

multicast

UNIVERSITY OF ROCHESTER **COMPUTER SCIENCE DEPARTMENT** NEWSLETTER

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Kautz Brings Commonsense Reasoning to UR

This fall our department welcomes Henry Kautz back to URCS. As a Ph.D. alumnus from 1987, Henry is a familiar face to some of our long-time faculty and staff. Since Henry received his degree in the '80s, however, he has been making a name for himself throughout the A.I. research community. To help us all get a better understanding of Henry and his work, our *Multicast* editor interviewed Henry recently about his move to Rochester.

Editor: Your work in assisted cognition intersects with disciplines in the Medical Center, the School of Engineering and throughout River Campus. Was the favorable interdisciplinary environment at UR one of the attractions in returning to UR?

HK: Yes: I was very attracted to the interdisciplinary environment at UR, and particularly the fact that there was already a great deal of interest and support at the university for connecting computer science with the caregiving side of medicine, as exemplified by the UR Center for Future Health.

Editor: What has sparked your interest in computers and accessibility?

HK: My father came down with early onset Alzheimer's in his late 50s. He was able to live at home for over a decade with my mother, because she helped prompt him through activities of daily living. It occurred to me that if some of this kind of routine

(See Kautz, page 7)

Henry Kautz joined the faculty of the Department of Computer Science at the University of Rochester this fall, after a career as a professor at the University of Washington and a research scientist and department head at AT&T Bell Laboratories. His contributions to artificial intelligence include:

- Fundamental results on the complexity of temporal and nonmonotonic reasoning;
- Fast stochastic search algorithms for solving constraint satisfaction problems;
- Methods for speeding up inference by knowledge compilation;
- The planning as satisfiability framework, the best known method for optimal deterministic planning, as shown in the 2004 and 2006 International Planning Competitions;
- Statistical-relational methods for learning patterns of human behavior;
- The Assisted Cognition Project, which is combining work in AI, human-computer interaction, sensing, and ubiquitous computing to create assistive technology for persons with cognitive disabilities.

Dr. Kautz is a recipient of the Computers and Thought Award from the International Joint Conference on Artificial Intelligence and a Fellow of the American Association for Artificial Intelligence. His academic degrees include an A.B. in mathematics from Cornell University, an M.A. in creative writing from the Johns Hopkins University, an M.Sc. in Computer Science from the University of Toronto, and a Ph.D. in computer science from the University of Rochester.



Awards and Promotions

Michael Scott and John Mellor-Crummey (Ph.D. '90) have received the Edsger W. Dijkstra Prize in Distributed Computing for their 1991 paper "Algorithms for scalable synchronization on shared-memory multiprocessors." Scott and Mellor-Crummey received the Dijkstra Prize at the 25th Annual Association for Computing Machinery (ACM) Symposium on Principles of Distributed Computing, held July 23-26 in Denver. The Dijkstra Prize is the highest recognition given by the distributed systems theory community.

Sandhya Dwarkadas has been promoted to Professor of Computer Science and of Electrical and Computer Engineering.

Robbie Jacobs & graduate student Manu Chhabra won the best paper award in the area of computational models of perception and action at the Conference of the

Cognitive Science Society (\$1000 prize). The title of the paper is "Properties of Synergies Arising From a Theory of Optimal Motor Behavior."

D. Albonese, G. P. Semeraro, **G. Magklis, M. L. Scott, R. Balasubramonian, and S. Dwarkadas.** were awarded US patent #7,089,443 for multiple clock domain microprocessors issued August 2006.

Daniel Gildea has received a National Science Foundation Faculty Early Career Development grant for his work in Semantics for Statistical Machine Translation.

Bill Scherer and Michael Scott received Most Popular Poster Presentation award at PODC'05 for their poster on probabilistic contention management for software transactional memory.

Chen Ding has been promoted to Associate Professor of Computer Science.

Wendi Heinzelman was promoted to Associate Professor of Electrical and Computer Engineering and of Computer Science.

Calin Cascaval, Evelyn Duesterwald, and **Sandhya Dwarkadas**, colleagues at IBM, were awarded a patent for "Mechanism for on-line prediction of future performance measurements in a computer system", U.S. patent 7,072,805, issued July 2006.

Mitsu Ogihara has been granted a patent for "Music feature extraction using wavelet coefficient histograms" with co-inventors Tao Li and Qi Li.

Chen Ding gave an invited talk at the Living Computation and Evolvable Software Conference sponsored by CISCO Systems in July, 2006.

Recent Ph.D. Theses

Xue Gu

Towers Perrin

An Equilibrium Point Based Humanoids Control Model

Anthanasios Papathanasiou

Intel Corporation

Power Efficiency throu I/O Access Pattern Reshaping

William N. Scherer III

Rice University

Synchronization and Concurrency in User-Level Software Systems

Jonathan M. Shaw

Shaw Technologies, Inc.

Unifying Perception and Curiosity

Weilie Yi

Microsoft

Modeling Sequential Natural Behavior Based on Visual Routines

Laura Sanchis Passes at 49

Laura Sanchis, (Ph.D. '89) died Sunday, April 9th after a long illness. Laura was Professor of Computer Science at Colgate University at the time of her death. She was a dedicated scholar, specializing in the fields of computer science and mathematics. Her research centered on theoretical computer science, algorithms, and compiler design. Over the years she published articles in eminent journals, such as Discrete Mathematics, Mathematical Systems Theory, Theoretical Computer Science, The Journal of Graph Theory, and the DIMACS Series in Discrete Mathematics. As a graduate student at Rochester, Prof. Chris Brown remembered Laura as "one of our all-time smartest students." He recalls giving her a project on color vision and pointing her to what he thought was the best text (by a very well known author). She convinced him that about 20 pages of the book and the whole theory he wanted her to use were absolutely wrong!



At Colgate, Laura was Ashwin Lall's (now a URCS 4th year grad student) high honors thesis advisor. His thesis was based on a theorem of Mitsu Ogihara's. She greatly encouraged Ashwin to apply to Rochester to pursue a Ph.D. in theory. He and fellow Colgate alumni were very saddened by her death and are currently working to get an award named for Prof. Sanchis at Colgate. For more information about her career at Colgate go to http://www.colgatealumni.org/cgi-any/newspages.dll/pages?record=1031&bid=&nfid=&htmlfile=newspages3_alumni.htm.

Ballard Takes Detour to Texas



Still in racing form, Dana crosses the finish line in URCS's first ever race 9/2005.

