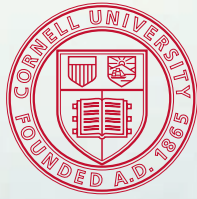
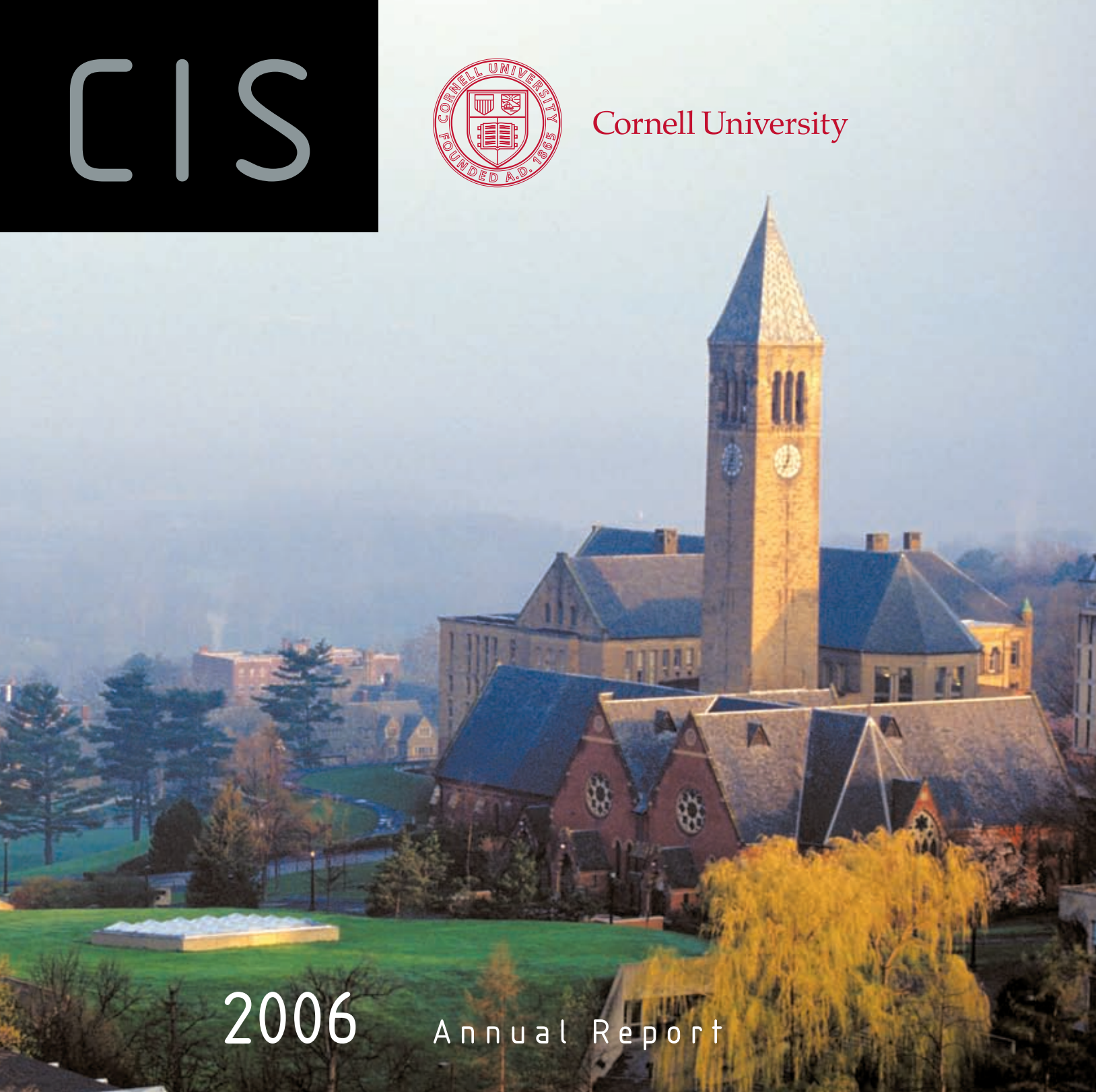


CIS



Cornell University



2006

Annual Report

COMPUTING
AND
INFORMATION
SCIENCE

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College of Veterinary Medicine

School of Industrial and Labor Relations

Johnson Graduate School of Management

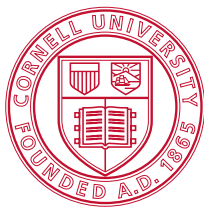
College of Architecture, Art, and Planning

College of Engineering

College of Arts and Sciences

College of Agriculture and Life Sciences

Graduate School



Cornell University

Law School

Weill Medical College

School of Hotel Administration

CIS

Weaving together experts from disciplines throughout Cornell University in an atmosphere of collegiality.

Department of Computer Science

Computational Biology

Computational Science and Engineering

Cornell Theory Center

Department of Statistical Science

Information Science Program

Program of Computer Graphics

Robert L. Constable



Toward William H. Gates Hall on the information campus

The end of 2005 proved to be an exciting and important time in the relatively short history of the Faculty of Computing and Information Science. In December, the Bill & Melinda Gates Foundation gifted CIS twenty-five million dollars toward the construction of William H. Gates Hall, which will be built as the signature building of the developing "information campus" at Cornell.

This generous gift was the culmination of an interaction with the Foundation initiated by former Cornell President Lehman and facilitated by our good friend and benefactor Narayana Murthy, founder of InfoSys and a Cornell trustee. Keshav Pingali, who holds the India Chair, helped me prepare a proposal to the Foundation, submitted by the president and the CIS dean.

For some time, as part of the process of seeking funding, we in CIS had thought seriously about an information campus and the academic programs it would house. In summer 2005, the CIS building committee, led by Ken Birman, started planning the information campus. The committee worked with Rafael Vinoly Architects to create a program analysis and initial site evaluation. They provided

information needed by the Foundation in deciding to make its gift. In June 2006, the Ballinger architectural firm did further site analysis, and a potential site was identified by the university pending further study and approvals. This site would connect Gates Hall to existing CIS space in Upson and Rhodes Halls and would provide a splendid new entrance to the Cornell campus from Collegetown, a modern Eddy Gate.

