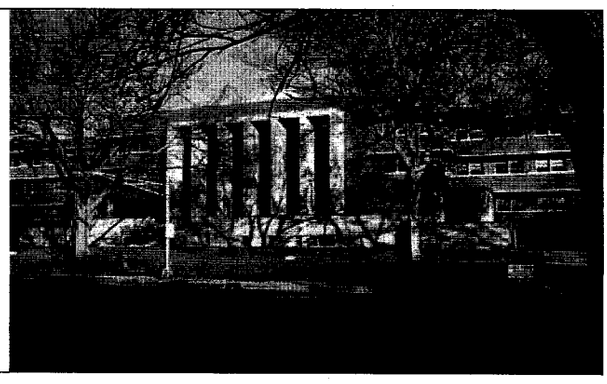
UofL Math Gazette 2005-2006

The Newsletter of the
Department of Mathematics
College of Arts & Sciences
University of Louisville



How to Reach Us

Te. (502) 852-6826
Fax. (502) 852-7132
Email: math@louisville.edu or
www.math.louisville.edu

Chair of the Department:
Dr. Thomas Riedel
Professor of Mathematics
Email: Thomas.Riedel@louisville.edu

Co-editors of the Gazette:
Dr. Lee Gibson
Assistant Professor of Mathematics
Nannette Dix
Administrative Assistant

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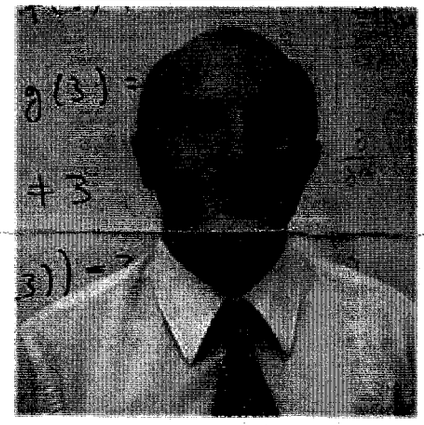


Dr. Thomas Riedel

Let me begin by thanking the many of you who have contributed to the success of the Department in many ways. The dedication and hard work of our faculty, staff and students are a main source of our accomplishments. But in a time of shrinking state support the numerous financial contributions made by you, our alumni and friends are essential for our continued success. Over the years several large donations have helped establish undergraduate scholarships, graduate fellowships and lecture series, while smaller ones have helped us to provide a better experience for our students. The Mathematics Commons Room was made possible by such donations and is a place for students and faculty to gather, discuss mathematics, and do home work as well as relax. A small kitchen area will soon be finished, thus completing the room. I encourage you to stop by the department and see this first hand.

The Department is having another very successful year in teaching and research. The faculty continues to publish in high quality journals, make presentations at national and international meetings and receive grants. Our Ph.D. program is in full swing with many students now working on their dissertations; we expect our first graduates to enter the

work force in 2006. We have added many new talented students at the undergraduate and graduate level and more of them are involved in research and international experiences.

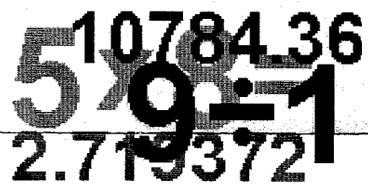
Several changes have occurred in the past year; Dr. Davitt retired after 35 years of outstanding service to the Department and the University. He has not slowed down and won (again) a Metroversity Award for his development of an Honors Seminar. He continues his involvement in the Honors Program and the Department on a part time basis through our phased-in retirement program. We thank him for his past and continuing service. Crystal Wynn, who was the Department's receptionist for over 3 years, decided to change careers and left this past Spring term. Stephen Altman was hired to fill this position; he is a recent UofL graduate who attends Law School in the evening.

We were fortunate to hire three new tenure-track assistant Professors. Dr. Lee Gibson joined us after receiving his Ph.D. from Cornell University. He research involves random walks on graphs. Lee is a known quantity as he received an MA degree from our department in 1999. Dr. Alica Miller received her degree from Michigan State University and came to us after a 3 year VIGRE postdoc at the University of Illinois, Urbana-Champaign and a one year post doc at the University of California, Irvine. Her research interests lie in the area of topological dynamics. Dr. Jon-Lark Kim works in the area of algebraic coding theory and joined us after a 3 year post-doc at the University of Nebraska, Lincoln following his graduate studies at the University of Illinois, Chicago.

Two new term faculty members joined us as well: Dr. Hamid Kulosman, working in commutative algebra, obtained his Ph.D. from the University of Illinois, Urbana-Champaign and spent one year in a post-doc at the University of California, Riverside; Mr. Trevor Irwin is working on finishing his dissertation at Indiana University, Bloomington, in the area of descriptive set theory.

