

ACM PROGRAMMING TEAM MAKES WORLD FINALS *Harbin, China hosts "Battle of the Brains"*

For the first time in URCS history, our undergraduate programming team won the Northeast North America Association for Computing Machinery International Collegiate Programming Contest Regional competition and advanced to the ACM-ICPC World Finals, this year held in Harbin, China.

Usually overshadowed by the powerhouse MIT in our region, our highest finish previously had been third in 2009. This year, our team of Xiaoqing (Sean) Tang '12, Ian Christopher '10, and Dennis Huo '10, placed first at the Regional Finals, solving one more problem at the buzzer, and moving ahead of MIT. The World Finals, also known as the "Battle of the Brains", brought 103 teams from five continents to frigid Harbin in the sub-zero month of February. The International Festival of Ice and Snow provided entertainment and incredible sights between competition events. The daytime high temperature was -20° F, but the students, along with their coach Assistant Professor Daniel Štefankovič, were properly attired with sponsor-issued outerwear, including par-

kas, snow pants, hats, mittens and muffs.

Though the students were there for the competition, plenty of time was allowed for everyone to acclimate to the competition environment, recover from jet lag, and enjoy the incredible Festival of Ice and Snow. Sean Tang especially enjoyed touring Harbin. "After practicing so hard before we left

Rochester, it was really nice to have time to relax and enjoy the Festival." Ian Christopher enjoyed being part of the prestigious competition and interacting with competitors from all over the world, eating dinner with a South African team, building a snow sculpture with a South American team and hanging out with a French team all in the same day. The fun and games did take a back



Dennis Huo, Ian Christopher, Xiaoqing Tang and Coach Daniel Štefankovič at the International Festival of Ice and Snow in Harbin China.

seat to the real reason why everyone was there: the competition itself.

The competition floor was multiple rows of computer tables and chairs in a huge hall filled with almost (ACM, Page 3)





Message from the Chair **by Henry Kautz** **From Snowbird to the Googleplex**

This summer I had the privilege to attend two meetings that presented many insights into the future of computer science research and education.

The first was the Computing Research Association (CRA) Conference at Snowbird, Utah. The membership of the CRA consists of nearly all of the organizations in North America that perform research in computer science, including all the PhD-granting CS departments. Every other year, the CRA invites the chairs of computer science departments to a conference at Snowbird (a mountain resort near Salt Lake City) in order to learn about and discuss computer science education, important emerging areas of computing research, and government policies that impact computing research and education.

The second meeting was the Google Faculty Summit. Each summer, Google invites about 100 CS faculty members, at all levels of seniority, to a symposium at the Googleplex, Google's headquarters in California. The Summit gives faculty members an opportunity to learn about the work going on inside Google, and to hear Google scientists and engineers present research challenges to the broader CS community.

The two meetings shared many common themes. One was the growing importance of research about online social networks. At Snowbird, the deputy director of the Defense Advanced Research Projects Agency (DARPA) discussed the DARPA Network Challenge, a demonstra-

tion of how online communities could be motivated to solve information-gathering problems that are too large and hard to be solved by any traditional government agency. At Google, we heard about a new large scale social network search engine, which enables a user to find just the right people the user needs for advice or recommendations, using information from dozens of social websites.

"Big data" and cloud computing was another common theme of the meetings. At Snowbird, we discussed how healthcare will be revolutionized by new ways of collecting and using enormous amounts of health data - including lifestyle data (exercise, nutrition, etc.) collected on our smartphones, not just clinical data. This data revolution will enable countless applications, ranging from computerized personal trainers that help users maintain their health or mitigate chronic conditions, to new personalized drugs and therapies. At Google, we heard about the challenges of creating and managing the planetary-scale data systems that power Google services.

Both social computing and big data naturally lead to questions about privacy and security, and research in these areas was discussed at both meetings. Work in privacy must take into account many different kinds of concerns and constraints, including those that are legal (e.g., privacy laws are radically different in different countries), technical (e.g., creating provably secure cryptographic protocols), and social (e.g., how can we give users finer grained control over access to their private information, without overwhelming them with complexity?).

The faculty members at Snowbird and the scientists at Google were both concerned about the relatively low number of stu-

FACULTY NEWS AND AWARDS

Muthu Venkitasubramaniam, a researcher in cryptography and complexity, will become an assistant professor in our department in Fall 2011. He is receiving his Ph.D. from Cornell University, and before arriving at UR, will hold a CRA Computational Innovation postdoctoral fellowship at NYU. A full profile of Muthu will appear in next year's issue of Multicast.

Michael L. Scott recently returned from Barcelona, where he was invited to teach a course on Transactional Memory at the 6th Intl. Summer School on Advanced Computer Architecture and Compilation

for High-Performance and Embedded Systems (ACACES), sponsored by the EU-funded Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC).

Kai Shen has received a Google Research Award on the project of "Online request Adaptation on Multicore Servers".

Chris Brown and Randal Nelson's work was recently featured in WIRED magazine. See article on Page 7 or go to the interactive link: http://www.wired.com/magazine/2010/07/ff_daguerrotype_panorama/

(ACM, from page 1)

500 people. Each of our team members mentioned how they had practiced in a quiet lab without much distraction and that was very different from the actual competition. There was noise, the sound of many languages being spoken, shouts of joy and frustration, lights, cameras on cranes and spectator conversation. Because they were trying to solve the hardest problems they had ever faced, maintaining focus was extremely difficult. The pressure built each time another team solved a problem and were rewarded with a color-coded balloon specific to that problem. In the end, the winning team solved seven of eleven problems. Our team solved three and received honorable mention. Many teams were unable to solve any.



A thermometer made of ice

expecting frigid temperatures and the ice and snow sculptures of Harbin, but the experience would be “cool” the second time around just the same.

Though not the end result they would have liked, each of the students realized that this competition gave them opportunities that will be remembered throughout their lives. Coach Daniel Štefankovič, who now has attended this competition as both a competitor and a coach, knows that these students improved their problem solving and coding skills and made them very appealing to big companies and graduate schools.

With the graduation of Dennis and Ian, Coach Štefankovič is hoping to select our next team with a small competition in September. Since the previous team had ACM-ICPC experience (Ian and Dennis for three years, Sean for two), it would be good to find students who work well together and have strong individual skills in algorithms and coding (Dennis was a Top Coder participant). New teammates will also need a commitment to the competition throughout their undergraduate years. Ideal teammates would also enjoy the pressure of competition, be willing to practice, and work well as a team.

