conduit!

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Brown University

INTERNET AGENT ECONOMICS: A Trading Agent Competition

Amy Greenwald

Suppose you want to buy a used Canon AE-1 SLR camera and flash at an on-line auction. At last count, over 4000 links to on-line auction sites were available at *advocacynet.com*. It would be a daunting task to manually monitor prices and make bidding decisions at all sites currently offering the camera—especially if the flash accessory is sometimes bundled with the camera, and sometimes auctioned separately. But for the next generation of automated trading agents—bots—this will be a routine task.

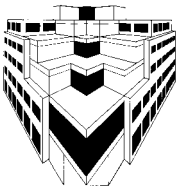
Simultaneous auctions, which arise naturally on the Internet, are a challenge to bidders, particularly when complementary and substitutable goods are on offer. Complementary goods are items such as a flash, a tripod, and a case, that would complement a camera—but a bidder desires any of the former only if s/he is certain to acquire the latter. Substitutable goods are goods such as the Canon AE-1 and the Canon A-1—a bidder desires one or the other, but not both. In combinatorial auctions, bidders bid on combinations of items, such as "camera and flash for $295"; in these auctions, the (NP-complete) problem of determining how to allocate the goods so as to maximize revenue falls to the hands of the auctioneer. In simultaneous auctions, however, the complexity burden lies with the bidders.

The first international trading agent competition (TAC), organized by the AI laboratory at the University of Michigan and led by Mike Wellman, challenged its entrants to best-design a trading agent capable of bidding in simultaneous on-line auctions for substitutable and complementary goods. TAC was a success, as 22 agents from around the world entered the competition; 12 of them qualified to compete in the finals, which were held at ICMAS '00 in Boston this past July. My agent, RoxyBot, developed in collaboration with Justin Boyan of NASA Ames Research, finished in a four-way statistical tie for first place.

> *"Simultaneous auctions, which arise naturally on the Internet, are a challenge to bidders...but for the next generation of bots they will be a routine task"*

Rules

The TAC competition consisted of a series of game instances, each of which pitted eight autonomous bidding agents against one another. Each TAC agent simulated a travel agent with eight clients who were



interested in traveling from TACtown to Boston and home again during a five-day period. Each client was characterized by a random set of preferences for the possible arrival and departure dates, hotel rooms (The Grand Hotel and Le Fleabag Inn), and entertainment tickets (symphony, theater, and baseball). A TAC agent's score in a game instance was the difference between the total utility it obtained for its clients (i.e., measure of success as determined by its clients' preferences) and the agent's expenditures.

In order to obtain utility for a client, an agent had to construct a complete travel package for that client by purchasing airline tickets to and from TACtown and securing hotel reservations. It was also possible to obtain additional utility by supplementing a travel package with entertainment tickets. Each item was sold separately at auction: in total there were 28 goods, and therefore 28 simultaneous auctions. Airline tickets were sold in single-seller auctions that cleared continuously. Hotel room reservations were sold in simultaneous ascending 'English' auctions (auctions like those for antiques and art). These auctions could clear at random after a sufficient period of inactivity, but otherwise cleared at the end of the game. Entertainment tickets were traded in continuous 'double' auctions (auctions like those on the New York Stock Exchange).

Complete details are available at:
http://tac.eecs.umich.edu.

Decisions

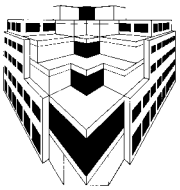
During a TAC game, agents were continuously faced with three basic decisions: what goods to bid on, how many to bid for, and what price to bid at. These bidding decisions were complicated by the tradeoffs resulting from complementary and substitutable goods. For example, a flight to Boston complements a flight back to TACtown, but a one-way ticket is of no utility. Similarly, an entertainment ticket for a given night would complement a travel package that included that night, a flight arriving that day, a hotel room for that night, and a flight departing the next day—but the entertainment ticket is of value only if the complete travel package is obtained. Moreover, multiple entertainment tickets on a given night are substitutable (a single client can go to at most one of symphony, theater, and baseball); thus, an agent had to trade off among its clients' preferences for the various types of entertainment tickets and their price differential. Similarly, the good and bad hotel rooms were substitutable: an agent had to trade off between its clients' preferences for the good hotel and the price differential between the two hotels.

Strategies

The most substantial strategic dichotomy in the competing TAC-agent designs was in the use of greedy vs. (approximately) optimal decision-making algorithms. Greedy algorithms are simple to implement and fast, but in general exhibit suboptimal performance. Optimal algorithms must repeatedly solve NP-complete problems in real time. For example, while some agents focused on obtaining complete packages, others made bidding decisions on travel packages alone (i.e., flights and hotel rooms) without regard for entertainment tickets, essentially breaking the TAC problem down into two subproblems, and solving greedily. Although simpler, the greedy strategy is not optimal in general. In particular, it is preferable to extend a client's stay whenever the utility obtained by assigning that client an additional entertainment ticket exceeds the cost of the ticket and an additional hotel room (plus any travel penalties incurred). Similarly, it is sometimes preferable to sell entertainment tickets and shorten a client's stay accordingly. A second example of this strategic dichotomy was seen in the fact that some agents aimed to satisfy each of their clients in turn (greedy), whereas others made global decisions regarding all their clients' interests simultaneously (optimal).

RoxyBot

RoxyBot is short for "ApproximateBot," a name that represents our goal of constructing a trading agent whose strategies approximate optimal behavior. Using AI heuristic search techniques, RoxyBot incorporated an optimal solver for the problem of *allocation*—assigning already purchased goods to clients at the end of the game so as to maximize total utility. RoxyBot also incorporated an optimal



solver for the more general problem of *completion*—determining the optimal quantity of each item to buy and sell given current holdings and forecast prices. The formulation of the completion problem involves a novel data structure called a *priceline* designed to handle (estimated) prices, (estimated) supply and demand, sunk costs, hedging, and arbitrage in a unified way. RoxyBot's high-level strategy is outlined in Table 1.

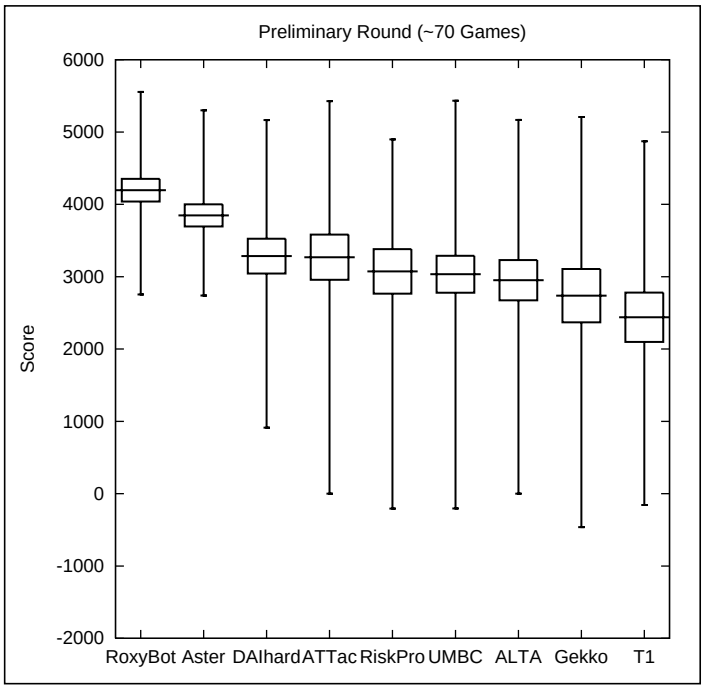
(A) **While** enough time remains for at least 1 bidding cycle, **do**:
1. **Update** current prices and holdings for each open auction.
2. Based on current and historical price trajectories, **estimate** closing prices and the supply and demand of each good; store these estimates and current holdings as a **priceline**.
3. Run the **completer** to determine the optimal quantity of each flight, hotel, and entertainment ticket desired; compute the difference between the optimal values and current holdings.
4. Set **bid/ask price** strategically to buy desired goods at minimum cost and sell undesired goods at maximum prices.

