



# School of Mathematical Sciences

newsletter

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## SMS Research Programs Initiatives

### HIGHLIGHTS:

- SMS Research Initiatives
- Strengthening an Infrastructure
- Faculty Awards
- Stay In Touch

### INSIDE THIS ISSUE:

- Faculty News, 2
- Fundraising Corner 3
- Lifelines 4

### Mathematics' Role in Counterterrorism

Crossing countries, oceans and hemispheres, a secret terrorist cell's activities form a growing pattern—a pattern that can be detected through the use of mathematics. Research such as this is being conducted in the School of Mathematical Sciences (SMS). "I really think that people need to realize the critical role that math will play in the war against terror," says Dr. Bernard Brooks, associate professor and SMS assistant head of research programs.

That critical role is being recognized by the global community as evidenced by the international cadre of mathematicians and interdisciplinary scholars who convened at RIT on September 20-22 to participate in the fourth Conference on Mathematical Methods in Counterterrorism. Hosted by the SMS, the conference highlighted mathematical theories that aid in identification of patterns and potential solutions designed to disrupt terrorist cells, prevent border penetration, increase border security, deter terrorist cell formation, and increase information security. Catastrophe risk consultant Gordon Woo, from London, UK-based Risk Management Solutions, addressed mathematical modeling for terrorism and environmental damages in his keynote speech to the attendees from Denmark, Germany, England, Canada, Jamaica, the Netherlands and the US.

Brooks and event co-coordinators Drs. Anthony Harkin and Jonathan Farley announced the launch of the Consortium for Mathematical Methods in Counterterrorism during the conference. The creative multi-university consortium initiative was developed to be an information clearinghouse, a source for expert contacts and a site for policymakers to pose real-world problems for mathematical solutions. For details about the conference or the consortium, please visit [www.rit.edu/~cmmc/](http://www.rit.edu/~cmmc/).

Courtesy University News Services

### The Center for Computational Relativity and Gravitation

The Center for Computational Relativity and Gravitation (CCRG) held its inauguration and ribbon-cutting ceremony on October 19<sup>th</sup>, 2007. Among the many that attended the opening was Rochester Institute of Technology President Dr. William Destler, College of Science Dean Dr. Ian Gately, School of Mathematical Sciences Head Dr. Sophia Maggelakis along with the Director of the CCRG, Dr. Manuela Campanelli. The primary mission of the CCRG is to foster scientific knowledge and discovery in computational astrophysics and gravitation. The Center promotes excellence in research and education in its core areas as well as in related areas of applied mathematics and computational sciences.



Donald Boyd addresses the CCRG Ribbon Cutting Ceremony platform party at the October 19<sup>th</sup> event. Pictured L-R: Donald Boyd, VP of Research; Manuela Campanelli, CCRG Director; David Merritt, CCRG Faculty-Researcher; Bill Destler; RIT President; Sophia Maggelakis, SMS Head; Ian Gately, COS Dean; Andrew Moore, Graduate Programs Dean; Stanley McKenzie, RIT Provost.

Along with Dr. Campanelli, the CCRG employs three full-time faculty: Assistant Professor Dr. Joshua Faber, Associate Professor Dr. Carlos Lousto, and Assistant Professor Yosef Zlochower. Additionally, Alessia Gualandris and Hiroyuki Nakano serve as postdoctoral researchers.

Research programs in the Center currently include: galactic dynamics, the study of formation and evolution of star clusters and active galactic nuclei containing super massive black holes, and galaxy mergers; numerical rela-

tivity, the modeling and simulation of astrophysical sources of gravitational waves such as black-hole and/or neutron star binaries, theoretical predictions and analysis of gravitational wave signals; fluid dynamics and general relativistic magneto-hydrodynamics, the modeling and simulation of neutron star systems and accretion disks and jets around black holes; and scientific visualization, the development of new visualizations techniques to visualize complex data sets generated by the simulations. Some of the CCRG research findings can be read in the June 8 edition of *Physical Review Letter* and the June 2 issue of *New Scientist*, which was the issue cover story. For more information about the Center, please visit <http://ccrg.rit.edu/>.