The CIS-Microsoft Relationship

Our connection to Bill Gates resonates well with the history of Cornell and of the Computer Science Department. Over one hundred years ago, Ezra Cornell started Cornell University with the fortune he made during the communication revolution of the time: the telegraph industry. Just thirteen years ago, Gates was influenced by Cornell alum Steven Sinofsky, now vice president for the Windows division, to orient Microsoft to the Internet and advance the modern digital communication revolution. As Gates said in his book, *The Road Ahead*,



"One of our enduring traditions is that the faculty gathers at noon every day to eat lunch while discussing the latest research results"

—Charlie Van Loan

"On a recruiting trip to Cornell University in late 1993 my technical assistant Steven Sinofsky was impressed by the way the academic community was using the Internet to communicate. When I heard Steve talk about what was happening at Cornell, I began to take the Internet quite seriously."

The Computer Science Department has been closely involved with Microsoft for over a decade. Many faculty have research ties with Microsoft Research, and Microsoft has been an important player in the development of the Theory Center.

We have always seen Microsoft as a "computing and information science company," and the vision put forward by Gates in *The Road Ahead* is close to that embraced by CIS: computing will touch every aspect of life and is critical to solving the most pressing scientific, engineering, and social problems facing the world.

The Computer Science Department's Fortieth Anniversary Celebration

This annual report contains a piece on the October 1st celebration of the fortieth anniversary of the Computer Science Department. In the introduction to the booklet produced for the occasion, Charlie Van Loan said that a great department must be excellent in research and teaching; it cannot lead in all areas, but it must be a world leader in some. A great department, he said, must take the lead in defining how the field evolves, and it must have some quality that makes it unique. He defined that quality for the computer science department:

"... the unique texture of our department stems, I believe, from our collegiality. One of our enduring traditions is that the faculty gathers at noon every day to eat lunch while discussing the latest research results"

He went on to point out that many of the research results reported in the booklet were sparked by these discussions. I recall a wonderful collaboration between David Gries and myself that started just this way in the Statler Club in 1972. I want to thank David for the superb job he did in editing the fortieth anniversary booklet, which you can see online.

During its forty years, Cornell Computer Science has been rated among the top four or five departments in the country. This year, *US News & World Report* rated the department fifth and ranked it highly in three sub areas: theory, programming languages, and artificial intelligence.

Change in Computer Science Leadership

Charlie Van Loan completed his term as chair of the Computer Science Department (CS). As chair for seven years, Charlie won the faculty's admiration for his boundless capacity for hard work and for the friendly and supportive work environment he has cultured. In his first years as chair, he remained the undergraduate program director and became head of recruiting as well. He also served as the first director of graduate studies for the new field of Computational Science & Engineering, formed by CIS.

I was honored to appoint Eva Tardos as chair. Eva is one of the most distinguished faculty in CIS, known for her fundamental results about networks, and over the years she has exhibited

exceptional leadership skills. Eva had received the overwhelming recommendation from the CS faculty to be the next chair.

We look forward with anticipation to new and exciting innovation in computing research and education. Forty years ago, we had no idea that computing and our Computer Science Department would be where they are today. Eva is just the right person to start CS off on another forty years; we cannot predict where the field will take us, but rest assured that we will be involved in constructing the future.

The Department of Statistical Science

The other department in CIS, the Department of Statistical Science (DSS), was rated sixth by the *US News & World Report* in 2006 and fifth in the 1995 National Research Council rankings. We expect that the growing synergy between CS and Statistics, as disciplines fundamentally concerned with understanding large amounts of data using mathematics and computation, will strengthen both of these outstanding departments.

We are fortunate to have Marty Wells as DSS chair. He has provided exceptional leadership to the department and this year accomplished the alignment of Statistical Consulting with DSS. This will provide excellent opportunities for professional masters students to help with consulting and learn "on the job." Marty and Director of Graduate Studies John Bunge have worked with CIS Assistant Dean Jennifer Wofford and Engineering College Career Services to restructure the placement services for professional masters students. DSS is planning to expand the professional degree program.

The Information Science Program

The Information Science (IS) Ph.D. program attracted a significant pool of outstanding applicants, two of whom won fellowships in the Graduate School's competition. The Information Science Colloquium Series this year included a host of national leaders such as Hal Varian, David Levy, Pamela Samuelson, Lee Giles, Andrew Odlyzko, and Gregory Crane.

Information Science also won a university grant from the Institute for Social Sciences (ISS). Their winning proposal, called *Getting Connected: Social Science in the Age of Networks*, was instrumental in winning a two million dollar cyber-tools NSF grant on very large datasets for social science. The Principal Investigators, all IS faculty, are Michael Macy (chair of Sociology), Geri Gay (chair of Communication), and Dan Huttenlocher (DGS for IS).

As part of this project, Jon Kleinberg (CS and IS) and David Easley (Economics and IS) are creating a new undergraduate IS course titled "Networks" that will be cross-listed with Economics and Sociology. This course will introduce students to networks in three worlds: technical (e.g., the Web and Internet), social, and natural (e.g., pathway networks in the cell).

The Getting Connected project will also organize two work-

shops. In fall 2006, the topic will be the diffusion of information, and in the spring, Microsoft will partner with Cornell to present a workshop about the impact of the Internet on our understanding of truth and knowledge. CIS is pleased to be a key player in these major intellectual events on campus next year.

Computational Biology: Bridging the Rift

The Bridging the Rift Project (BTR), led by CS professor Ron Elber, has taken a major step forward in bioinformatics. Ron and I traveled to Jordan in May to work with five public Jordanian research universities to select scientists who will be funded by BTR to study at Cornell in preparation for joining the Library of the Desert research project.

Cornell is a major partner in this project, with the dual goal of advancing regional peace and creating a state-of-the-art science project for the Arava desert border region between Israel and Jordan.

The Cornell Theory Center

The Cornell Theory Center (CTC) is now the Cornell University portal to the National Science Foundation TeraGrid network. Acting Director Tony Ingraffea and Vice Provost for Research Bob Richardson led the CTC efforts to join the TeraGrid. The TeraGrid is a key focus of e-Science research in the United States, and the CTC is a gateway for data-driven science, with WebLab and the Arecibo pulsar datasets as major new resources on the grid.

The CTC also won an award for its work over the past four years in partnership with Microsoft, leading to the cluster computing version of the Windows operating system. Industry expects the Cornell/Microsoft collaboration to make personal supercomputing a reality. The new CTC partnership with Microsoft will focus on exploiting personal supercomputing in science and engineering.

To help in CTC planning, CIS Associate Dean for Computational Science and Engineering John Guckenheimer organized an external review of the Theory Center. The review committee gave high praise to the CTC staff and to the plans developed by acting director Tony Ingraffea and his leadership team.

Conclusion

The educational and research programs of CIS are in rapidly advancing areas of science: the information sciences. They are driven by exponentially expanding technologies that change the way knowledge is created and disseminated—the core activities of the academy.





