School of Mathematical Sciences

2009 Eisenhart Recipient Hossein Shahmohamad

His office walls are lined with pictures of his smiling classes throughout the years, and Hossein Shahmohamad, associate professor and Graduate Programs Director, holds many dear to his heart. His formula for successful teaching is summarized, he says, by passion and respect. "You are here to give every person the quality of teaching they deserve," he says, "I treat my 500th student like my very first student, with the same degree of quality, attention, and care." That passion was recognized by RIT when Shahmohamad was awarded the 2009 Richard and Virginia Eisenhart Award for Excellence in Teaching.

His devotion extends to all his students, not just those with the highest grades. Shahmohamad is no pushover, assigning what he and students alike describe as a great deal of homework. He says this is actually critical for encouraging

their long-term success: "I give a lot of homework, but then they see later why I did. I feel a duty to project upon them that they can and should succeed. Friendship comes in the end."

As a nine year SMS professor, Shahmohamad is quick to sing the praises of his colleagues. "I'm so flattered to have won this award, and there are so many people in this college and school who deserve it as well." In particular, he says that the atmosphere created by former SMS Head and current COS Interim Dean Sophia Maggelakis has been crucial for his success and that of the other faculty. Dean Maggelakis in turn says Shahmohamad helps to create such an atmosphere. "He is a likable, compassionate, and talented teacher who makes his classes fun and enjoyable and is enthusiastic about his teaching and his faculty responsibilities. Hossein does a great job

mixing together hard work and humor, and he makes sure that his students succeed and have a fulfilling educational experience."

Part of Shahmohamad's way with students might be due to his recent status as one himself. He recently earned an MBA from RIT's E. Philip Saunders College of Business. "I think it's great if you have a PhD in science and a Master's degree orthogonal to it. When you combine them, they make you so much stronger."

Clearly not one to rest on his laurels, Shahmohamad feels he can still improve as a teacher. He says smiling, "After winning it [the Eisenhart Award] once, you want to take it [teaching] a notch higher and see if you can achieve that level of excellence again." Congratulations to Dr. Shahmohamad.

Messages to SMS Alumni

Alumni: *Where are you now?*

We would like to begin a new serial article section about YOU! But, in order for us to do so, we need your help. If you are interested in sharing a brief update about what is new in your life, please feel free to send staff assistant Tina Williams an e-mail at tmwbkg@rit.edu to give us an update about life and career changes you've made and your "extra curricular" activities. Please be sure to provide us with current contact information and let us know if you have e-mail, too. When each

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.

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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 Student Support Services Specialist Carrie Koneski at caksma@rit.edu.

New SMS Faculty Members

Nathan Cahill, Ph.D.

Dr. Nathan Cahill joined SMS as Associate Professor. He received a Doctor of Philosophy at Oxford University in engineering science in 2009. His research addresses the use of variational techniques for registration of medical images.

Nate is an RIT alumnus. He graduated in the MS applied math program in 2000. In 1996, he worked at the Eastman Kodak Company as a co-op and, in 1998, joined Kodak and became a senior researcher in the imaging science labs. He is the recipient of numerous patents that address image analysis, 3-D imaging and medical imaging. In 2005, Nate began graduate studies in medical imaging computation at Oxford.

In 2008, Nate married Kathleen Embt, who is also an RIT alumna having earned a B.S. in applied mathematics. Outside of his professional activity Nate enjoys travel, postmodern literature, movies, jazz and classical music.

Linlin Chen, Ph.D.

Dr. Linlin Chen joined SMS as Assistant Professor in 2009. Linlin was awarded her Ph.D. in 2008 from the University of Rochester in statistics. Her research interests include biostatistics and microarray gene expression data analysis. She subsequently received a postdoctoral fellowship for one year at the University of Rochester's cancer center where she worked on a study for cancer patient survival.

Linlin was born in China and studied applied mathematics at the University of Beijing. She then attended Rice University where she earned a masters degree in computer science. Before her studies at the University of Rochester, she worked as a software engineer at Schlumberger Oil.

Linlin enjoys cooking and reading but especially raising her two daughters with her husband, who is a faculty member in computer science at the University of Rochester.

Jobby Jacob, Ph.D.

Dr. Jobby Jacob has joined SMS as Assistant Professor. He received his Ph.D. from Clemson University in graph theory. Jobby's professional interests include discreet math and combinatorics. He also holds two masters degrees in statistics, with an interest in data analysis and in computational mathematics.

