



Gear receives U of I's highest alumni honor



Bill Gear

When C. W. (Bill) Gear introduced his novel methods for finding solutions to stiff equations, almost overnight solving these very difficult but important problems became routine, and the computer program that implemented these methods made Gear's name a household word among scientists and engineers across a myriad of disciplines. Gear's name is also one closely associated with the

Department of Computer Science at the University of Illinois, where he spent more than three decades, first as a graduate student and later as a faculty member and head. Now, he is the first computer scientist whose portrait graces the halls of the Illini Union as a recipient of the University of Illinois's highest alumni honor, the Alumni Association's Alumni Achievement Award. Gear re-

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Reed named Gutgsell Professor

On May 7, 2001, Dan Reed was invested as an Edward William Gutgsell and Jane Marr Gutgsell Endowed Professor at a ceremony held at the Beckman Institute. He was recognized for innovative collaborative research and for working with government, private industry, and academia to chart the future of computational science and engineering. The professorships were funded through an estate gift from the Gutgsells, who were loyal and generous supporters of the university their entire lives. Both earned BS degrees in 1934—he in LAS and she in journalism. They both died in 1989. In 1998, the university established the Gutgsell Professorships to recognize some of its most distinguished senior faculty.

Reed recently stepped down as department head of computer science in May and will be interim head until a replacement is found. He continues as a professor of computer science and director of the National Center for Supercomputing Applications (NCSA) and the National Computational Science Alliance. n

Laursen and Matsushita endow new fellowships

Fellowships are one of the best ways to attract the brightest and most promising graduate students to our department. Recognizing this, Andy and Shana Laursen and Shigenori Matsushita have established and fully funded two new endowed fellowships that will benefit computer science students now and for generations to come: The Laursen Fellowship and the Muroga Fellowship.

Andy Laursen has had a long and productive career, starting at Bell Laboratories. He earned his MS at University of Illinois in 1982 as part of the company's advanced degree program and returned to Bell Labs, where he worked on electronic switching systems. He moved on to Tolerant Systems, before spending a decade at Oracle, where he was one of the original designers of

Oracle6. He was most recently at Phone.com as vice president of engineering before he retired in the summer of 2000. He and Shana, an educator, live with their two sons in Auburn, Calif. Their fellowship will be called the Andrew and Shana Laursen Fellowship.

Shigenori Matsushita established a fellowship in honor of Professor Saburo Muroga, with whom he studied at Illinois in 1962-63. It will be called the Saburo Muroga Fellowship. Matsushita has had a long career at Toshiba Corp. and now works for Wink Communications in Japan.

An article on Matsushita appears on page 9, and an article on Laursen from the January 2001 CS Alumni News can be found at www.cs.uiuc.edu. n

Tebbe wins two alumni honors

Mark Tebbe seems to be appearing in every issue of the *CS Alumni News* lately. This time, his accomplishments have been recognized with two very important awards: The Chicago Illini of the Year Award and the College of Engineering Alumni Award for Distinguished Service.



Mark Tebbe with longtime friend Professor Sylvian Ray, who has been ACM's adviser from its inception.

After graduating with a BS in CS in 1983, Tebbe went to Arthur Andersen. A year later, he started Lante, a consulting firm, with money borrowed from his credit card and with a passion for microcomputers and networking. His company has grown from a two-person operation in Chicago to a major public company with offices in 10 cities and more than 300 employees, many of whom are U of I graduates. Tebbe is an authority on emerging technologies and has appeared in numerous publications, including *InfoWorld*, for which he writes the weekly column "Behind the Lines." In 1999, Tebbe was named to the "40 under 40" list in *Crain's Chicago Business*, and the following year he was inducted into the Chicago Area Entrepreneurial Hall of Fame. He is a founding member of two leading computer groups in Chicago, is active in many technological organizations and standard committees, and serves on several corporate boards.

Tebbe returns to campus often and has been especially supportive of the Association for Computing Machinery, which he resurrected on campus in the early 1980s. He was pivotal in making CS eligible to compete in Engineering Open House, and he and his colleagues won the department's first EOH award. In 1999 he joined the College of Engineering Advisory Board and delivered a talk as part of the department's Distinguished Entrepreneur Series. He received the Chicago Illini of the Year Award at the Chicago Athletic Club on March 1, 2001, and the COE alumni award at the Illini Union during Convocation on April 20, 2001. n

From the corner office . . .

Reed says farewell

Over five years ago, I agreed to take on the challenges and responsibilities associated with leading the department. During that time, we have seen extraordinary changes in computing within the department, across the campus, and in our daily lives. The Internet has become a household word, in large part due to the seminal contributions of our alumni, students and faculty. Moreover, information technology is now recognized as one of the primary engines of national and international economic growth. I have been proud, privileged, and humbled to serve as head of one of the world's very best computer science departments during this time.

As I look back on the past five years, I take great pride in the department's accomplishments.

- The launch of our Internet distance learning program, based on streaming media distribution of courses and our professional MCS degree.
- Dramatic growth in our departmental endowment for undergraduate scholarships, graduate fellowships, chairs, and professorships.
- An equally dramatic increase in the department's annual research expenditures, reflecting a renewed commitment to cutting edge research and associated research infrastructure.
- Tom Siebel's incredible donation of \$32M to endow the Siebel Center for Computer Science, a dramatic new \$75M facility for computer science education and research. Along with this donation, our faculty size will grow to 63, graduate enrollments will increase to over 500, and undergraduate enrollments will rise to over 1,300.
- A broad and intellectually deep distinguished entrepreneur lecture series that brings our successful alumni back to the department, with all lectures webcast via the Internet.
- Recruiting new faculty and staff, the next generation of Illinois excellence. During the past five years, fifteen new faculty members joined the department as the early founders and giants of the field retired. The influx of new ideas and research directions from all of these additions is bearing great fruit.

One of the constants in computing is change, and leadership positions are no exception. I recently accepted a new

position as director of the National Center for Supercomputing Applications (NCSA) at Illinois and its associated consortium of fifty national partners, the National Computational Science Alliance. This is an exciting new opportunity for me to help define the future of high-performance computing in the United States.

In my new role as NCSA and Alliance director, I will be leading creation and deployment of a new generation of computing, communication, and storage systems for the national science and engineering research community. In this role, I look forward to working with the computer science department to advance the state of computing at Illinois and around the world.

Keep inventing the future! — *Dan*

More changes

Not only has **Dan Reed** stepped down as head of the CS department (he will remain on the CS faculty and continue to serve as director of NCSA) . . . **David Daniel**, who has been head of the civil engineering department for the past five years, replaced **William Schowalter** as dean of the College of Engineering. **Steve Kang** left as head of ECE to become dean of the engineering college at University of California at Santa Cruz. **Richard Blahut** is the new ECE head. **Nancy Cantor**, provost and psychology professor at the University of Michigan, will become the Urbana campus's new chancellor, replacing **Michael Aiken**, who is retiring. **Jeremiah Sullivan** has been head of physics since **David Campbell** left to become dean of engineering at Boston University. Chemistry professor **Jiri Jonas** is retiring as director of the Beckman Institute. **Jim Bottum**, executive director of NCSA, is leaving to become CTO of Purdue University. n



Dean David Daniel, Chancellor Michael Aiken, and Professor Dan Reed at Reed's investiture as a Gutsell Professor.

Kay Tomlin honored



Kay Tomlin

Kay Tomlin, secretary in the department's academic office, won the 2000-01 Chancellor's Distinguished Staff Award. Professor Sam Kamin, director of undergraduate programs, who nominated Tomlin, wrote: "Her dedication to her work, her caring attitude, her cheerfulness even in times of great stress, and her willingness and ability to sort out bureaucratic problems make her a virtual legend among CS faculty

and students." For the past 11 years, Tomlin has been a key contact person for undergraduates, helping students with academic problems or issues that arise as they navigate through the university. In 1998, she was honored with the Dads Day Award, which is based on student nominations. According to Professor Dan Reed, department head, "Kay is a calm and reassuring voice, with a quick smile and a deep knowledge of possible solutions and alternatives. She mends intellectual and emotional skinned knees, dispenses wisdom, and moves with a quiet grace that makes even the most worried student and harried professor feel at ease."

Microsoft hosts lunch

For the second time in what is becoming another fun tradition, we held a lunch for alumni at Microsoft in Redmond, Wash. The lunch was hosted by technical recruiter Tracy Foltz, a familiar face in the halls of DCL. About 25 alumni, many of them recent grads, showed up on February 20, 2001, where Bill Kubitz and Judy Tolliver updated everyone on department activities. Jane Liu, longtime professor in the department until joining Microsoft in May 2000, also came. Foltz reported another stellar year of recruiting at Illinois.