Charlie Van Loan

Are we ready to set sail on a “flat world?”

Cornell computer science majors reason about complicated systems, complicated algorithms, and complicated data.

They appreciate the design process and understand what it means to build a reliable software system. They appreciate the scientific method and understand what it means to verify a model through simulation. They work with programs that display intelligence and consequently, clarify their own view of human intelligence. The well-educated computer science major is a three-way scholar, part engineer, part scientist, and part philosopher. And they are more than ready to set sail in the world.

But are they ready to set sail on a “flat world?” Compass needles deflect in the presence of outsourcing, insourcing, and open sourcing. These are among the ten “flatteners” described in the first chapter of Thomas Friedman’s bestseller, *The World Is Flat*. Friedman proclaims a new world economic order that is (in many ways) the consequence of computer science-driven breakthroughs and their capitalization. You get the picture simply by thinking about Google and PayPal and Bangalore and Shanghai. *The World is Flat* is an ego trip for computer scientists, a reminder about the importance of their work.

My own personal favorite among the Friedman “flatteners” is the fall of the Berlin Wall in 1989, which set the stage for global free markets. Real-time, matrix-based signal processing intimidated the Soviets into thinking that President Reagan’s Star Wars program might just work. High performance scientific computing in the west, specifically parallel matrix computations, could not be trumped, and that was the end of the U.S.S.R.

We should be glad that the world is flat. We should be glad that an internet-based mom-and-pop business can compete with

a large corporation. We should be glad that anybody can visit the Library of Congress with cheap hardware and a decent browser. We should be glad that there is a growing middle class in India and China. To say that the world is flat is to say that the playing field has been leveled and, in the long-term, that is our best interest. Al-Khwarizmi (790-840 A.D.) leveled the playing field for a millennium with his work on the Hindu-Arabic place-value system and cool, easy-to-use algorithms for base-ten arithmetic. What would the world be like if only the rich and powerful were long-division savvy?

But let us not kid ourselves, leveling implies disruption and worry. Looking over our own backyard, we see that academic computer science has its own “flat world” problems. Once upon a time, computer science had a monopoly on students interested in computing; the only way for an undergraduate to get a computer science “fix” was to major in computer science. This has all changed. Operations research, electrical engineering, mechanical engineering, and biology each have a rich computer science component—simply think about research in the areas of networks, embedded systems, robotics, and genomics. A new generation of students is able to satisfy their interest in computer science by majoring elsewhere and taking elective courses with us.

Are we giving away the store? Are we outsourcing the best of our subject to colleagues in nearby disciplines, leaving behind a hollow, unattractive shell of a major and a cadre of unemployable graduates? Not at Cornell. We are taking the steps necessary to play to the creative side of our undergraduates much earlier in the curriculum with a new game design minor, a focus on undergraduate research, and an increasing facility for multi-disciplinary work. Creativity, with its hooks into research and social context, is how to capture and keep the freshman mind.

Computer Science Celebrates

Forty Years

Computer science at Cornell celebrated its fortieth anniversary on October 1, 2005. Many friends of the department showed up, including ninety of our 360 Ph.D.s—twenty-five percent, including the first Ph.D. from 1966. It was a wonderful time for catching up with people we hadn't seen for years, to showcase what our department has accomplished, and to look to the future.

The festivities started with an evening social gathering in the beautiful atrium that joins Phillips, Upson, and the new Duffield Hall—a facility for nanoscale science and engineering constructed under the leadership of then dean of engineering, John Hopcroft. The next day was devoted to eleven presentations by Cornell alumni, each discussing the past, present, and future of some aspect of computer science. David Gries gave a humorous and well-received banquet speech in which he roasted various faculty members and students, talked about the past, and discussed principles on which the success of the department has been based.

Forty years is young compared to other fields, but the intense, rapid development of computer science is unprecedented. In the 1960's, when we were dealing with mainframes and punched cards, no one in the world foresaw computing and information science as we know it today. But we are proud that Cornell Computer Science has played a significant part in developing the education and research that made current-day computing possible. We have made key research contributions in many different areas of computer science, and we have authored texts that set the standard for the field in algorithms, automata theory and formal languages, computational complexity,

compiler construction, information retrieval, numerical analysis, programming methodology, and more, and have contributed more than our share of the research in these fields.

Gerry Salton, who succumbed to cancer just over ten years ago, exemplifies our role in groundbreaking research. With the department since its start, Gerry was Mr. Information Retrieval—the man most responsible for the development of this area. His thirty years of steady research reached full fruition in the 1990's when it made possible the search engines we all use today. Only then could his vision and persistence be fully appreciated.

We started with just an M.S.-Ph.D. program. Our goal was to help populate the new computer science departments that would be developed in the near future. We concentrated on what was then the core of computer science: theory of computation, algorithms, programming languages and systems, information retrieval, and numerical analysis.

In the late 1980's, we began hiring strongly in artificial intelligence. Now, AI, with about nine faculty, is our largest group and is winning increasing acclaim for their research, including an armful of best paper awards at this year's top conferences. The article on page 18 discusses our current role in AI and



During its forty years, Cornell computer science has been rated among the top four or five departments in the country.

how multidisciplinary work in AI has helped us become more influential.

The change to multidisciplinary work took place gradually. Early on, like many other departments, we concentrated on the core of computer science, and we talked mainly to each other. Our daily discussions over lunch and coffee fostered a collegial and collaborative atmosphere, but in an inward fashion. In the early 1980's, individual faculty began collaborating with faculty outside of computer science. The recognition of the need for multidisciplinary work then grew steadily, so much so that in the late 1990's, we inspired Cornell to start the unique "Faculty of Computing and Information Science" in order to facilitate computing throughout the university. The Faculty of CIS, essentially a college without students (computer science gives degrees in the Colleges of Engineering, Arts and Sciences, and Agriculture and Life Sciences), now houses two departments and half a dozen institutes and centers. CIS, led by our own Dean Bob Constable, is driving innovation in computing in everything from digital libraries to computational biology to computing in the arts.

We have always been thought of as a theoretical department, but we have contributed to the development of real systems all along and our presence in systems continues to increase. Microsoft's Bill Gates turned on to the Internet in the 1990's because of what alumnus Steve Sinofsky reported was happening at Cornell. Current faculty member Paul Francis is responsible for NAT (Network Address Translation, which allows you to have a home network even though there aren't



enough IP addresses to go around), and Gün Sirer's system CoDoNS is being deployed to serve the Internet domain name space in all of China. These are just two examples of real systems work done by our faculty.