Jobby is from Cochin in the state of Kerala in southwest India. He came to the United States in 2003 to study at the University of Kentucky, after earning an MS in computational mathematics at the Indian Institute of Technology. Jobby recently married in May 2009 and his wife Bonnie is finishing her Ph.D. in applied mathematics at Clemson.

Outside of his work in mathematics, Jobby enjoys baseball and his favorite team is the Atlanta Braves.

NASA Outreach Grant Funds Rochester Science Cafe

Mark Noble, Guest Speaker 10/27

The city of Rochester is now home to a Science Café; a free, general audience, monthly science presentation and Q&A session focusing on exciting and current scientific research topics. The series is being co-organized by SMS professors Joshua Faber and Manuela Campanelli, with funding provided by a two-year grant from NASA to support the effort, and David Goldfarb of the University of Rochester's biology department.

The Cafe kicked off on September 22 with a talk by Richard Glor, Assistant Professor of biology at the University of Rochester, on the topic of "Darwin's Five Theories of Evolution." An audience of over 90 people came to the Pittsford Plaza Barnes and Noble to hear the public presentation and participate in a free-ranging discussion afterwards. Rochester's Science Cafe is modeled after similar efforts across the United States and worldwide. They feature the chance for everyone to have face-to-face conversations with practicing scientists, explore some of the most interesting and widely discussed issues in a variety of research fields, and make connections between science and other disciplines.

Future talks will be take place on the fourth Thursday of each month. On November 24, the Cafe will host Philippe Fauchet, Distinguished Professor of Electrical and Computer Engineering at the University of Rochester, as he talks about "Energy for the 21st Century and Beyond." Everyone is welcome not only to attend but to invite friends, family, and anyone else who might be interested in learning about these exciting areas of research and discovery.

SMS faculty, staff and families enjoyed a fall picnic at Powder Mill Park in September.

Here you see the next generation of

mathematicians and statisticians.

And a good time was had by all!

Fundraising Corner

In our last few editions of the Fundraising Corner, we have explored needs in support of student learning, retention, and outreach. In this edition, our focus will shift slightly to examine the support and benefit of establishing a School of Mathematical Sciences Lecture Series.

As professionals, when we see a lecture of career interest, what do we do? We often decide if we want to attend and then determine if our employers might be able to justify and support sending us to the conference in hopes we will bring back to the company valuable information. What if our employer thought the lecture would benefit many people at the organization? It wouldn't make financial sense to send 10 or 15 people to the same conference or lecture. Rather, the employer would explore the possibility of bringing the lecturer to the worksite, hosting a series of talks that would benefit many different groups at the organization. This is one way that organizations can provide on-site educational investment for their workforce, while controlling expenses—creating more "bang for the buck."

It is that type of on-site exposure and "bang for the buck" that we hope to create through our SMS Lecture Series. Only this "bang" would not only expose our faculty to interesting new disciplines but would expose our students to them as well. While you have heard of the growth in the number of our faculty and their diverse research interests, there are still many areas of mathematics, statistics and their applications that would be of great interest to them.

By bringing appropriate experts to the SMS to provide a series of talks to faculty and students over the course of several days, we will provide opportunities for many faculty and students to cultivate interests in new and important mathematical or statistical fields.

The proposed Lecture Series will greatly add to the intellectual climate of the School and will very likely open avenues to important research and collaborations for our faculty and our students.

Our goal is to generate annual funding equivalent to $15,000 per year to host three guest lecturers at the SMS. This funding would subsidize travel, accommodations and a modest honorarium for the lecturers, enabling them to exchange ideas with and expose students and faculty to new opportunities in the mathematical sciences disciplines.

For more information about collaborating with us to ensure this initiative comes to fruition, please feel free to contact Mark Gaul, Senior Director of Development, or Shelly Cicero, Senior Staff Assistant, at mrgdar@rit.edu or msc1511@rit.edu.