Dana Ballard and his wife, Mary Hayhoe, have been planning to retire to the Bahamas for many years. With a home under construction on that tropical island, it seemed only a matter of time before they would be leaving Rochester. But this summer, Dana & Mary packed up their Virtual Reality lab equipment, several students and staff members, and headed to the University of Texas, Austin. What prompted such an abrupt detour in their plans? Perhaps it was the incentives they were given by UTA, or the hope for a warmer winter. Dana has always been full of surprises so we may never know. We'll sure miss his shoot-from-the-hip style, his story telling and infectious laugh, as well as his academic contributions over 31 years at Rochester.

URCS Research Highlight: Scalable Synchronization

Michael Scott never meant to become an expert on synchronization. It just sort of happened by accident. Scott, now the senior member of Rochester's Systems faculty, was attending ASPLOS III (the ACM Conference on Architectural Support for Programming Languages and Operating Systems) in 1989 when he met up with John Mellor-Crummey, a recent URCS alum who had joined the faculty at Rice University. Though the two had never written a paper together, they had been friends at Rochester, and sat together at the conference. Partway through the first day, a team from Wisconsin presented a new hardware mechanism for low-latency synchronization. John and Michael immediately realized that a similar mechanism could be built in software. By the end of the talk they had devised the first version of what is now known as the MCS queue-based spin lock. They presented the lock at ASPLOS IV and in a 1991 article in ACM TOCS (Transactions on Computer Systems). The TOCS paper included a wide-ranging survey of new and existing lock and barrier algorithms, together with a detailed analysis of their performance and recommendations for users of various kinds of machines. Fifteen years later, the paper is still required reading in operating systems courses around the world. This past summer it earned John and Michael the 2006 Edsger W. Dijkstra Prize in Distributed Computing, the highest honor conferred by the distributed systems theory community.

In any concurrent system, whether physically parallel or timesliced, synchronization serves to constrain the possible interleavings of operations in different threads of control, to preclude erroneous cases. The most basic form of synchronization, codified by Dijkstra in 1965, is *mutual exclusion*, in which only one thread at a time is permitted to execute some *critical section* of code. Traditionally, mutual exclusion has been achieved by means of locks:

```
acquire lock L
  perform critical work protected by L
release lock L
```

Prior to the late 1980s, all known locks for multiprocessors suffered from *contention*: a processor attempting to acquire a lock would impose memory or network load that slowed down other processors, including the one trying to complete its critical work and release the lock. The MCS lock was the first practical algorithm to eliminate this contention. It is widely used in operating systems and library packages for both commercial and research systems.

In their original work on scalable synchronization, John and Michael produced a series of four papers. John's focus then shifted to compilation for parallel machines. Michael continued to work on synchronization part-time. With Tom LeBlanc, Brian Marsh, and other members of

the Psyche operating system project, he explored the implementation of synchronization in the operating system. With Leonidas Kontothanassis (now at Intel) and Bob Wisniewski (at IBM Research) he explored the interaction of scheduling and queue-based locks. With Maged Michael (also at IBM Research) he explored the implementation of atomic instructions and the design of nonblocking data structures: their nonblocking M&S queue is the fastest known concurrent queue algorithm; among other places, it appears in the Java standard library.

Several times over the years, Michael has suspected that synchronization might be a "solved problem," but new topics have continued to emerge. In recent years he and his students have turned their attention to three topics in particular. First, in collaboration with Bill Scherer (now on faculty at Rice University) and Bijun He (now at Google), he has extended queue-based locks to accommodate timeout and to tolerate preemption. This work, which received the Best Paper award at the 2005 International Conference on High-Performance Computing, allows a thread to "get out of line" if it waits too long, or if the operating system decides to use the processor for another purpose. Second, in collaboration with Bill Scherer and Doug Lea (Professor of Computer Science at SUNY Oswego), Michael has developed so-called *dual data structures*, which extend traditional nonblocking techniques to accommodate condition synchronization. A *synchronous queue*, for example, stalls both producers and consumers until a communication partner arrives. New SynchronousQueue and Exchanger classes based on this work have been adopted for inclusion in the Java 6 standard library. The SynchronousQueue in particular improves the throughput of the Executor mechanism (the heart of thread management in Java) by a decimal order of magnitude. A paper on this work took the Best Student Paper award at PPOPP 2006 (the ACM Conference on Principles and Practice of Parallel Programming).

Finally, and perhaps most exciting, Michael is working with Bill Scherer, with URCS colleague Sandhya Dwarkadas, and with current students Virendra Marathe, Mike Spear, Arrvindh Shriraman, Vinod Sivasankaran, and Hemayet Hossain on topics in *transactional memory*. (Several recent URCS BS alumni, including Chris Heriot, David Eisenstat, and Athul Acharya have also been involved.)

Transactional memory avoids most of the complexity and pitfalls of programming with locks. Superficially it is similar to the code above:

```
begin transaction
  perform atomic work
end transaction
```

The difference is that the programmer does not have to figure out which data is protected by which lock. Moreover

the underlying system executes transactions in different threads concurrently whenever it can. Transactions eliminate a variety of traditional problems with locks, including deadlock, missing or incorrect locking, priority inversion, convoying, and performance loss due to preemption. As shown in **Figure 1**, they can even improve performance.

Originally proposed by Herlihy and Moss in 1993, transactional memory has become a very hot topic in recent

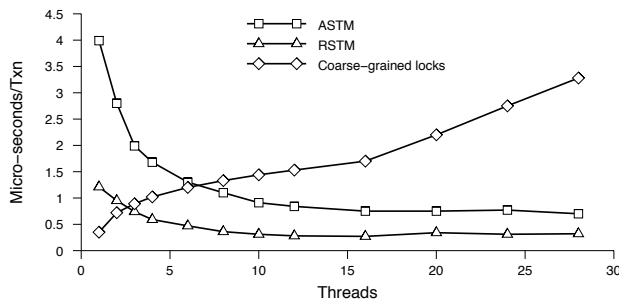


Figure 1. Synchronization cost for operations on a simple hash table. RSTM is Rochester's open-source Software Transactional Memory system. Its overhead is dramatically lower than that of previous-generation systems, of which ASTM is a leading example. Naïve locking is lower yet when only one or two threads are using the table, but RSTM gets better with higher levels of concurrency, while naïve locking gets worse.

years due to hardware and software breakthroughs and to the rise of multithreaded and multicore processor chips.

For decades, interest in parallelism and concurrency was limited mainly to researchers in scientific computing and operating systems. This began to change in the 1990s with the proliferation of multiprocessor servers for web sites. It is about to explode into the mainstream: the architectural techniques that fueled a million-fold increase in processing power since the advent of the microprocessor have reached the point of diminishing returns. All the major vendors are moving to multithreaded and multicore chips, which make parallelism explicit. As a result, every programmer on the planet will soon be facing issues that once plagued only the limited high end, and transactional memory is the most promising technology to deal with the complexity.