Six people from the 1960's had a long career with the department. Gerry Salton passed away in 1995, and Dick Conway retired a few years ago. Juris Hartmanis, John Hopcroft, Bob Constable, and David Gries are still active.

But Cornell is contributing new leadership in computer science research and education. Our original core research areas and AI have been joined by many new applied and multidisciplinary areas, including computational biology, computing in the arts, digital libraries, databases, data mining, grid computing, graphics in medicine and movies, and security. The best way to learn more about our work is to read the informative fifty-page booklet produced for the occasion: visit www.cs.cornell.edu and click on the red fortieth anniversary banner.

We don't know where computer science will be in the next forty years, but we venture to say this: Assuming that we maintain our ambience, our level of research and education, and our will to change with the times that we showed in the first forty years, CS@Cornell will still be making significant contributions to research and education. We look forward to seeing everyone again forty years from now!

CS starts with faculty Dick Conway, Pat Fischer, Juris Hartmanis (Chair), Chris Pottle, Gerry Salton, Sid Saltzman, Bob Walker.

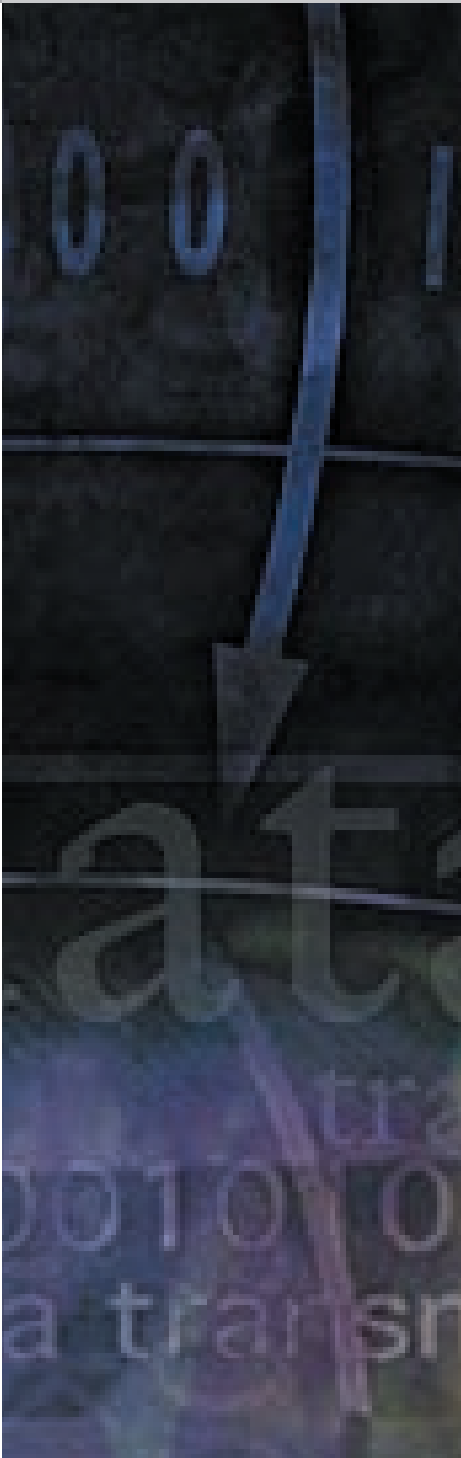
Juris Hartmanis publishes the paper that starts the field of computational complexity, with Dick Stearns: "On the computational complexity of algorithms." Later, they receive the ACM Turing Award for this work.

Gerry Salton brings his SMART system, started in 1961 at Harvard. SMART is a major testbed for 35 years of experimental research in information retrieval.

CS produces its first Ph.D., Joel Sturman, a transfer from Electrical Engineering.

CIS Units

CIS Departments



The Department of Computer Science

In recent years the department has complemented its strength in the essential core areas (artificial intelligence, programming languages, scientific computing, systems, and theory) with new commitments to databases, graphics, machine learning, and natural language processing. Cornell's Department of Computer Science is widely known for its collegiality and its ability to move rapidly into new interdisciplinary fields such as information science and computational biology. The department's challenge is to be simultaneously strong in the core areas of computer science while being a major force in emerging and interdisciplinary areas that are being developed within CIS. The high-level research goals are:

- to help science, engineering, and business by making it possible for those communities to (a) interpret unprecedented volumes of data and (b) build models and simulations to cope with exceedingly complex problems,
- to design and build the efficient, scalable, secure, and reliable systems that will form the foundation of our information-based economy and national infrastructure,
- to develop algorithms and languages that extend and automate the human capacity to visualize, reason, and compute, and
- to advance the theoretical foundations of computer science with new mathematics that support the analysis of complex systems and computational processes.

This broad agenda is made possible by faculty whose research interests radiate in many directions and whose commitment to teaching is deep. The computer science major in the College of Engineering and the computer science major in the College of Arts and Sciences emphasize breadth across the field and encourage students to develop a strong expertise in a second area. The one-year Master of Engineering program gives students the opportunity to take a range of forefront courses and to develop skills that enhance their marketability. The Ph.D. program is highly ranked and over the past forty years has graduated many students who have gone on to influence the course of computer science research in the world.

For more information, see <http://www.cs.cornell.edu/>.

The Department of Statistical Science

Statisticians work at the interface of mathematics, computing, and data analysis. Statistics is, at its core, about representing information. Notions like expectation and variance are meant to provide compact descriptions of large amounts of data. Large amounts of data are the stock in trade of many disciplines, so statisticians often are involved in analyzing data generated by research in other disciplines.

In biology, the role of statistics is so significant—in problems ranging from the

Juris Hartmanis and Dick Stearns publish the first of many influential texts by CS: *Algebraic Structure: Theory of Sequential Machines* (Prentice Hall).

Roland Sweet, John Hopcroft join.

Gerry Salton publishes the classic IR text, *Automatic Information Organization and Retrieval* (McGraw-Hill).

Ken Brown, Peter Wegner join.

Dick Conway, Bill Maxwell, and Louis Miller, publish the classic text, *Theory of Scheduling* (Addison-Wesley).

Howard Morgan, Alan Shaw, Robert Wagner, Bob Constable join.



CIS Programs



design of clinical experiments to the analysis of genetic, genomic, and proteomic data—that a whole new field of biostatistics has emerged. Computer science also has great interest in problems of information representation, so there is a great deal of work at the interface of computer science and statistics, particularly on topics such as machine learning (automatic classification of data) and data mining (finding interesting patterns in large datasets). Indeed, we seem to be witnessing the beginning of a field of computational statistics.