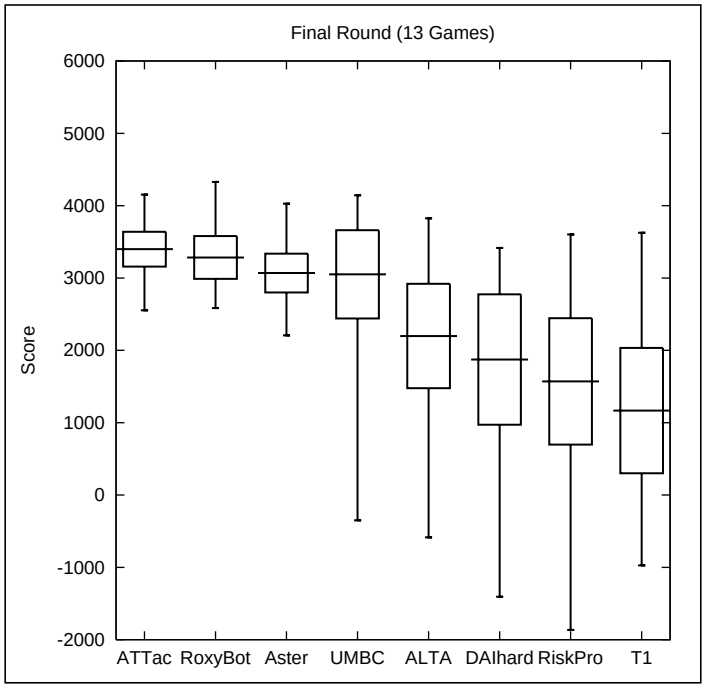
(B) After all auctions have closed, run the **allocator** to assign goods optimally to individual clients.

Table I

Results

The results of the TAC competition are depicted in the graphs below: the first graph depicts the scores in qualifying rounds (up to 90 games, with the lowest 10 scores dropped), and the second graph depicts the scores on competition day (13 games). Along with RoxyBot, the other three top-scoring teams were ATTac, Aster, and UMBCTac. ATTac, built by a team of researchers at AT&T (including Michael Littman, Brown PhD '96), is an agent whose functionality is best characterized as adaptable; its flexibility enabled it to cope with a wide variety of scenarios during the competition. Aster, developed by **Brown CS's IPP Partner intertrust.com**, is an agent that is neither strictly greedy nor strictly optimal; scalability, rather than optimality, was foremost among its designers' goals, since they expect many situations of practical interest to be more complex and less structured than TAC. UMBCTac's competitive edge is that it conserves network bandwidth; on average, this agent updates its bidding data every 4-6 seconds, providing a significant advantage over the reported 8-20-second delays experienced by competing agents. There was a





Mean, minimum and maximum at 95% confidence interval

TAC panel at EC '00 in Minneapolis this October, in which the top four TAC agent teams participated. Next year's competition will be held in conjunction with EC '01.

Artificial Intelligence and Economics

My graduate seminar this semester, *Internet Agent Economics*, is concerned with the use of game theory and economics as frameworks in which to model the interactions of Internet agents. It covers both the design of Internet agents and the analysis of the potential impact of billions of such agents on technology and society. Selected topics include web auctions, automated negotiation, recommender systems, and shopbots and pricebots. With regard to the pedagogical aspects of TAC, graduate students may satisfy their programming requirement by implementing a (approximately optimal) TAC agent, while the final project in CS 141, my spring-semester undergraduate AI class, will be to build a (greedy) TAC agent.

CS AWARDED TWO NSF ITR GRANTS

David Laidlaw

In mid-September NSF announced the award of its prestigious Information Technology Research (ITR) grants.

The major goals of the program are to augment the nation's information technology knowledge base and strengthen its IT workforce. NSF director Rita Colwell said, 'These projects represent major innovations in information technology, rather than routine applications of existing technology.' 'This initiative,' said President Clinton in announcing the awards, 'will help strengthen America's leadership in a sector that has accounted for one-third of U.S. economic growth in recent years.' Brown Computer Science investigators received two of the only 62 'large' (more than $500,000) ITR grants awarded nationwide.

Prof. David Laidlaw's four-year, $2.3-million grant will fund an interdisciplinary and inter-university research team that includes Brown's Andy van Dam, an artist, an applied mathematician, a biomedical engineer, biologists, and perceptual psychologists who will develop new ways to look at scientific data from magnetic resonance imaging (MRI), computer-sim-

"THE UNIQUENESS OF CS92" borne out ...

In the spring '99 issue of ***conduit!****, Roger Blumberg wrote about CS92, the Educational Software Seminar, in which our undergraduates create instructional software for local schools including Vartan Gregorian Fox Point Elementary School. One weekend afternoon in September, he sent the following letter to the four students who worked on one of the spring 2000 projects for the Gregorian School:*

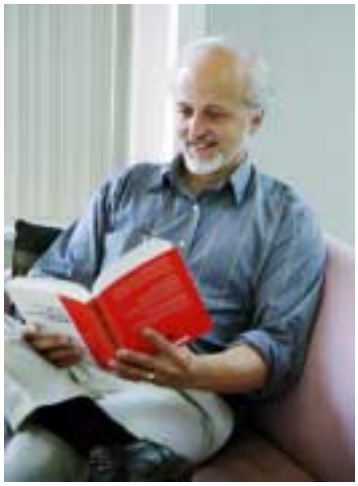
Dear Roberto, Ranyee, Kevin and Imeh,

A few hours ago my doorbell rang and it was one of the kids in the neighborhood selling giant candy bars to support school field trips. It turned out the school was Vartan Gregorian and he was in the third grade, so I asked who his teacher was this year and sure enough it was Karen, so I asked him what he was learning in math (I didn't say anything about computers). Well, the kid's face immediately lit up and he launched into a giant, breathless sentence about your Mad Math Minute, about how they use it at school and he even got to bring a copy home and put it on their PC and now he uses it at home, and on and on. His father was with him as the kid walked around pushing the candy bars, and added "Yeah, it's really a pretty cool program, and you know some Brown students made it!" I said yeah, I knew. I wanted to tell you all about this, since it really is a testament to your having created something that not only works but genuinely gets the kids excited. The kid's enthusiasm and comments really made my day (more than the 4-pack of Reese's!), and I hope you'll take some pride and pleasure in it too. I also hope you're all well and good and having an excellent semester. All the best,

Roger

ulated blood flow research, and geographic remote sensing.

'Current MRI technology, for example, can supply huge amounts of data, but there is no practical way of visualizing it,' Laidlaw said. More information could be extracted from an MRI if one could somehow look at the multiple values represented at each point of the image.



Stan Zdonik

The team will apply ideas from painting, sculpture, drawing and graphic design to create new visualization tools that portray huge amounts of data as effectively as possible. 'We're looking for more expressive pictures than are currently available,' Laidlaw said. The researchers will use perceptual psychology to compare the effectiveness of visualization tools in several environments, including virtual reality, desktop workstations, paper and 3D rapid-prototyping output. The tools will be developed and evaluated in close collaboration with scientists in three disciplines: neurobiologists studying neural development and diseases via biological imaging, computational flow researchers studying blood flow through arteries, and geographers using remote sensing for environmental monitoring and natural resource management.