Next year the ACM-ICPC World Finals will be held in Cairo, Egypt. If Sean has his way, the URCS team will be back to computer science’s “big dance” next year. He won’t be



The team hard at work during the competition

(Kautz, from page 2)

dents, and the absolutely low number of women, who are now undergraduate majors in computer science. The current pipeline will not be able to supply the numbers of computer scientists and engineers needed to keep the innovation economy on track. Forecasts from the Department of Labor and many other organizations all show that computer science is one of the very best careers for creative work, pay, and job security, but this message has not yet gotten through to students, parents, and high school counselors.

The CRA is working to dispel many common myths - for example, that computer scientists don’t do work that involves interacting with other people, or that addresses “meaningful” problems such as protecting the environment or improving healthcare. One notable myth-busting effort of the CRA is “dot diva”, an educational outreach effort and website (<http://www.dotdiva.org>) designed for and in cooperation with high school girls, which provides information about the wide range of computing careers in every area of the arts, humanities, and sciences.

At Google, we learned about App Inventor, a system de-

signed to make programming fun and interesting for high school students. App Inventor lets anyone create novel Android phone applications using a simple visual programming interface. Students are excited to create applications that relate to their own lives and that they can share with their friends.

By the end of both conferences, my fellow attendees and I felt the same way - exhilarated, a little exhausted, but excited to go back to our labs and classrooms. We have tools more powerful than any we could have dreamed of a decade ago, and every reason to believe that we have only begun to scratch the surface of what can be created. We have opportunities to discover novel computational solutions to the most pressing challenges in health, the environment, society, and science. We have begun to grapple with new kinds of problem solving that integrate social and machine intelligence. If we succeed in conveying a fraction of this excitement to our students, the next generation of computers scientists and engineers - well, then, we can count these meetings at Snowbird and the Googleplex as time well spent!

DANIEL ŠTEFANKOVIČ'S PROLIFIC MIND

Professor Daniel Štefankovič lives in a world where graphs, probabilities, algebra and topological ideas mingle freely and lead him to surprising insights and ingenious algorithms, with potential relevance to the real world. Here is a sampling.

Crossing Numbers— topology or algebra?

Suppose we visualize a social network by representing people as squares and drawing a connection between any two people that are friends. An important aesthetic attribute of such visualization is the number of crossings among the connections—minimization of this quantity leads to the concept of “crossing number”. Note that a crossing number of 0 implies that a graph is planar—it can be drawn with no crossings at all. Crossing numbers have a flavor of topology since we allow connections of arbitrary shape.

A theorem of Hanani-Tutte states that if a graph can be drawn so that every pair of edges intersects evenly then the graph has crossing number zero. This provides an algebraic basis (technically, a system of linear equations) for checking whether a graph is planar, even if we have not yet found a topological distortion of the graph that minimizes edge crossings. A natural question, raised by Pach and Tóth in 2000, is whether the agreement be-

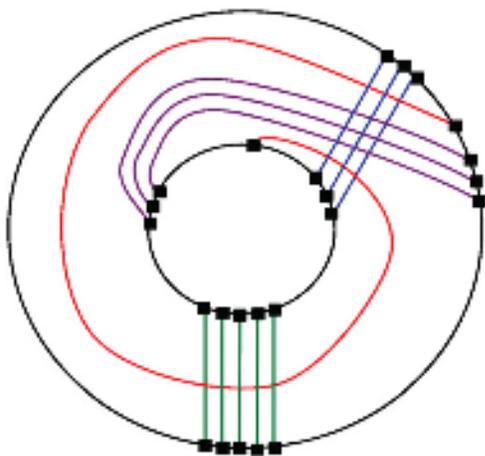


Figure 1. A graph with 24 vertices and 5 kinds of edges (green, red, blue, violet, and black). The “algebraic” version of the crossing number is 14; the crossings of red and blue edges do not count, since they cross evenly. The reader can check, by trying various drawings, that the “topological” version of the crossing number is 15 (we assume that the black edges are “heavy” and hence cannot be crossed).

tween algebraic and topological versions of the crossing number extends beyond the zero case. Pelsmajer, Schaefer, and Štefankovič constructed an example showing a divergence of the algebraic and topological versions (see Figure 1) and gave an intuitive topological proof of the Hanani-Tutte theorem and related results.

Counting, graphs, and weighted matrices

Going back to social networks: a group of people none of whom are friends is called an independent set of the network. For example, in Figure 1 the two largest independent sets are of size 12, each consisting of 6 alternate members of the black outer circle and 6 alternate members of the black inner circle. If we were to omit the black connections, the 12 outer and 12 inner nodes would form two independent sets. A related concept is that of a bipartite social network; this has two groups of people (say, female and male) with friendships only between the groups. For example, if we omit the black connections in Figure 1, we are left with a bipartite network. The problem of counting the number of independent sets in bipartite networks has numerous applications, for example, to the problem of matching medical residents to hospitals. Ge and Štefankovič found a curious connection between independent sets and zero-one matrices weighted by their rank (see Figure 2).

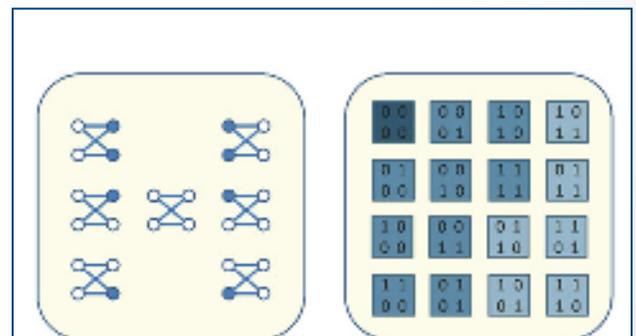
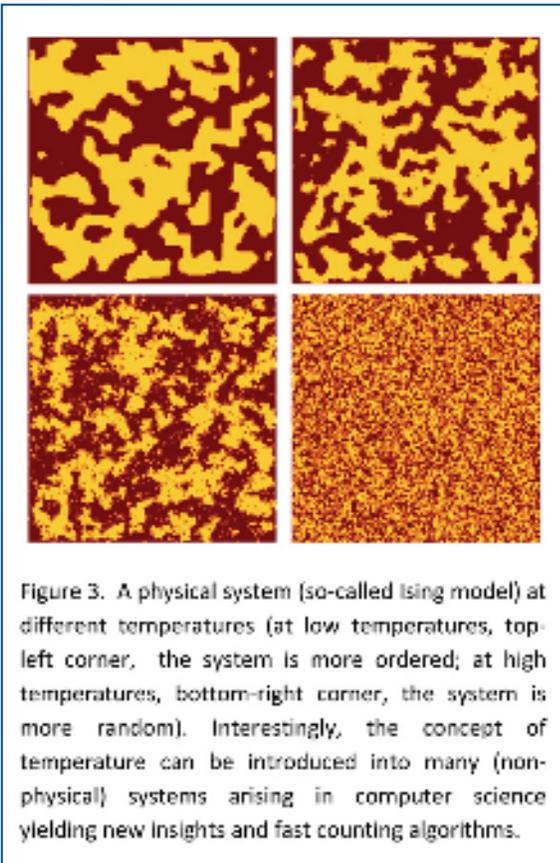