The Department of Statistical Science (DSS) offers a Master of Professional Studies (MPS) degree in applied statistics and a Doctor of Philosophy (M.S./Ph.D.) degree in statistics. The academic and research programs at DSS take advantage of Cornell's extensive resources, drawing from many colleges and research groups.

For more information, see <http://www.stat.cornell.edu/>.

Program of Computer Graphics

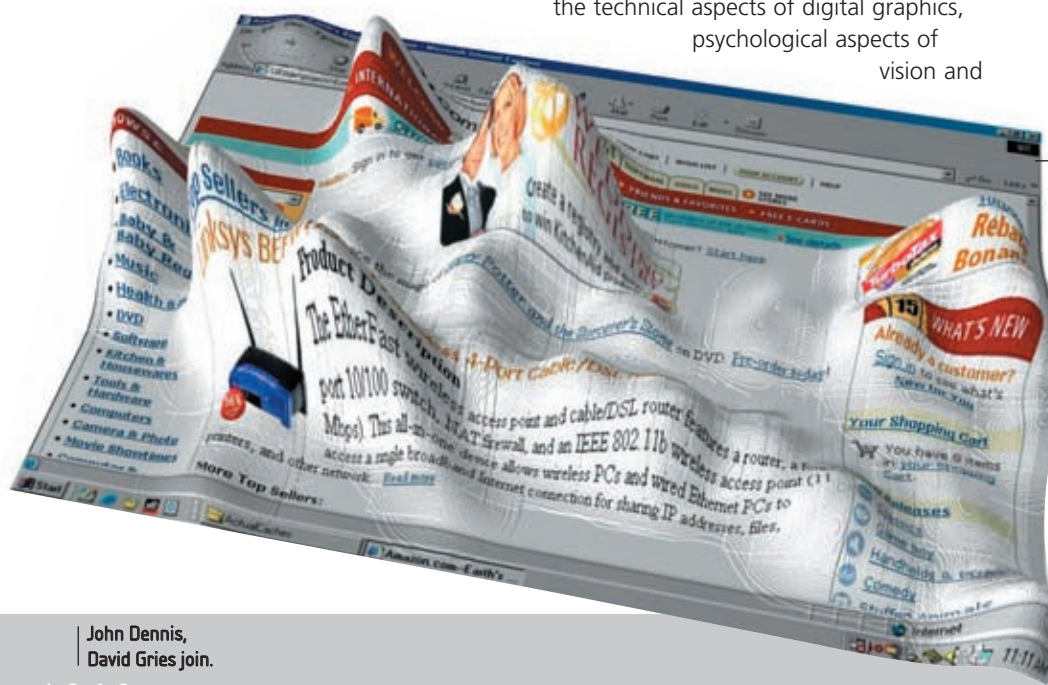
Computer graphics is a rapidly evolving field that has had significant impact on most scientific, artistic, and engineering fields. Graphics is the most common and efficient means of human-machine communication. At Cornell, research and teaching in computer graphics are centered in the Computer Science Department and the closely affiliated Program of Computer Graphics (PCG), one of the world's leading computer graphics laboratories and a dominant force in the international computer graphics community for more than thirty years.

The field of computer graphics relates to the broader area of digital arts and graphics, a new CIS program area that involves computer graphics researchers, architects, artists, art historians, perception psychologists, and information scientists. This program will explore the interaction of graphics and arts by considering the technical aspects of digital graphics, psychological aspects of vision and

perception, and the creation of art in a time of digital reproduction.

Research in graphics requires a multidisciplinary team with knowledge in algorithms, systems, numerical simulation, machine vision, software and hardware engineering, physics, optics, and perception psychology. The PCG is particularly famous for both its work on realistic rendering—simulating environments that are physically accurate and perceptually indistinguishable from real world scenes—and its influence on the architectural design and computer animation industries. Current graphics research at Cornell includes realistic interactive rendering, advanced material modeling, human visual perception in graphics, modeling complex scenes, image-based modeling and rendering, animation, and display technology.

For more information, see <http://www.graphics.cornell.edu/>.



The Human Computer Interaction Group, led by Professor Geri Gay, uses eye-tracking to understand how users traverse through web-based information space. This model depicts aggregate results of an eye-tracking experiment. The peaks show high levels of interest in particular region of the website. Or could it be people hiding under a rubber floor?

John Dennis,
David Gries join.

John Hopcroft and Jeff Ullman publish their classic text, *Formal Languages and Their Relation to Automata* (Addison-Wesley).

Gerry Salton becomes editor-in-chief of the *Journal of the ACM*—the first of many influential editorial positions held by members of CS.



Information Science Program

Information science is an interdisciplinary program within CIS. It brings together faculty, researchers, and students who share an interest in the boundary between computer science and the social sciences. The program studies digital information systems in their social, cultural, economic, historical, legal, and political contexts. The academic programs are divided into three streams: information systems, which draws from computer science and operations research; human computer interaction, which includes communication, psychology, and cognitive studies; and social studies of computing, which draws from science and technology studies, law, and economics.

The program offers a Ph.D.; its first group of students entered in fall 2004. Undergraduate majors in information science are offered in the College of Arts and Sciences and the College of Agriculture and Life Sciences. In the College of Engineering, information science is one of the specializations in the major of information science, systems, and technology. All undergraduate colleges offer minors or concentrations in information science.

The Information Science program is home to several large research groups, including the Human Computer Interaction Group; the ePrint arXiv; the National Science Foundation's National Science Digital Library;

and the Cornell Web Lab. The 2006 theme project for Cornell's Institute for the Social Sciences, "Getting Connected: Social Science in the Age of Networks," is based in part on Information Science research.

For further information see <http://www.infosci.cornell.edu/>.

Computational Biology

Computation has become essential to biological research. Genomic databases, protein structure databanks, magnetic resonance images of the human brain, and remote sensing data contain unprecedented amounts of detailed information that are transforming almost all of biology. Complex patterns, structure, and interactions raise fundamental and fascinating questions that can be addressed only using computational methods, and computational biologists are creating new tools to analyze these new sources of data.

More than fifty Cornell professors in six university colleges, including the Weill Medical College in New York City, are involved in computational biology. They tend to be quantitatively-oriented biologists, biophysicists, doctors and medical researchers, mechanical engineers, computer scientists, and others, and they are looking at everything from the genetic differences between humans and chimpanzees to how protein chains "fold" into three-dimensional structures to how hearts pump.