*Alumni are the true measure
of a great university.*

Andy Yao wins Turing Award

The university's first alumnus to win

Andrew Chi-Chih Yao, PhD 75, is the first University of Illinois alumnus to win the A. M. Turing Award, computing's highest honor. The ACM established the award for contributions of lasting and major technical importance to the computer field. It was presented to Yao on February 1, 2001, in recognition of his fundamental contributions to the theory of computation, including the complexity-based theory of pseudorandom number generation, cryptography, and communication complexity. "It was thrilling," said Yao. "I was very honored to receive the Turing Award and to join the ranks of so many great scientists who have gotten the award before."

When Yao entered National Taiwan University in 1963, computer science was a relatively unimportant discipline. Interested in the theoretical side of science and "the mysteries of the universe," Yao studied physics, assuming he would pursue an academic career. For graduate school, Yao studied physics with 1979 Nobel Prize winner Sheldon Glashow at Harvard University and completed his PhD there in 1972.

Yao spent a year as a postdoctoral researcher at the University of California at Santa Barbara while his wife, Frances Yao, was completing her PhD in mathematics at MIT. Through her work, he became so enthralled with algorithms and complexity that he decided to study computer science. Tired of living far apart, they both came to the University of Illinois in 1973, where she became a faculty member in the computer science department, and he became a graduate student in computer science. "Yao is exceptionally gifted," said his thesis adviser Dave Liu. "He works on challenging problems and invariably comes up with very deep results." Yao completed his PhD in record time—only two years.

Yao joined MIT's math department in 1975, and Frances Yao joined the computer science department at Brown University. "Life has always been teaching courses and doing research, solving problems, going to conferences," said Yao. "This year was typical." But living in Providence, R.I. and exhausted from all the commuting, they eventually left for Stanford University, where he was recruited by Donald Knuth, himself a Turing Award winner in 1974. At Stanford, Yao devoted his work to the analysis of algorithms and its complement, complexity. "Algorithms involve clever methods to solve problems efficiently," he explained. "On the complexity side, you ask the question: 'What is the best you can do?'"

Ten years later, with the opportunity to come in on the ground floor of a newly independent computer science department, Yao moved to Princeton University, where

he is the William and Edna Macaleer Professor of Engineering and Applied Science. He described his life as a professor as simple and not changing much from year to year. "Working in the academic world means that you are working more or less seven days a week. When I was in college, I enjoyed playing basketball and games like Bridge and Go. After becoming a researcher, work fills the time and space, although I do enjoy listening to classical music." Frances Yao, now retired, is a pianist.

In 1987, Yao won the George Polya prize from SIAM for his work in combinatorial theory. In 1996, he won the first Donald E. Knuth prize from the ACM and IEEE for his fundamental research in computational complexity, and he gained recognition as the harbinger of complexity theory as a major area. Yao is also a fellow of the ACM, member of the NAS, AAAS, and Academia Sinica, and a Guggenheim Fellowship recipient.

"Over the years, I've been working on problems with lots of different flavors, as the subject evolves," said Yao. Recently, has been working in quantum computing, an area on the field's wild and woolly frontier, which relies on quantum physics and the unique properties of atoms or nuclei that can serve as a computer's processor and memory. "Physicists have been interested in this for a number of years," noted Yao, "but only in the last seven or eight years have computer scientists become interested in it. It is a radically different, futuristic kind of computing. It's more speculative at this point, but it's based upon a different principle of doing computation. There is huge potential in quantum computing, but only time will tell whether it can become a reality.

"The most rewarding life is trying to find something you really love to do and can do well," he continued. "It's pretty hard to predict what's going to happen, but if you are doing what you love, and you are good, then you will have your reward already . . . I can look back on my days at Illinois with fondness. In hindsight I can say it was the best place to study computer science because it suited my personality very nicely. It is a kind of dignified and quiet place, but with a lot of smart professors and classmates. There were lots of things going on every day. It's hard to describe." n



Andy Yao

Monty Denneau designing Blue Gene

Monty Denneau, MS 78, PhD Math 78, and his colleagues at IBM are busy building the world's first petaflop (10^{15}) computer, named Blue Gene. Using Denneau's ultramiminalist computer architecture, Blue Gene represents one of the biggest leaps in machine design in decades. It will be able to process 1 quadrillion operations per second—faster than most of today's supercomputers and 2 million times faster than the PC on your desk. It will use 4 million processors instead of the typical 4,000. Started in 1999, Blue Gene will take 5 years to build at a cost of \$100 million, the standard price tag for an IBM supercomputer. ASCI Red, at Sandia National Laboratories, is currently one of the world's most powerful supercomputers, capable of 2 trillion operations per second—less than just one board of Blue Gene.

The son of factory workers in Lincoln Park, New Jersey, Denneau was a serious ham radio operator in the 7th grade. A self-described science nerd, he was good at science and math and okay at the other stuff. Regular math classes bored him—he preferred to shoot paperclips and fold paper airplanes. Had it not been for a good school with great teachers who gave him piles of math books to pore over, Denneau would have been ripe for reform school.

At the urging of his teachers, he attended MIT, where he studied philosophy before eventually succumbing to his first love, mathematics. For graduate school, he attended Boston University to work with logicians Rohit Parikh and David Ellerman. Two of his more colorful achievements there were beginning the tuition riot during his freshman year, and thankfully failing in an experiment with the manufacture of explosives that earned him a severe letter from the local police.

Attracted by logician and mathematics professor Gaisi Takeuti, Denneau left Boston to continue his graduate studies at the University of Illinois. His mathematics thesis preshadowed what he would do later in life—tackle an unsolved, very hard problem. His thesis on decidability in Hilbert space was high risk. Almost no work had been done on the problem, and there was no reason to think that it was even solvable. But solve it he did, and he graduated in 1978 with a PhD in math.

So how did he also get an MS in computer science in the same year? Denneau's attitude toward computers at that time was that they were "untouchable, grungy engineering things." But he took Professor Mike Faiman's logic design course anyway, which involved a contest to design a small interface circuit. Denneau won the contest and took home its prize, a microprocessor. With the realization that he now possessed "a whole computer in this little chip," Denneau set about building a computer from it from scratch, getting help by pestering

people and making numerous trips to the hardware store in Everitt Lab. Obsessed, he built it, and it worked. His computer science thesis, under the guidance of Professor Dan Gajski, proposed a new parallel machine, and his supercomputer career was born.

When IBM offered him the chance to work on a commercial supercomputer endeavor called the High End Machine Project, Denneau packed his bags for IBM's T. J. Watson Research Center in Yorktown Heights, New York. After a while, with no new ground being broken, his interest in the project began to wane. Meanwhile, Ravi Nair, MS 76, PhD 78, who had been Denneau's Pascal teacher at Illinois, and Se June Hong, MS EE 67, PhD EE 69, were working on a machine that would speed up the process of deciding how wires would be laid out on a chip, using a grid of special purpose computing elements. Denneau enthusiastically joined the effort and suggested a Zilog Z80-based prototype be built. Then he and Nair built what was called the Wiring Machine, and it was one of the world's first parallel processors, which contained 64 microprocessors. "People said we couldn't do it," he recalled, "because the failure rate would be so high. But it worked fine, and we demonstrated that it could solve a problem, but we were naive about how to take a prototype and put it into a production environment." The machine ended out having no impact on processing at the company at all, but Denneau credits the project for leading him merrily down the computer design path at IBM.

After the Wiring Machine, Denneau took up logic simulation by building a machine called the Yorktown Simulation Engine, a hard-wired, parallel machine that would run logic simulation 1,000 times faster than a conventional computer. It was a specialized machine that took four values, performed a logical function on them, and returned a result. This machine evolved into IBM's AWAN, which was able to simulate the behavior of many billions of gates per second. Simple as it was, it has had a



Monty Denneau

tremendous impact on IBM and the company's ability to release commercial machines on time.

The computer that Denneau is most proud of is the GF-11, a special-purpose QCD (quantum chromodynamics) machine designed to compute the mass of a proton from first principles. Built almost entirely out of off-the-shelf parts, GF-11 had 576 very large printed circuit boards (almost 2 feet wide), each containing about 500 components.