The URCS synchronization group is exploring a variety of topics in transactional memory, including conflict detection, contention management, formal semantics, performance enhancement, and hardware support. Their RSTM implementation of software transactional memory was recently released to the Open Source community, and work in transactional memory was the centerpiece of a recent half-million dollar award to Professors Scott and Dwarkadas from the National Science Foundation. Other support for the synchronization group has come from IBM, Sun, and Intel. Further information can be found at www.cs.rochester.edu/research/synchronization.

Rochester to host NAACL in April, 2007

The Human Language Technologies Annual Conference of the North American Association for Computational Linguistics (NAACL-HLT 07) will be held in Rochester, NY, from April 22-28, 2007. It will be hosted by the University of Rochester and held at the Hyatt Regency in downtown Rochester. For more information, please go to the website <http://www.cs.rochester.edu/meetings/hlt-naacl07/>.



UR Connection at NAACL '06 - L-R Marc Vilain, Diane Litman (PhD alumna, now at U. of Pittsburgh), Mary Swift (research scientist), Matt Post (grad student), Jenine Turner (UG alum, now at Brown), Hao Zhang (grad student) , David McClosky & Micha Elsner (both UG alums, now at Brown), Dan Gildea (faculty), Amanda Stent (at SUNY Stony Brook) & Joel Tetreault (at U. of Pittsburgh) (both Ph.D. alums).

Graduate Alumni News and Notes

Balasubramonian, Rajeev (Ph.D.'04) – “I received an NSF CAREER award for a proposal titled ‘Exploring Heterogeneity within Chip Multiprocessors’.”

Blaylock, Nathan (Ph.D. '06) – has returned to the US from Germany (Saarland Univeristy) and is now working for Cycorp in Austin, TX.

Boutell, Matt (Ph.D.'05) – “We have enjoyed the transition to Indiana. Rose-Hulman is full of lots of top-notch students who make teaching seem easy. “

Chambers, Nate (B.S. '02, M.S. '03) –Nate is moving away from hurricane-prone Pensacola, Florida to earthquake-prone Palo Alto, CA where he was accepted into Stanford’s Computer Science Ph.D. program. He plans to continue studying natural language processing.

Ciaraldi, Mike (M.S.'90) – “I’m still Professor of Practice in CS at WPI. I’m also now involved in the new Robotics Engineering major being developed. I just had my sixth play produced on campus (April, 2006) and the first production of one of my plays in Boston (January, 2006).”

Cottrell, Gary (Ph.D. '85) – “We got a new puppy! His name is Wally and he is a second generation Hurricane Katrina rescue dog. There are lots of puppies in New Orleans area that are being shipped out to where other shelters can put them up for adoption.”

Crowl, Lawrence (Ph.D. '91) – has moved from Sun Microsystems to Google in CA.

Denber, Michele (Ph.D. '80) – “I still split my time mostly between Rochester and Florida with my partner Raine and our German Shepherd Foofie. I’ve been occupying myself working on my program to do automatic futures trading on the net, and being thankful for the skills I acquired in the department that enable me to do that :-). I’m also toying with the idea of getting my seaplane rating, and wanting to fly a P-51 while I still can. Last year I got a ride in a B-17 - that was amazing :-).”

Dominguez, Melissa (Ph.D. '03) – “ I’m now living in the Chicago area, and I’ve started my own company (DBK Acoustics) currently contracting for GNResound/Beltone, a hearing aid company. I got married last fall. Life’s going really well. We bought a townhouse and we’ve been enjoying getting it into shape.”

Fanty, Mark (Ph.D. '88) – “I am now Director, Network ASR Core Technology, at Nuance Communications, Inc. I’ve not changed companies in 9 years, really, but first SpeechWorks was bought by ScanSoft, then ScanSoft

bought Nuance and decided to use the name.”

Garg, Rajeev (M.S. '05) – is working at Intel in Folsom, CA.

Gertner, Ilya (Ph.D. '80) – “I am ‘moving up’ and will be working for the space agency, The Aerospace Corporation, starting on July 15th. Although I am beginning to see people classified as ‘unaffiliated or retired,’ I like my work and could help out new graduates (US citizens) who are interested in a career in the Department of Defense. “

Han, Yenjo (Ph.D. '94) – is director of Dasan Networks, Inc. in Seoul, South Korea.

Luciw, William (M.S. '89) – William is Managing Director at Viewpoint West Partners LLC, a technology advisory company and bespoke consultancy. Viewpoint West Partners LLC is currently launching Media Mob TV, Inc. and William is managing this process.

Meira, Wagner (Ph.D. '98) – “I received an IBM Faculty Award last year. I also became the chair of the Center for High Performance Visualization that IBM opened at UFMG. Finally, I have two kids, Gabriel, who is 4, and Marina, who is 1 year old.”

Mellor-Crummey, John (Ph.D. '90) – “Michael Scott and I are co-recipients of the 2006 Edsger W. Dijkstra Prize in Distributed Computing for our paper ‘Algorithms for scalable synchronization on shared-memory multiprocessors’ (ACM Transactions on Computer Systems, 9(1), 1991). “ (see Page 2).

Potter, Robert (M.S. '89) – “My wife Susan, my 2 boys Jackson and Max, and I have settled in the Syracuse area. Susan is teaching accounting and I have been a full-time house-husband while we are settling in. I’ll be looking for a job in the fall. Living in Phoenix was fun, but I’m glad to be back in a temperate climate with actual seasons!”

Rao, Raj (Ph.D. '98) – “On the academic front, I’ve been promoted to Associate Professor. On the personal front, my wife Anu and I have been promoted to parents of a rapid crawling machine named Anika, who will turn one year old in July.”

Sanchis, Laura (Ph.D.'89) – Professor of Computer Science at Colgate University; passed away April 9, 2006. (See Page 3)

Slayden Mitchell, April (M.S. '03) – “I got married on New Year’s Eve to Jeff Mitchell and my full name is now April Slayden Mitchell. I’m still at HP Labs.”

