

# Mathematics at UMW

Fall 2005

a newsletter of the Department of Mathematics at the University of Mary Washington

## Welcome Back!

*Dr. Hydorn, chair*

Big things are happening here in Trinkle! If all goes according to plan, Mathematics students will be sharing the B8 and B10 computer labs with students from the Music department and the building will be wired for 24/7 computer access! The department is very excited about having a computer lab for our students to complete homework and project activities!

We have a very full schedule of activities and events already planned for this fall, including speakers and problem solving sessions, and we're making additional plans for events in the spring. Last year I held "Chat with the Chair" sessions to meet with students to discuss their interests and ideas for activities and courses. I plan on having these sessions again this year so please watch for an e-mail invitation from me.

The department will be conducting another search this year for the second of our four new tenure track faculty members. Most likely we will be conducting interviews in January so please watch for announcements about meeting the candidates and attending their presentations. We will also be conducting a search for a full-time replacement for Betty Durrer, who retired last year. This search will be conducted some time in the spring. In the meantime, Wyatt Mangum has joined the department on a full-time basis. Welcome Wyatt!

Many thanks again to Dr. Mellinger for coordinating the Newsletter this year. Please let either him or me know if you have ideas for articles for future editions!

Best wishes for a successful year!  $\Omega$

## Goodbye to Betty Durrer

Congratulations to Professor Betty Durrer who retired spring 2005. Professor Durrer taught in the department since 1986. She earned her Masters degree in mathematics from the University of Virginia after receiving a B.L.S. right here at Mary Washington. Prior to her arrival at Mary Washington, she was a mathematician and technician at the Naval Surface Warfare Center at Dahlgren for over 15 years. Professor Durrer was a very popular teacher on campus and we are very sad to see her retire. Fortunately, we will still see her around from time to time as an adjunct. We wish her all the best in this new stage of her life!  $\Omega$



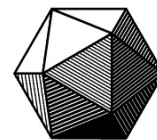
## Welcome to Dr. Randall Helmstutler

The department is happy to welcome the first of our four new hires over the next several years. Dr. Randall Helmstutler joins us after earning his Master's degree at the University of Illinois and his Ph.D. at the University of Virginia in 2004. He held a 1-year position at Washington and Lee University last academic year. Dr. Helmstutler is an expert in topology, specifically a branch known as stable homotopy theory. His dissertation, "Quillen Equivalent Categories of Functors," develops a Morita theory for stable model categories. Dr. Helmstutler is a native of Virginia. He collects records (the vinyl kind), plays bass, and enjoys a variety of ethnic foods. We are very happy to have him on board. Please welcome him when you see him around Trinkle.  $\Omega$



*Dr. Randall Helmstutler*

## New MAA Officers



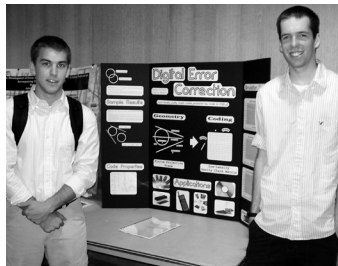
Our student section of the Mathematical Association of American elected new officers this past spring. The new president is **Ryan Platt** (rplatt1ta@umw.edu). Please contact **www.MAA.ORG** Ryan if you would like to become involved in this student group. MAA sponsors many activities throughout the year including the annual *Bowling Against the Profs*, a booth at the multicultural fair, the winter holiday party, and the summer picnic, as well as monthly meetings. The MAA group also makes t-shirts every year with some sort of witty mathematical content. Last year's t-shirts "Don't Drink and Derive" were quite a hit.  $\Omega$

## A Second Year of Success in the Summer Science Institute

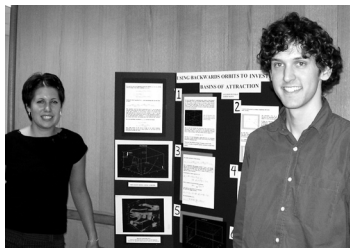
During the summer of 2004, the mathematics department participated for the first time in the Summer Science Institute here at UMW. In 2005 we participated again with two faculty members and four students. The Institute supports participating students with a \$2500 stipend plus free room and board for a period of 10 weeks while the students work on a research project under the direction of a faculty mentor.

This year students Sean Droms and Chris Meyer worked with Dr. Mellinger on a research project involving error-correcting codes.

Sean and Chris constructed various classes of codes using matrices defined by special sets of points and lines defined in a finite projective plane. Their project led to some very nice mathematical results that were detailed in a research article they submitted to the journal *Designs, Codes, and Cryptography*. These students also did some high-scale computing to test their codes via simulation. Using a 3.6 GHz computer purchased by the school for use with this project, the students were able to collect simulation data for most of their shorter length codes. By turning a computer lab in Trinkle into a virtual parallel system with 20+ processors, the students were able to obtain data for some of the longer length codes as well. The project was a tremendous learning experience for both students, as well as Dr. Mellinger.