Under Prof. Stanley Zdonik's five-year, $3.2-million grant, researchers (CS's Steve Reiss, Michael Franklin of UC Berkeley, and Mitch Cherniack, CS PhD '99 and now on the faculty at Brandeis) will study ways to make using the Internet faster and more responsive by designing web-based middleware—software to enhance the interaction between users and Web servers. The team's research focuses on designing technology to let people create profiles of their information interests and on developing techniques that can use those profiles to manage web data intelligently.

Another goal of the research is to explore how user profiles might let people update the information they carry in their portable computers and cell phones. The team hopes to develop techniques that would allow someone to plug into an Ethernet socket to update the limited memory of a computing device. The user would receive updated e-mail and other information. The researchers hope to make such "data recharging" on a portable device as simple as recharging a battery.

THE ARTEMIS PROJECT

Project organizer, CS chairman Tom Dean

The original creators of the Artemis Project were Anne Spalter and Andy van Dam, as part of their NSF STC outreach program.

Encouraging women to pursue a high-tech career means fostering interest in computers and technology during their early teens. To this end, CS chairman Tom Dean, organizer of the four-year-old Artemis Project, recruited four Brown students from the department's Women in Computer Science (WICS) group to run a five-week summer camp for girls finishing the 8th grade who were interested in science and technology.

"If you want to encourage young women to get excited about the field," says Tom Dean, "it's probably not a good idea to get a bunch of stodgy old computer science professors together." Instead, he called upon Christine Davis '02, Seema Ramchandani '02, Maryam Saleh '01 and Gloria Satgunam '03 to coordinate the project and mentor the girls. To launch the project they got a $15,000 donation from the Microsoft Local Community Alliance, $7,500 from the Brown University Leadership Alliance, and further support from Brown's Undergraduate Teaching and Research Assistantship program. Named after the Greek goddess of the hunt, known for her strength, independence and courage, the Artemis Project aimed to introduce concrete computer skills and abstract computer science concepts while developing self-confidence and leadership in an encouraging and challenging environment. Similar all-girl camps are becoming a popular method to overcome what experts call the digital gender divide, the relative absence of women from science and technology-related fields.

To promote the program, the Brown students visited area schools and met with guidance counselors. They were well received by instructors who saw that the camp's activities and environment would nurture the girls' curiosity, teamwork, self-confidence and creativity. Said Brown student Seema Ramchandani, "We want girls to become confident in themselves. They are between ages 12 and 16. That's the age that most female teens are going through a lot of difficulties.... There are stereotypes that doing computers is not cool.... We have to help them have the confidence to get up there and say, 'I can do it and not put society's values before my own.'"

Forsaking early-morning television and fun with friends, 17 teenage girls spent five weeks in the department's computer labs, building Web pages, robots, designing computer programs and developing an enthusiasm for everything high-tech. The main focus for the Brown students was to teach the girls that technology is an enabling tool; to encourage them to be designers of technology and dispel the perception that it is an antisocial and solitary activity. Each participant was assigned an undergraduate female mentor from the WICS group with whom they corresponded by email. In addition to using logic and deductive reasoning in exploring topics in CS such as object-oriented programming, AI, smart robots and computer animation, they learned the practical skills needed to use word processing, email and the World Wide Web. During camp, the girls were divided into groups of five with an instructor. One group built two robots, programming one to follow a black line while the other lifted its hat when you shook its hand or waved in front of it! Another team worked on computer games featuring pirate ships, another designed computer maze games, and yet another waded through a huge pile of Legos to create a candy dispenser! To build teamwork and leadership skills, the students participated in more traditional camp activities—negotiating a rope course, throwing water balloons and being blindfolded and led around by a partner. Despite challenges and initial aggravations, the girls began opening important lines of communication among themselves and with their instructors and soon came to appreciate the benefits of cooperation and teamwork.

Talks by CS faculty and alumni as well as field trips to the Boston Science Museum and the CS virtual reality lab rounded out the schedule. Talks on art and science, computer animation and women in science and engineering stimulated much active discussion. A visit by Danah Boyd '99, now at MIT's Media Lab, helped spark lively conversations about women and technology—Danah is an ardent feminist. Beside the hardcore focus on technology, there was plenty of time for just plain fun—a breakdancing session (now they can all jenga and down rock!), a spontaneous pajama party at a Thayer St. Indian eatery after the daily infusion of lunchtime sandwiches began to pall, and many whacky trips to the supermarket. The high point of the five weeks was the last day, when parents, friends and siblings arrived for a big party (shrimp, not sandwiches at this event!) and the girls were able to show off their projects, web pages and robots. Thanks to the great generosity of Microsoft, each girl was given a huge amount of software to take home. The instructors had asked

Artemis coordinators, l to r: Gloria Satgunam '03, Seema Ramchandani '02, Maryam Saleh '01, Christine Davis '02

The coordinators designed this lively and informative poster as a fun way to document the many facets of the five-week program

Microsoft to donate software so they could give each girl a parting gift. A list of choices was submitted (please send either this or this, etc.), and Microsoft sent the entire list, enough for 20 students!

For the four Brown students, the Artemis experience required a major commitment of time, effort and patience, but each gained insight and not a small amount of self-knowledge, as the following reactions attest:

Christine Davis

The last three months have been crazy! From the work we put in last semester recruiting at various middle schools in and around Providence (with no direct access to a car, mind you) to trying to tie up all the loose ends and move forward full speed with CS148 (Building Intelligent Robots), things have been a little hectic, to say the least. But through all of our adventures we have managed to pull through, coming closer together and learning a lot along the way. We've come a long way in our ability to work as a team—I've also gained a lot of respect for my teachers and professors. I don't think I ever knew how hard they work or how much energy they put in just to teach their often recalcitrant students. Teaching also requires more patience than I ever thought possible. Working with students who have never programmed before or dealt with computers at such an intense level (both the Artemis girls and some of the CS148 students, since there are no prerequisites for the course) requires a different mindset from the one I have when working with my peers. I will be able to use the experience I gained with Artemis when thinking about the best way to teach these concepts to the CS148 students.

Gloria Satgunam

This was definitely a one-of-a-kind experience for me. Artemis was so much fun as well as so much work. I have always enjoyed working with kids, but being responsible for maintaining the focus of 17 young girls six hours a day proved to be quite a challenge. However, the innovative way in which we introduced the girls to computers and robotics helped a great deal. From Lego Mindstorm® robots to Klik and Play's graphically oriented programming language to our own interactive games, I believe that we succeeded in providing an interesting and fun environment in which the girls could learn and have fun simultaneously.

Maryam Saleh

My goal for this program was to "creatively" engage a group of young girls into learning more about science. To achieve this we designed an educational environment with no competition and no absolute authority. The students

weren't awarded grades for completing a project: we trusted them and their self-motivation. Furthermore, to eliminate the impersonal aspect of a student-teacher relationship, we usually split the class into groups of five accompanied by an instructor.

Still, there were times when lack of interest called for more motivational speaking on our part. When the robots would fall apart, so would the girls' drive. This is where our responsibility kicked in to keep them interested. Whether it be by making clowns of ourselves or the use of another tactic, the important part was to stay honest. Each instructor was simply a more experienced group member providing the means necessary to come up with a solution. I avoided showing them a simpler path to the finish line. And yes, sometimes the girls came up with innovative ways of solving a problem, and sometimes not. But since they had experienced their way and had seen it didn't work, they were more willing to hear another method. I noticed in our discussions that most girls had inquisitive minds that questioned what was offered to them as fact. They always challenged us to have solid proof behind everything we taught them. Hence, they motivated us to be well informed and not take anything for granted. It was a reminder of what I consider one of the most important lessons in life.