It was called the GF-11 for 11 gigaflops. It was going to be GF-10, but unfortunately someone else had already taken that name. GF-11 didn't seem so bad—another gigaflop could be squeezed in, plus it was a humorous play on GF(11), a mathematical term. "In retrospect," he reflected, "that was one of my most stupid decisions. That extra 10 percent performance cost me two years of design time." Denneau described two special features of the GF-11. First, it was an extremely wide instruction word machine (256 bits), and each part controlled a different part of the processor, like an extreme case of a VLIW machine. The processor was completely compiled out. They ran the program, observed it, and retained only the necessary instructions. "It was like SIMD," he said, "but it worked on different data at different addresses. The result was that GF-11 got 90 percent utilization." Second, the switch was also completely compiled out. "We took a whole computational graph," said Denneau, "and compiled it in space and time onto a 3-stage Benes-network. The result was that the switch didn't have the usual pileups that normal switches have. We had a God's-eye view of the computation so that the machine sent data at exactly the right time to go through the switch."

At the same time as GF-11, Denneau worked on yet another machine that was so specialized that it never came close to becoming mainstream. Called Little Fermat, it used a Fermat ring to factor large numbers and was built with MIT student Saed Younis as part of a masters thesis. The machine gained some publicity when writer Richard Preston featured it in a story about the Chudnovsky brothers called "Mountains of Pi," which appeared *The New Yorker* (March 2, 1992).

Late in the GF-11 project, Denneau had been chatting with a neurologist at IBM who was doing simulations of the electrical behavior of the hippocampus, a part of the human brain related to memory, to see how it related to epilepsy. Because the problem required mind-boggling amounts of computation, Denneau wondered how to build a machine to perform these simulations 1,000 times faster than current machines. That's how the idea of a building a teraflop machine came up. It would involve tens of thousands of processors and a gigantic switch based on a single-switch chip.

The teraflop machine generated a fair amount of

interest at IBM, especially with Denneau's stellar track record, so he and his group built the switch chip and network interface. "At that time," said Denneau, "IBM needed to get into the parallel processing business. We had nothing. They figured that if they took our switch and interface and combined them with an RS 6000 node, they'd have a parallel machine." That's what they did, and it marked the start of the highly successful SP series. The bad news was that the hippocampus simulation was left in the dust as everyone went to work on the SP product. "The whole thing was a great success," said Denneau, "but the poor neurologist had to wait another ten years for his machine."

Blue Gene is Denneau's next big thing, and it's enormous. Some fun analogies are in order. Blue Gene's switching networks are equivalent to giving everyone in the world two ISDN modems. Its pipe can download the entire content of the entire World Wide Web, about 100 terabytes, in less than a second. It will be 1,000 times more powerful than Deep Blue, the IBM supercomputer that defeated chess champion Garry Kasparov in 1997. If a PC was an inch high, Blue Gene would be over 20 miles high—more than four times the height of Mt. Everest.

Blue Gene was hatched in 1995 when Denneau and IBM designer Peter Hochschild were kicking around the idea of building a machine for photo-quality computer graphics using a computationally intensive technique called ray tracing. Farms of workstations used ray tracing to produce the computer-animated film *Toy Story*, in which each frame took many hours of computing time. With "aggressive simplicity" as his mantra, Denneau began by designing a ray-tracing chip while colleague Hank Warren worked on a C compiler for generating executable code. Meanwhile, Ambuj Goyal, VP of systems and software for IBM, had been shopping around for a project to define a new state of the art for supercomputers, and IBM's computational biology group was wrestling with the protein folding problem. Denneau was asked if he could scale up his proposed ray-tracing machine and apply it to protein folding. "Sure, why not?" was his reply. In jest he dubbed the new machine Blue Gene, but the name stuck.

Blue Gene's first task will be to simulate protein folding in an attempt to solve the protein folding problem. When proteins form, they fold—coil, curl, twist, and bend—into their functional shapes, something our bodies do in less than a second. A protein's shape corresponds to its function, whether it's an enzyme, hormone, or antibody, or gives structure to things like skin or bone. Understanding this incredibly complex process will help scientists design more effective drugs, because most drugs work by latching onto a protein and triggering it to perform or block a particular action. It may also produce cures for important diseases thought to be due to changes

protein shape, such as Alzheimer's disease and mad cow disease.

The protein folding problem was perfect for the kind of design Denneau had in mind for Blue Gene. Modeling protein folding involves balancing energy and entropy of atoms of both protein and solvent. Several thousands of pairs of atoms are subject to tens of millions of forces that must be tracked over 200 billion time steps. The calculations could be divided naturally into millions of threads, one for each pair of atoms, with each thread requiring very little memory, which is used mainly to record the location of the two atoms.

The biggest technical constraints for building a petaflop computer thus far have been the latency problem (the speed with which a chip addresses the memory) and power consumption. Although processor speeds have increased exponentially over the years, the time to fetch data from memory is only slightly less than half of what it was 20 years ago (about 300 nanoseconds). Therefore, putting more and more transistors on a chip is not the answer to the speed problem. Using conventional chips would consume over a quarter billion watts of power, an overwhelming amount.

Denneau plans to solve these problems by using a new technology that combines processor and memory on one chip so that latency is reduced to just 10 nanoseconds. There will be only minimal cache—primarily DRAM will be used. To compensate for the resulting slower memory speeds, the machine will use multi-threading. Each of Blue Gene's clusters will perform 4 tasks, or threads, simultaneously. If one is busy, the next one will pick up the thread. This architecture is called SMASH (simple, multiple, and self-healing). Denneau is particularly excited about using embedded DRAM for the first time on a large scale, thereby avoiding the DRAM bottlenecks that cripple current machines.

"With Blue Gene," said Denneau, "we're not in the business of running any particular benchmark on a processor. We want to execute a particular application as quickly as possible with the least amount of power. There are millions of threads of computation, so instead of building a small number of processors to handle them, why not build a simple processor to execute just one thread and replicate it millions of times? This system philosophy gives staggering improvement over conventional approaches."

IBM and other companies use die as large as 21x21 mm for their processors, and the resulting yields are quite poor. One defect in a chip might cause you to throw out the whole thing. "In real life, nothing is perfect," Denneau pointed out. "A good fraction of your body is broken at any one time, but you still function. It is too costly to require every chip to be perfect. Suppose five percent of the processors are bad. Does anybody care? It turns out,

nobody cares. No one can tell the difference. The programming is done in such a way that it finds out where the good processors and distributes the computation only among the good processors. The result is that the yields are going to be so high that we can probably package all the die on one wafer." This means, for example, that one "CPU chip" would actually contain hundreds of CPUs. If some of them don't work, they simply won't be used by the OS. The concept is similar to bad blocks on a hard disk.

Blue Gene is being built with off-the-shelf IBM technology, with 0.18 micron ASICs processors and off-the-shelf macros. Without custom design, Denneau cannot run Blue Gene as fast as he would like, but he will still come out ahead because of these and other architectural innovations. Denneau relishes having replaced the PowerPC's instruction set, with its several hundred commands, to almost nothing—only 57!

Plans for Blue Gene's configuration continue to evolve. Right now, it will have a 32x32-foot core that is 2 feet high. Each chip will contain 128 processors, each running at one gigaflop. Every four processors will share a floating point unit and a data cache, so that each chip will be capable of 32 gigaflops. There will be 36 chips on a board, and there will be four boards in a stack. The stacks will be arranged in a 16x16 grid, like floor tiles, and they will be connected to each other. "But we may rearrange that," said Denneau. The OSHA-compliant Blue Gene will sit under the floor so that technicians working on it will have a way to escape a fire without having to squeeze between the board stacks. "Originally the machine was to be 8 feet high," he said, "but the clear-



Monty Denneau talks with Joe Hoane, BS 84, one of the creators of Deep Blue, the IBM supercomputer that defeated chess champion Garry Kasparov in 1997. Blue Gene will be 1,000 times more powerful than Deep Blue.

ance for a person to slide under the interconnect was only 2 feet, and they wouldn't let us do it because of the escape problem."

And then there are the big BTU problems of power consumption and heat generation. One-foot diameter pipes, pumping 1,000 gallons of water per minute, will cool Blue Gene via a gigantic turbine water cooler, 8 feet high and 15 feet long, affectionately known as Bertha. Blue Gene must demand no more than 2 million watts, the maximum available at IBM Watson.