Finally, I would like to draw your attention to our 2006 William Marshall Bullitt Lecture, which will be given by Dr. Vera Pless from the University of Illinois, Chicago. Dr. Pless is an internationally known mathematician who works in the area of algebraic coding theory. Details can be found in this newsletter, as well as at our website.

Hopefully you will find something of interest in this issue and I encourage you to contact us and let us know your thoughts. We appreciate your comments and support; if you are in the area please stop by for a visit or just check us out at our website:
http://www.math.louisville.edu



Brief Early History of the Department of Mathematics at UofL

By: Dick Davitt

The Department of Mathematics at the University of Louisville was established in 1907 along with the university's College of Liberal Arts. The campus of the college was located downtown on Broadway until 1925 when it moved to Belknap Campus. The first extant catalogue of the University of Louisville in the University Archives is the 1909-1910 catalogue. The Mathematics Department is one of the 19 non-Medical School departments listed therein. Like many of those departments, it had only one full-time faculty member. His name was Dr. Louis Siff. However the mathematics program was the most extensive one described in the catalogue -- with four required courses and fourteen elective courses. As was the case for most undergraduate mathematics curricula of that era, the highest level courses were Differential Equations and Advanced Calculus.

Department Changes

The Math Department would like to welcome the following individuals who joined the department at the beginning of the 2005-2006 academic year.

Students

* Esteban Chavez, comes to U of L from his hometown of Mexico City, where he was completing his bachelor's degree. He is interested in probability theory and its applications to financial mathematics and risk theory.

* Benjamin Chisman, from Cape Girardeau, Missouri served as a high school mathematics teacher in Charlestown, Indiana before coming to U of L to work on a master's degree in mathematics.

* Srdan Hrkalovic, from Slavonski Brod, Croatia, studied at Western Kentucky University in Bowling Green, Kentucky before starting the Ph.D. program at U of L. He is interested in number theory

* Kristen Keish is originally from Vandalia, Ohio, and completed her BA in Math with a minor in classics at Transylvania University. She is interested in discrete math and algebra.

* Mohamad Khan joins the graduate program as a transfer student from Montana. He is originally from Varanasi, India, and is interested in image processing and medical imaging.

* Andrew Ritchie is a Louisville native and U of L alumnus, although he was born in Seoul, Korea. He is interested in statistics, number theory, and numerical analysis.

* Guoxin Tang joins the department from the Tianjin University of Commerce. His hometown is Tongxiang city, China, and he is interested in mathematical modeling and statistics.

* Hamed Zahedi started in U of L in fall 2004 as a continuing study under graduate. He was admitted to the graduate program in spring 2005. Hamed was born in U.S. but his parents are Iranian (Persian), and he grew up in Iran. Hamed is interested in probability, statistics and actuarial sciences.

Faculty

* U of L alumnus Lee Gibson is originally from Bell County, Kentucky. Before returning to U of L, he graduated from Cornell University with a thesis written in the area of probability theory.

* Trevor Irwin is a California native who studied descriptive set theory and continua theory at the University of Indiana at Bloomington. Trevor taught at the University of Wisconsin at Madison before coming to U of L.

* Jon-Lark Kim, from DeaJeon, South Korea completed his Ph.D. at the University of Illinois at Chicago in 2002 in the area of Algebraic Coding Theory. Before coming to U of L, Jon-Lark was a research assistant professor at the University of Nebraska at Lincoln teaching courses including Graph Theory and Cryptography and doing research on the construction of new self-dual codes, low-density parity-check codes, and quantum error-correcting codes.

* Hamid Kulosman, originally from Sarajevo, Bosnia and Herzegovina, completed his Ph.D. in commutative algebra at the University of Illinois at Urbana-Champaign. Hamid was previously a postdoctoral associate at the University of California at Riverside.

* Alica Miller is also from Sarajevo, and completed her Ph.D. in Topological Dynamics at Michigan State University. Alica was a postdoctoral associate at the University of Illinois at Urbana-Champaign and at the University of California at Irvine before joining the faculty at U of L.

Staff

* Stephen Altman joined the department staff as office clerk. Stephen graduated from the political science department here at U of L, and is now a student in the Brandeis School of Law.

Scholarship Endowments and Gifts

As always, we appreciate the kindness and generosity of alumni and other friends of mathematics. During the 2004-2005 academic year, designated donor gifts increased the principal of various department endowments. In addition, the

department received some unrestricted gift donations, which are used to supplement departmental activities for the mathematics community at U of L. In many cases contributions were received in response to the department newsletter, the U of L Math Gazette.