Programmed to move and react to light sensors, this robot was made by the the team of Jamie Burr, Classical High School; Amanda Boyanowski, Shea High School; Nancy Tavares, Cranston East High School; and Nicole Terrien, Seekonk High School

Seema Ramchandani

Certain things you learn through classrooms, others are learned through experience. During Artemis I had a chance to experience a new niche within the community as a coordinator (which includes being a team member, mentor, teacher, student). After the first few days, we realized that the key to making a day successful was to assign a goal for the entire group and work together to realize it by the end of the day. In a group, each woman supports, checks up on and becomes a resource to the others. Within the first week, it seemed like the girls had also learned their first lessons on "working in groups". On the fourth day, I had given them the assignment of organizing themselves by their birthday while blindfolded and without speaking. At first, seventeen girls spent fifteen minutes on the green outside our building complaining (breaking the silence rule) that it was impossible even to try. After realizing it was impossible to gain my sympathy, one girl implemented an idea of communication and it spread like wildfire; with encouragement from us, they completed the task within 15 minutes. The girls might lose complete hope in completing the mission that you gave them, or you might have a limp hair day, fall flat on your butt during breakdancing, or drop three robots on the floor simultaneously after each group spent four hours building them, but the great thing was that you could take a five-minute break and there were three other women to help you out.

One of the Artemis teenagers is now taking a well-rounded course load at Shea High School, including classes in business, math and science to prepare for a high-tech career. She hopes to attend Brown, as do most of the participants. Says chairman Tom Dean, "We'd be ecstatic, if the class of 2008 had a few more women graduating in computer science as a result of this summer's Artemis Project."

www.cs.brown/orgs/artemis

In mid-October, Professor Emeritus Peter Wegner was awarded the Austrian Medal of Honor for Science and the Arts, First Class. The ceremony, attended by senior colleagues, was held at the Faculty Club. Austrian Consul General Dr. Harald Miltner, who bestowed the medal upon Peter, thanked him for his work in helping Austrian computer scientists. CS chairman Tom Dean described Peter "as a god in the programming languages pantheon", one of the first to explore the connection between programming language, which controls how computers function, and the hardware of computer machinery. Said Dean, "His research is so vital, that just recently, two talks during an academic computer conference in South Carolina were largely devoted to Peter's latest work." After the award ceremony, Dr. Miltner and his wife accompanied Peter and Judith for cake (shaped like Peter's award) at a more casual get-together in the department, attended by the rest of the faculty, staff and students.

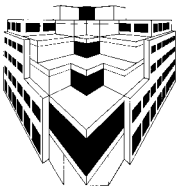
The great wonder for us all is that Peter, who survived the Holocaust thanks to the "Kindertransport," also survived being hit by a bus and spending many weeks near death in a London hospital, this just two weeks before he was to go to Austria to receive the Medal of Honor in June '99. Having the ceremony essentially brought to Peter; however, made it all the more significant, since his colleagues and friends were able to participate and wish him well on this great occasion.

ALUMNI EMAILS

JOSÉ CASTAÑOS, PhD '00

It feels like a long time since Commencement. The week after graduation I joined IBM Watson, just north of New York City. This region is very nice, with large forests for hiking where you often see deer, and the Hudson is not far away. We have some great neighbors, such as Hillary, although it gets a little annoying when her husband comes for a weekend and we have to wait for them on the highways.

Nevertheless, I live just half an hour away from Grand Central Station so a trip to Broadway and a nice dinner are relatively common. As you can imagine, I have not even started to explore everything that Manhattan has to offer, but I have already learned a few lessons. Not



only should you bring a lot of cash but you should also plan well in advance because chances are that several million New Yorkers are trying to do exactly the same thing. For example, don't just show up at the door of the US Open without tickets and expect to get in. And forget about getting seats for the Subway Series!

Here at IBM we are starting a project called Blue Gene. Our goal is to build a computer with a million processors and 1-petaflops performance (this is 100 times more powerful than the new ASCI White) to study the folding of human proteins. This is one of the most interesting questions in biology. The function of a protein is determined in large part by its three-dimensional structure, and many diseases like Alzheimer's and mad cow disease are caused by misfolded proteins. Understanding and simulating this process can help us provide new treatments and design new drugs. These simulations are very compute-intensive, and a machine as powerful as Blue Gene will still require about a year of compute time to fold one protein, a phenomenon that can occur in nature in just a few milliseconds.

Taking advantage of Blue Gene's massive parallelism is our challenge. Blue Gene should still run in case of faults since we expect a chip to fail every day. Our algorithms should provide predictable performance in this degraded machine. We will also consume all the available power north of New York City but we should be able to slow down the machine in the summer to cope with power shortages.

As you can see, I am trying to make good use of my Brown education. Please, don't forget to mail me my ***conduit!***. And, by the way, I like the new web site much better. José *castanos@us.ibm.com*

TED CAMUS, PhD '95

Greetings! Well, after almost four exciting years working on iris-matching algorithms and products, Sensar has been acquired by IriScan, the company from which we licensed the core iris-matching software. As you may remember, I had worked on the WFOV ("wide-field-of-view"), which located the subject's eye in 3D space using stereo and face-template matching algorithms, and was later the algorithms lead for on our next-generation product intended for ATMs, called "R3." The latter ultimately resulted in an impressive product demo; however, as it turned out, R3 was basically ahead of its time and was suspended.

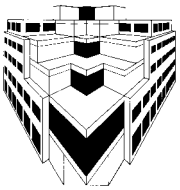
While things did not work out as I had planned, I've since joined Sensar's parent company, Sarnoff Corporation, working in the newly formed Robot Vision Group under the Vision Technologies lab. (I did manage to spend a week in Paris before changing jobs, a wise move!) The lab works on several government and commercial consulting contracts, and is also very interested in generating spinoffs (of which Sensar was the first). So, I may find myself involved with a startup yet! Best wishes, Ted *tcamus@sarnoff.com*

JACK HUMPHREY, ScB '95

Hello, ***conduit!*** readers—The last five years have been great, both personally and professionally. I am now living in Austin, Texas, and having an amazing experience at Reactivity—more on that later.

After graduation, I joined Electronic Book Technologies in Providence and helped create a web content management system called DynaBase. Jeff Vogel was my manager, and Ed Bielawa joined us at the beginning of 1996—it was a great team! During my time at EBT (through July 1997), we were acquired by Inso Corporation, which has since downsized to include only the DynaBase business and is now called eBusiness Technologies. I'm happy to report that the product lives on, is still evolving, and continues to be sold today.

When a small but significant blizzard hit New England on April 1, 1997 (a day I happened to be scheduled to fly out to San Francisco), I admitted to myself that this Texas boy was not cut out to be a New Englander. With nothing but the greatest admiration for those of you who stand up to winter year after year, I headed back to whence I came, the sunny climes of Austin. Here, I found a unique and ambitious company called Trilogy and joined up. During my three years there, I helped to develop infrastructure technologies for our e-business products, including a web application development framework that



supplemented ASP, Java Servlets, and JavaServer Pages (JSP).