(see Grads, page 15)

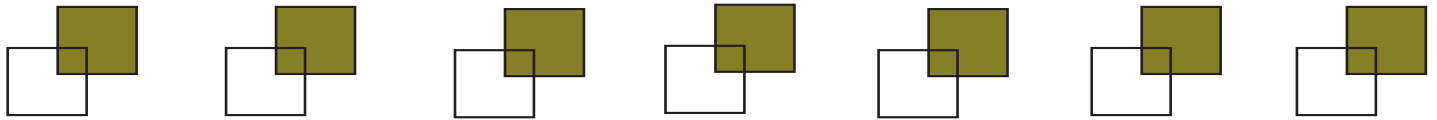
Please send graduate updates to Peg Meeker at meeker@cs.rochester.edu

(Kautz, from page 1)

prompting could be automated, it could benefit both people with cognitive decline and their family caregivers, who are often exhausted from needing to be attentive to the disabled person 24 hours a day.

Since my days as a graduate student I have been intrigued by the idea of AI systems that could understand human behavior and communicate with people. Furthermore, around this time I started talking with scientists at Intel Research who were developing various kinds of wearable and wireless sensors that could be used for detecting low-level behavior, such as moving and touching objects. I started the Assisted Cognition Project to support the interdisciplinary effort that would be necessary to bring all these areas together: AI, human computer interaction, sensing, and medical care-giving.

Editor: You have spent parts of your career in both academia and industry and have achieved productive results in both areas.



This current appointment will combine them both with a joint appointment at URCS and Kodak. How is this blended relationship going to be advantageous to you, URCS and Kodak? What are you hoping to achieve with this alliance?

HK: I am very excited to be working with both URCS and Kodak. UR has a strong reputation for work in AI and cognitive science. Kodak will be growing a world-class research department in these same areas in order develop new ways to help people organize and access the images, videos, and other digital data that tell the stories of their lives.

The joint appointment will be a win for everyone. Part of my work will be to help Kodak access the broad range and depth of expertise in computing and cognitive science across the university. This will allow the Kodak research group to sharply focus on the specific people and projects that need to be kept in-house. The university will benefit by opportunities for internships and jobs for our students, sponsored research projects for our faculty, and by using the partnership with Kodak to raise our national visibility. For example, one project I would like to get going is to organize an international conference on digital life capture to be held at UR and sponsored by Kodak.

Personally, I will benefit because I find the best ideas for basic research when working on real-world problems, and there are many deep technical connections between my research on human behavior understanding and the practical problems of organizing a person's digital life data. Finally, photography and filmmaking are my main hobbies – so my work at Kodak will bring together my vocation and avocation.

Editor: Where do you see assisted technologies in 10 years? How will this benefit the aging baby boomers and their caregivers?

HK: The biggest impact of assistive technology in 10 years will be to enable many people to “age in place” – that is, to delay entering a nursing home or other restrictive facilities where they lose all independence. The technology will be deployed both in ordinary homes and in the new kinds of mixed-age assisted living communities that are now being built around the country.

The advantages to the aging baby boomers include independence, safety, and – by using the technology we are developing to support the use of public transit – access to places in their community – such as friends, work and volunteer opportunities, and familiar stores and parks.

The advantage to family caregivers will be to decrease their level of stress and worry. Many family members often have health problems of their own that are aggravated by the stress of constant care-giving. For example, a person who cares for a spouse with Alzheimer's is more likely to die first!

Editor: You will be relocating your family to Rochester. What are you looking forward to doing in your free time in the Western NY area? What will you miss the most about leaving the Northwest?

HK: All of my relatives are in upstate NY, so I am looking forward to spending time with them and having my children grow up with strong relationships with their cousins, aunts and uncles, and grandparents.

I'm also looking forward to having my children in great schools (in Brighton). Few people outside of Washington State realize it has one of the worst-funded public school systems in the country. Class sizes are double what they are in upstate NY, and many qualified students are not allowed to take advanced math, science, or English courses, because there is not enough room. I'll miss the view of mountains in Seattle ... and the weather. I've gotten used to cool, misty weather year round: having seasons will be a bit of a shock.

Editor: There are many different research topics you have worked on throughout the years. Is there one common thread that ties them all together? Do you have a favorite project (past, present or future)? Why is it your favorite?

HK: My favorite project is always my most current, so that would be the work on assisted cognition. It is also the broadest, and has gotten me to spend time talking with a lot of people I would not have met otherwise. The common thread of my work is efficient commonsense reasoning: how to formally model both the physical and social worlds, and quickly derive interesting conclusions.



Crovella Prioritizes Teaching and Research



Mark Crovella, '94
Prof. of Computer Science
Boston University

Mark Crovella received his Ph.D. from Rochester in 1994, and is currently a faculty member at Boston University. As our featured graduate alumni, we recently interviewed him for Multicast:

Editor: Your work since leaving UR has been a combination of academic research/teaching and entrepreneurship/industry consulting. Why are you active in both? How do you

feel they influence each other? Do you have a favorite?

MC: I graduated from UR in 1994. George Ferguson and myself and a couple others had just started putting up the very first department Web pages. In moving to BU it was natural for my research interests to shift toward the Web and the Internet.

But being involved with Internet research almost unavoidably meant being involved with startups. I remember hearing in 1996 that some of my peers were leaving their positions for Internet startups. It seemed like a risky thing to do at the time. But by 1999 it seemed that all my colleagues had a startup on their CV. It almost seemed like a mandatory career component. And a lot of people were really enjoying the challenges and satisfactions of building products and businesses.

My entrepreneurship has always been very small-scale. Azer Bestavros and I took some ideas for Web server design that we had researched in the lab, filed for a patent, and started a company. I still have a CD holding the product's first commercial version on my wall. Pretty soon we learned that there are lots of surprises in the business world – like the fact that if Microsoft announces a competing product, you're pretty much out of luck. Our company almost disappeared, but in the end we were purchased by a slightly larger company. I went to work for them, to help them develop our product. A few months later they were purchased by a pretty big company -- Network Appliance. So for a while I was an employee of NetApp. In about a year I got to be part of companies with 3, 50, and 1000+ employees.

That was exciting, and I learned a lot, but above all I learned that I really love teaching and research much more than being in the business world. It boils down to two things: the incredible intellectual freedom that one has as an academic, and the satisfaction that one gets as a teacher.

Editor: You had the opportunity to spend a year in France. Did the whole family go? How was that experience?

MC: Before 1996 I had never been outside the US (unless you count Canada, which when you grow up in Buffalo, doesn't seem to be another country). When I got the chance to take a sabbatical, I didn't think it would be practical to go abroad, mostly because my daughter was entering 9th grade and we didn't think she'd want to move. But when we said "How about living in Paris?" she changed her mind. So we went, thanks in part to grants from CNRS and Sprint Labs.

