Telford, England between September 3 – 6, 2012. While in attendance, Alfred gave a joint scholarly presentation with Sun Jianan (a former graduate student) entitled, "*Statistical Properties of the Convoluted beta-Weibull Distribution.*"



Alfred also attended the following conferences:

- Joint Statistical Meeting of the American Statistical Association. San Diego. July 29 – August 2, 2012. He presented the following talks:
  - *Statistical Modeling and Ranking of the English Premier Soccer League*, with Caila Blanton, a RUE student in 2011.
  - *Transition Probabilities and Randomness in the English Premier League*, with Jerry Jackson, a RUE student in 2011.
- Conference on Statistics in Sports. Miami University, Oxford, OH. September 28 – 29, 2012.
- MAA Fall Conference. Baldwin-Wallace University. Berea Ohio. October 19 – 20, 2012.

Our 2008–12 M.A. in Mathematics Graduates

Congratulations to our recent master's level graduates!

May 10, 2008:	Steven Lacek, Tue Ly, William Morrison, Issa Traore, Lin Yuan
Aug 15, 2008:	Mary Crytzer, Keshav Pokhrel, Stacy Scudder
May 9, 2009:	Derek Sturgill, Kenneth Thomas
Aug 14, 2009:	Olusegun Otunuga, Xun Sun
May 8, 2010:	Joy Mayenchein, Thembinkosi Mkhatshwa, Patrick Riley
Aug 13, 2010:	Grace Amusan, Lisa Mathis, Devon Tivener
May 7, 2011:	Jessica Briscoe, Thomas Cuchta, Casie McGee, Clyde-Emmanuel Meador, Pai Song, Jianan Sun
July 8, 2011:	Sher Chhetri
Dec 13, 2011:	Richard Merritt, Dong Ngo, Tu Nguyen
May 5, 2012:	Maggie Chenoweth, Anthony Hernandez, Nonhle Mdziniso, Alaeddine Saadaoui

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