### Center for Applied and Computational Mathematics

On November 7<sup>th</sup>, the School of Mathematical Sciences debuted its Center for Applied and Computational Mathematics (CACM) website, the e-face of SMS research activities. The website coordinates the School's applied research activities to focus on developing and emerging applications as well as involving undergraduate and graduate students in that research. CACM provides organization for research groups and collaboration for interdisciplinary researchers in science and engineering.

Center Director Dr. Anthony Harkin unveiled the website to SMS faculty and staff. The site showcases faculty and student research as well as special events hosted by CACM. One such event was the inaugural CACM lecture by Dr. Charles Peskin on November 9<sup>th</sup>. Dr. Peskin, from the Courant Institute, spoke about his research in the applied and computational mathematics of the heart to a standing-room-only, interdisciplinary crowd of faculty, students and staff. To view current research activities or to join a research cluster, please visit <http://acm.rit.edu>.

## Prof. Deana Olles



Deana Olles is originally from the Rochester area, attending high school in Greece NY and, after graduating, attending Monroe Community College for two years. She transferred to the University of Tennessee at Chattanooga where she was a double major in mathematics and history.

Upon graduation from UTC, Prof. Olles chose to attend RIT

for graduate school, working with Dr. Bernie Brooks in his dynamical systems research program. She received a graduate research assistantship to work on her master's thesis "Rumor Propagation over Random and Small World Networks." During this time, she complemented her education by teaching as an Adjunct Professor at MCC.

In addition to her teaching duties as a lecturer, Prof. Olles continues her research with Dr. Brooks on the rumor propagation project.

She is recently married and her husband, Mark, teaches in RIT's College of Engineering.

It is a pleasure to welcome alumna Deana Olles to the faculty.

## Dr. Carmeliza Navasca



Carmeliza Navasca attended the University of California at Berkeley, receiving a bachelor's degree in mathematics in 1997. She went to graduate school at the University of California at Davis and earned a Ph.D. in 2002. Her thesis centered upon the Hamilton-Jacobi partial differential equation for large dimensional problems.

Dr. Navasca has held several post-

doctoral positions, including: one year at the University of Waterloo in Canada, working on numerical methods for solving the algebraic Riccati equation; three years at the University of California in Los Angeles, working on applications involving inverse problems, parameter identification, and numerical methods for solving the Hamilton Jacobi partial differential equation

using hyperbolic conservation laws; and one year at the *Centre National De La Recherche Scientifique* (CNRS) in France, working on tensor decomposition applied to wireless communication.

Dr. Navasca is married to Dr. Shannon Starr, an Assistant Professor at the University of Rochester.

Welcome to the SMS, Carmeliza!

*Mathematical Association of America 2007 Henry L. Alder Award in Distinguished Teaching to Darren Narayan, RIT-SMS*

## Prof. Tom Prevendoski



Tom Prevendoski joined our faculty this year as a lecturer. He is a graduate of RIT, having received his BS degree in applied mathematics in 2003. He then spent two years at the University of Arizona where he earned a master's degree in systems engineering. Following this, Prof. Prevendoski moved to Ohio State University where he is currently working on an MS in applied

statistics. He plans to earn a doctorate in statistics education.

Prof. Prevendoski came to RIT because he wanted to work with students. His experiences elsewhere showed that in many places an interest in teaching undergraduates is regarded as a positively harmful eccentricity, and he sought out RIT because of its emphasis on undergraduate education.

When not preparing his teaching assignments or working on his thesis, Prof. Prevendoski relaxes by listening to music (all kinds) and reading, especially science fiction.

It is a pleasure to welcome Tom Prevendoski, one of our graduates, to the faculty.