Professionally, the sabbatical was everything one would hope for. Personally, I think the greatest impact was on my daughter. In Paris her classmates were from many different places -- Croatia, Japan, South Africa, etc. Her eyes were opened to the world as a whole and she came back with a completely different perspective. In fact, she just returned from another half-year in France on an exchange program. She went to French lycee and now speaks really excellent French.

Editor: How does your thesis work relate to your current research work?

MC: It's the same thing I tell my students: what you learn as a PhD student is a way of thinking, a taste for problems, and a large set of scientific skills. I was lucky enough to get a terrific grounding in those things at UR. While my thesis was in parallel processing, pretty soon after coming to BU I was focused almost exclusively on networking. In fact my first NSF grant was for work in parallel processing, and a year or so in I felt that I should call my program officer. I told her that I was mainly working in networking and asked if it was OK if I didn't focus so much on the parallel processing side. She was terrific, very supportive, and said that was fine.

But broadly speaking, the shift hasn't been that great. My thesis work was on measurement and modeling of parallel systems. Often, what I do now is still measurement and modeling, but it's applied to the Internet rather than parallel processors.

Editor: Your paper "Self-Similarity in World Wide Web Traffic" is described as one of the most cited papers by CiteSeer. To what do you attribute its popularity?

MC: Sometimes you just get lucky! What our paper did was connect phenomena in two apparently different worlds: computer networking and file systems. At the time the unusual statistical property of "self-similarity" in network traffic was getting a lot of attention. We happened to have data from measuring Web surfers that allowed us to show how the properties of Web pages (and

(Crovella, from page 8)

files generally) could explain where self-similarity came from. It provided a satisfying solution to the mystery of how this property arose. And to support this explanation we were lucky enough to have the right data, in the right place at the right time.

Editor: You co-authored a book published in 2006, and will attain the level of full professor in Sept 2006. How do you balance teaching, research, writing, consulting & family life? You are a very busy guy!

MC: Well, I have to say I was very glad when the book was done. I have an even greater respect than before for successful book authors. It will be a while before I take on something like that again.

I'm not sure it's a good thing, but the main way I find to balance family with work is to fit things in where I have time. One of a professor's most important skills is the ability to shift one's attention quickly from one topic to another. So I fit a lot of work in after the kids go to sleep, and before the family wakes up, and so on. Sometimes I will get something done using only 5 or 10 minutes that I have between family activities. It's hectic at times but it seems to work.

Editor: What do you do for fun and relaxation?

MC: I still play hockey, just like I did with the department when I was there. Although some would dispute that what I am doing really constitutes playing hockey. I ski and I play tennis and I run. Every year I dream about running the Boston Marathon. Maybe next year.

Living in Boston it's hard not to be infected with the insanity that is called Red Sox baseball. My office is a couple blocks from Fenway and I try to sneak over there for a game when I can. As I am writing this they are playing a double header against the Yankees. You can feel the electricity in the air.

Editor: Your advisor, Tom LeBlanc, is now provost at the University of Miami. Do you have any aspirations for academic administration?

MC: Well, I would never say never, but for now I'm happy to experience that vicariously through Tom. It's hard to imagine giving up the satisfactions of research and teaching at this point.

Editor: What was the best thing that your UR experience prepared you for in work or life?

MC: How to get up quickly after being tripped in a hockey game. Seriously, my PhD experience taught me so many lessons and brought so many skills, tangible and intangible, that it's hard to answer. One thing that I didn't expect to learn was that even the most famous researchers are people, and that the pursuit of science is a very social

endeavor. I learned to treat my colleagues as friends as well as competitors or collaborators. This is a lesson that was learned by absorbing the atmosphere at UR, and it has been incredibly important to me in my career.

Editor: What's it like to be in the Boston area, with all the universities and the industries that have developed from their research?

MC: I have a feeling of there being a lot of history around me here. When I was at UR I read "The Soul of a New Machine" which is a great story about an intense technology race between Data General and Digital Equipment Corporation, two famous Boston companies. All the companies in that story are now gone, but you think about it when you drive on Route 128. I have a similar feeling when I visit BBN, where the first Internet nodes were built.

The cluster of universities in Boston makes for a very rich intellectual environment. Between MIT, BU, and Harvard (all within a 5-minute bike ride of each other) there are probably a couple of lectures every day that I'd like to attend. There are probably a dozen people within walking distance that I'd like to collaborate with.

Editor: How will the technology in your field of research evolve in the next 10 years? How will your work impact that?

MC: If I could answer that question really well, I could be a very successful researcher. In my own corner of networking sometimes I feel we are playing "catch-up" with the innovators who come from left field. The Web was invented at a physics lab, after which we computer scientists jumped in and did all kinds of research (including my own). Then a student in a dorm room invented Napster, after which computer scientists rushed into the world of peer-to-peer services. With that kind of track record it's hard to guess what the next big thing will be, let alone where it will come from.

It's pretty clear that networking will increasingly shift to mobile, wireless users. Right now I am wondering what sorts of applications will arise when everyone has wireless devices with them all the time. Networks that are not based on the Internet, and that may spring into existence just to enable a single application, could be a coming evolutionary stage.

Editor: Are you in touch with any UR alums from your class? Do you collaborate with anyone from UR?

MC: The friendships that I formed at UR have been some of the longest-lasting for me. I am touch with about 5 or 6 UR alums on a regular basis. I am constantly thinking about how to facilitate the same kinds of connections between my students and their peers here at BU and elsewhere. And to collaborate with a UR alum would be a real treat. Maybe next year!

Life after College - Undergraduate Updates

Arora, Tarun '00 – "I finished my 1st year at the Kellogg School of Management (Northwestern U.) and spent the summer consulting with BCG (Boston Consulting Group) Singapore."

Berlin, Dan '01 – married Melissa Kucinski on June 3rd at The University of Rochester Interfaith Chapel. Dan received his J.D. from the George Washington University School of Law in 2004. He worked for IBM Research in Yorktown Heights, NY for two years on compilers and currently works for Google in Washington, D.C. on licensing, copyrights, and engineering.

Bhopale, Seema '04 – "I am now about 2 years along in my Ph.D. program and planning to take my oral qualifying exams at the end of this year. I have finished all required courses and I am proud to report that my computer science experience is taking me far as I have been able to do the analysis and programming for a collaborative prostate cancer research project being funded by the NCI Mouse Models for Human Cancers Consortium and the NCI NanoSystems Biology Cancer Center. I'm engaged to a fellow grad student, and I still find time to take an African dance class once a week."

Bulatewicz, Tom '01 – Tom received his Ph.D. from the University of Oregon in June. His thesis title was "Support for model coupling: An interface-based approach".

Burke, Andrew '03 – "I'm currently working as a Tools Developer at Insomniac Games, Inc. in Los Angeles."