Figure 2. The connection between independent sets and matrices illustrated for C_4 , the cycle on 4 vertices. The picture on the left shows all 7 independent sets of C_4 . The picture on the right shows all 2×2 zero-one matrices, with the color indicating their rank (dark color = low rank, light color = high rank). The correspondence is not obvious—the independent sets assigned to a matrix are obtained from vectors which when multiplied by the matrix yield the zero vector.

Sampling and Counting - introducing temperature

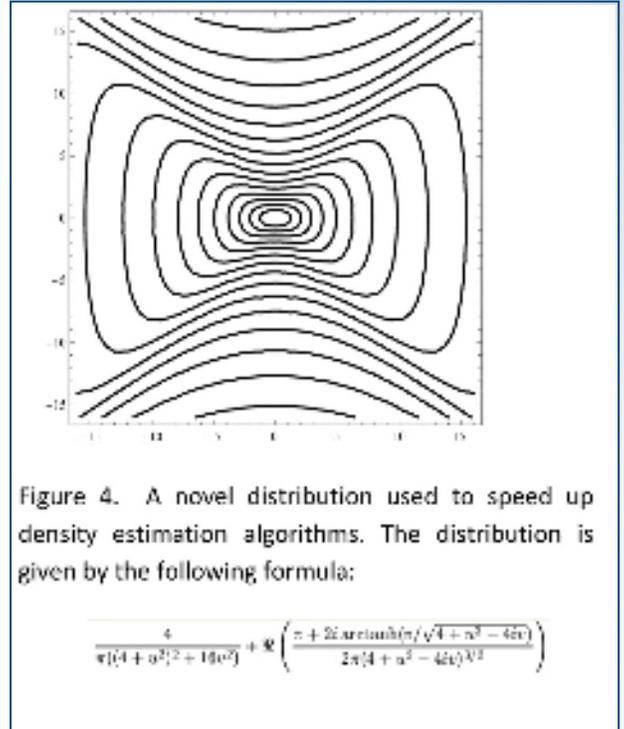
Ever noticed the little counter under the web search engine results? Counting is everywhere—search results, statistical tests, statistical physics, and solutions of constraint satisfaction problems. Large counts are rarely exact but typically approximated (this is usually accomplished using a product estimator—a product of smaller and easier to estimate quantities which are often obtained by studying the effect of removing one variable or one constraint from a problem). Štefankovič, Vempala, and Vigoda discovered that counting algorithms can be made significantly faster by introducing temperature, a concept from statistical physics, into computer science problems (see Figure 3). Inspecting properties of configurations at different temperatures yields a more efficient product estimator.



Density Estimation – pick the most diverse explanations

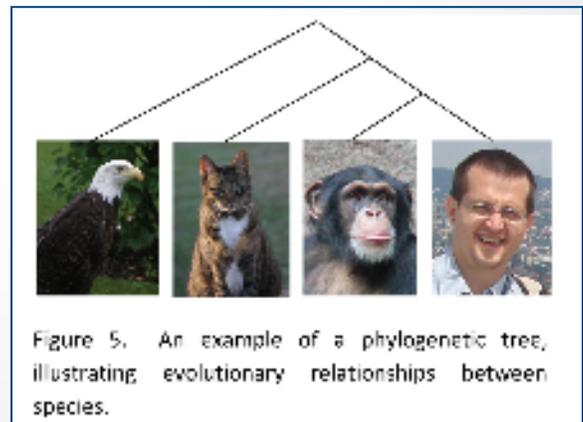
One of the basic tasks in science is extraction of hypothesis from data sets. Mahalanabis and Štefankovič studied the computational efficiency of this process and came up with the following simple principle: “To select from a collection of possible explanations repeat the following. Select the two most diverse explanations and use the data to eliminate one of them.” The principle was central in designing faster density estimation algorithms. To achieve further speedup they extended dimension reduction techniques to deal with den-

sities. This involved sampling from oddball distributions (such as the one displayed in Figure 4) arising from stochastic integrals.



Phylogeny – do we have fast algorithms?

The problem of reconstructing the evolutionary tree (see Figure 5) is a source of interesting mathematical and algorithmic questions. In molecular phylogeny one tries to reconstruct the tree using information from DNA sequences by fitting a relatively simple graphical model to the data (the main idea is, roughly, that more closely related species have more similar DNA). Štefankovič and Vigoda studied the following question: when can we have fast algorithms that are guaranteed to find the most likely model? On the positive side they showed that for trees that do not go far in the evolutionary history the existing Markov chain Monte Carlo methods can reconstruct the most likely tree. On the negative side it turns out that the likelihood methods can fail to reconstruct the correct tree if there is a variability in the speed of evolution at different positions in the DNA.



GRADUATE ALUMNI NEWS

Ardis, Paul (Ph.D. '09) is working as a Research Associate at Research Associates for Defense Conversion Inc., in Rome NY. It is in the Air Force Research Laboratory.

Ardis, Tanushree Mittal (M.S. '07) "I'm still working with University IT at UR and pursuing a part-time MBA at the Simon School."

Cai, Zhenlei (M.S. '98) "I am now working at Efficient Frontier Inc, in Sunnyvale CA."

Coombs, David (Ph.D. '92) "SAIC acquired SET in January. Ironically, I'm back in the same part of SAIC that I left to join SET."

Dominguez, Melissa (Ph.D. '03) "I was married in 2005 to Jeff Bondy. We have a 2 year old daughter, Trela, and a new addition, daughter Beatrix, born in August. I'm currently working as a senior software developer at Primal in Waterloo, Ontario, Canada <http://www.primal.com>. Before this, we were in Chicago for about 4 years."

Dzikovska, Myroslava (Ph.D. '04) "I am still working at Edinburgh University. I think I will be here for a while yet, so I just bought a new flat. I may even be able to put up guests now ;-)."