The department is thankful to alumni, friends and family who support the department endowments. Without their generosity, we would be unable to provide many of the offerings that make our department unique.

* The Mary Brookover Award, awarded to Lindsey Pearson.

* The C. Coleman Petty Scholarship was awarded to Leanne Hurth.

* The Robert J. Bickel Scholarship was awarded to Dana Blakemoore.

* The Bullitt Fellowship was awarded to Benjamin Allgeier.

* The McSweeny Scholarships were awarded to Alyssa Cramer and Kelly Houston

* The Ken F. & Sandra S. Hohman Graduate Fellowship in Mathematics was awarded to Qiang Ao, Sanguo Shen, and Christiana Petrou

* The newly established Dr. Lois Pedigo Scholarship in Mathematics will be awarded for the first time in the coming year.

Faculty Activities

Sampling of 2004-2005 research publications

* A characterization of the Stolarsky mean. Thomas Riedel and Ron Sahoo; Aequationes Mathematicae volume 70 (2005), no. 1-2, 51--62.

* Separation properties for graph-directed self-similar fractals. Manav Das (with G.A. Edgar); Topology and its Applications volume 152 (2005) no. 1-2, 138--156.

* Classification problems in continuum theory. Udayan Darji (with R. Camerlo and A. Marcone); Transactions of the American Mathematics Society volume 357 (205) no. 11, 4301-4328.

* Spreading speeds as slowest wave speeds for cooperative systems. Bingtuan Li (with H. Weinberger and M. Lewis) Mathematical Biosciences volume 196 (2005), no. 1, 82--98.
* Green's function for the Helmholtz equation in a layered half-space. Yongzhi Xu (with R. Gilbert) Complex Variables. Theory and Application. volume 50 (2005), no. 7-11, 869--876.

* Sphere-of-influence graphs on a sphere. Ewa Kubicka and Grzegorz Kubicki; Ars Combinatoria volume 70 (2004), 183--190.

* Consensus functions on tree quasi-orders that satisfy an independence condition. Bob Powers and Fred McMorris; Mathematical Social Sciences volume 48 (2004), no. 2, 183--192.

Sampling of seminar titles

* Some Open Problems on Graphs, Permanents, and Tree Packing. Professor André Kézdy

* Introduction to Free Spectra of Finite Groups & Algebras. Professor Steve Seif

* Weak and Local Differentiability - a comparison of Calderon-Zygmund and Sobolev spaces. Professor David Swanson

* More f(x)^{-1}=f^{-1}(x). Professor Lee Larson

* Some problems in transcendence theory. Professor Milton Nash

* Stability of n-th Flett points. Professor Iwona Pawlikowska

* Langevin equation and hybridization reaction on DNA-microarrays. Professor Greg Rempala

* Markov Chain-Monte Carlo Methods. Professor Ryan Gill

Sampling of conference talks

* Using SAS to Make an Independent Assessment of Electronic Medical Record. Professor Patricia Ceritto, 2004 Southeast SAS Users Group Conference, Nashville Tennessee

* Residuation on the bicyclic semigroup. Robert McFadden, Fall Southeastern Sectional Meeting of the American Mathematical Society (AMS), Nashville, Tennessee, October 2004.

* Listening for Perfect Matchings in Bipartite Graphs, Andre Kezdy, and Fall

Southeastern Sectional Meeting of the AMS, Nashville, Tennessee, and October 2004.

* An inverse problem for the free boundary model of ductal carcinoma in situ. Steve Xu, Fall Southeastern Sectional Meeting of the AMS, Nashville, Tennessee, October 2004.

* Asymptotic growth of free spectra of finite semigroups, Steve Seif, Fall Southeastern Sectional Meeting of the AMS, Nashville, Tennessee, October 2004.

* Non-smooth change of variables, David Swanson, Fall Western Sectional Meeting of the AMS, Albuquerque, New Mexico, October 2004

Student Activities

Graduate Student activities:

* Mussie Tesfamicael; Statistics and Applied Probability Seminar talk. Structural Equation Modeling for Assessing Microarray Data.

* Michal Czajkowski; Statistics and Applied Probability Seminar talk. General broken line regression model in cohort studies.

* Congratulations to Joseph Twagilimana, Jennifer Ferrell, David Nfodjo, Sanguo Shen, Chakib Battioui, Christiana Petrou, Jeremi White, and Mussie Tesfamicael for completing the internship component of the Ph.D. program during the 2004-2005 academic year.