*Mathematical Association of America 2007 Carl B. Allendoerfer Award for Article of Expository Excellence to Carl Lutzer, RIT-SMS*

## Dr. Chulmin Kim



Chulmin Kim, a new assistant professor in the SMS, was born in Daejeon, Korea. He received his bachelor's degree in mathematics from Kyunghee University in Korea, his master's degree in mathematics from Wichita State University, and his Ph. D. in statistics from the University of Iowa. Prior to coming to RIT, Dr. Kim was a visiting assistant professor at the University of Minnesota at Morris, and, subsequently, a

visiting assistant professor at the University of Florida at Gainesville. His fields of interest in statistics are multivariate analysis, linear models and biostatistics.

Dr. Kim is married and his wife, Hee Soo, has a degree in hospitality management earned in Switzerland. She has worked in a managerial capacity in five star hotels both in Beijing and Seoul.

Dr. Kim enjoys playing the piano, is a church choir member, and plays keyboard in a gospel band. Among his reasons for coming to RIT is that he prefers to live in an urban environment for the cultural diversity it provides. He looks forward to a profitable association with the School of Mathematical Sciences at RIT.

Chulmin, welcome to the SMS faculty!

# Fundraising Corner

PAGE 3



Together, we grow and learn.

Students in Calculus Workshop.

Imagine an academic department of approximately 30 faculty members serving the math or stats educational needs of 10,000 students. Fast forward seven years and imagine that the same academic group has ballooned to almost 60 faculty serving the needs of more than 12,000. In addition to course lectures, those faculty are using more technologies in the classroom, collaborating with students interested in research, developing more curricular options for

students and publishing original and creative mathematical research to increase knowledge in areas such as imaging science, bio-statistics, bio-mathematics, astrophysics, rumor propagation and counterterrorism.

This *is* our reality! While we embrace our growth, it also brings the challenge of providing the right level of support to students and faculty as well as finding the resources to fund that support. As SMS alumni, you know that great facilities, programs and faculty made a huge difference in your SMS student experience and laid the foundation for your professional growth. But did you know that tuition and fees cover only about 60 percent of RIT's costs to operate the university? To ensure that future SMS students have access to the same re-

sources, we need the support of our alumni and friends.

In this newsletter issue, we've provided a listing of important needs for which we currently seek support. Both gifts and gifts-in-kind (equipment, supplies, etc.) are valuable to the future of the SMS. Upcoming editions of the newsletter will provide details on some of these needs. Our hope is to give you a comprehensive look at how we are growing and how you can help us maintain quality as we expand in size and scope. For more information on these needs, or to support SMS with a gift, please contact Mark Gaul, Director of Development for the College of Science, at 585-475-7047 or by email at [mark.gaul@rit.edu](mailto:mark.gaul@rit.edu) or Shelly Cicero, Senior Staff Assistant – SMS, at 585-475-7465 or [msc1511@rit.edu](mailto:msc1511@rit.edu).

The School of Mathematical Sciences hosted an REU (Research Experience for Undergraduates) program in mathematics during the summer of 2007. Eight students from a national pool of approximately 100 applicants participated during the session. The REU was funded by the National Science Foundation and will continue during summers 2009 and 2010.

## Support Opportunities

Opportunity	Rationale
Undergraduate Research Program	to enhance student education through research, to showcase students' professional work through publication and conference presentations
K-12 Outreach	to provide outreach to teachers to assist them in better preparing students for college level mathematics
Student Resource	to retain promising students who, through no fault of their own, are experiencing financial difficulties that could prevent the completion of their RIT education, to retain the best and brightest students, to enhance student life
Faculty Development Assistance	to develop and orient junior faculty, to retain top faculty members
Visiting Professorship Chair	to infuse new areas of expertise into the School, to generate PR/media opportunities
Lecture Series	to provide travel and honorarium expenses to guest speakers, to enhance student educational experiences
Student Lab Technology	to create an endowment that will allow the School to continuously upgrade and replace technology and equipment in student labs and classrooms, thereby freeing up annual funding for program use and expansion
Merit Scholarships	to assist student retention, reward exceptional student achievement, and increase enrollment
SMS Fund	to provide much needed funds in support of growth and development of personnel and expenses
Faculty / Staff Technology	to create an endowment that will allow the School to continuously upgrade and replace technology used by faculty and staff, thereby freeing up annual funding for program use and expansion
Mathematics and Statistics Library	to provide much needed funds that will increase student research and study resources specifically targeted to mathematics and statistics