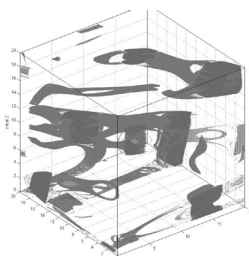
Chris Meyer and Sean Droms



Allison Piccolo and Jared Moon

Allison Piccolo and Jared Moon worked with Dr. Edmunds on a research project in the area of dynamical systems. During a previous summer research project, Keith Manion was able to identify parameter values for which a simple competition model produced multiple

attractors. Allison and Jared focused on one specific scenario featuring five separate attractors - three periodic and two chaotic. The basin of attraction for each attractor (as pictured) was computed within a region of Euclidean space, revealing quite an intricate structure. They performed several types of mathematical analysis on the underlying system of equations, notably a computation of backwards orbits in an attempt to fill out basins of attraction. Both students plan to continue this research in honors projects during their senior year.  $\Omega$



Basin of attraction

## James Farmer Scholars Program Introduces Mathematical Modeling Class

This summer, Dr. Jeff Edmunds piloted a week-long course in Mathematical Modeling for the James Farmer Scholars Program. The students learned about functions, curve-fitting, and difference equations, and applied these ideas in studying population trends across the globe. They got some hands-on experience with computers and graphing calculators, and presented their results to each other in class.



Students from the James Farmer Scholars Program

The James Farmer Scholars Program brings local African-American students in grades 7-12 to campus for monthly Saturday sessions during the school year and for one full week during the summer. The program was created to provide encouragement and access to students who show academic promise but may not have considered college as a part of their future. The program is currently working to expand offerings in mathematics and science.  $\Omega$

## Upcoming Electives

Every three semesters the department offers a topics course, Math 461, on some topic that is not normally offered during the regular course rotation. This spring, Dr. Mellinger will be offering a course titled *Coding and Cryptography*. Prerequisites for the course are Linear Algebra (Math 300) and Discrete Mathematics (Math 325), or permission of the instructor. The course will include mathematical topics dealing with encryption, crypt-analysis, and reliability of communication. Students interested in future careers with the government or industry are encouraged to register for this rarely offered course. See Dr. Mellinger if you have questions.

For planning purposes, here is a list of some of the upcoming elective courses that the department will be offering.

**Spring 06:** 330 – Foundations of Advanced Mathematics, 381 – Probability and Statistical Inference, and 461 – Coding and Cryptography

**Fall 06:** 321 – Number Theory, 351 – Numerical Analysis, and 372 – Non-Euclidean Geometry

**Spring 07:** 330 – Foundations of Advanced Mathematics, 411 – Chaotic Dynamical Systems, and 461 – Topics in Mathematics (topic undecided)  $\Omega$

## 2004 Sees an Impressive Group of Graduates

In the spring of 2004 the department graduated an impressive group of seniors, four of whom wrote honors theses. First is **Daniel Bowers** whose thesis, "Elliptic curves and their applications in cryptography" was written under the direction of Dr. Lehman. Dan was president of the student MAA group for two years and heads to the University of Wyoming this fall to pursue graduate work in number theory. **Amanda Passmore** wrote a thesis titled "An elementary solution to the ménage problem" under the direction of Dr. Mellinger. Mandy heads to Florida State in the fall to pursue a Masters degree in financial mathematics.



*Daniel Bowers*



*Mandy Passmore and Jenny Stovall*

**Lisa Song**, our first interdisciplinary honors student, wrote a thesis titled "Application of transition matrix theory and stochastic modeling to *Aeschynomene virginica* population dynamics, a threatened species" under the co-direction of Dr. Edmunds and Dr. Griffith from biology. Lisa's thesis marks an important trend toward increased

interdisciplinary studies in mathematics nowadays and we hope to continue to sponsor projects jointly with other departments on campus. Lisa plans to apply for admission to medical school this year. Last, but certainly not least, is **Jenny Stovall**, our 2004 winner of the Oscar Schultz Award. Jenny wrote a thesis titled "A new class of codes from finite geometry" under the direction of Dr. Mellinger, which was accepted for publication in the *IIME Journal*. Jenny starts a graduate program in mathematics at the University of Delaware this fall.

Other graduates include **Hojun Hwang** and **David Straightiff**, who both completed independent studies during their senior year in differential geometry under the direction of Dr. Chiang. Also, mathematics education major **Shannon Hemstreet** got a job teaching at Gayle Middle School in Stafford County and **Lisa Cummings Irving** is teaching at a middle school in Chesterfield County. Finally, **Keith Manion** is working as an analyst for a major baking company (George Weston Bakeries) in Charlotte, NC.

We are very proud of our graduates! Please stay in touch!  $\Omega$

## Upcoming Student Activities

Following our successful speaker series last fall, the department is happy to welcome a series of speakers for fall 2005. The fall speaker series was started to help students learn about mathematics, apart from what they learn in the classroom. Our goal is to help our students figure out what to do with their degree, and see what sort of interesting things happen in mathematics, outside of the tiny world of Trinkle 119.