* Susan White attended and prested a paper on "Structure of Generic and A.E. Mappings from Z to Z" at the 25th Annual Mathematics Symposium at Western Kentucky University.

Congratulations to Christiana Petrou, John Schwarz, Carrie Anderson, Jonathan Daniel, Maggie Gibson, Tianyang Wang, David Schroerlucke, and Benjamine Allgeier for complete the requirements for the Master's of Arts in Mathematics during the 2004-2005 academic year.

Undergraduate activities:

The Math Club has been having a fun year attending conferences, having interesting speakers, organizing picnics and other social activities. They meet once every two weeks, alternating between academic and social activities. During the follow of 2005, several math club members attended the Third Annual Conference on Mathematics and Biology at the Miami University of Ohio. Several people from the department gave talks on diverse topics such as cryptography, fractals and genetic at the meetings. Kelly Houston and Kim Meyer, President and Vice-President, will be attending the Eighth Annual Nebraska Conference for Undergraduate Women in Nebraska. They will give a talk on small subsets of the real line.

Congratulations to the 2004-2005 Bachelor's of Arts and Bachelor's of Science graduates from the math department: Kathleen Jewell, Richard Henderson, Edward Rockwell, Kara Riley, John Muller, Zachery Wood, Hunter Austin, Todd Moudy, Bridget Norton, Christopher Barnes, Hallie Hutchinson, Tina Dillander, Peter Weigel, Sarah Cross, Christopher Kaufman, Emily Lucas, Kelli Thompson, Lisa Ortega, Carter Markham, Kenneth Key, Elizabeth Vollman, Erin Mulroney, Lindsey Pierson, Tiffany Beaumont and Binta Sidibe.

Community Outreach

Bullitt Lecture

Each year, the Mathematics Department's Bullitt Lecture brings a distinguished mathematician to Louisville to speak to a general audience about important and cutting-edge mathematics. The 2006 Bullitt Lecture will as usual be free for all participants, and will be held at 7:00 P.M. on Thursday, March 30 in the Middleton Auditorium (Belknap Campus, Strickler Hall, room 101). The lecture will be given by Dr. Vera Pless, a professor of mathematics at the University of Illinois at Chicago who is recognized as a leading contributor to the development of coding theory. The title of her talk is ``Error-Correcting Codes: Practical Origins and Mathematical Implications''.

"The practical problem underlying coding theory is the efficient and accurate transmission of information from one place to another. Practical uses at present include the high-fidelity on compact disc

recordings, the transmission of financial information, data transfer from one computer to another or from memory to a central processor, and information from a distinct source such as weather or communications satellites. Error-correcting codes deal with the problem of detecting and correcting transmission errors caused by noise on a channel." During her lecture, Dr. Pless will give all the basic definitions and demonstrate how codes can correct errors.

Dr. Pless received her undergraduate degree from the University of Chicago and a Ph.D from Northwestern in 1957. She worked as a researcher for the Air Force Cambridge Research Laboratory, where she studied coding theory during the early stages of its development. Dr. Pless joined the University of Illinois-Chicago's department of Mathematics, Statistics and Computer Science as a full professor in 1975. She has published over 120 papers and is co-editor of the 2169-page ``Handbook of Coding Theory''.

William Marshall Bullitt, a Solicitor General of the United States under President William Howard Taft, corresponded with many mathematicians and scientists of his time, including Albert Einstein. He collected a large number of rare mathematical manuscripts that he kept on display at his law office in downtown Louisville. His collection, one of the world's most extraordinary collections of first edition mathematical works, is now housed at the Belknap Library at U of L. Professor Richard Davitt of the Mathematics Department has done extensive work studying and publicizing the Bullitt Collection. Davitt's work came to the attention of the Bullitt family and led to the establishment of the Bullitt Endowment which funds the annual Bullitt Lecture.

For more information about the Bullitt Lectures, please visit http://www.math.louisville.edu/Bullitt.

GEMS Program

The Groundwork Education in Mathematics and Science GK-12 grant is half way through the second of three years. This year there are four Math graduate students, Melissa Baker, Adam Jobson, Susan White, and Lesley Wiglesworth, and one undergraduate, Fadden Holden, among the Fellows. The Mathematics students are helping 8 elementary teachers at Auburndale, Blake, Eisenhower, Sanders, and Rutherford elementary schools. As the Fellows and Mentors (including faculty members Wiley Williams and Steve Seif) work to increase the content knowledge and use of best-practices instruction by the teachers, the Fellows are improving their communication skills and are generating excitement about reasoning and calculating among the students.