Now I've been at Reactivity for two and a half months and I love it! (The only thing we're missing is other Brown grads.) Reactivity was founded in 1997 in Silicon Valley, with the mission of bringing together technical innovators to build great new companies. We now have offices in Silicon Valley, Austin, Boston, and Seattle. There are two parts to our business: startup services and startup creation. We provide high-value technology services to our clients, usually fledgling technology companies who don't yet have development teams. In a sense, we become a client's "virtual" product development team and build either a prototype or a version-1.0 product. That's startup services, which is very rewarding and interesting, but there's also startup creation—internally, we spend a lot of time brainstorming, investigating, and prototyping new ideas for technology companies. When these ideas take off, they can spin out into their own companies, with Reactivity employees leaving as founders and first employees. Zaplet (formerly Firedrop) is our first spinoff and is doing great. I encourage everyone to check out their unique technology, which enables truly dynamic email. Next time you want to schedule a group meeting or poll your friends, go to *http://www.zaplet.com*.

I recently visited Brown on a recruiting trip and got to visit with Professors Zdonik, Savage, and van Dam, as well as a few students. It was great to catch up with everyone and hear about all of the interesting things that are going on in Brown CS. I'd love to hear from anyone out there in the extended community—feel free to drop me a line at *jack@fivewells.com*.

TWO NEW CS FACULTY

Shriram Krishnamurthi

Shriram Krishnamurthi was born and raised in Bangalore, a beautiful cantonment town 3000 ft. above sea level known as the Garden City of India. In 1989 he came to the US on a scholarship to Ohio Wesleyan University in Delaware, Ohio. After Bangalore, Delaware seemed a staid place to Shriram. Still, he enjoyed his time there, jokingly calling himself an academic quarterback because he saw his hard work enhancing their GPA profile!

For his junior year he took a semester off to visit Hungary and attend the Budapest Semesters in Mathematics program. Different countries produce scholars who excel in different branches of mathematics, and Hungarians are brilliant at combinatorics—a prime area of interest to computer scientists. His classmates there included students from several American and Canadian universities. He knew in high school that he wanted to attend graduate school, so he focused on a liberal arts curriculum at Ohio Wesleyan with the agreeable anticipation of studying computer science in grad school. He feels he could not have received as broad an education in India.

Shriram did his graduate work at Rice University because the CS faculty there taught algorithms and programming languages of just the right flavor to interest him. His first year was spent on computational biology with Alejandro Schäffer, working on the software package SOFTLINK. During this period he co-authored a paper on genetic linkage analysis, which has proven extremely popular given the recent focus on the human genome project. However, despite his success in this area, it was programming languages in which he saw true beauty. Says Shriram, "If it's not beautiful, you may as well go and get a high-paying job!"

While Shriram was still trying to come up with a suitable research topic for his thesis, his advisor Matthias Felleisen had an epiphany that was to change both their lives. Flying home from a conference on

education, he began analyzing his experiences. What, he wondered, was the single most frustrating aspect of educating students? They are all very smart, but decidedly miseducated in computer science. He decided to change his entire research focus to teaching programming design to freshmen; but he quickly realized that by then it's already too late, so students must get their grounding in high school in order to perform adequately as freshmen. A more modern and sophisticated approach to CS was needed. From this emerged a new curriculum, TeachScheme!, and a plethora of pedagogical problems and a corresponding number of topics for Shriram's thesis.

Students need software tools that grow in sophistication along with the students. Their implementors would like to reduce the construction burden by building these extensibly. Components of his thesis included software construction and programming languages, two strongly interrelated areas, which required studying the semantics and implementation of advanced programming languages, particularly from the viewpoint of software construction. His work focused on how to create programming environments that let users build programming support for domain-specific languages, how to build large systems with combinations of these, and how to let the pieces written in each language communicate with one another.

This cartoon was a gift to Shriram from Dave Archer, one of the teachers in the TeachScheme! program

Four years ago Shriram's group at Rice started a high school outreach program called the TeachScheme! Project that trains high school and college teachers in the TeachScheme! curriculum. While they're still collecting statistical evidence on the project's outcomes, it appears to be especially successful at retaining and motivating female students. Next summer, Shriram and his wife Kathi will teach joint high school workshops at Brown and Worcester Polytechnic. Shriram and his colleagues have produced a textbook *How to Design Programs* and have developed the DrScheme programming environment. The three facets of the project bring together the unique combination of software design, a textbook that lays it all out, and a programming environment that reinforces the principles and grows with the students. Coincidentally, because both the textbook and software are available gratis on the Web, an increasing number of home-schoolers, retirees and others have been using this material.

Shriram is still getting used to the scale of Providence; it's small, but he has been enjoying the architectural details of the buildings, both old and new, and reveling in a city where he can really walk (hardly possible in Houston). He has become a loyal WaterFire buff, drawn to it by its communal feel. He is looking forward to the cold weather and to traveling up north, and is eager to do some kayaking. He is delighted that Providence is located at the convergence of two rivers, the Woonasquatucket and the Moshassuck, since he maintains that "any city worth its salt must have at least one river and one hill." For the latter, College Hill certainly fills the bill.

Shriram also enjoys the theatre and Peter Greenaway movies. He and Kathi thor-

oughly enjoyed the RI Film Festival during their first week in town, seeing seven films in four days. They're still checking out vegetarian restaurants in the area but have found the Garden Grill to be best so far. Since they like long road trips, they're anticipating some major explorations of New England. He's a serious blues enthusiast and is currently looking for the best local clubs—all suggestions welcome.

Michael Black

Michael Black was born in North Carolina but grew up in Baltimore. When he was 15, his parents retired and moved to Point Roberts, Washington, a small peninsula just below the 49th parallel surrounded by glorious scenery, but devoid of schools! He actually attended high school just across the border in Canada.

He went to college at the University of British Columbia in Vancouver, starting out in psychology. In his second year he took a CS course, mainly because he knew he should, despite being terrified of computers: he felt that computers were the future, and besides, it was the only class that fit his schedule. The course was programming for non-majors, mainly forestry majors, and they learned Fortran programming on punched cards. Michael found this surprisingly appealing; he loved the tactile and aural sensations of the cards going through the reader. His goal at the time was to become an architect, and there were plenty of courses on 'computer architecture' around—unfortunately, of course, these were courses on the architecture of computers, not buildings! However, he found he could combine his interest in computers and humans by doing artificial intelligence.

After graduating he found there were no jobs in Canada, so he went to California hoping for a job in AI research. With only a bachelor's degree, he was fortunate to land a job working on expert systems at GTE, then later doing computer vision at ADS. Both companies paid for his master's degree at Stanford, which he worked on part-time. During this period he learned a lot about the corporate world. He then decided on a PhD and went to Yale, which was quite relaxing in comparison to holding down a full-time job and attending graduate school at Stanford. There, he worked with a group of psychophysicists who were studying human visual perception. He came to appreciate interdisciplinary research that combines computer science with neuroscience, cognitive science, and mathematics. One of the things that attracted Michael to Brown was this same mix of disciplines and the collaborative spirit here, and he is excited to be part of the Brain Sciences Program at Brown.

When Michael graduated in '92, he took a post-doctoral position at the University of Toronto and thoroughly enjoyed the experience. There he met Allan Jepson, who proved to be a great collaborator, supporter and friend. His next job took him to Xerox PARC. It was an appealing move as PARC had always seemed a magical place where scientists, anthropologists, engineers, and artists mix with the energy of Silicon Valley. Two years later he was managing the image-understanding area and eventually founded a new group in digital video analysis. Michael designed this as an academic group within an industrial lab with only a few

Behind the scenes at Michael's photo session: Our attempts at an all-bubble background met with limited success, despite valiant blowing by Jennet Kirschenbaum and Dawn Nicholaus!

permanent researchers and many students, visiting faculty and sabbatical visitors, a new model and a more dynamic environment than was common at PARC. In the final analysis, however, Michael wanted to be in an academic environment, where ten years along there would be some guarantee that he could pursue the research problems that interested him.