Our fall speaker series will start with a pair of talks from our summer research students. They will share their experiences doing real mathematical research during the summer of 2005. Their talks will be complemented with a welcome reception for all of our new majors. Keep your eye out for more details. Later in September, Dr. Helmstutler will give an introductory talk to the department to provide us the opportunity to understand his research. In October, we welcome Dr. David Shoenthal from Longwood University, and our very own Dr. Konieczny (or, Dr. K as we know him) will present some of his own research in November.

Just before the advising period, we plan to have a speaker from the National Security Agency visit UMW to discuss opportunities at this government agency which employs more mathematicians than anywhere else in the world. You'll hear more details about this talk in the fall. We are pleased to have Dr. Edward Bosch visit us on Tuesday, October 25. For over 24 years, Dr. Bosch worked at the Engineering Research Development Center (ERDC) in Fort Belvoir, Virginia, developing mathematical and statistical models for the exploitation of remote sensing applications. He is currently employed at the National Geospatial-Intelligence Agency in Reston, Virginia, where he continues to develop and manage remote sensing research. Dr. Bosch will talk a bit about his research and provide some information for our students on job opportunities after graduation. That same week, Dr. Ezra "Bud" Brown from Virginia Tech will speak on Thursday, October 27, at 5pm. Dr. Brown's graduate work and most of his fifty or so publications are in number theory. Recently he has written some terrific expository articles for *Mathematics Magazine* and he is sure to be a crowd pleaser. Students who are still pondering their post-graduation options should definitely plan to attend these talks scheduled just before advisement.

To complement our biweekly speakers, we plan to have "Pizza and Problems" sessions on the weeks when we are not hosting speakers. Each P-n-P session will be hosted by a faculty member who will suggest some intriguing problems from mathematics journals. Students will be encouraged to have a slice of pizza and discuss the problems together. This is a great way for students to start thinking a little outside the box and to start working on their problem solving skills. It's also a great inclusion for your resume! All mathematics majors are encouraged to attend.  $\Omega$



## Professional Activity

Your professors have been involved in a number of professional activities outside of the classroom during the last academic year. Here are just a few of the highlights. **Jeff Edmunds** traveled to Charleston, South Carolina, in March to deliver an invited talk "The Effect of Stage Structure in Models of Competing Species" at the Southeast Atlantic Sectional Meeting of the Society of Industrial and Applied Mathematics. **Janusz Konieczny** published 3 research articles last year, including the article titled "Semigroups of Transformations Commuting with Injective Nilpotents" in the journal *Communications in Algebra*. Our newest member, **Randall Helmstutler**, traveled to Albuquerque in August to participate in various workshops and other sessions for young mathematics faculty accepted to Project NExT (New Experiences in Teaching). This program, run by the Mathematical Association of America, aims at developing young mathematicians through a variety of activities. **Keith Mellinger** was accepted to Project NExT last academic year and joined Randall for part of the conference. **Wyatt Mangum** and **Suzanne Sumner** presented their joint research in chaotic dynamical systems titled "The Aggressive Patterns of Worker Honey Bees towards a Foreign Queen: Theory and Experiment" at the Apimondia International Apicultural Congress in Dublin, Ireland, in August. Dr. Mangum recently became editor-in-chief of the journal *Apiacta*, and Dr. Sumner co-presented the day-long workshop "The Kaleidoscopic Perspective on Institutional

Transformation: From Start to Finish" at the Society for College and University Planning conference in Washington, D.C. in July. Last October, **Keith Mellinger** traveled to Chicago, Illinois, where he delivered the invited talk "Classes of Codes Obtained from Quadratic Surfaces of  $PG(3,q)$ " at a special session on Codes and Applications at the American Mathematical Society Central Section meeting at Northwestern University. **Marie Sheckels** has been involved with three statewide grant projects focused on preparing in-service and pre-service mathematics teachers. She has served as the project evaluator and on course development teams for the "The Virginia Mathematics Specialist Project." She also served as the UMW project director for "Preparing Highly Qualified Middle School Mathematics Teachers Across Virginia." Both of these grant projects are funded through the Mathematics and Science Partnership Grant administered by the Virginia Department of Education. Dr. Sheckels also served as the UMW project director for the "VCEPT Evaluation and Mentoring Follow-On project," funded by the National Science Foundation. **Yuan-Jen Chiang** traveled overseas to give the presentation "Exponential Wave Maps and Applications" at the Third Pacific Rim Conference at Fudan University, Shanghai, China, in August of 2005. Finally, **Debra Hydorn** gave an invited presentation on service learning in statistics courses at the Joint Statistical Meetings in Minneapolis in August. She also had chapters published in two MAA publications, one on service learning and the other on interdisciplinary activities between mathematics and biology. [Ω](#)



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