When IBM first started to simulate Blue Gene, it was a disaster. The processors were running well, but they spent much more time communicating with each other than they did computing because of the overhead. They had to create messages, send them, look at the headers, take them apart, process them, put them in queues, etc. It was a real mess. Denneau solved that problem by running computation in two phases: a computation phase and a very fast communication phase. In the communication phase, a set of nodes, which can be either messages or computations, is compiled out in the least possible time onto novel hardware that keeps everything in alignment. It was the software equivalent of putting a traffic cop in a busy intersection.

Even with Blue Gene's muscle, the calculations simulating an average protein is expected to take about a year to complete. The good news is that because of Blue Gene's ability to self-heal, if something goes wrong, the program will not have to start all over again. The software will regularly check the status of each thread. If an error is detected, it can retry the last phase of the computation. If that doesn't work, the failed component is isolated, and the software simply works around it.

"I don't know what the market is for these machines," Denneau said of Blue Gene. "The field of parallel processing is littered with bodies," he said, ticking off the names of several companies that have tried and failed to successfully commercialize supercomputers.

Supercomputers face competition from clusters of PCs or workstations, which can deliver supercomputing power at a fraction of the cost. However, clusters are still too slow or unreliable for applications requiring tight coupling and low latency, like the protein folding problem. Will Blue Gene solely be a research tool or will it be a prototype for a commercial product? Who knows? But the lessons learned in building and running Blue Gene should lead to a new generation of computers.

There are about 50 others working with Denneau on Blue Gene. Denneau works mostly from a small room in an early 19th century farmhouse that he shares with his wife, Jeanne Farewell, a pianist, illustrator, and writer. By working at home, Denneau is able to sleep late and work hard, avoiding the irresistible distractions of Watson. It also keeps him out of the limelight, although

he admits to having enjoyed his 15 minutes of fame he received when Blue Gene was announced, including his picture in *Newsweek* (December 13, 1999).

Denneau has been designing supercomputers at IBM for more than 20 years, yet he still feels the same passion and excitement he had when he first arrived at IBM. "One of the most thrilling days of my life," he said, "was when I drove up to that beautiful stone and glass building on the hill at Yorktown Heights. It was like arriving at Camelot." n

IBM, Blue Gene, and us

M3T research

Professor Josep Torrellas received a \$2.7 million DARPA grant for the project "M3T: Morphable Multithreaded Memory Tiles." The co-PIs are Jose Moreira, PhD 95, Hubertus Franke from IBM, and researchers from BAE Systems, Vanderbilt University, and South-Western Research Institute. The goal is to explore adding support for dynamic reconfigurability to the hardware, compiler, and the operating system of IBM's Blue Gene. It is hoped that with such support, Blue Gene will deliver high performance for a much larger range of applications.

Blue Gene Workshop

Professors Torrellas, David Padua, and Klaus Schulten from U of I, and Dennis News, Pratap Pattnaik, and Moreira from IBM, plan to organize a Blue Gene Workshop in Spring 2002 at the university. The workshop will bring together experts in computer science and computational biology from all over the world. The goal will be to address the computer science and algorithm challenges in running breakthrough computational biology codes on terascale-level machines.

IBM donates SP2

Luiz DeRose, MS 92, PhD 96, from IBM successfully steered the donation of a powerful 16-processor IBM SP2 machine to professors Vikram Adve, David Padua, Dan Reed, and Torrellas. The machine is being used in a wide variety of projects. Adve is researching compiler-supported simulation of applications and virtual machine architectures for link-time and runtime optimization. Padua is researching memory models for parallel programs and extensions to OpenMP for NUMA systems. Reed is researching tools for parallel and grid-based performance analysis, and the characterization of application I/O behavior. Torrellas is testing architectural ideas and developing the compiler to support dynamic reconfigurability in Blue Gene and is characterizing the requirements of protein folding algorithms.

Shigenori Matsushita

A log bridge with thanks to America

Shigenori (Shig) Matsushita, MS 63, established a new fellowship in honor of Professor Saburo Muroga by endowing the Saburo and Yoko Muroga Fund in Computer Science.

When Matsushita studied at the University of Illinois, it was the height of the Kennedy era, and Japan was still one of the world's poorest countries. Before coming to Urbana, Matsushita had been earning only \$50 a month after three years as an electronics engineer for Toshiba Corp. in Japan. He bought his first television set in 1964 and installed his first home phone in 1968. There would have been no way to afford coming to the U.S. had he not been awarded a Fulbright grant and a research assistantship with tuition and fee waiver at the Digital Computer Laboratory.

At DCL, from 1962-63, Matsushita worked on the development of ILLIAC III, a pattern recognition computer. "What I learned in Urbana," he said, "was a better understanding of automata, a mathematical approach to logic, semiconductor physics, and above all, American ways of thinking. This expanded my own vision and competence."

After completing his MS in electrical engineering, Matsushita returned to Toshiba in Japan, determined to repay the American people throughout his career. He credited his MS for helping him earn his PhD in 1974 from the University of Tokyo, where he devised the mathematical crosstalk theory on digital parallel transmission lines.

Matsushita remained at Toshiba for more than 37 years in various positions, including senior engineering manager, general manager of product planning, VP and general manager of business planning, and executive VP of Toshiba Information Systems. During his tenure, he would always seek mutually beneficial joint efforts with

American companies and established more than a dozen corporate partnerships between Toshiba and American companies.

In his early years at Toshiba, Matsushita designed the one of the world's first commercial, microprogrammed computers, while at the same time coordinating joint development projects with both GE and Honeywell. In 1978, he directed Toshiba's resources away from mainframes and toward smaller computers, especially laptops. He established a joint venture between Toshiba and ComputerVision, a CAD company based in New Hampshire, and through his efforts, Toshiba was Sun Microsystems's first manufacturer partner in Japan. He also engineered an agreement between Toshiba Information Systems and Netscape in 1994, when Netscape employed only 50 people.

Wanting to work for an American company before compulsory retirement, common in Japan, in 1996 Matsushita joined California startup Wink Communications, as president of Wink Japan. There he helped apply Wink's technology to Japanese interactive television. In 1999, Wink had a successful IPO, and Matsushita was able to help establish the Muroga endowment.

"From time to time, I ask myself whether the American people's investment in me in the early 1960s was a successful one for them," Matsushita said. "and I renew my thanks and aspire to continue contributing as a bridge over the Pacific, even if it may be just a shaky log bridge."

n



Shig Matsushita

Tom Murrell dies

Thomas Allen Murrell died in Mount Pleasant, Michigan, on June 3, 2001. He was 87. His wife, Herta Homi, and two daughters survive. Murrell joined the faculty at U of I in 1947 and was one of the first faculty members of the Department of Computer Science. He received his PhD in physics from Wisconsin and worked with the Radiation Laboratory at MIT. As a civilian, he worked on aerial radar and navigation devices during WWII, and he was

awarded the Bronze Star by President Truman in 1946 for his service. His research at Illinois revolved around solid state circuit theory.



Tom Murrell

Jeff Holden and Amazon.com

Jeff Holden, BS 91, MCS 92, is one of the core members of Amazon.com and director of engineering. Growing up in Rochester Hills, Michigan, Jeff Holden's computer science roots can be traced back to his 6th grade love for *The Six Million Dollar Man*, the 1970s TV series about a bionic human, and rebuilding his Apple II. Because of its high ranking in computer science, Holden enrolled at the University of Illinois, where he spent many hours studying in The Down Under, a food court in the basement of the Union, and in deserted classrooms that he snuck into. Professor Sam Kamin's compiler class (CS 321) was one of his favorites, and he recalled being blown away with the automated MP-checkers in Simon Kaplan's machine-level programming class (CS 221). For a campus job, Holden became a lab sitter for the express privilege of being able to work all night in the Woodshop.

After his BS, he went straight to graduate school, joining the research group of cognitive neuroscientist Neal Cohen in the Beckman Institute. As a good, hard-working student, Holden caught the attention of a recruiter for D.E. Shaw, the investment powerhouse.

Holden had never given investment banking a thought, but not one to say no to something he didn't understand, he decided to check out the company. Mesmerized by New York City, the amazing people at Shaw, and the physical presence of Shaw's corporate headquarters, which he described as "a super sexy, totally artistic view of the office space," he took the job. At the time, Jeff Bezos was recently hired by Shaw as a rising star from Bankers Trust. Holden was assigned to work with Bezos in building the company's Third Market trading division.

One of Holden's first projects was to assemble a Stratus fault-tolerant computer right out of the box. "I didn't realize you were supposed to invite Stratus out to do that kind of thing," said Holden, "so I just pulled an all-nighter, and there it was, ready to go, the next morning when everyone showed up." Working at Shaw was a blast: "I wrote tons of cool code and built cool stuff. It was an outrageous experience—a rocket ride."