Traveling and hiking are favorite pastimes, as are theatre and film. While living in Point Roberts, he worked at a state park right on the water in the Strait of Georgia, where he enjoyed setting crab traps and watching killer whales, who came so close you could almost touch them. He commuted by bike in California and plans to continue biking in RI. He feels so passionate about his work that it

Nikolaos Triandopoulos (left in photo) was born and raised in Athens; both he and his parents had always hoped he'd continue his education in the US. Nikos developed his love of computer science in high school, which led him to study at the University of Patras in the Department of of Computer Engineering and Informatics. After graduating in '99, he spent a year in the math department at the University of Athens before applying to U.S. schools to get his PhD. The Kanellakis Fellowship was the deciding factor in his coming to Brown. Nikos enjoys traveling abroad, hiking in the countryside and skiing; he is looking forward to heading north to ski this winter.

Aris Anagnostopoulos was born in Houston, TX, where he lived for four years before his parents returned to Greece. Aris grew up in Thessaloniki, then moved to Athens when he was nine. His interest in computers began as a hobby, when he would spend hours playing on his father's computer. Like Nikos, he attended the University of Patras, and although he was a year behind Nikos, they attended some classes together. Aris enjoys several kinds of music, both Greek and foreign, and has a huge CD collection. He also loves traveling abroad and movies—preferably European ones.

Both Aris and Nikos had heard about Paris and his work from faculty members when they were still at the University of Patras, so becoming Kanellakis Fellows was a particular honor for them. Before leaving for the US and Brown, they visited General and Mrs. Kanellakis and were touched to see so many photographs of Paris and his family in their home. They plan a return visit over the Christmas holidays. Said Nikos, "We would prefer that Paris were here, of course, but we're honored to have been awarded this fellowship."

is almost a hobby as well as a job. He has made some excellent friendships and loves being part of a research community, enjoying the social network as much as the science.

He has been married for 16 years to Lee Millward, who grew up in Montreal. They met in high school when Lee was a senior, about to leave for university. She wasn't sure she wanted to date a guy still in high school! Lee is a novelist so her time is her own and she can accompany Michael on most of his conference trips here and abroad. They share the same hobbies and are both excited about this move to Providence. As a writer, Lee feels Providence offers a rich intellectual and artistic environment. They find the pace of life slower here than in California, less frenzied and money-centric and more balanced.

THE 25th IPP SYMPOSIUM

Host Amy Greenwald

Last semester, the Department's Industrial Partners Program sponsored its 25th symposium on the ubiquitous topic "E-Commerce: A Revolution in the Marketplace." E-commerce is pervasive in both the business world of our industrial partners, and the research world of computer scientists and other information technologists. The symposium encapsulated aspects of business-to-business (B2B) and business-to-consumer (B2C) E-commerce, as well as agent and other enabling technologies.

Steve Resnick of **Microsoft** kicked off the event, speaking about "Business-to-Business Market Innovations." Resnick presented an overview of the changes taking place in the electronic marketplace and the enabling technologies behind the scenes. Specifically, he described four transactional pricing mechanisms for marketplaces: forward auctions (many buyers, one seller), reverse auctions (many sellers, one buyer), dynamic exchanges (many buyers, many sellers), and electronic procurement (one buyer, one seller). In addition, he emphasized how the increased degree of B2B connectivity made possible by the Internet is affecting relationships among buyers, sellers, and their intermediaries: small-scale buyers and sellers can now participate in large-scale global markets that were inaccessible to all but the largest of enterprises just a few years ago. To provide an example of a global marketplace open to small businesses, Resnick was joined in his presentation by Bob Monroe of FreeMarkets.com, a company that conducts online auctions of everything needed by businesses including services. Bob gave a demo of an online auction in which suppliers across the globe competed in real time to provide a piece of heavy equipment to a domestic company. It was fascinating to see companies compete by progressively lowering their prices until the auction closed.

The next speaker was **Steve LeBlanc** of **Compaq**, who addressed the topic of "Secure Enterprise Infrastructure Planning for the New Millennium." He pointed out that (i) security breaks are common (64% of polled organizations reported a break-in during the past 12 months), (ii) security threats are rising, and (iii) security is a key obstacle to the success of E-commerce enterprises. His presentation analyzed technological trends for providing a secure network infrastructure for enterprises that are immersed in the heterogeneous Internet environment. Various scenarios were discussed that emphasized the pros and cons of emerging security technologies, including: IPSEC, SSL, Windows 2000 security features, Common Data Security Architecture and Public-Key Infrastructure. The talk concluded with a "how to" on developing an enterprise security system, giving attendees a starting point for developing their own strategic security plan.

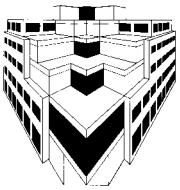
The third speaker was **Jeff Kephart** of the **T. J. Watson IBM Research Center**, whose talk was entitled "Software Agents and the Information Economy." Kephart envisions a future in which the world economy and the Internet will merge, and together evolve into an infor-

mation economy, bustling with billions of economically motivated software agents that exchange information, goods, and services with humans and other software agents. His talk surveyed research conducted by the Agents and Emergent Phenomena group at IBM on collective interactions among agents that dynamically price information goods or services. Among those topics surveyed, he described in some detail a model of shopbot economics in which shopbots (comparison shopping agents) strategically price their information services, buyers trade off as to whether or not to use shopbots, and sellers use pricebots to dynamically price commodities in response to predicted buyer behavior. He presented simulation results regarding the dynamics that arise in this model, demonstrating behaviors ranging from price wars among sellers to nonlinear pricing schedules for shopbots. These studies raise many fundamental issues, both theoretical and practical, particularly in the realms of multi-agent learning and dynamic optimization.

Just before lunch **John Piescik** of **American Management Systems** spoke on the topic "Can Dinosaurs Learn to Fly? Big Brick-and-Mortar Companies Don't Necessarily Face Extinction." John's thesis, as suggested by his title, was the competitive and institutional challenges of evolving companies in "Internet time," offering hope for those could-be business dinosaurs. He presented a set of dinosaur survival strategies that enable companies not only to survive but to prosper in a world reshaped by E-commerce.

After lunch, **Don Stanford** of **GTECH** (and now newly appointed Adjunct Professor (Research) in the Department) spoke on the topic "Past and Future Trends in High Speed Transaction Processing." The talk focused on some of the more popular on-line transaction processing (OLTP) architectures, including the one employed by GTECH in its lottery applications. Don emphasized that future access trends, such as the Internet and interactive television, are causing transaction processors to rethink current models. For example, it should be possible to take advantage of the high penetration of mobile phones in the consumer market with the recent developments regarding the wireless application protocol (WAP), which add security and ease of implementation. The future requirements for OLTP were discussed in light of these new methods of consumer access.

l to r: Steve LeBlanc, Compaq; John Savage, Brown; Boris Putanec, Ariba; John Piescik, American Management Systems; Steve Resnick, Microsoft; Amy Greenwald, Brown; Don Stanford, GTECH; Bob Monroe, FreeMarkets.com; Jeff Kephart, IBM; Ed Gottsman, Andersen Consulting



The next speaker, **Ed Gottsman** of **Andersen Consulting**, spoke on the topic: "Privacide—E-Commerce Opportunities in the Coming Panopticon." Ed drew his inspiration from the Panopticon, a novel building design proposed in the late 18th century by the philosopher Jeremy Bentham to address the surveillance problems inherent in the management of factory workers and prisoners (Bentham didn't really discriminate between them). The Panopticon's hub-and-spoke design and many one-way mirrors would let a small number of supervisors secretly keep watch over a much larger number of supervisees. Newly developing technologies for the inexpensive acquisition, transmission, analysis, and delivery of real-world data are creating the framework for a "collective Panopticon" in which everyone knows everything about everyone else. "Privacide" explores the technological and social forces working to bring about this modern panopticon, and the opportunities it will create for electronic commerce.