A new graduate field of computational biology, established in 2005, provides an academic structure that facilitates interdisciplinary training in this broad area. Problems investigated by computational biologists span a wide spectrum, including:

- the genetics of disease susceptibility
- comparing entire DNA genomes to uncover the secrets of evolution
- using protein structures to design new therapeutic drugs
- mathematical modeling of cellular signaling networks
- predicting how ecosystems will respond to climate change
- designing recovery plans for endangered species.
- animal behavior and ecology
- cognitive psychology and neurobiology
- modeling the spread of diseases

Research at Cornell in these areas usually involves interdepartmental collaborations to take advantage of Cornell's great breadth in the biological sciences and strength in computer science, mathematics, and the physical sciences. For example, researchers in the Departments of Computer Science, Molecular Biology and Genetics, and Chemistry and Chemical Biology focus on macromolecular biology. Predicting the structures and functions of proteins is a primary aim of research supported by the National Science Foundation (NSF), too. This group of researchers is strong, well organized, and has ties to the Computational Biology Service Unit in Cornell's Theory Center.

The group studying evolutionary genomics includes researchers from the Departments of Biological Statistics and Computational Biology, Molecular Biology

Ellis Horowitz, Jorge More,
John H. Williams join.

Jim Bunch joins.

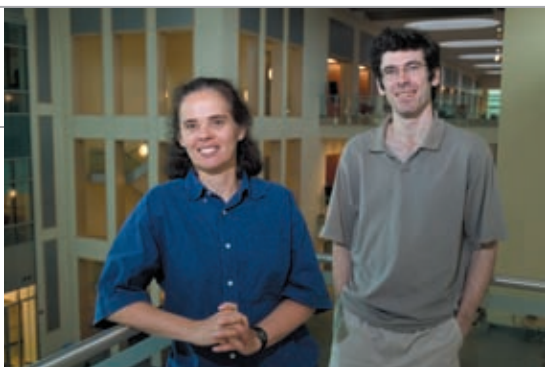
Gerry Salton
becomes chair.

Charles Moore,
Tim Teitelbaum join.

CS grows to
fifteen faculty.

Dick Conway's group develops PL/C, a subset of PL/1 designed for instructional purposes. The PL/C compiler is distributed to 100 institutions and instantly becomes the standard instructional PL/1 compiler.

David Gries publishes the first text on compiler construction, *Compiler Construction for Digital Computers* (John Wiley & Sons).



Selected Student Awards

and Genetics, and Ecology and Evolutionary Biology and is one of the strongest of its kind in the country. This group, like the macromolecular biology group, has strong ties to Cornell's Genomics Initiative, which has computational and statistical genomics as one of its major thrust areas.

Studies of non-linear systems bring together ecologists from the Departments of Ecology and Evolution and Natural Resources, neurobiologists from the Department of Neurobiology and Behavior, and mathematicians from the Center for Applied Mathematics for increasingly sophisticated analyses of some of the highly complex coupled systems that arise in biology.

Intracellular signaling networks are studied by a collaboration involving biologists, physicists, and engineers from the Departments of Chemistry and Chemical Biology, Physics, and Chemical and Biomolecular Engineering, and the Cornell Theory Center. The NSF recently provided Cornell with funds for an Integrative Graduate Education and Research Traineeship (IGERT) program in non-linear systems to help support students in this area.

Computational Science and Engineering

Within the sciences and engineering, it is frequently the interplay between theory, experiment, and computation that prompts innovation. To be effective in this environment, one needs a background that is rich in both applications and supporting areas of computer science and mathematics. The Computational Science

and Engineering (CSE) minor is tailor-made for this purpose. Created under the auspices of CIS, the program enables computationally oriented students to amplify their research strengths by choosing a modest number of suitable courses from a menu.

Going from application area to computational results requires domain expertise, mathematical modeling, numerical analysis, algorithm development, software implementation, program execution, analysis, validation, and visualization of results. CSE involves all of this. Although it includes elements from computer science, applied mathematics, engineering and science, CSE focuses on the integration of knowledge and methodologies from all of these disciplines, and as such is a subject that is distinct from any of them.

Cornell is famous for its support of multidisciplinary education, and the CSE minor exemplifies this university strength.

Finalist, CRA male undergraduate award
Eugene Medynskiy

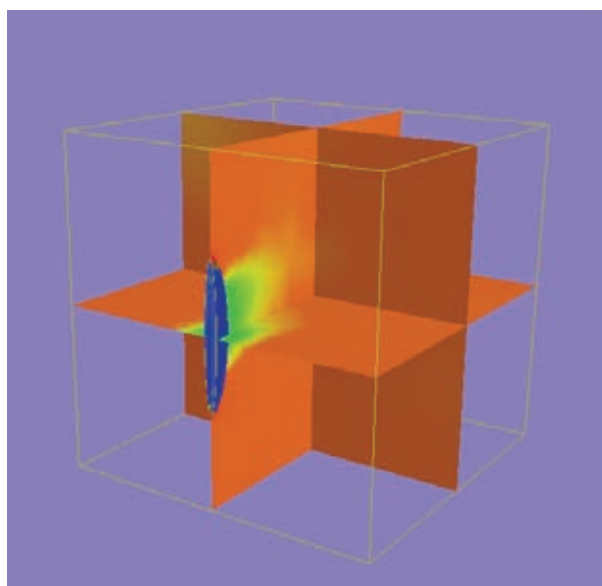
Microsoft Graduate Fellowship
Filip Radlinski

Lawrence Postdoctoral Fellowship
Greg Bronevetsky

Runner up, Mobile Game Mosh
Cornell team led by
Mohan Rajagopalan

First Place, Games 4 Girls
Lisa Marie Allen,
Sally Huang,
Dora Helen Fraeman,
Brenda Chen, and
Pamela Chuang

The Cornell Fracture Group is developing simulation tools to predict nucleation in aerospace-grade aluminum alloys. The model shows contours of the accumulated plastic slip on four slip planes in a single face center cubic crystal.



Juris Hartmanis becomes the founding editor of Springer-Verlag's *LNCS series (Lecture Notes in Computer Science)* and David Gries becomes the founding editor of Springer-Verlag's *Text and Monograph Series (TMS)*. Hartmanis and Gries maintain these positions for over thirty years.

Bob Tarjan,
Alan Demers join.

Dick Conway and David Gries publish the first programming text to deal with issues of correctness, like loop invariants, *An Introduction to Programming, a Structured Approach using PL/1 and PL/C* (Winthrop).

Shih-Ping Han joins.

John Dennis and Jorge More publish their landmark paper, "Quasi-Newton Methods, Motivation and Theory." The nonlinear equation solving business has not been the same since they showed just how far you could go with approximate Jacobians.