Just before Jeff Bezos left Shaw to start Amazon, he and Holden hung out over beers and discussed ideas for the name of the new company. "MakeItSo," a tribute to Captain Picard and customer-centricity, was one of Holden's favorite names, but Amazon.com won out. It had a nice ring to it, and the reference to a huge, voluminous river was also good. Bezos left for Seattle in 1995 to get the company started, but a two-year mass exodus clause in his employment agreement prevented Holden from joining him at that time. Two years and four seconds later, he did.



Jeff Holden

Holden was hired at Amazon as director of information technology. He was given responsibility for the "sourcing systems" space at the outset; at the time, this translated to simply making the systems that ordered books from suppliers work properly. (The company dealt solely with books. Their only suppliers were book distributors Ingram and Baker & Taylor, and Amazon had a modest \$60 million in revenues.) The complexity of the problem grew rapidly as Amazon added millions of additional products, several fulfillment centers in the United States, and expanded into four other countries.

"It became clear to me that supply chain management was one huge optimization problem," he said, "and the magnitude and complexity of that space at Amazon were beyond what had been addressed by the industry to date. My team was charged with building the systems to forecast demand for all of our products, optimally allocate inventory to fulfillment centers based on that demand (as well as physical and business constraints, cost, and customer experience trade-offs), and optimally match supply and demand and make fulfillment promises to customers in real-time, while orders are flowing in from the Web site. We also handle the complex routing and communication with our supplier community to procure and return items.

"It's a stochastic optimization problem. There is uncertainty in both vendor lead times as well as customer demand. Having uncertainty on both ends makes it extremely difficult, especially in combination with the massive SKU and supplier bases. The computational complexity is enormous. Because we're blazing a new trail in the supply chain arena, we very much consider supply chain management a core competency, and now, after a huge amount of work, a competitive advantage."

Holden predicts that Amazon.com will eventually become a technology and operations platform in addition to its role as an on-line retailer. “There are already some big hints of what is to come on that front,” he said. “For example, the Toys ‘R Us and Borders partnerships (which are very different from each other in terms of what aspects of their businesses are utilizing Amazon’s systems) and our Marketplace environment, which allows customers to become sellers and tie their products directly to the Amazon catalog.

When asked about the machines and operating systems Amazon uses, Holden explained that Amazon is in transition. “We’re in the midst of porting our entire contingent of systems from (mostly) Compaq’s flavor of Unix to Linux. It was a risk mitigation and cost reduction move. We wanted commodity hardware, a very

robust operating system, and a healthy selection of development tools for the engineering teams.”

As a director of an engineering team, Holden loves playing a key role in building the company, so that softens his longing to write code again. “It’s been a wild ride so far,” he said. “From a metaperspective, we’re making history at Amazon. Maybe it’ll all explode, and I’ll go down with the ship, but I love to think that I’ll look back in a bunch of years (when books have been written about Amazon and the birth of e-commerce) and say ‘I helped build that!’ – it’s a huge motivator for me.”

When he’s not working, which is rarely, Holden can be found outdoors—mountain biking, skiing, hiking, and driving fast. He lives in Seattle with his black Labrador, Spooky. n

Ray’s self-aiming camera mimics human brain

Professor Sylvian Ray and his colleagues set out to demonstrate the versatility of a simulated neural network, which they modeled after the superior colliculus of the human brain, by building a self-aiming camera.

The superior colliculus is the visual reflex center of the brain that decides which way a person turns his or her head in response to sensory stimuli such as visual and auditory cues. Using two cameras and a pair of omnidirectional microphones, Ray’s system can feed information to a simulated neural network that resides on a standard desktop computer. The system is designed to automatically aim a video camera and a directional microphone at the most probable target in the environment, based on the results of the neural network’s analysis. Specifically, the self-aiming camera receives audio from the microphones and video from a second wide-angle camera.

The camera senses motion by comparing successive video frames while the system monitors the audio signals from the pair of microphones. A sound-location algorithm analyses the audio signals and sends the information to the neural network model. Each superior colliculus neuron will estimate, on the basis of the video and audio inputs, the probability that the source is present at its corresponding location in the environment. The location of the model superior colliculus neuron with the largest response is chosen as the location of the most probable target, and the self-aiming camera, with a long-focus lens, will point in that direction. The camera re-aims itself every second at its current estimate of the most probable target location.

Eventually, using additional neural networks which respond to sights and sounds of special interest, the

system will allow imposition of a value system so that classes of objects, such as aircraft versus a flock of birds, can be chosen to aim at. The target image can also be transmitted to a human operator for further analysis.

The human brain’s power comes from its ability to integrate inputs from multiple sensory systems, and the response of a superior colliculus neuron to the input of one sensory modality is amplified by input of another modality. Multisensory enhancement is an important goal for the electronic systems that computer scientists and electrical engineers in the multisensory target detection area are working on.

Ray’s project was initially funded by a UI Critical Research Initiatives grant and is now receiving funding from the Office of Naval Research. The military is interested in its application in intelligent sentinels (remote surveillance devices). The system could also be used to track speakers in a classroom designed for Internet broadcasts and for exploring hostile environments such as volcanoes or other planets. Members of Ray’s team are CS graduate students Samarth Swarup and Alejandro Sarmiento, molecular and integrated physiology professor Tom Anastasio, and CS post-doctoral research associate Paul Patton. n



Self-aiming camera

Gear, continued from p. 1

ceived the award during commencement exercises on May 13, 2001 in recognition of his distinguished career.

As a child in a London suburb just after the end of World War II, Gear was able to get his hands on enough surplus electrical equipment to satisfy his craving to tinker with all things automatic and electronic. After attending one of the better high schools on a scholarship, Gear went on to study mathematics at Cambridge University, where he rowed on the Peterhouse College crew team.

The English Speaking Union, an association dedicated to promoting understanding among English-speaking countries around the world, was offering fellowships for study in the U.S., and Gear was encouraged by his teachers to apply. They advised him that his chances would be better if he came up with a more “interesting” school, rather than the usual MIT or Harvard. It was David Wheeler, Cambridge mathematician and chief programmer for the EDSAC project in the early 1950s, who recommended the University of Illinois.

Instead of staying for a year, as was typical for British students studying abroad, Gear stayed for four. His adviser was mathematician Abraham Taub, who played a key role in the ILLIAC project and would head the Digital Computer Laboratory after Ralph Meagher. ILLIAC was the only computer on campus, and there were only two computer classes available at the time: a programming class taught by Dave Muller and a class on logical design taught by Jim Robertson. Gear started out as a research

Stiff differential equations

Stiff differential equations come up time and again in science with systems that involve processes that happen on highly disparate time scales, such as a rapidly cooling object or a rapidly dampening wave. There are regions of the phase space where the velocity or magnitude of the vector field changes rapidly. Because the solutions have very large derivatives, the integrator must be sensitive to these rapid changes in magnitude. The method that Gear came up with, naturally called Gear’s Method, is well suited for this class of equations, and it is one of the oldest and still the most widely used approach to solving these problems today.

assistant with Muller, writing library programs for the ILLIAC, before working with Don Gillies on the architecture of a new computer, the ILLIAC II. Meagher was head of DCL, and he enforced a rule forbidding RA work to be used for a thesis. So Gear’s thesis work was with Taub in numerical analysis. Gear worked hard, caught an occasional movie, married an American undergraduate student, had a baby, and splurged on a \$15 used television set. By 1960, he had earned his PhD in mathematics.

Because of his visa situation, Gear was forced to return to England and remain there for two years. University salaries were pitifully low, so he took a job at IBM British Laboratories. Even so, his salary was half that of Illinois’s as a graduate student. As a computer architect, Gear helped design the company’s first microprogrammed computer and spent many fun hours on the shop floor debugging the prototype with an oscilloscope. Alas, the machine lost out to the 7044 in internal competition mainly because of its cost. During his last few months at IBM, Gear was on the System/360 design team, which got him back to the U.S. several times to meet with IBM researchers, including Gene Amdahl and Fred Brooks, in Poughkeepsie, N.Y. Only weeks before returning to the U.S., Gear had another child, under whom he hid heavy items on the plane trip back to avoid the weight restriction on checked-in luggage.

IBM offered Gear a job upon his return to the U.S., but Gear opted go to Illinois to be an assistant professor among less than ten faculty members in computer science. The ILLIAC II was just being finished, and Gear wrote an assembler and minimal operating system for it so that the university could actually use the machine. He also led a group to write a Fortran compiler for it.