Carlberg, Jason '03 – "I've been continuing my work as a Software Development Engineer II at CSG Systems, Inc. here in Omaha. We're currently busy developing the next generation of Cable and Telephony billing software for several major broadband service providers, including Comcast, Echostar and Time Warner."

Chambers, Nate '02, MS '03 – Nate is moving away from hurricane-prone Pensacola, FL to earthquake-prone Palo Alto, CA where he was accepted into Stanford's Computer Science PhD program. He plans to continue studying natural language processing.

Clever, Jacob '03 – "I completed the 3 year Operations Leadership Development Program at BAE Systems in Nashua, NH. Upon graduating I accepted a position as a Quality Assurance Engineer and I am continuing my part-time work in the MBA program at Bentley College. I still live in Nashua, NH with my wife Karen (UR class of '04) and my 19 month old son Owen."

Dahlgren, Jeremy '02 – "I'm getting married on August 26th. I am still working for TextWise LLC here in Rochester. I was promoted to Senior Software Engineer in February. I also have purchased a house."

Fischer, Luke '03 – "I am currently attending the Simon School part-time for my MBA and expect to graduate in 2007. I received a promotion in the Registrar's Office at UR. We are currently launching several new student applications for the UR including a major/minor/cluster search engine and online degree audits."

Forney, Zeb '02 – "I just received my MBA from the Krannert Business School at Purdue. I started a job in mid-July with a small company called Simulex, Inc. They're based in West Lafayette, IN."

Frankel-Goldwater, Lee '06 – "I am currently working with the Student Conservation Association on the Zuni Indian Reservation in New Mexico collecting data to help prevent destructive wildfires."

Frueh, Andrew '03 – "I'm getting married to Karen Copeland (ESM '03) this January in Atlanta, GA. I am beginning work on my thesis project for my computer animation MFA from RIT. I have also been working as Creative Lead / Multimedia Developer for Second Ave."



*Flashback - Fall '97
Annual Picnic*

*Front Row:
Aaron Gerega, Craig
Harman,
Josh Blumberg*

*Back Row:
Alex Rau
Mike Leselrod
Jonah Inikori
Josh Pincus
Mac McCauley*

Software in Pittsford, NY.”

George, Michael '03 – “I’m still at Cornell, working on my Ph.D. I’m focusing on programming languages, and I’m teaching a course this summer.”

Gerega, Aaron '99 – “I’m currently on an overseas assignment (Lockheed Martin) working with a partner company in Rome. Kelly (wife) and I will be here until December '07 assuming everything goes as planned. We’d be happy to hear from anybody who’s in the neighborhood.”

Heavey, Brendan '02 – “I’m still in Buffalo doing database stuff for a cardiology research lab and in the graduate program for Biostatistics. I’ve got one class left for the masters requirements and will be starting PhD coursework in the fall. I’m unsure whether I’ll actually complete the Ph.D. but everything seems to be getting along pretty well so I’m continuing along this path until I am called elsewhere. As for big life changes, I welcomed 4 new baby saltwater fish and a shrimp into my life this year.”

Hill, Brandeis '00 – “I am getting married on Sept. 2, 2006 to Gemez Marshall and we’ll be honeymooning in Maui. I plan to defend my Ph.D. at RPI by December of 2006.”

Hilton, Rod '04 – “I work for a company named Axiom. I’m their lead Java developer, working with a group of 12 other developers on data mining projects. I write most of the low-level, back-end stuff. I also got a Java Programmer certification from Sun.”

Horowitz, Daniel '05 – “Last year I was working for Accenture in NYC. Now I’m working for a small analytics startup in NYC on Wall St.”

Hortiatis, Paul '04 – “Last December I moved to NYC and started working for GoalQuest. We provide tools for universities to engage and communicate with prospective students through Alumni. I work in web development, database management and IT.”

Isman, Mike '04 – is now working at a startup internet company called Eons, run by the founder of Monster.com, Jeff Taylor. It’s a website for people over 50, with lots of age appropriate content, job listings, longevity calculator, and many other applications.

Keck, Jason '03 – “I recently took a job as an Optical Coatings Engineer at Semrock, a Rochester company that makes thin-film optics for biomedical applications. I am also (still) at UR part-time getting my masters in Materials Science.”

Kimball, Erin '04 – “I guess my only update is that I am post-generals now (I think they call them cumulative exams there) and have received my Masters of Arts in Chemical Engineering. I still have a long way to go for my Ph.D. doing research with hydrogen fuel cells, but one step at a time, right? :)”

Ku, Jason '01 – “After 5 years of leading technical development teams, I’ve decided to leave London (3 months shy of becoming a British citizen) and return to school. In Jan. I’ll be starting the accelerated MBA program at INSEAD where I’ll spend 8 months in Singapore, 2 months in Fontainebleau, and 2 months in Philadelphia at the Wharton school. As this international program

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requires fluency in 3 languages, I confidently announced I knew C, C++, and Java. Needless to say I got blank stares. ;)”

Lambe, Dennis '03 – “I’m currently writing embedded process control software for the R&D dept. of a boiler and burner instrumentation company called Preferred Utilities that operates out of my hometown, Danbury CT.”

Lewis, Steven '00 – “In May 2006 I received my Master of Public Administration degree from the State University of New York (SUNY) College at Brockport, where I continue to work as Web Manager. I am a founding director and officer of the Higher Education Web Professionals Association.”

Linsky, Kenny '05 – “I have a new position at TML Information Services as a software developer.”

Luis, Cristina '01 – “I’ll be in Albuquerque, NM, at the 58th Special Operations Wing learning to be an HC-130 navigator. That’s my last course before I make it to Tucson and the 79th Rescue Squadron. I’ve been orienteering like crazy lately. Spent a week in north TX at an orienteering camp for high school kids. In August I went to Denmark with the US team for the World Orienteering Championships as official team support. Didn’t make the team (maybe in a few years?) but I get to be there and tape up some blisters.”

McCusker, Jim '99 – “I started Nepaug Business Solutions back in January of 2005. We provide IT services to small companies that they wouldn’t be able to get otherwise. This includes software engineering, web site development, and IT outsourcing. The company doubled in size in May to 2 people, and we hope to add a third by fall.”

Mohan, Shailan '99 – “I moved back to New Delhi, India in March 2006, to set up the India Development Center for a mobile game development company called Hovr Inc.”

Moldover, Jonathan '99 – “I have recently started a new job. I’m working as a client engineer (programmer) at a startup MMO (massively multiplayer online) developer, Perpetual Entertainment. Cool job, fun folks, gaming geeks and computers.”