The final speaker of the day was **Boris Putanec** of **Ariba** (AB '92, ScM '93). He entitled his talk "XML and B2B: The Birth of a Standard." In his talk Boris described the process that Ariba has followed in creating an XML-based common interaction paradigm between companies wishing to engage in e-business transactions.

fac.activities@cs.brown.edu

Roger Blumberg.

In addition to his CS92 preparations, Roger Blumberg is teaching a course titled "Science and Society in 20th-Century America" in the History, Philosophy and Social Sciences Department at the Rhode Island School of Design (RISD).

Tom Dean.

The department has been the recipient of significant corporate largesse recently. Macromedia has given us software for our NT machines to the tune of $150K—45 copies each of Dreamweaver, Director, Authorware and Freehand, and six copies of Fontographer, as well as 90-day licenses for copies of Web 101, Macromedia's curriculum for using the above products, for use solely in our new NT lab.

Amy Greenwald.

In addition to participating in the TAC competition and co-chairing last semester's IPP symposium (see related articles in this issue), Amy co-organized a workshop on Multi-Agent Learning at ICML in Palo Alto in July, and a conference on Probability, Conditionals, and Games in New York City in August. She also presented a paper at Games 2000 in Bilbao, the first international meeting of the Game Theory Society, whose membership includes about 15% (and growing) computer scientists. The most exciting of Amy's summer escapades, however, was her participation in the CRA's Distributed Mentor Program, through which she supervised two women undergraduates, Rebecca Hutchinson and Gunes Ercal, who visited Brown from Bucknell and USC, respectively.

Philip Klein.

Philip is on leave from Brown and working as chief scientist at a mobile-commerce startup in Berkeley. He has thereby joined the ranks of those eager to hire Brown CS grads!

The "Sunlab" got a top-to-bottom overhaul this year. The popular tiered classroom now sports Sun Ultra 10 workstations with 18" flat screens mounted on articulated arms
http://www.cs.brown.edu/system/hardware/workstations.html

Shriram Krishnamurthi.

Shriram was on the program committee for the International Conference on Functional Programing, 2000, held in Montreal in September.

David Laidlaw.

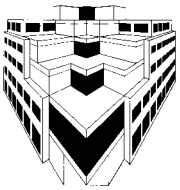
David and three students attended the visualization conference in Salt Lake City in October. The students each presented a paper. He will be going to NIH in December to talk about medical imaging work. He just received a prestigious NSF ITR grant—$2.3 million over four years; details in an article above.

Franco Preparata.

Franco presented a paper at Recomb2000, the foremost international conference in computational biology, held this year in Tokyo. In June he organized in Torino, Italy, for the Italian Accademia dei Lincei an international forum on quantum computing that brought together leaders in this field from physics and computer science. He chaired the international committee for the award of the Gödel Prize, the premier award for outstanding and influential papers in theoretical computer science (conferred this year on M. Vardi and A. Wolper). As the principal investigator of a four-member team including Eli Upfal, he received a two-year $850K grant from NSF for computational biology research, jointly awarded by the CISE and Biology Directorates. He has been recently appointed for a three-year term to the Review Committee for the Mathematics and Computer Science Division of Argonne National Laboratory.

Steven Reiss.

Steven's garden produced lots of eggplants, peppers, and tomatoes in season and is still producing carrots, broccoli, pumpkins and Brussels sprouts. His current research involves completing various aspects of his visualization system and exploring a new environmental framework to manage the evolution of software designs and code simultaneously. In addition, he has a part in the ITR grant that



was awarded to Stan Zdonik for studying data centers and Internet data access. Finally, he is preparing to lead another junior faculty search and to help in the process of upgrading or replacing our computer equipment next summer.

John Savage.

In May John was reelected to a third year as President of the Faculty Club Board of Managers. On October 5 the Club sponsored a "Faculty Shelving Party" to receive books donated by members of the Brown faculty for the newly renovated Club Reading Room. Martha Joukowsky, President-Elect, who with her husband Art made a major gift last spring to Brown to redecorate and furnish the Reading Room, proposed that this party be held to collect books for the new cabinets installed during the redecoration. A small crowd of very pleased faculty members attended and presented their books to the Club.

Roberto Tamassia.

Roberto has been appointed Director of the Center for Geometric Computing. The second edition of his textbook *Data Structures and Algorithms in Java* (coauthored with Michael Goodrich) was published in August by Wiley.

Eli Upfal.

In August Eli was an invited speaker at the Oberwolfach meeting on efficient algorithms in Germany. Together with his postdoc, Milos Hauskrecht, he presented a joint paper in the Fifth International Conference on Artificial Intelligence Planning and Scheduling, in California in May. The same month he visited the Weizmann Institute in Israel.

Andries van Dam.

Andy was awarded the 2000 SIGCSE Award for Outstanding Contributions to Computing Sciences Education ("as a hypertext pioneer and a champion of computing education for many years") and was keynote speaker for SIGCSE 2000. In addition, he was keynote speaker for IEEE VR2000, and has initiated a project that is brainstorming means of establishing a consortium of companies, government agencies, and foundations to fund a Grand Challenge-style set of interdisciplinary research projects in educational technology. He has been elected a fellow of the American Academy of Arts and Sciences.

Pascal Van Hentenryck.

Pascal had a frantic summer. He received an EEC grant in June and had to learn European and Belgian budget procedures in six days and seven nights (they don't have Trina to help there). He then gave an invited tutorial at the Computational Logic Conference in London, finished a patent application, and flew to Atlanta for the International Symposium on Mathematical Programming, where he was cluster chair for constraint programming, before coming back to Providence to welcome his family and prepare for his computer architecture class. He also became associate editor of *Operation Research Letters* in August.

Stan Zdonik.

Stan received a $3.2-million, 5-year NSF ITR grant for "Data centers: managing data with profiles", which will explore using profiles of users' information interests to manage web data intelligently; details in an article above.

CHARNIAK UNPLUGGED

Those of you who visit the CS web site are aware that the Sciences Library is being frequented by some peregrine falcons. Peregrines eat pretty much just other birds, and the pigeon population hereabouts has thinned out considerably. We were finding random wings and other non-delectable body parts on the CIT decks. While in principle I can appreciate the thrill of seeing one of these rare birds, I find the practice much less interesting. Every time I have seen them they look like smudges sitting on the 14th floor. On one occasion when editor-in-chief Suzi Howe and a new faculty member, Shriram Krishnamurthi, were enthusing about the bird, the curmudgeon in me came out with "When you've seen one duck you've seen 'em all." (Subsequently, I was reading a biography of Murray Gell-Mann, who is best known for postulating and naming quarks. In the book Gell-Mann is described as somewhat of an intellectual showboat. Once a colleague who was hiking with Gell-Mann found himself forced to listen to Gell-Mann give the Latin name of every bird they encountered. The colleague responded, "They all look like ducks to me!")