The Fortran compiler that Gear wrote for ILLIAC II was based on the IBM 7094’s, so that people could run the same job on either machine. One day, a physicist was



Gear teaching in his younger days

running a very large program on ILLIAC II, and the compiler complained about it. “It was one of those strange errors,” recalled Gear. “It was deep in the guts of the program, and I couldn’t figure out how it would ever get to that point, but I put a message in that said, ‘If you see this message, please see Gear.’ It was an option on a branch that I didn’t think could happen. The physicist came running over complaining that his program ran on the 7094 but not on the ILLIAC. It turned out that the input contained an error. A plus sign was missing, and the 7094 assumed multiplication. So the program ran on the 7094, but the answer it got was wrong.”

Gear is best known for his work in numerical algorithms and was one of the early people to explore new methods for the solution of stiff equations, a special class of differential equations (see box on p. 10). He got his start on the numerical solution of differential equations from Taub when he was a graduate student, and when numerical analyst Leslie Fox was visiting Illinois from Oxford, Gear received further encouragement.

During several summers, Gear did some interesting work on differential equations at Argonne National Laboratories. A chemist practically dared him into action by declaring that his group had problems they were solving on an analog computer that Gear and his digital computers couldn’t even touch. It was true—solving stiff differential equations on a digital computer was very tedious and time consuming. The analog-digital battle challenged Gear to think about how to better solve such equations digitally.

“I rediscovered methods that already existed,” he said modestly, “but I put them together in a different way and coded them to get the characteristics needed. I found that people had already used these methods, but not as effectively, probably because they didn’t fully understand them. So I popularized them and put them into automatic code, which is what got them into big use.”

When Gear became department head in 1985, the computer science faculty had grown to about 30. Gear’s research, which started out in computer architecture, had spanned to include software in the early 1960s, and then graphics in the late 1960s and early 70s. In his later years with the department, he had moved more and more to mathematical software and computational science, which was what he was doing when he was recruited in 1990 to head the newly formed computer science division of the NEC Research Institute in Princeton, N.J.

NEC Research Institute is a collaborative facility focused on long-term, fundamental research in computer and physical sciences. Only two years after Gear started, the lab’s president died, and Gear was appointed president. When he turned 65 in 2000, Gear retired according to Japanese company custom. Over his long career, he wrote 14 books and more than 60 papers, and became a

fellow of ACM, IEEE, and AAAS, a member of the NAE, president of SIAM, and a Fulbright fellowship recipient.

Gear continues to conduct research on his own. “I’m doing work in computer vision and a few other things—whatever takes my fancy. And I don’t have to keep a sponsor satisfied with the results,” he chuckled. He also looks forward to traveling more and visiting his grandchildren. His passion for the theater takes him and his wife Ann to London each year to see Shakespeare performed at the National Theatre, and he is also a fan of the opera. Sadly, he had sold his sailboat which had been languishing in the garage. Maybe he’ll get another one. n

Rocket man pays a visit



Professor Michael Heath and Fred Ordway, former NASA rocket scientist and technical adviser to Stanley Kubrick during the production of 2001: A Space Odyssey, a copy of which he is holding.

Fred Ordway was in town in April for the 3rd Roger Ebert Overlooked Film Festival (see www.ebertfest.com). During his visit, Ordway spoke to the Rocket Center, which Heath heads. In 1959, Ordway joined Werner von Braun’s rocket team, first at the Army Ballistic Missile Agency and later at NASA-Marshall Space Flight Center. In 1965-66, Ordway was the science and technical adviser to Stanley Kubrick during the making of *2001: A Space Odyssey*. His latest book, *Visions of Spaceflight*, brings together for the first time in one volume original space art spanning five centuries. n

EOH 2001

Engineering Open House took place, as it does every year, the first weekend of March. Computer science students put on several award-winning displays. The PLO (Programmers' Liberation Organization) won first place for their interactive boxing game called Win2KO. Another first place went to an ACM project called CLAIRE, a system which evaluates facial expression recognition in real time. Second place went to two ACM projects: WAVE, a wireless, music on-demand delivery system; and CyberGerm 2.0, a self-regulating, artificial ecosystem.

A time capsule buried outside Engineering Hall by EOH students in 1975 was unearthed, and two items from the CS department were found. One was a "computer in a bag," a research project by Yu Kwan Wo, MS 70, PhD 73. It was an early prototype of a microcomputer, featuring solar panels and wireless communications. The second was a tech report on the APE (autonomous processing element) machine, written by Wo, who went on to a long career at Bell Laboratories.

This year a new time capsule, to be opened in 50 years, was buried. Keith Wessel, BS 99, MS 01, submitted the following items on behalf of the CS department, with a letter describing the current state of computing technology: a six-foot segment of category 5 copper Ethernet cable with RJ-45 connectors on both ends, currently the university's standard, which runs 100 megabits per second of data along distances up to 328 feet from the network switch; and a short segment of single-mode fiber, capable of gigabit networking for distances up to six kilometers via a Class 1 1300 nanometer laser, found in all buildings north of Green Street. n



Computer in a bag



SigBio members Christella Lai and Rob Harmon demonstrate Cybergerm, a program that uses finite automata as an environment to host a simulated ecosystem.

ACM conference 2001

The annual Reflections|Projections conference was held on campus October 6-8, 2000. Keynote speaker was Jerry Fiddler, BA 74, MS 77, founder and chairman of WindRiver Systems, who gave his own reflections and projections on the state of computing. Another highlight was Michael Abrash's talk about Microsoft's Xbox. Other speakers, panel discussions, workshops, a programming contest, and a job fair rounded out the event, which drew ACMers from across the midwest. ACM has 17 active special interest groups and about 500 members. ACM chair was Josh Michaels and conference chair was Erik Gilling. Next year's conference will be October 12-14, 2001. For details, see www.acm.uiuc.edu/conference.



Jerry Fiddler chats with ACM members before his keynote talk. Daniel Sachs, Vikram Kulkarni, Mike Khalili, Fiddler, and Erik Gilling.



Jesse Scaria, BS 00, Jared Ahrens, BS 00, Beth Wisdom, BS 85, MS Math 88, and George Schmidt, BS Math 80, MS 83, recruit for Lucent during ACM's job fair during the fall conference.

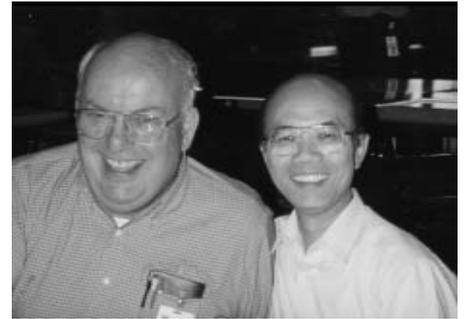
IBM and Illinois celebrate

Our ties with IBM just keep getting stronger. In November 1998, we held our first alumni reception at IBM Research in Yorktown Heights, N.Y., which was attended by about 40 CS ECE, and physics alumni. In October 2000, we had another gathering at IBM and expanded it to include a University of Illinois Technology Forum. A dozen university professors, including department heads and center directors, gave brief technical talks to IBM personnel. This was followed by a wonderful party for alumni in the geographical area. IBM hosts were physics alum Randy Isaac, VP of systems, technology and science at IBM Research and ECE alum and research staff member Se June Hong. Isaac is on the College of Engineering advisory board and is the executive champion for IBM and the university.

We followed the October event with an IBM Day on campus. This time, it was IBM research personnel who gave talks to university staff. Professor and director of the Coordinated Science Lab, Ravi Iyer, coordinated the day-long event. Among the dozen IBM researchers who participated were several alumni:

Kevin Warren and Daniel Connors, from ECE, and CS alumni Ravi Nair, MS 76, PhD 78, and Daniel Sturman, MS 94, PhD 96. Lorraine M. Herger, senior manager of emerging systems software and manager of the Blue Gene project was one of the presenters.

Our history with IBM goes way back. In 1958, the U of I campus installed an IBM 650 computer, which was replaced four years later with a 7090-1401 system. A year after that, IBM loaned DCL equipment for the ILLIAC II project. In 1967, the CS department acquired its first IBM System/360-50 computer, adding a System/360-70 a few months later, incorporating it into the ILLINET, one of the earliest computer networks. In the early 1980s the department spearheaded Project Excel for deploying personal computers across campus, and it set up one of the first networked undergraduate teaching laboratories using IBM AT personal computers. Many other IBM machines have come through the doors of DCL, and many graduates from the department have entered the doors of IBM as scientists and engineers.