Eveland, Chris (Ph.D. '03) "I'm now Director of R&D at InfoTech International in Jacksonville, FL. Latest personal news is that I delivered our son Sebastian at home in December '09. Not planned that way, but he was in a hurry. :) Since my last update was in '07, I also got married (7/07), and had a daughter (Zoë, 8/08). Nothing major planned for '10."

Gafer, Neil (Ph.D. '90) "I started working for Microsoft in September 2008."

Heliotis, James (Ph.D. '84) "My elder daughter Alexandra, who was born when I was finishing my Ph.D. was married this August!"

Jalan, Abhinav (M.S. '05) "I left Fair Isaac in December 2005 to join Google in Bangalore, India. Now I am at Google in Mountain View, CA since March 2010."

Lall, Ashwin (Ph.D. '08) "On a personal note, I got married in July to Erin (who I met in college). This fall, I start a tenure-track position at Denison University in Granville, OH (about half an hour outside Columbus), which I am very much looking forward to. I've had a really wonderful two years as a post-doc at Georgia Tech, but, sadly, it cannot last forever."

Learn, Andrew (MS '01) Now a major in the U.S. Air Force, Andy completed an assignment in 2009 as Director of Network Operations Integration, Joint Task Force for Global Network Operations, where he implemented military network defense projects. He currently works in Strategic Planning for the Director, Defense Information Systems Agency, and is expecting to move in Fall 2010 to Air Force Headquarters at the Pentagon. He and his wife Varya are proud parents of a 1-year-old girl, Leeza.

Light, Marc (Ph.D. '96) "I am the Lead Research Scientist at Thomson Reuters."

Parthasarathy, Srinivasan (Ph.D. '00) "I have been promoted to Professor (full) at Ohio State."

Pinheiro, Eduardo (M.S. '00) "I was promoted to Senior Staff at Google."

Pook, Polly (Ph.D. '96) "I left Bangladesh this spring. I was promoted to Acting Dean of Undergraduate Studies at the Asian University for Women last February but I stepped down and I'm coming home!"

Purav, Chikita (M.S. '05) "I headed back home to India in April. I have accepted an offer for a fellowship with Teach for India for 2 years and will be joining their program to work for 2 yrs as a class teacher in a government-run public school. Yes, it's not much money. Yes, it's last minute, but I'm super excited! :D I just wanted to say thank you to everyone for everything. Life's been an amazing journey so far, and I am looking forward to this new chapter. <http://www.teachforindia.org>."

Sanders, Brandon (Ph.D. '05) "I'm now the CTO at AboutUs. Also Shelly

& I have a son Sequoia Sky, born in October 2009."

Sarukkai, Ramesh (Ph.D. '96) "I am currently Senior Management at Google Inc., in the Video/Youtube area."

Sharek, Greg (M.S. '99) "I'm still at ARM Inc., in Austin Texas."

Shen, Xipeng (Ph.D. '06) "Here are some recent honors of mine: NSF CAREER Award 2010, Best Paper Award on PPOPP 2010, and IBM CAS Canada Research Faculty Fellow 2010."

Slayden Mitchell, April (M.S. '02) "I'm still in California working at HP as a Senior Research Engineer and my baby girl Harper just turned 1 ½. I run into University of Rochester alums all over the place."

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Sequoia Sanders

Smith, Ed (Ph.D. '82) "I've moved back to Portland, Oregon. I'm finishing up my MFA in Film Production from Loyola Marymount University, Los Angeles this year from Portland. I just got a job working on Video-On-Demand server software for Arris Group in Beaverton, OR."

Stent, Amanda (Ph.D. '01) "I am now a Principal Member of Technical Staff, AT&T Labs - Research, Florham Park, NJ (full-time as of 2009, but actually the move started after I was granted tenure at Stony Brook in 2007/early 2008)."

Tang, Chunqiang (Ph.D. '04) "As for news, now I have two kids: Michael Zhiyuan Tang was born in Oct 2009, and Amy Zhiqing Tang was born in January 2008. I also won multiple IBM awards last year and the information is on the Web at <http://www.cs.rochester.edu/news/2009-12/chunqiang-tang-phd04-wins-multiple-ibm-research-awards>."

Thakur, Mayur (Ph.D. '04) "I moved in July 2007 to the Bay Area to work at Google. In July 2009 we moved from the Bay Area to Google's New York office. I work as a research engi-

neer there. If anyone from Uof R is in the area, I would be very happy to show them around Google."

Vallino, Jim (Ph.D. '98) "I was one of two people this year who were awarded RIT's Eisenhart Award for Outstanding Teaching. Also as of July 1st, I was named chair of the Department of Software Engineering at RIT."

VanDurme, Benjamin (BS '01, Ph.D. '09) "I defended my Ph.D. thesis at URCS in December, and am now research faculty at Johns Hopkins University, as part of the Human Language Technology Center of Excellence."

Williams, Graeme (Ph.D. '80) "I'm currently working for Axeda as their developer evangelist, a possibly temporary, possibly permanent position. My youngest child just graduated and got a job, which generated about equal parts pride and relief. I also became the president of a small non-profit, the Downtown Waltham Partnership, which is a downtown revitalization effort."

REDISCOVERING LIFE IN THE 1840S WITH STATE-OF-THE-ART IMAGE PROCESSING

A recent article in WIRED magazine (pages 124-129 in the August 2010 issue--vol. 18 no. 8) by Julie Rehmeyer prominently features a collaboration between URCS and the George Eastman House in the computer-aided restoration of a daguerreotype. The 1848 daguerreotype depicts the Cincinnati waterfront in amazing detail. But in a digital version containing 9 billion pixels, one in every 500 pixels was found to be obscured by a dust mote. GEH, thanks to contacts established by Professor Chris Brown (URCS) and UR Senior Associate Dean Tom DiPiero, turned to URCS. Subsequently doctoral students Ross Messing and Paul Ardis, and URCS undergraduate Xiaoqing Tang, under the guidance of Professor Randal Nelson (URCS) undertook the project to detect and fill in the "holes" left by

dust motes. After employing machine learning techniques to identify these holes, they were able to use state-of-the-art inpainting techniques to infer the missing pixels. In addition they developed a technique to separate out the faint, distinctive "brush strokes" left by the polishing of the daguerreotype surface prior to exposure, aiding in the identification of the daguerreotypist who created an image. The results of the restoration were astonishing. The date and an approximate time--around 2pm--of the image had already been established from the vessels in the harbor, and from the configuration of shadows. When the restored 1-millimeter image of the clock on a clock tower was examined, it showed a time of 1:55!