Faculty Profiles

Professor Emeritus Richard M. Davitt

After 35 years at the University of Louisville, Professor Richard M. Davitt officially retired as a full-time faculty member in June 2005 and became a Professor Emeritus. During the ensuing three academic years, he is in a phased retirement stage that involves a half-time appointment during which he teaches full time each fall semester and continues to do research in the history of mathematics. His teaching primarily involves teaching Honors Scholars seminar, a freshman course in the university's Honors Program and Honors Program sections of Department of Mathematics courses. His connection with the Honors Program is a long-standing one that included being a Distinguished University Honors Professor for three academic years. Indeed he was the acting director of the program for the 2003-2004 academic year during that tenure.

Dr. Davitt's research program continues his long-standing interest in investigating the careers and impacts of American (and immigrant) mathematicians and institutions on the teaching and research missions of American Universities. For example, he has published articles on Professors G.A. Miller (University of Illinois), Emil Artin (Indiana University and Princeton University), Charles Loewner (University of Louisville and Stanford University), Otto Szasz (University of Cincinnati), Fritz John (University of Kentucky and Courant Mathematical Institute), and Cecil B. Read (University of

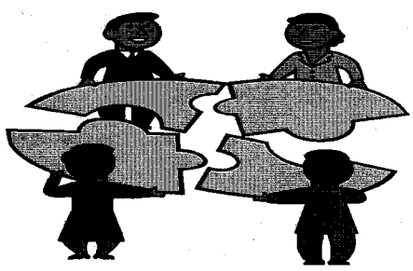
Wichita and Central Michigan University). He is currently in the process of writing a detailed history of the Kentucky Section of the Mathematical Association of America in his role as the official historian of the section.

Professor Bingtuan Li

My research lies in mathematical biology. Mathematical models include nonlinear ordinary differential equations, reaction-diffusion equations, and integrodifference equations. Biological problems include modeling competition between species for common resources, and predicting population spread in biological invasions. Mathematical approaches include analytical methods for dynamical systems, bifurcation theory, and numerical simulations.

David Swanson

I am studying the dynamics of equations related to fluid flow. A basic problem is to compare the observed behavior of the flow (currents, eddys, and cavitation) with the predictions of the equations which model the flow. In real observations, a previously well-behaved fluid flow can become turbulent in a short amount of time. The corresponding mathematical problem is to determine the length of time for which the model, starting with a well-behaved flow, will continue to predict a well-behaved flow until the onset of turbulence. Even for the celebrated Navier-Stokes equations, it is not generally known whether this time is finite or infinite. This is one of the $1M prizes offered from the Clay Mathematics Institute (http://www.claymath.org).



Puzzler

Old Puzzler and Solution

Basketball star Shanille O'Keal's team statistician keeps track of the number S(N), of successful free throws she has made in her first N attempts of the season. Early in the season, S(N) was less than 80% of N, but by the end of the season, S(N) was more than 80% of N Was there necessarily a moment in between when S(N) was exactly 80% of N?

Solution:

Although a direct proof can be written, the following is more succinct.

Suppose that S(N) is never equal to 0.8N. Then, there must have been an N such that $S(N)/N < 4/5$ and $S(N+1)/(N+1) > 4/5$. Since she must have hit the N+1'st free throw in order to increase her average, $S(N+1)=S(N)+1$. That means that after a bit of manipulation, $4N-1<5S(N)<4N$. But this is a contradiction, since the integer 5S(N) cannot lie between the two consecutive integers 4N-1 and 4N. So, it must be that there was a moment when S(N) was exactly 80% of N.

It is also interesting to note that this is also true for the percentage k/k+1 for any integer k.

Special thanks to Robert White, M.A. Math, 1953 alumnus, for his contribution to this puzzler.

9.2 New Puzzler

A boy goes off to college and after the first semester he's run out of money. In fact, he's so broke he doesn't have enough money to call home, or to even send a letter. However, he manages to find a postcard with a stamp already on it. He sends the following message, "Send. More money."

Here's how the message looked:

```
  send
+more
------
money
```

The question is, how much money do they send him? Believe it or not, taking each letter that appears in the message to be a digit from zero to nine, there's only one solution.

Think you know? Send or e-mail your solution to: Dr. Lee Gibson, lrgibs01@louisville.edu - U of L Math Department, Louisville, KY 40292.

Mathematics Department Donation Card

Name: _____

Address: _____
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Enclosed is my gift of $ _____ to enhance the activities of the Mathematics Department.

I would like my gift to go toward:

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_____ Student Activities
_____ General Gifts

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Thanks for your generosity!

Department of Mathematics
College of Arts & Sciences
University of Louisville NS 328
Louisville, Kentucky 40292