Connor Haugh, MS 58, PhD 61, and Tak Ning, MS 68, PhD 71



Christian Wells and Donny Chan, both BS 00



Luis De Rose, MS 92, PhD 96, and Professor Josep Torrellas



Dan Oblinger, PhD 98, Carolyn Brodie, PhD 99, Mark Brodie, PhD 00, and Professor Dan Roth



Kiyoshi Maryama, MS 70, PhD 72, and EE alumni Se June Hong, MS 67, PhD 69 and Hwa Yu, BS 53, MS 54, PhD 58

2000-01 CS awards

3M Undergraduate Scholarship – **Elizabeth B. Silberg**
C. W. Gear Outstanding Graduate Award – **V. Prasanna Krishnan**
C. W. Gear Outstanding Junior Faculty Award – **Jeffrey G. Erickson**
C. W. Gear Outstanding Undergraduate Awards – **Noura Sharabash, Mark F. Hoemmen**
C.L. and J. W-S. Liu Award – **Alper Ungor**
Conexant Systems Scholarship – **David L. Zanter**
Cohen Undergrad Scholarships – **Martha N. Teklu, N. Mitchell Miter**
Daniel L. Slotnick Scholarship – **Clifford J. Andrus**
David J. Kuck Best Thesis Awards – **Xiaohui Gu (MS), Raghupathy Sivakumar (PhD)**
Duncan H. Lawrie Award – **Joshua M. Michaels**
Dunn Undergraduate Scholarship – **Jason H. Wong**
Franz Hohn and J.P. Nash Scholarships – **Gang Zou, Rushabh Doshi**
Hughes Award – **Toby Lael, Colin P. Miller, Jason M. Miller, Andrew L. Rosenfeld, Edward H. Sibbald, Chandra V. Koneru, N. Leonard Miller**
James N. Snyder Awards – **Michael A. Munie, Jakob Metzler**
John R. Pasta Awards – **Matthew W. Campbell, Matthew R. Ahrens**
Outstanding Teaching Assistant – **Amitabh P. Dave**
Ray Ozzie Fellowship – **Xue Liu**
Siebel Scholars – **John Borland, Diwakar Gupta, Sarosh Havewala, Prasanna Krishnan, Adam Laud, Ekta Manaktala, Joseph Pepper, Rebecca Peterson, Jason Shah**
Spyglass Scholarships – **Joyce L. Chau, Yue Chen, Rachel E. Kai, Maria A. Luca, Mary E. Pacold, Kelly W. Yeh**
W. J. Poppelbaum Memorial Award – **Milos Prvulovic**
William and Ruth Witt Scholarship – **Olga Dimitrijevic**
Altera Scholarship – **Sairam Muthialu**
Crowe Chizek Scholarship – **Brooke A. Herman**
Inforte Corporation Scholarship – **N. Mitchell Miter**
John Deere Scholarships – **John Lloyd Wright, Qihua (Lily) Yang**
4.0 Seniors – **Timothy L. Hinrichs, Stephen E. Schrock, Mark F. Hoemmen**
Warren William Young Scholarship – **Shane P. Vadbunker**
Bronze Tablet – **Yu Qing Cheng, Albert L. Chu, Rushabh Doshi, Timothy L. Hinrichs, Asher M. Kach, Stephen E. Schrock, Noura Sharabash, Yi-yun (Frances) Qian, Ashley Wise, Vincent L. Yang**
Knight of St. Pat – **Stephen E. Hunia**
Cheng R T Fellow – **Christopher J. Hughes**
Alpha Lambda Delta Award – **Andrew P. Cushing**



What do these three Bronze Tablet award winners have in common? They are all officers of WinDevils, the ACM special interest group devoted to Windows programming and development. From left to right, Stephen Schrock, Ashley Wise, and Rushabh Doshi. All three are bound for graduate school.

Faculty win College of Engineering awards

Samuel Kamin won the Stanley H. Pierce Award, given by the College of Engineering for having done the most to develop empathetic student-faculty cooperation. Kamin created a newsgroup to serve as a clearinghouse for questions and discussions among faculty and students. As director of undergraduate programs, he streamlined the advising and registration process and encouraged faculty to be more active in recognizing student achievement with award nominations. He also headed the department's teaching improvement committee.

Jeff Erickson won the Everitt Award for Teaching Excellence, one of the most coveted awards, given to only two chosen in a survey of undergraduate students in the College of Engineering. Erickson, a computational geometer, is an enthusiastic and creative teacher of some of the most difficult subjects in computer science. He is renown in the department for his lectures, demonstrations, and even his exams, and has inspired some of his students to choose graduate school and research careers. He is a member of the courses and curriculum committee, working to improve the overall quality of courses and instruction in the department.

Dan Roth was one of three assistant professors in the College of Engineering to win a Xerox Award for faculty research. Roth's research areas are in learning, natural language, and artificial intelligence. Already, his research has led to the wide use of machine learning techniques in intelligent human-machine interaction and to the integration of learning into large-scale intelligent systems. n

For a complete list of awards and their descriptions, visit our Web site, www.cs.uiuc.edu.

Classnotes



Roger Johnson

Roger Johnson, BS 65, MS 66, PhD 70, is chairman and CEO of Information Technology, Ltd. in La Jolla, Calif., after retiring as a VP at SAIC in San Diego. He is heavily

involved in display technology.

Dan Dobberpuhl, BS 67, left SiByte, a fabless semiconductor company, to become VP and general manager of Broadcom Corp. in San Jose, Calif. Before that, he was with Digital Semiconductor where he was a key architect of the Alpha processor and a design leader for a variety of VLSI projects, including the PDP-11 and MicroVAX 2.

Larry Weber, BS 69, MS 71, PhD 75, all in EE, was featured in the August 30, 2000, *Wall Street Journal*. His company, Plasmaco, has produced the first, 60-inch-wide flat-screen TV. Plasmaco is now owned by

Matsushita Electric Industrial Co. Plasma screen technology was invented Weber's EE professors, Don Bitzer and Gene Slotto.



Sandra Rankin

romance novelist writing under then name Allison Lane. Before turning to writing, she was a programmer and ran horse shows. She lives in San Jose, and her latest book is *The Notorious Widow* (Signet Regency, 2000).

Susan Quickstad Pace, BS 70, is an award-winning

Professor Muroga unites alumni in Silicon Valley



Professor Saburo Muroga has done an incredible job of keeping up with his former students and researcher associates, here and in Japan, many of whom have gone on to very successful careers. This photo was taken at a gathering in Palo Alto on January 14, 2001. Seated: Yahiko Kambayashi, Professor, Kyoto University, visitor in Muroga's group, 1971-73; Professor Saburo Muroga; Toshihide Ibaraki, Professor, Kyoto University, visitor in Muroga's group, 1967-69. Standing: Tso-Kai Martin Liu, former VP, Sun Microsystems, MS 69, PhD 72; Kuang-Chien Chen, VP, Verplex Systems, MS 87, PhD 91; Yao-Tung Yen, former VP, Pericom Semiconductor, MS 63, PhD 66; Hung-Chi Lai, VP, Fujitsu Laboratories, PhD 76; Shumpei Kawasaki, Hitachi Semiconductor, PhD 80; Ming-Huei Young, IOTA Technology, MS 76, PhD 78; Xuequn Xiang, VP, Incentia Design Systems, MS 84, PhD 90.

Edward M. Lerner, BS Physics 71, MS 73, is on sabbatical from Cable and Wireless Internet in Sterling, Va., and writing science fiction stories, two of which appeared in the SF magazine *Analog*. Check out www.sfw.org/members/lerner.

Sandy Rankin, BS 74, is Director of Software Technical Support at IBM in Somers, N.Y. She is responsible for re-engineering IBM's software product support and implementing IBM's Web-based support. Husband **John Rankin**, BS 72, is at IBM in Poughkeepsie, N.Y. He is a Senior Software Engineer, and he works on improving operating system and middleware performance on IBM's



Michael Borman

mainframe computer systems. John and Sandy will celebrate their 25th wedding anniversary at the end of June.

Ben Lerner, BS 75, MS EE 79, is director of e-shopping engine development for ShopEaze.com in Sunnyvale, Calif. The company provides outsourced online shopping solutions for retailers in the food and drug industry. He previously held positions with Sun Microsystems,



Joe Bowbeer at Copper Canyon in Mexico.