*UR CS researchers pose at the George Eastman House in the antique equipment room.
Front row left to right: Xiaoqing Tang, Randal Nelson, Chris Brown
Back row left to right: Ross Messing and Paul Ardis*

PROSHANTO MUKHERJI: FROM LAW DISCOVERY IN LOGICAL WORLDS TO LAW PRACTICE IN THE REAL WORLD

Proshanto entered the Ph.D. program at URCS in 2000, coming to us with dazzling credentials from New Jersey Institute of Technology. In 2006, he successfully defended a very interesting thesis on discovering logical laws implicit in a given set of facts, by observing what sorts of facts co-occurred more often than one would expect by chance. This has potential applications in areas such as automated planning, data mining, and modeling scientific discovery. To our surprise, he entered Harvard Law School after writing his dissertation, and passed the bar magna cum laude in 2009. Perhaps we shouldn't have been surprised, since we knew of his broad interests, for example in military history, poetry, and literature in general. He is now a patent attorney in Boston at Fish & Richardson, a law firm that can boast numerous lawyers with computer science PhDs. He is married to Rachel Sussman, who also has a UR Ph.D., jointly in Linguistics and Brain and Cognitive Science. Recently Proshanto was interviewed for *Multicast*.

Q: Do you see a correlation between your CS graduate work in AI and your area of law?

A: My AI background gave me an unusual perspective on the nature of Law. Fundamentally, AI and Law are both concerned with creating problem-solving systems. Both seek to map descriptions of real-world conditions to "appropriate" responsive actions, and both have to deal with the fact that real-world conditions are just too complex to be tractable to formal analysis.

The difference lies in how they tackle this complexity. AI systems do so largely by assuming it away—for instance, by modeling the input in a simple-but-tractable form such as first-order logic or a set of low-dimensional feature vectors. Legal systems, on the other hand, deal with the complexity of their inputs by invoking the human brain as an oracle. For instance, negligence rules specify that liability will attach to exactly those acts that were performed without "reasonable care." This rule in effect calls the brain of the fact-finder (the judge or jury) as a subroutine, and uses it to classify the complex facts of specific cases as "reasonable care" or "no reasonable care," in light of human experience and common sense. Similar calls to the human common-sense subroutine are

found throughout the law, from small-claims adjudication to constitutional review of legislation.

Coming from AI, I naturally thought of the ability to invoke the full power of human common-sense reasoning as the most exciting tool in the legal problem-solving toolkit. I was surprised to find, however, that people without an AI background did not see this at all. Many legal scholars, including some of my professors, find function-call words like "reasonable" and "intentional" distasteful in legal rules. Partly, this is because they feel that these open-ended terms leave room for the fact-finder's prejudices to affect decisions—which is true. But partly, they dislike these words for precisely the reason that they are powerful and necessary—namely, that it isn't possible to state their meaning in formal terms. Never having tried to use formal methods to duplicate aspects of human cognition, they don't realize what how extraordinary that is. My AI background gave me a different view.

Q: How have you benefited from your CS background in your field of law?

A: In some parts of academia, I think there is a perhaps excessive emphasis on the importance of going on to a career in research after getting a Ph.D. In its most extreme form (usually not in CS), I've seen this attitude take on an almost mystical tinge. But I think that the intellectual and technical skills one gets from a Ph.D. are valuable—and marketable—in many other fields.

Patent law, in particular, needs Ph.Ds. My law firm, for instance, already employs sixty-one Ph.Ds in various fields, and is constantly looking for more. Although a lot of lawyers lost their job in the recession, very few lawyers with Ph.Ds did.

I have found my CS background to be an invaluable asset. First, the substantive technical knowledge I gained has been very useful. For instance, while I was in law school, I worked with the Electronic Frontier Foundation to file legal papers to invalidate a patent on an NLP technology; I would not have been able to do it in the time available without a prior understanding of the field. Second, skills such as the ability to understand scientific papers, the confidence to quickly learn about unfamiliar technologies, and the vocabulary and assurance to talk with researchers and engineers about technical matters



Proshanto Mukherji, Ph.D., JD

are often at a premium within law firms. Researchers take these fundamental skills for granted, but since they are not part of the standard law school curriculum, many new patent lawyers must struggle to acquire them on top of a heavy case load.

Q: *What do you see as the biggest challenge in your field in the next ten years?*

A: This is an exciting time to be a patent lawyer. The field is in flux, trying to adapt itself to new technologies and new models of innovation production. This is its biggest challenge as well as its biggest opportunity.

The patent system tries to strike a delicate balance between the social costs and social benefits of exclusivity. On the one hand, patents have both short term and long term costs. In the short term, they create monopolies, which lead to the under-use of patented technologies. In the long term, they can increase the cost of follow-on research, thus potentially reducing the rate of innovation. On the other hand, patents also have long-term benefits. They create incentives to invent, to disclose the inventions once made, and to make the up-front investment necessary to transform these inventions into commercial products.

New technologies and new models of innovation can change this balance, and require corresponding changes to the law. The system is currently trying to adapt to at least two new developments. First, there is the rise of new technologies over the past few decades, such as biotechnology and software. We are still trying to reach consensus on when, and to what extent, innovations in these areas should be patentable.

Second, the patent system has to adapt to a new model of generating innovation, which is best represented by the free and open-source software movement. Because this model allows free use of its products to all, it gets few of the benefits of the patent system, but suffers all of its costs. The current patent system therefore creates a market distortion against this business model. On the other hand, eliminating patents entirely would probably create a similar market distortions against traditional systems of software innovation, which rely on exclusivity.

A lot will be changing in the next few years, and patent lawyers are in a position to shape the way new ideas and innovations are handled within our legal system; the incentives and penalties they create will profoundly influence the direction research takes within this country.

RICK RASHID VISITS ROCHESTER

Dr. Rick Rashid, the Senior Vice-President of Microsoft Research, visited UR April 13-15, giving talks on "The Future of Computing" and "A Personal History of Computing." This was a rare opportunity to hear and meet one of most important scientists and leaders in the computer industry. Dr. Rashid received his Ph.D. from UR in 1980, and became a professor at CMU. His research interests span artificial intelligence, operating systems, networking and multiprocessors. In 1991 he became the founding director Microsoft Research, and grew it into the premiere industrial research laboratory in computer science.