# Lifelines

## Alumni: *Please Stay in Touch*

We are interested in hearing from you! Feel free to send staff assistant Tina Williams an e-mail at [tmwbkg@rit.edu](mailto:tmwbkg@rit.edu) to give us an update of your preferred mailing address and phone number, any career changes you've made and your "extra curricular" activities. Please let us know if you have e-mail, too. As the new edition of the newsletter becomes available on our web site, we'll send you an e-mail about it. Almost two-thirds of our readers enjoy accessing the web version of our newsletter rather than receiving a paper copy! Best wishes.



### 2007 PiRIT Officers

Pictured L-R: Manny Lopez, advisor; Ryan Lewis, Web-Master; Patricia Diute, advisor; Kyle Wright, Treasurer; Michael Margitus, Vice-President; Kate Grzedzicki, President and Justin Talbot, Interim Secretary. Not pictured: Stowe Beecher, Secretary-elect.

### SMS Newsletter Editorial Information:

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To share information for upcoming editions, visit us on the web at [math.rit.edu](http://math.rit.edu) or [stat.rit.edu](http://stat.rit.edu), phone us at 585-475-2498, or email us at [msc1511@rit.edu](mailto:msc1511@rit.edu).

## Calling all Co-ops

Does your company need additional employees during the summer months or for special projects that may take 10 to 20 weeks to complete? That is exactly what our majors can do for you and your company. Whether it is a single or double block co-op (10 or 20 weeks respectively), hiring a mathematics or statistics major can be a win-win situation. Your company's work will be accomplished by a qualified, skilled employee and our majors will receive real-world experience—something for their resumes as well as to assist in paying for their education. If you would like additional information, e-mail Director of Student Services Tiffany Schwanger at [tdpsma@rit.edu](mailto:tdpsma@rit.edu).

## FOUR of JANUARY'S TOP EIGHT PROBLEM LIST

1. Many years ago, an intercollegiate math contest posed the problem of factoring  $x^8 + 98x^4 + 1$ .

Current mathematical software easily solves this problem. So we propose the following generalization. For the expression  $x^8 + cx^4 + 1$ , find a formula which generates all positive, integral values of  $c$  for which this expression is factorable and give the general factors. (*JRM*, due 2/1/08.)

2. A two-pan balance and 16 coins of different weights are given. What is the fewest number of usages of the balance needed to determine the heaviest coin, the second heaviest coin, and the third heaviest coin? (*PME*, due 3/1/08.)

4. Show that if  $P$  is an even perfect number, then there exist positive integers  $a < b < c$  such that  $P = a + b + c$  and  $(a + b)^2 + (a + c)^2 = (b + c)^2$ ; that is,  $(a + b, a + c, b + c)$  is a Pythagorean triple. [A *perfect number* is an integer that is the sum of its proper positive divisors. The first perfect number is 6 and the second is 28.] (*CMJ*, due 2/15/08.)

8. Prove or disprove: every monic polynomial with rational coefficients and real zeros is the characteristic polynomial of a symmetric matrix with rational entries. [A *monic polynomial* is a polynomial  $x^n + a_{n-1}x^{n-1} + \dots + a_1x + a_0$  in which the coefficient of the highest order term is 1.] (*AMM*, due 3/31/08.)

If you have a question, comment, or solution, contact Anurag Agarwal ([axasma@rit.edu](mailto:axasma@rit.edu), 08-3216) or Matt Coppenbarger ([mecmsa@rit.edu](mailto:mecmsa@rit.edu), 08-3234).