(see Page 12)

(Undergraduate news, from page 11)

Mueller, Daniel '06 – has begun working at zipcar in the Boston area.

Mufti, Yasser '99 – “This year I’m spending half my year in Shanghai helping grow a team here, so just finished a 4 month stint in Shanghai (pretty exciting). Other than that, still at Microsoft in Seattle.”

Norwood, Jonathan '04 – “I’m a consultant at Accenture in Philadelphia now. I got tired of building vaporware for the government so I decided that working 80 hour (sometimes 100 hour) weeks would be more fun. Loving life and having a good time :-).”

Oldak, Trevor '06 – “I’m currently working at Nexaweb Technologies in Burlington, MA, where I work on their Rich Internet Application development platform, utilizing jRex, Java, JavaScript, and XML.”

Orlando, David '03 – “I’m still down here at Duke. Still working on my computational biology / bioinformatics PhD. The work is going well, no publications to report yet, but I have a few on the horizon. That’s as interesting as my life has been. ”

Pearson, Jonathan '05 – “I am finishing up my Master’s at the U of R and plan to get married in January.”

Prithviraj, Preethum '05 – “I graduated from a paramedic program and received my results from the National Registry Exam, which I passed! I’m currently working for Lifecare Ambulance (soon as a Paramedic). In addition to that, I’m also an active member of the local Safe Kids Coalition out of Rainbow Babies and Children’s Hospital. I’m also a member of the Northeast Ohio Medical Reserve Corp. In the next few months, I’ll be setting up a website to be used by health programs in the area to manage clinical scheduling, documentation, and student progress. ”

Ramachandran, Ajit '96 – “I have been a product development lead at Agilent Technologies. I resigned my job in the first week of August to go to business school at the Kellogg School of Management at Northwestern University in their MMM (dual-degree) program as a Toigo Fellow. My wife Deepa and I were blessed with our son Hrishikesh in June 2005. ”

Rau, Alex '99 – “Currently I am an Enterprise Architect at AIG’s DBG (domestic brokerage group). Still working in Jersey City. ”

Ruskin, Jon '06 – began working at Microsoft in Seattle, working in their SEARCH group.

Sankar, Nandini '97 – “I am very happy to let you know that I had a baby girl on the 11th of May. We named her Reina Piparaiya! She is doing well and growing fast!”

Schmid, Jonathan '03 – “I’m working part time at Schmid & Co., Inc. and taking part time classes at Drexel Univ. to prepare for application to graduate schools this fall.”

Sloan, David '06 – “I relocated to Mountain View,

CA to begin work at Google this fall.”

Studer, Ahren '04 – “I’m still at CMU. I received my masters in ECE last month and will continue towards the Ph.D. With regards to awards, I received “Best Student Paper” award at the 4th International Conference on Applied Cryptography and Network Security (ACNS 06) and the Frank J. Marshall Graduate Fellowship. Also, I am engaged to Cassandra King (UR Math & Stats '06).”

Swier, Robert '01, '02 – “After finishing my B.S. and M.S. at Rochester in 2002 (with the 3+2 program), I came to the University of Toronto for a Ph.D. I’m still here and I love life in this city. I’m also *contemplating* becoming a permanent resident of Canada.”

Tong, Matt '03 – “I’m still a Ph.D. student at UCSD where I’ve been an IGERT Fellow in a program on Vision and Learning in Humans and Machines. I had a paper in Cognitive Science Society Meeting in Italy last year, which ended up winning the Marr Prize for best student paper. ”

Uzilov, Andrew '05 – “Three weeks before graduation, I spontaneously fell in love with a beautiful redhead named Kathleen Hutchison, who is a hard sciences double major just like me, and followed her to Berkeley, California, where we now live together and work for University of California, Berkeley and the Lawrence Berkeley National Lab, respectively. I have published my first paper based on research I did at the lab of Dr. David Mathews at UR. Currently I’m working for the lab of Dr. Ian Holmes, continuing research in a similar vein and doing some related web development on the side that will at least somewhat revolutionize genome browser technology. ”

Van Dam, Rob '05 – “I’m currently slaving away towards my Masters at Brigham Young University and should be done by next April. I’m also simultaneously working as a programmer at BlueHost (a webhosting company). We welcomed a baby girl, Katie Rose, into our family on August 5th.”

Vanyukov, Vladimir '05 – “I graduated from Simon and started work at JPMorgan on July 7th. ”

Vayanis, Andrew '05 – “I’m currently working as a software engineer for AOL in the DC area.”

Ward, Justin '03 – “I’m working for Rosenblatt Securities in NYC. It’s still more or less sys admin work, but I’m doing a lot more design rather than just implementation, and due to being such a small company, there’s very little of the corporate BS that can make office jobs so painful.”

Weingarten, Tom '06 – “I’ll begin NYU’s Computational Biology Ph.D. Program in the fall on an IGERT fellowship.”

Yurasits, Kevin '01 – “I’m in my second year at Wachovia Securities programming order management systems and other financial applications. I have a son who is now 3 years old.”

Zschau, Aaron '02 – “I’m currently working for Z-Tech Associates in Lexington, MA and recently purchased a town house in Waltham. Not too much else to report other than I’ve been busy between the move and work.”

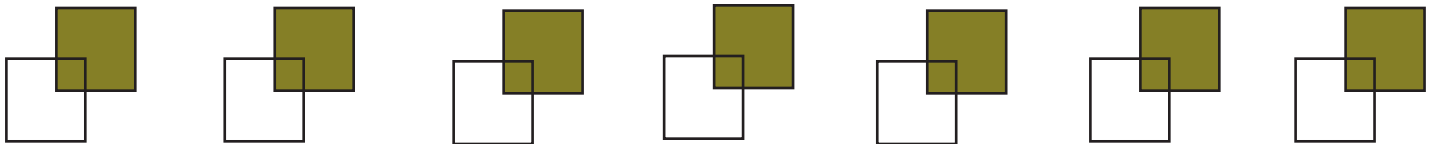
Victorious at Computer Science Games!



L-R (back) Dan MULLowney, Harry Glaser, Mike Rotondo, Will deBeaumont, (front) David Lu, Tom O'Neill, and David Sloan

Seven URCS undergraduates trekked to Montreal, Quebec March 3-5th to compete in the Computer Science Games, an annual competition geared for undergraduates. For three days, participants were challenged individually and as a team in fourteen different competitions against 33 other teams, including programming, logic, algorithms and web design. Fun events included team sports, where our team crushed the opponents in volleyball. Our winning flash-out video and team skit proved that our social and creative skills are as developed as our technical skills. The cluster system really works!