Recent Ph.D. Theses

Paul Ardis

*Controlling and Evaluating Inpainting
Research Associates for
Defense Conversion, Inc.*

Fabrizio Morbini

*Computational Infrastructure for a
Self-Aware Agent
Institute of Creative Technologies
University of California*

Benjamin VanDurme

*Extracting Implicit Knowledge from Text
Johns Hopkins University*



*Rick Rashid, URCS Ph.D. alum and
VP of Microsoft Research visited URCS in April.*

UNDERGRADUATE ALUMNI NEWS...



Aashna Plaisier

Bhopale Plaisier, Seema '04 I defended my Ph.D. in Molecular and Medical Pharmacology at the end of Feb. Our baby, Aashna Lynn Plaisier, was born May 10 of this year. She's thriving at almost 3 months. Now, I'm spending my time playing with her and finishing a second paper. Here is my first first-author paper: (it is actually an algorithm I developed with my PI) <http://nar.oxfordjournals.org/cgi/content/abstract/gkq636v1> .

Burke, Andy '03 "In February, I released a small iPhone game called TapTime. More recently, I just started as the Director of the Tools Group at Whitemoon Dreams, Inc., a small, independent video game start-up in Pasadena, CA."

Calarese Baird, Diana '03 and Baird, Tyrone '01 went to South Africa to attend the World Cup Soccer games. They hope to go to the next one in Brazil as well. They have a daughter, Sonya who was born in 1/09.

Clingerman, Chris BS '09, MS '10 will be going to UPenn to pursue a robotics Ph.D. this fall.

Clubb, David '06 "I joined Hitachi Consulting's Washington D.C. office in August 2009. As a consultant I have worked on a number of interesting projects. While the work can be a bit stressful at times, I am learning a lot and enjoying the variety of different things I do each day."

Dremeaux, Andy '06 "Pearl Shavzin and I married last September. I am currently doing freelance ad agency work in NYC."

Feil-Seifer, David '03 "I'm still at USC. This year, I was the recipient of the USC George Bekey Service Award. Also the USC Interaction Lab is a recipient of the PR2 Robot from Willow Garage as part of the PR2 Beta Program. This is a competition where 11 groups were selected out of 78 for outstanding research potential."

Frankel-Goldwater, Lee '06 "Doing well and about to begin a year of travels that will culminate with 9 months of study in Israel learning about ecology, permaculture, and peace building. These efforts will help in completing a masters degree from NYU in environmental conservation education. I'm glad for the foundation in critical reasoning and AI philosophy that I gained with CS. They have and will continue to assist me in my endeavors."

Hamilton, Jeff '01 "Amy Hamilton ('01) and I had our first child, Wyatt Marshall Hamilton, in February.



Sonya Baird



Wyatt and Jeff Hamilton

We moved back to Austin last summer, and I'm still with Google working on Android."

Hall, Garrett '10 "I am now fully employed at Tyco Electronics SubCom in Eatontown, NJ as a software developer."

Hilton, Rod '04 married CS minor Julia Sando on August 8th, 2009 at the Interfaith Chapel. CS alums in attendance included Dennis Lambe, Tori Sweetser and Sam Hathaway.

Horowitz, Daniel '05 "I got engaged to Lilya Rozenberg, a '05 U of R pre-med grad. She just graduated from NYU dental school. I am still working at 1010data with several other U of R graduates, one of them being Jake Pershing '10."

Inamdar, Peenak '00 "I'm currently working at an education consulting & product company, Wireless Generation, as a solution's architect/technology consultant. Outside of work I'm on the board of a local chapter for a professional IT & business architects community called IASA (<http://www.facebook.com/1/59ff9;www.iasahome.org>)."

Kimball, Erin '04 "I defended my Ph.D. in Chemical Engineering from Princeton in January and have been living in the Netherlands since November. I work for a company called TNO doing research on carbon dioxide capture and sustainable biomass and completely love it! I've been traveling all over Europe and think I have tripled the number of countries I've been to in the last 7 months! Its been good :)."

Kollar, Thomas '04 is a Ph.D. candidate at MIT and plans to graduate in the fall of 2010. On Sept. 19, 2009, he married Elizabeth Whitwell on the Riviera Maya.

Liveikis, Edward '01 "I'm currently working as the Development Manager working on completing a PS3/XBox360 AAA video game at THQ Kaos New York. I also have a daughter Ana, age 2."

Lu, David '07 continues his Ph.D. work at Washington University in St. Louis, now working with Dr. Bill Smart in the area of Human Robot Interaction, specifically the intersection between robotics and theatre. David recently accepted a summer internship at Walt Disney Imagineering.

Mackenroth, Adam '96 "I was laid off from my job in February 2009. I finally found a new job at the end of September 2009 that I am enjoying very much. I am now a database administrator for PnJ Machining (www.pnjmachining.com). From a personal hobby standpoint, I have taken up the challenge of geocaching. I'm mentioning that because it's a very techie thing if you haven't heard of it."

Margolis, Ben '05 "I'm currently working at California Cryobank as their web developer. I play sax in The Heart-sleeves in Boston."

Merz, Evan '04 "On May 30th I got married to Dr. Erin Woodhead, a psychology researcher who interned at the UR Medical Center back in 2003. In the fall, I am entering into the Algorithmic Composition program the University of California at Santa Cruz. This is a DMA (Doctor of Musical Arts) program that combines AI and music. I am

...FROM ACROSS THE MILES

studying with UR Engineering and Eastman Music Alumnus Paul Nauert."

Meyer, Jason '00 finished his MBA at NYU this May, and is excited to return to Rochester for his 10th reunion in October.

Mohan, Shailan '99 "The major update on my end is that I am currently doing my MBA at INSEAD, and expect to graduate in December 2010."

Muderick, Aaron '98 "In November 2009, I was elected to Narberth Borough Council. Narberth is a small Philadelphia suburb where I live with my wife Elizabeth, and two children Sara (6) and Rebecca (3). In January, after taking office, the council elected me to be their Vice-President."

Norine, Christopher '09 "I've just started Primary Flight Training as a Student Naval Flight Officer with CTW-6, and my only claim to fame right now is that my current command shares a hanger with the Blue Angels and I get to hang out in very comfortable flight suits."

Nur, Nawrose '03 "I was recently promoted to Technical Consultant at AllscriptsMisys Healthcare, and for the past year have been helping to implement and support ongoing system operations of Allscripts Enterprise level Electronic Health Record at Columbia University Medical Center. My wife and I will also be celebrating our three year anniversary this July...and hope to soon revisit Rochester to give her a tour of my alma mater. How time flies!"