CCRG Expands into Data Analysis

The Center for Computational Relativity and Gravitation (CCRG), founded in 2007, has rapidly established a leading place within the field of numerical relativity, with four SMS faculty members who study the evolution of black holes and other astrophysical systems by using supercomputers. Their calculations provide predictions of the forms of gravitational waves, distortions of spacetime travelling at the speed of light, emitted by these systems. Modern gravitational wave detectors, like the LIGO (Laser Interferometer Gravitational-wave Observatory) facilities in Louisiana and Washington state and the Virgo detector near Pisa, Italy, are striving to make the first direct detection of these waves. With the addition of new faculty member John Whelan, the CCRG is now establishing its strength in that detection effort in the field of gravitational wave data analysis. "LIGO and Virgo are the most sensitive gravitational wave detectors ever built," says Whelan, "and with them we have a good chance to detect gravitational waves and open a new window on the universe." Gravitational wave data analysts work to extract faint astrophysical signals from instrumental noise, using a combination of signal models, statistical inference, and detector characterization. If the combined efforts of numerical relativity and data analysis result in a confirmed detection, it will mark the first test of Einstein's general theory of relativity in the strong-field, non-linear regime, possibly confirming the existence of a phenomena predicted almost a century ago.

For more information on this project and other CCRG endeavors, check out http://ccrg.rit.edu.

SMS Events

Combinatorics Conference:

RIT hosted 23rd Midwest Conference on Combinatorics, Cryptography, and Computing on October 3-4, 2009.

Organizers of the conference were Drs. Hossein Shahmohamad, Darren Narayan, Anurag Agarwal, and Jobby Jacob of RIT and Dr. Ebrahim Salehi of UNLV. There were more than 80 attendees from all over the world that visited RIT for this international conference. The invited speakers were Profs. Derek Corneil of University of Toronto, Jeff Dinitz of University of Vermont, Sergi Elizalde of Dartmouth College, Curt Lindner of Auburn University, Chris Rodger of Auburn University, and Douglas West of University of Illinois. A specific volume of the Journal of Combinatorial Mathematics and Combinatorial Computing (JCMCC) will be set aside for papers based on the conference talks.

Faculty/Alumni/Staff Finger Lakes Wine Tour 10/19

Annual PiRIT Student Pumpkin Carving Contest 10/30
"The Pumpkin Surgery"

NYCAM Conference:

RIT hosted the first New York Conference on Applied Mathematics on Saturday October 17, 2009. Organizers of the conference were Drs. Bernard Brooks, Anthony Harkin and Jerry Yang of RIT, Drs. Jae-Hun Jung of SUNY Buffalo, Herb Kunze of University of Guelph, Robert McCann of University of Toronto, Uday Banerjee of Syracuse University, and Alexander Vladimirsky of Cornell University. The keynote speakers of the conference were Profs. Jacques Dumais, Department of Organismic and Evolutionary Biology, Harvard University and Weiqing Ren, Courant Institute of Mathematical Sciences, New York University. More than 70 attendees visited RIT for this conference.

Advancing Wound Care Using Mathematics

Wound healing involves a well-orchestrated and complex process that leads to repair of injured tissues. Under normal circumstances wound healing occurs in three phases: inflammation , when platelets make clots to stop bleeding , a variety of white blood cells go to work to destroy foreign agents and generate growth factors needed for repair; proliferation, when new blood vessels form and when cells produce a bed, called the extracellular matrix, on which the repair occurs; and remodeling, which occurs after closure of the wound, the repaired wound site gains strength and the normal function of injured tissue returns.

Although the phases involved in normal wound healing overlap, they occur in a timely manner and are tightly regulated. A wound in which one of the above phases has been disrupted will not heal normally and may be infected. These types of wounds are said to be chronic due to the underlying physiological problems associated with their development. Chronic wounds represent a major health problem affecting about 6.5 million people in the United States.

The complicated process of wound healing needs to be better understood. Mathematical models, like those being developed by Dr. Ephraim Agyingi, can shed some light into understanding the biological mechanisms involved with the hope that they will lead to improvements in wound care. These models will provide guidance in developing treatment therapies that accelerate the healing rate of the wound. A model also reduces the need for guesswork and in doing so provides very useful information whether and when a normal wound will become chronic.

Our work is primarily focused on skin wounds such as burns or cuts. Skin is the largest organ of the body whose main function is to serve as a protective barrier. Rapidly closing and repairing any injury of the skin is very important. We use systems of partial differential equations to model normal and infected skin wounds. The model captures the production of growth factors, regeneration of blood vessels, and the supply of oxygen in the wounded area for normal wounds. The effect of bacteria is incorporated to investigate whether the wound will become chronic. The resulting system of equations is solved numerically. Simulations of the model are as expected for normal wounds and do go further to suggest a possible therapy for accelerating the healing process of the wound. Simulations for wounds containing bacteria clearly distinguished whether a wound is infected (chronic). Further work to investigate when the wound becomes infected is on-going. Results of this work have been presented at national and international meetings and have also been submitted for publication.