Al Aho, John Hopcroft, and Jeff Ullman publish their classic text, *The Design and Analysis of Computer Algorithms* (Addison-Wesley).

CIS Centers and Institutes

Cornell Theory Center

The Cornell Theory Center (CTC) is Cornell's high-performance computing and interdisciplinary research center. CTC is focused on providing cyberinfrastructure resources for research and education; these resources include high-performance and data-intensive computing hardware and expertise, visualization, and K-12 outreach. Scientific and engineering projects supported by CTC represent a wide variety of disciplines, including bioinformatics, behavioral and social sciences, computer science, engineering, geosciences, mathematics, physical sciences, and business. The center serves more than 150 faculty research groups across campus and at the Weill Cornell Medical College.

CTC is widely recognized for pioneering the use of industry-standard hardware and software to create a productive, large-

scale computing environment. Strategic partnerships with Microsoft and Intel were critical in achieving this vision. CTC's platform expertise includes AIX, Linux, MAC OS X, Windows Server 2003, Windows Compute Cluster Server 2003, and UNIX. Supporting 90 active research projects, the CTC runs a cluster computing environment with approximately 1800 processors.

CTC also operates a CAVE, providing a three-dimensional, stereo immersive virtual reality environment for viewing scientific, engineering, architectural, and art applications. The CAVE enhances a variety of research projects and undergraduate courses at both Cornell University and Syracuse University, including an architecture course and an engineering design course that is taught in conjunction with the NASA/NYS/AT&T-sponsored Advanced Interactive Discovery Environment for Engineering Education Project.

CTC's Computational Biology Service Unit (CBSU) (<http://cbsu.tc.cornell.edu>), headed by CS professor Ron Elber, applies computational resources and expertise to a variety of applications in the life sciences, ranging from canine genetics and plant breeding to protein structure modeling. The CBSU is also active in training undergraduates through the CBSU Undergraduate Summer Internship program.

The Computational Materials Institute (CMI) at CTC focuses on fracture mechanics, which serves as one of the application areas for the Adaptive Software Project (ASP) led by CEE professor Tony Ingraffea. Funded by the National Science Foundation under an ITR grant, ASP is developing software systems that can adapt to changes at the application, algorithmic, and system levels. Ongoing projects include the application of .NET and Web services to high-performance computing, investigations into semi-automatic application-level checkpointing, and studies of automatic flight vehicle health monitoring and diagnosis.

CS professor Johannes Gehrke leads CTC's data-intensive computing initiatives. He is applying his data mining expertise to a breadth of applications, including three petabyte-scale data-intensive projects: large-scale astronomical surveys using the Arecibo radiotelescope, physically accurate rendering in computer graphics, and a study of the structure



Members of the Cornell Fracture Group, John Emery and Andy Liu, use the advanced three-dimensional stereo visualization tools in the CAVE to examine realistic models of the polycrystalline microstructure typically observed in aerospace-grade aluminum.

1975
Jim Donahue,
Charlie Van Loan join.

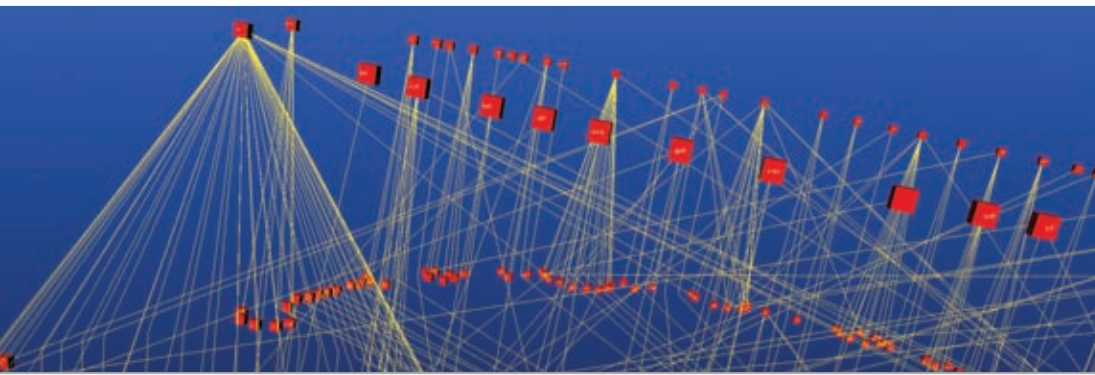
Bob Constable starts the development of PL/CV. Developed over nine years, PL/CV eventually resulted in Nuprl, a system for mathematical reasoning, which is in heavy use today. Thirty PhD students learned how to do research using PL/CV and Nuprl.

Gerry Salton's new book receives the Best Information Science Book Award of 1975 from ASIS, *Dynamic Information Library Processing* (Prentice Hall).

1976
Corky Cartwright joins.

Dick Conway and David Gries publish several variations of their intro to programming text.

John Dennis and Charlie Van Loan procure HP-67 programmable calculators. For the first time within the confines of the department, it was possible to execute a stored program.



and evolution of the World Wide Web. This work is funded in part by a Research Infrastructure (RI) grant from the National Science Foundation awarded to CIS. Professor Gehrke also heads up CTC's new eScience Unit (eSU). eSU provides a breadth of services to researchers with data-intensive applications—database systems and data storage management, database programming and consulting, data curation, and data mining.

CTC also does pioneering work in science communication, outreach, and informal education through the use of multi-user virtual environments. SciCentr.org, an online multi-user museum, engages youth through the appeal of social gaming. CTC shares research conducted by Cornell scientists and faculty in fields such as biotechnology, astrophysics, materials science, computer science, communication, fine arts, theatre arts, music, and architecture. The SciCentr museum includes interactive exhibits and laboratories based on computer game technology created by interdisciplinary teams of undergraduate programmers, designers, and content developers. These teams rely on the talents of CS undergraduates. CS also contributes key members to the pool of undergraduate mentors who support teams of middle and high school students creating their own virtual exhibits at remote locations through SciCentr's SciFair science communication program. CTC began a partnership with Cornell's Public Service Center this year to enhance the community service experience of the SciFair mentors.

For more information, see <http://www.tc.cornell.edu/>.

Information Assurance Institute

The U.S. Air Force Research Laboratory (AFRL)/Cornell Information Assurance Institute (IAI) supports a broad spectrum of research and education efforts aimed at developing a science and technology base that can enhance information assurance and networked information-systems trustworthiness. IAI is also intended to foster closer collaborations among Cornell and AFRL researchers. Fred B. Schneider is the director.