*Banner contest winner
Tom O'Neill*

O'Neill, Tom '07 This year the URCS department ran a contest to design a new banner for the URCS home page. Tom's entry was selected to be the winner by an overwhelming margin by the CS community. Currently, Tom lives in Seattle and works for Microsoft as a Program Manager on Bing's Core Ranking team. Outside of work he enjoys Xbox, running and skiing.

Orlando, David '03 "I graduated from Duke with my Ph.D. in Computational Biology and moved to Boston to take a postdoc position in Dr. Richard Young's lab in the Whitehead Institute."

Oussayef, Karim '04 "I'm working as an attorney at Ropes & Gray doing Intellectual Property law. (Lots of computer cases)."

Reisfeld, Daryl '03 "I graduated with an MBA from Columbia Business School in May. I then got married on June 12, 2010 to Jennifer Tolchin in Rye Brook, NY. I have now returned to Booz & Co. full-time as a management consultant, specializing in operations strategy."

Rifle, Mike '07 "I'm getting pretty regular work as an actor - nothing major - but between that and bartending I'm making a living."

Rogers, Jennifer '02 "I'm working at Triangle Transit as a Data Analyst. My focus is on improving the quality of data that is collected on the vehicles for several transit agencies



Jonathan Schmid

in the region. I also am looking at how we analyze the data that is collected. It's been a change from computer science, but I'm happy to be working in the transit industry."

Schmid, Jonathan '03 "I graduated from Penn Engineering at last with an MsE in Robotics. I plan to seek employment in the simulation and modeling industries."

Sherwin, Brian '07 "I have a new job working for a start-up in California, LiveOps Inc. I dropped Wal-mart corporate like a bad habit."

Tam, Jonathan '02 "Last year I moved over to Johnson & Johnson Consumer Companies, Inc. in Skillman, NJ as a Brand Manager/Product Director. I'm responsible for digital marketing and web operations for a new brand/program called UPLIV, an online stress management program. I live in Lawrenceville, NJ with my wife of almost 3 years, Brendalys, and my nearly two year old daughter, Kaylani."

Thomas, Thomas '07 "I will be pursuing a full time MS at URCS this fall."

Tilton, Michael '08 "In January 2010, we purchased our first home (thanks to the homebuyers credit) in the city of ROC on the border of Brighton. In June 2010, I was promoted to Developer II at Paychex."



Jenny Turner-Trauring

Turner-Trauring, Jenine '03 got married to Itamar Trauring in August '09.

Uzilov, Andrew '05 "I am in my 3rd year of the bioinformatics Ph.D. program at UCSC (go Slugs!), currently preparing for my advancement exam. I am also planning for my wedding on Sept. 5 to fellow UR alum Kathleen Hutchison in Carmel Valley, CA! I am writing my fifth journal article, and this summer I taught programming (Python and C++) to high school kids for summer camp organized by the Digital Media Academy at Stanford. I also just finished my first of three years as a fellow of the National Science Foundation Graduate Research Fellowship Program."

Van Dam, Robert '05 "I had a second daughter, Alexis, in February '09, who joined her older sister Katie, now 4. I completed my Masters in Computer Science from Brigham Young University in August '08 and I now work at Bluehost.com in Provo, UT."

VanDurme, Benjamin BS '01, Ph.D. '09 "I defended my Ph.D. thesis at URCS in December, and am now research faculty at Johns Hopkins University, as part of the Human Language Technology Center of Excellence."

Weingarten, Tom '06 "I won the Outstanding Teaching Award from NYU CAS, and an award with the same name from NYU GSAS."

FROM SIMULATORS TO THE COCKPIT

Tyrone Baird leads a dual life



Tyrone in the cockpit of C-17

Tyrone Baird graduated from URCS in 2001. He is currently employed at Northrop Grumman in CA, and is also a C-17 pilot in the California Air Force Reserves. He has been called to active duty in recent years, and has been assigned to both military and humanitarian missions. Tyrone is married to Diana Calarese Baird '03 and together they have a daughter Sonya, born 1/09. Recently he was interviewed for *Multicast*.

Q: *We know about your CS history, but how did you get started in the Air Force Reserves?*

A: I've always been fascinated with airplanes and how they work. I wanted to learn how to fly but I had a tremendous fear of heights that I never thought I would be able to overcome. One day, I decided to take a flying lesson to see if it would help me overcome my fear, and I immediately fell in love with it. After graduating from the U of R, I felt that I had the time and the resources to become a Military Officer and ultimately a pilot, so I decided to pursue that goal. First, I had to complete flying lessons at a civilian school to get my private pilot license. I then received a sponsorship by a reserve flying squadron located in Southern California to become a C-17 pilot. I attended Officer Training School at Maxwell AFB Alabama, then Undergraduate Pilot Training at Laughlin AFB in Del Rio, Texas. The entire training process took 2 years! It definitely was one of the most difficult challenges I have ever faced, but it was well worth it.

Q: *Tell us about your job as a pilot in the Air Force Reserves. How often are you called to active duty?*

A: It depends on the needs of the military. When I first became a pilot 3 years ago, the conflict in the Middle East was still very active and they needed as many airlift pilots as possible. Because of that situation, I was placed on active duty orders for close to one year, staging out of Ramstein Air Base in Germany. Our main assignment was to fly aero-medical evacuation missions out of the various combat zones in Iraq.

After completing my active duty tour, I was

placed in the reserves and have been a traditional reservist ever since. As a traditional reservist, there are still a large number of missions that we perform around the world, including those into Iraq and Afghanistan in support of the Global War on Terrorism. These missions do not require the unit to be fully activated in order to participate, which gives traditional reservists the added flexibility to be able to live semi-normal civilian lives and still actively contribute to the needs of the military.

Q: *What kind of missions are you sent on when flying the C-17 transport planes?*

A: There are a wide variety of missions that we perform; they range from simple one day training missions to direct Presidential mobility support (transporting the President's security service detail and his vehicles) that take us around the world. One mission in particular that will have a lasting impact on me was "Operation Unified Response." This mission was to support the Haiti earthquake disaster relief. We flew a number of sorties from Charleston Air Force Base in South Carolina, transporting medical supplies, reconstruction equipment, and rescue and recovery personnel. The U.S. military relief effort was overwhelming, but so was the magnitude of the disaster. Flying into Port-Au-Prince, from the air, the aftermath of the earthquake was all too clear. Most buildings in the city had collapsed, and the port itself was completely destroyed. There were people everywhere in the streets; it almost seemed like they were walking to nowhere. I've never witnessed anything like it before or since. I was definitely humbled and extremely grateful to be able to help. On each return trip to the U.S. we transported a full load of Haitian-American refugees to Orlando, Florida. Most of those people had not received any basic necessities for close to one week. Fortunately, the processing station in Florida took great care of them in getting them what they needed.