Elsewhere in this issue you will see mention of the taping of the documentary "2001: HAL's Legacy" that I was involved in. As noted there, I assume that I was asked to be the talking head who would deliver the bad news about how far current computer understanding of language falls short of the "predictions" in the movie. Of course, this is hardly news to any of us in the field, and thousands of others could and would have delivered the same opinions. I don't know why I was chosen, unless they were looking for someone with a bowtie. At the end of the taping David Stork (who is doing the interviews) asked me if there was any question I wished I had been asked. I said that a good one would have been to ask me about wrong turns in the research path we have been taking. So David asked me, and I said that I thought I had taken a 20-year wrong turn. As grad students, I and most of my colleagues all thought that it was pointless to worry about getting computers to learn English, and that instead we should try to program in the ability directly. The argument is that since we are so much smarter than computers, if we can't figure out how to do it, what chance would a computer have? I now believe this argument is wrong, despite how logical it seems. It turns out that the computer's speed, and in particular its ability to look at a lot of text, often can compensate for its stupidity.

The department got some new carpets this summer. This was not announced, and I happened to be away the day they did the fourth floor. The next day I was treading on the thing when Jennet Kirschenbaum (assistant to the department chair) asked me how I liked it. I had no

Eugene amid PBS's recording gear

idea what she was talking about. Even though the old carpet was green, and the new one blue/purple, I had not noticed the difference! There was even a "new carpet" smell that I only noticed after the fact. I am really oblivious to my surroundings at times. (Yes, I know, this paragraph wasn't all that great—in fact, the editor told me so. But our editor-in-chief needs more verbiage, and I also need to set up a line in the next story.)

This one falls under the heading of "Providence, beautiful Providence." If you occasionally visit mid-town Manhattan, or are a dedicated reader of the **New York Times** (both descriptions fit me), you will know that Manhattan has been invaded by a herd of plastic cows. The cows, about seven feet long by five feet high, are each decorated in an imaginative way, and given a fitting name. For example, a cow with abstract heads and body parts painted on is called "PiCOWso." I gather such plastic herds first popped up in Switzerland or some such place, and were then copied in other cities, New York being the most prominent. Providence, however, decided on something different—large replicas of Mr. Potato Head®. Why Mr. Potato Head? Because the maker of the toy, Hasbro, has its headquarters in Rhode Island. There is a Mr. Potato ATM in front of the Fleet Bank building (though no money comes out) and a Ms. Potato Bishop in front of an Episcopal church. At any rate, I was talking with Suzi Howe when this topic came up. Suzi deprecated them, and when I said I liked them Suzi pretended to retch on my carpet (the old one, we only got new ones in the hallways). But Suzi's reaction was nothing compared to that of a neighbor of mine, a RISD faculty member, who also dislikes them. My potato defense brought a look of such incredulity that I though I might be asked to turn in my RISD Museum membership card. What particularly incensed my neighbor was one stationed next to, and completely upstaging, a Howard Ben-Tre sculpture near the convention center. (Ben-Tre is probably Providence's most famous artist. One of his best sculptures can be found in the main modern art gallery of the Metropolitan Museum in New York.) The Mr. Potato Head does, in fact, overshadow the convention-center sculpture, but I think this is the sculpture's problem. The piece should have been placed indoors; outdoor sculptures have to be prepared to fight for their visual space, and this one is not up

continued on back page

Enough said!

OUR MOST RECENT PhDs

NAME	ADVISOR	THESIS	NEW POSITION
Costas Busch	Maurice Herlihy	"A Study on Distributed Structures"	Assistant Prof. at Rensselaer Polytechnic Institute working on distributed computing. "Recently, my research has been focused on two topics: counting networks and hot-potato routing. Counting networks are highly distributed data structures used for efficient implementation of counters. In my research I improve on known counting network constructions and demonstrate how counting networks can be adapted for supporting new kinds of operations. Hot-potato routing is a bufferless form of routing which is used in optical networks. In my research I contribute new hot-potato algorithms for the mesh network topology that improve significally on previously known algorithms."
José Castaños	John Savage	"Parallel Adaptive Unstructured Computation"	Doing research on the Blue Gene project at IBM T.J. Watson Research Center
Vasiliki Chatzi	Franco Preparata	"Integer-Coordinate Crystalline Meshes"	Synopsys, Inc. in Mountain View, CA
Niyu Ge	Eugene Charniak	"An Approach to Anaphoric Pronouns"	IBM T.J. Watson Research Center
Lee Markosian	John Hughes	"Art-Based Modeling and Rendering for Computer Graphics"	Doing a 2-year postdoc at Princeton University and collaborating with John Hughes on a project that they hope will result in a SIGGRAPH submission this year.
Sharon Caraballo	Eugene Charniak	"Automatic Construction of a Hypernym-Labeled Noun Hierarchy from Text"	Assistant Prof. at Georgetown University

The new Microsoft lab (mslab) before its transformation

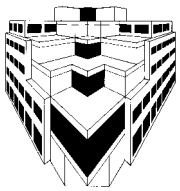
The 4th floor of our building was recently invaded by a 6-to 8-person TV crew and all their voluminous gear that was making a film for PBS showing next year, "2001: HAL's Legacy." Interviews with Profs. Andy van Dam and Eugene Charniak were taped for this project, which compares the achievements in computer science and technology portrayed in the 1968 movie "2001: A Space Odyssey" with what has actually been done. Writer Arthur C. Clarke and director Stanley Kubrick were widely praised at the time for trying to get the science right.' How closely, the project asks, does the future they envisioned then match developments in information technology 33 years later?

What brought this project to Brown CS? Part of the answer is that its writer, David Stork, had heard Andy lecture some years ago and had also read his graphics text. It may also have been the intriguing contrast between the expectations 30 years ago and the achievements now in Eugene's and Andy's two fields. The '60s were a heady time for AI and high hopes were held for natural language processing—as embodied in HAL's ability to communicate with all-but-human facility. Yet the intervening 32 years have shown how extremely difficult such problems are. In contrast, computer graphics, evident in the original movie only in primitive forms, has advanced beyond the then state of the art, and is now well on its way to what's viewed as its next stage of development, full 3D immersive environments of the type simulated in Brown's Cave.

I'm sorry Dave, I'm afraid I can't do that.

Whether any of the Brown footage will survive the editing process is something we won't know, of course, until the film is aired sometime in 2001. Until then, we look forward to seeing our CS faculty in HAL's company!

The mslab almost complete. Technical staffers Jeff Coady and Tom Heft still working on the machines



to it. However, I refrained from expressing this opinion. I figured I was in deep enough trouble already.

Every year at graduation time there is a special faculty meeting for officially voting to award degrees to that year's recipients. The meeting is usually pretty boring, although it is not completely ceremonial. Every department sends a representative armed with a list of people to whom it expects to award degrees. The faculty member must make sure that the list agrees with the registrar's list, which is printed in the agenda for the meeting. Occasionally mistakes are found. Typically these mistakes are boring, although if you were an individual left out you might not think so. This year, however, the registrar managed to come up with a new and pretty racy mistake. In the list of honors and graduate degrees, the degree recipient's name is followed by the name of the field in which the person is receiving the degree (e.g., "Computer Science"). One such field is "Public Policy and American Institutions". This year, unfortunately, the registrar uniformly left the "l" out of "Public". At the end of the meeting the Pub(l)ic Policy representative stood to thank the parliamentarian, who had been, interestingly enough, the only person to spot the mistake. I have saved a copy of the agenda as I figure it will be a collector's item one day and also to fend off accusations that this is an urban legend. The thought of what would have happened if the degrees had been printed this way still makes me smile.

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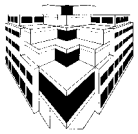

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