Other winning events were X-treme Programming, Algorithms and Debugging, but it was a consistent top 10 finish in all events that won them the 1st place trophy. The CS Cup trophy, much like the Stanley Cup in hockey, will stay with the winning team till next year's competition, at which point our team hopes to keep it in Rochester for another year.



Eisenstat Top Undergraduate in the Nation

David E. Eisenstat was selected the top male undergraduate in the nation in this year's Computing Research Association's Outstanding Undergraduate Award Competition. David's exceptional summer REU research at both Yale University (on population protocols) and Lafayette College (on combinatorics) resulted in conference papers, journal publication and several more submissions. His honors thesis project work at URCS with the Rochester Software Transactional Memory Group (RSTM) focused on building a source-to-source compiler that recognizes language extensions for transactional memory. With strong emphasis in the areas of both systems and theory, as well as a double major in mathematics, he had many options for his future study. David was valedictorian of his class, elected to Phi Beta Kappa in his junior year, and performed in vocal ensembles while at Rochester. He began his Ph.D. studies at Princeton this fall on a National Defense Science and Engineering Graduate Fellowship through the Army Research Office. The CRA award presentation took place this summer at PODC '06.



David Eisenstat '06

Russell Bent Optimizes Life

In Russell Bent's junior year at Rochester he began an independent study project with Lane Hemaspaandra, grad student Gabriel Istrate and fellow undergraduate Mike Schear. His work on error correcting codes, which resulted in a refereed journal publication his senior year, changed the direction of his life. Up until that research experience, Russ hadn't even considered graduate school as an option. Working on that particular project showed him that research was both exciting and interesting and that grad school could be in his future.

Russ began his Ph.D. studies at Brown University in the fall of 2000 and found that his previous research provided him with a strong foundation. He explained, "It takes many students time to adjust from the undergrad environment where you know all the problems have a solution, to a graduate environment where you do not know if there exists an answer to your research problem or if you are even asking the right question!" Having done research at UR, his adjustment was relatively seamless. The transition to the CS Department at Brown was also quite smooth as the departments are similar in their close-knit feel. The size of the faculty and student body is comparable. Both departments emphasize the success of each individual student and not the quota system found at some schools. It's no wonder that five of our URCS alumni have begun their Ph.D. studies at Brown in recent years.

Russ completed his Ph.D. in the spring of '05. Along with his advisor, Pascal VanHenterick, they have a book to be released this fall. Look for "Online Stochastic Combinatorial Optimization" from MIT Press (ISBN0262220806) coming soon to a bookstore near you! Soon after graduation he moved to New Mexico to work at Los Alamos National Labs. He found right away that LANL is a nice combination of academia & industry. Russell enjoys the opportunity to do basic research in conjunction with projects that have direct application to existing technological challenges. The future holds much to be discovered in the field of combinatorial optimization. His current work is in the area of (infrastructure and network) analysis and development. What is interesting to him is to see that many infrastructure research problems can be characterized as optimization problems (think scheduling, routing, etc.) so there is a very direct application of his graduate studies to his current programmatic work at the lab. He sees a critical component of his future work hinging on identifying and solving the basic underlying optimization problems inherent to infrastructure problems. The intent is that through understanding these core problems he can both advance the field of optimization and apply this understanding to problems that arise in practice.

It's not all about work for Russ & his wife Sabrina. The move from Providence to New Mexico has been exciting for both of them. Though they are farther away from family and friends, the sunshine isn't hard to adjust to! They spend their free time exploring the wildlands of New Mexico, hiking, skiing and snowshoeing, and hope one day to have reached the highest point in each of the fifty states.

When asked what part of his undergrad education at Rochester has influenced him the most, Russ responded that though the concept is somewhat vague, it was learning how to think like a computer scientist. He says from a theoretical perspective, for example, when considering a problem, it's learning to ask what will be an effective algorithm to solve the problem and what guarantees on performance, solution quality, etc., can be provided. It also ranges all the way to implementation in terms of how to actually convert the algorithm to something that can be used effectively and efficiently to explore the problem being considered. This skill to think as a scientist, and Lane Hemaspaandra's strong influence to encourage Russ to apply to graduate school, have had a considerable impact and have contributed to his success today.



Russell Bent '00 enjoys New Mexico

Research Honors Awarded

Research honors were awarded to three graduating seniors at the departmental diploma ceremony in May.

Athul Acharya, (advisor Michael Scott), completed his thesis entitled "Contention Management for the Rochester Software Transactional Memory". Athul is attending Purdue University for Computer Science.

David Eisenstat, (advisor Michael Scott), defended his honors thesis entitled "Two Interfaces to the Rochester Software Transaction Memory System". He began attending Princeton University to study Computer Science this fall.

Tom Weingarten completed his thesis during his junior year. (advisor Mitsu Ogihara). His thesis was entitled "Stochastic Simulations of Biochemical Pathways". Tom is attending NYU in Bioinformatics.

(Grads, from page 6)

Steyn, Gavin (M.S. '93) – "I am now at BEA Systems in the Boston area."

Tang, ChunQuiang (Ph.D. '05) – "I got married on February 28, 2006. My wife, Hua Xiang, is also a researcher at IBM T.J. Watson Research Center."

Tao, Yiyang (MS. '99) – "I left Microsoft this summer to begin my MBA study at Harvard Business School in August."

Thakur, Mayur (Ph.D. '05) – "I am still at University of Missouri-Rolla. I got married last month to Anuradha Roy. Anu and I spent the summer in Boston where I had a visiting assistant professorship."

Williams, Graeme (Ph.D. '80) – "My elder daughter Sarah just graduated from Johns Hopkins in biology and is going to UCSC in the fall to study science writing. My son Evan will be a freshman at James Madison. I've now worked for my present employer, a small company that develops quality management software, for just over two years."

Zhang, Yilian (M.S. '03) – "I have been working at the University of South Carolina Aiken for several years. My title is Assistant Professor."

And they're off!



Our second annual River Run was held on Sept. 8th during the department's yearly picnic. The race had more participants than last year, and rumor has it that people were training for it! Overall winner of this year's race was lab manager Jim Roche (sunglasses on left).

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A Salute to the Class of 2006!

Athul Acharya
Scott Agnew
Andrew Bemont
Roland Cheng
David Clubb
Marshall Crumiller
William deBeaumont
Andy Dremeaux
David Eisenstat
Lee Frankel-Goldwater

Jeffrey Hayes
Zaiming Michael He
John Paul Heidkamp
Christopher Heriot
Wen-Hsien Hu
Matthew Koch
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