Relief supplies for Operation Unified Response

Q: *How does each job impact the other? Does it put you in an interesting position at Northrop Grumman that you are both a pilot and a computer scientist?*



Haitian relief victims boarding C-17

A: Being a member of the Air Force definitely puts me in a unique position at my job with Northrop Grumman. I get to see the perspective from both sides; from the user point of view (the military) and the provider. I find that I can bring many of my experiences gained while I was deployed to my current job. For example, one project that I worked on involved the creation of an advanced tactical data communications link between aircraft. Communication systems are

an essential part of any aircraft, and based on my field experience, I was able to provide the systems engineers and software developers with firsthand feedback on various types of communications challenges we typically encounter as pilots, and I suggested changes to make this system better.

My background as a computer programmer enhances my ability to perform my flying duties. The C-17, like many other modern aircraft, has a built-in mission computer. This computer is programmed for every flight we take. It's not programmed in the sense that we write code, compile and run it. Instead, it takes various inputs from the pilots such as air temperature, winds, air pressure, flight path waypoints, etc, and computes all the necessary parameters the aircraft will need to accomplish the mission safely. Having the computer science background makes the process of "programming" the aircraft easier and intuitive.

Q: How computerized are the planes? Are they really like the flight simulators in video games?

A: Many pilots consider modern airplanes to be very



Cargo hold with Haitian relief victims en route to US

big and expensive flying computers. Almost every system in the aircraft, i.e. hydraulics, electrical, flight control, communications, life support, etc., is driven by embedded computers with manual backups. The aircraft autopilot and auto throttles take constant feedback from the surrounding environment and compute exact positions to place control surfaces (rudders, ailerons, flaps, or any other surface of the airplane that controls how the plane moves through the air) much faster than any human being could accomplish. This makes for very smooth flights, and helps us pilot the aircraft in the safest way possible. Some flight simulators and video games are very similar in reproducing the way airplanes fly. In fact a lot of our training is done in full size, high fidelity motion simulators, making the transition to flying the aircraft practically unnoticeable.

Q: *If it won't ruin your top secret clearance, where do you think the future of computer technology will be in the aircraft industry? What kind of products have you worked on at Northrop Grumman?*

A: The US military is moving more and more towards automated systems, removing the human factor entirely from the aircraft. In the near future there will be many more unmanned air vehicles (UAVs) and unmanned combat air vehicles (UCAVs). There are a large number of projects currently under development by the Department of Defense and government contractors like Northrop Grumman. Their intent is to minimize the presence of humans in the extremely hazardous combat environments they face during war, as well as to avoid having people perform repetitive mundane tasks such as aerial patrolling. With the increasing pace of computing power and the leaps in artificial intelligence, these highly complex automated systems will need less human intervention and soon they will be able completely perform all phases of a mission without any human input.

At Northrop Grumman, I've worked on a few different projects, but my main focus has been working on air to air and air to ground communications systems. Most of the work is classified above secret, but what I can say is that it is highly challenging and rewarding. I believe it will continue to help keep our military the best in the world and keep our soldiers safe.

Q: *What is the most valuable skill you learned at UR CS*

and why?

A: The most valuable skill I learned was critical thinking; to be able to look at problems from different perspectives to find a solution. I learned this from taking Computer Science courses such as Data Structures, Discrete Mathematics and Design of Efficient Algorithms. Almost every day I go to work, either at Northrop Grumman, or at the Air Force, I come across problems where I can apply my knowledge to find solutions. At Northrop Grumman, the software development process requires not only the ability to physically code the system, but also come up with design solutions to various computing problems that make the systems highly efficient due to the types of environments they will operate in. During combat situations, many of these systems become critical to keeping our troops safe, therefore the code has to be robust and as free of errors as possible.

Q: *What's the most rewarding part of your life now? What do you do for fun and relaxation?*

A: I have to say by far, it is the time I'm able to spend with my wife Diana and daughter, Sonya. I can see how it can be easy to take one's family for granted, but being away from them just makes me realize even more how much joy and fulfillment they bring to my life. Being able to help out when disaster strikes a part of the world, or to help keep this country safe by working on future defense technologies, or even helping the French government clean up the mine infested waters off the coast of New Caledonia by transporting US Navy mine detecting dolphins, are all very rewarding experiences in their own way. If it wasn't for my wonderful family, however, I wouldn't be able to enjoy those rewards the way I do.

For fun, whenever I get a chance, I like to go SCUBA diving. I also enjoy spending time with the family at the beach. Sonya especially seems to like going to the beach and playing in the sand. Luckily, we live in Southern California, so there are plenty of beaches we can go to on the weekends and when I have time off.

I believe that our daughter will definitely have a high interest in becoming a URCS alumna since both her parents are. However, it might be a little bit difficult convincing her to leave the perpetually mediterranean Southern California climate to face the harsh winters in Rochester! She seems to really enjoy the warm weather and the beaches.

**If you graduated in a year that ends in 5 or 0,
Please join us Meliora Weekend, Oct 15th @ 3:30-5:30PM for the
Computer Science Undergraduate and Graduate Reunion Open House
in Computer Studies Bldg. 601**

Congratulations to the Class of 2010

E. Wyatt Anderson
Ian Christopher
Martin Collins
Kevin Gessner
Garrett Hall
Chase Hermsen
Dennis Huo
Bryan Jacobs
Joseph Kachinsky
Damian LaRue

Darly Paredes
John Pershing
Robert Ramsay
James Regan
Gabriel Schwartz
Michael Seid
Emily Vukman
Gregory Wilbur
Andrew Wood



First and Final photo of CSC Undergrads in April 2010 in the "Tree of Life" in Genesee Valley Park. This summer, the tree uprooted and split at the base due to root rot. No one was injured. RIP Tree of Life!

<http://www.cs.rochester.edu>

Multicast

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University of Rochester

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Editor/DesignerMarty Guenther
Editorial AdvisorLen Schubert
Contributors Marty Guenther, Henry Kautz,
Len Schubert, Daniel Štefankovič

Meliora Weekend
October 14-17, 2010

<http://www.rochester.edu/melioraweekend/>

Thank you to all donors who have contributed to the University of Rochester in the last year. If you are interested in donating to the department or the University, please go to the alumni website and look for “Online Giving.”

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