BroadVision, and Daisy Systems.

Alf Weaver, MS 73, PhD 76, was awarded the IEEE Third Millennium Medal at the annual conference in Nagoya, Japan in October 2001. He is professor of computer science at Univeristy of Virginia in Charlottesville.



Lawrence Levy

James A. Kutsch, PhD 76, is VP of information technology services for Convergys Corp. in Jacksonville, Fla. The company is an integrated billing and customer care services provider. Prior to that, he was with Bell Labs and AT&T.

Kutsch, who works with his seeing eye dog Yulland, has been blind since he was 16, and his PhD thesis was on a talking computer terminal.



Cynthia Tao

Michael Borman, BS 77, is VP of worldwide sales for IBMs UNIX Servers and workstations located in White Plains, N.Y. He is working to continue to grow their business at the best growth rates in the industry. He and his wife Gina have two daughters, Lauren (16) and Bridget (14). Between dance performances, lacrosse games, swim meets and a



Carl Kadie

big old house that needs constant attention, the Borman family keeps busy all day (and all night with teenagers as you can imagine). Still rooting for the Fighting Illini to win it all in the NCAA.

Joe Bowbeer, BS 80, spent about 10 years in Boston, first at MIT and later at Software Arts and Apollo before driving to Panama and spending a year and a half in Mexico. He is now in Seattle, where he is a software design engineer specializing in Java. He currently working at UIEvolution on applications for mobile devices. He is also a volunteer ESL teacher through Seattle's CASA Latina.

Lawrence T. Levy, MCS 80, is a senior applications programmer at IBM in White Plains, N.Y. He is a Certified Lotus professional in Domino application development, and designs and develops Domino applications for IBM's finance community. His wife, Ming-Me Lam, also works for IBM as a market analyst. When they're not in the office, they enjoy exploring the historic Hudson Valley and discovering new exotic restaurants in and around New York City.

Cynthia Tao, BS 83 and BA Philoso-

phy 83, is a project executive at IBM in Hawthorne, N.Y.

Paul Yung-Ho Shih, MS NucE 83, MS 86, PhD 91, after a long career at Microsoft, left to become VP of the Information Appliance division of High Tech Computer Corp., the company which produced the iPaq PDA for Compaq. Their specialty is PDA OEM/ODM. Shih divides his time between Seattle and Taiwan and is thinking about teaching in the future.

Carl Kadie, BS 85, MS 89, PhD 95, is a research software design engineer in the decision theory and adaptive systems group at Microsoft Research. He is particularly interested in collaborative filtering. His wife, Nanci Vaeth, MFA 88, is a professional costume designer for the opera and theater.

Jeffrey C. Jones, BS 86, is a database administrator for AOL in Reston, Va. He and his wife, Lisa K. Jones, BS Math 87, had a baby boy, Max Charles, in February 2001.

Mary McDowell, BS 86, is senior VP and general manager of Compaq Computer, in Houston, Tex. She was recently listed in *Business Week* as one of the highest paid women executives in the U.S.



Gaige Paulsen

Rosanne G. Marshak, BS 87, is still performing with her acclaimed rock band, Poster Children, which records with Warner Brothers. She is also visiting coordinator for a U of I program in fine and applied arts called Computing for the Arts.

Tim Krauskopf, MS 87, is VP and



Stanford professor Gene Golub, BS 53, MA 54, and PhD 59, spoke at Midwest Numerical Analysis Day in DCL on May 12, 2001.

general manager of Motorola's Internet Software and Content Group in Schaumburg, Ill. After co-founding and working for Spyglass, Krauskopf held top positions at two startups, PCQuote.com and Parlano, which later merged with HyperFeed Technologies. His job is to help Motorola exploit wireless Internet technologies.

Sandra D. Ruth-Diesen, BS 88, and her husband Kevin Diesen, BS ME 86, had a baby girl, Brieta Ruth, in April 2000. She is a programmer analyst at Parker-Hannifin in Huntsville, AL.

Scott Ernsteen, BS Accy 88, MCS 90, is VP of planning at Manufacturers Bank in Chicago. He is a CPA as well as a certified information systems auditor and is married to Stephanie Lerner-Ernsteen, BS HDFS 88, and MSW 90.

Dee Henderson, BS 88, published her seventh book, a novel called *The Guardian* (Multnoma Publishers, 2001), which was praised by *Publisher's Weekly*. She lives in Springfield, Ill.

Kumar K. Goswami, MS 88, PhD 93, and his wife, **Krishna Subramanian**, MS 93, are co-founders of Kovair in

Sunnyvale, Calif. He is president and CTO, and she is CEO. Kumar has worked for various companies including IBM, Tandem/Compaq, General Electric, Raytheon, and Onlive! Technologies. Krishna was previously at Sun Microsystems, where she helped develop Java Studio. She was recognized by Women in Technology International as an Outstanding Technical Woman in 1996.

Kevin McFall, BS 89, is director of enterprise application development for Tribune Company's media services group. Previously he co-founded, with Delbert Sims, BS ME 89, and served as president of The Urban Technologists, an IT consulting firm.

Gaige Paulsen, BS 89, is CTO at Inter.net, a global ISP in Herndon, Va. Paulsen's career path started when he left NCSA as one of the co-authors of NCSA Telnet to found Intercon, which was bought by PSInet, then spun off to Ascend, which was bought by Lucent.

Todd Biske, BS 91, MS 94, and **Andrea Kish Biske**, BS Civile 95, had a baby girl, Elena Clair, in June 2000.

Todd is a lead systems programmer with A.G. Edwards & Sons in St. Louis.



Chris Wilson

works for Sequoia Peripherals in Portland, Ore.

Louis Koziarz, BS 91, reports that Williams closed down its pinball division to concentrate on slot machines. After some turmoil, he

and several ex-Williams engineers started their own company to design and consult for the coin-op industry and are designing and programming a pinball machine for Stern Pinball.

See-Mong (Stan) Tan, MS 91, PhD 99, is now director of Quicktime at Apple Computer in Cupertino, Calif. He and his wife, Yong-Kian Soh, had their second child, a girl, in April 2001.

Chris Wilson, BS 92. One of the original Mosaic team members at NCSA, Wilson is a program manager working on IE. His wife, Jennifer Cole, BS Psych 92, is a social worker.



Neil Young, right, with fellow Deere alum Ray Parrish, BS 73.

The are also new restauranteurs with the Uncommon Grounds Cafe, best described as a coffeehouse and wine cafe. It's in the Roosevelt district of North Seattle.

Alex Bratton, BS CompE 93, founded the Net Squad, a technology incubator based in

Oakbrook, Ill. He was previously CTO for Sports At Home, a Chicago-area firm specializing in Web-based contest sign-ups for television



Eric Adams

shows.

Chris Meyer, BS 93, was married to Karen Walker in September 2000. He works for Hewlett-Packard in Richardson, Tex.

Scott Banister left start-up incubator Idealab to form a stealth e-mail infrastructure company called Godspeed Networks, co-founded by Hotmail founder Jack Smith. Banister is VP of products.

Gregory E. Morris, BS IPS 75, MTCS 95, was married to Terry Felke in June 2000. He is an electronics and CS professor at College of Lake County in Grayslake, Ill.

Eric Adams, BS 95, is chief database architect with Lante in Seattle. He recently bought a log house Carnation, Wash., home of "contented cows," and continues to work and play hard. In addition to river boarding and rafting, Adams completed an extreme skiing course in Verbier, Switzerland last winter.

Paul Rajlich, BS 95, MS 98, and his work in the CAVE were featured in the April 2, 2001, issue of *Forbes ASAP*. In addition to his work as a research programmer at NCSA, Rajlich heads Visbox, a VR startup.

Mark J. Faulkner, BS 98, was married in July 2000 to Jaimie A. Kunce, BA Spanish 99. He is an application development manager for Anderson Financial Network in Bloomington, Ill.

Michael Piacenza, BS 99, was married in October 2000 to Donna Johnson, BFA 99. He works for Accenture in Chicago.

Caine Schneider, BS 99, was married to Nicole Hirst in September 2000. He works for Stanley Consultants in Muscatine, Ia.

Anthony Michael, MS Physics and MCS 99, was married to Robin Daniel in December 2000. He is a software engineer for Lockheed Martin Astronautics in Aurora, Colo.

Neil C. Young, BS 00, was married to Katherine Morris in May 2000. Young is an infrastructure analyst with Deere & Co. in Moline, Ill.



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