AFRL researchers participate in Cornell research projects, facilitating technology transfer and exposing Cornell researchers to problems facing the Air Force; Cornell researchers become involved in AFRL projects and have access to unique AFRL facilities. The institute thus makes both Cornell and AFRL more attractive places to work, facilitating recruitment of higher-caliber personnel at each site.

Under the auspices of IAI, Cornell researchers are now involved in the development of the Air Force's Joint Battlespace Infosphere (JBI) and the Global Information Grid. Various other technical collaborations are also being explored—in the use of



"gossip protocols," in language-based security policy-enforcement technology, in the design of trusted computing systems, and in data mining from networks of sensors.

For further information, see <http://www.cis.cornell.edu/iai/>.

Intelligent Information Systems Institute

The mission of the Intelligent Information Systems Institute (IISI), founded in December of 2000, is to perform and stimulate research in computational and data-intensive methods for intelligent decision-making systems, to foster collaborations within the scientific community, and to play a leadership role in the research and dissemination of the core areas of the institute. The institute is funded by the Air Force Research Laboratory, with Carla Gomes as director.

The IISI supports basic research within CIS, promoting a cross-fertilization of approaches from different disciplines, including computer science, engineering, operations research, economics, mathematics, statistics, and physics. Areas of research within the IISI are search and complexity, planning and scheduling, large-scale distributed networks, data mining and information retrieval, reasoning under uncertainty, natural-language processing, machine learning, multi-agent systems, and combinatorial auctions.

For further information, see <http://www.cis.cornell.edu/iisi/>.

Juris Hartmanis becomes chair for the second time.

CS acquires its first computer, a PDP 11/60.

Frank Luk, Fred Schneider join.

CS introduces two undergrad degrees: B.A. in Arts & Sciences and B.S. in Engineering. CS started with just an M.S./Ph.D. program in order to produce Ph.D.s to populate future CS departments.

Dick Conway becomes series editor for Winthrop Publishers.

David Gries and student Susan Owicki receive the ACM Programming Languages and Systems Award for their paper "An axiomatic proof technique for parallel programs." Based on Susan's Ph.D. thesis, this paper introduces interference freedom as the basis for proving parallel programs correct.

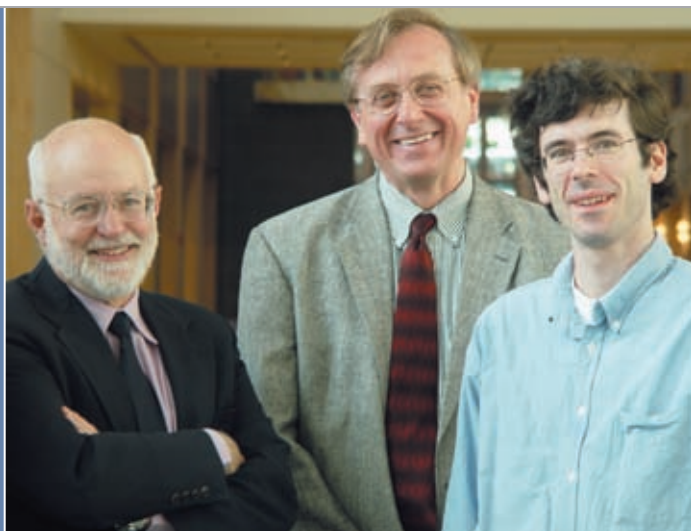
Bob Constable and student Mike O'Donnell publish *A Programming Logic* (Winthrop).

Cornell Professor Jon Kleinberg receives 2005 MacArthur 'Genius Award'

by Blaine P. Friedlander Jr.
Cornell Press Relations Office

The John D. and Catherine T. MacArthur Foundation named Jon Kleinberg, Cornell professor of computer science, among the twenty-five new MacArthur Fellows—the so-called “Genius Awards”—for 2005. He will receive \$500,000 in no-strings-attached support over the next five years.

Kleinberg extended the concept of “six degrees of separation” by introducing the notion of navigability—how well the information structure of the network allows individuals to make distant connections efficiently. This has important implications both in sociology and in distributed network architecture design and in applications, such



as peer-to-peer file sharing.

In addition, Kleinberg has developed an algorithm—a method on which computer programs can be based—for identifying the structure of Web site interactions. His algorithm distinguishes “authority” sites, which contain definitive information, from “hub” sites, which refer to authority sites using hyperlinks. The algorithm is used in several contemporary Web search engines, where sites that are most linked to by the most important hubs are listed higher in search results.

Recently he has applied these ideas to sociology and is a member of a group of computer scientists and sociologists collaborating to study the sociology of the Web. “It’s great to be working with sociologists, because they bring such different perspectives, and they’re so good at posing interesting questions,” he noted.

His work is useful to biologists as well. Four years ago, Kleinberg worked with Cornell researchers to compare the genomes of related plant species. Making “comparative gene maps” had been a slow, painstaking process that in the past had been done by hand, taking months or years. With algorithms developed by Kleinberg and his collaborators, comparative genomic maps of maize and rice were made in minutes.

CIS now has two MacArthur Fellows, Jon Kleinberg and Paul Ginsparg. Paul won for his contributions to scientific communication, another facet of the communications revolution. This year he received the Evan Peters award, the highest honor in the digital library field.

Interdisciplinary Team Wins \$2M NSF Grant

The National Science Foundation awarded an interdisciplinary team of Cornell researchers \$2 million over two years to develop tools to support work in computational social science. The new tools will be developed by a team of researchers from various Cornell departments and the Faculty of Computing and Information Science, including principal investigator Michael Macy, David Strang, Dan Huttenlocher, Jon Kleinberg, William Arms, and Geri Gay.

Daniel Leivant joins.

Gerry Salton becomes chair of ACM SIGIR.

Bengt Aspvall, John Gilbert,
Sam Toueg join.

CIS obtains a \$2.6 million, five-year CER (Coordinated Experimental Research) grant, a major step in increasing its presence in experimental computing.

Cornell adopts the Cornell Program Synthesizer for instruction in programming. Tim Teitelbaum and student Tom Reps developed this precursor to today's integrated development environments (IDEs) for teaching a subset of PL/1 on Terak microcomputers, replacing the batchprocessing punch-card system then in use. In 1980-1981, the Cornell Program Synthesizer is distributed to eighty institutions.

Selected CIS Awards

Paul Evan Peters Award
Paul Ginsparg

George B. Dantzig Prize
Eva Tardos

ACM Vannevar Bush Best Paper Award,
Joint Conference on Digital Libraries 2006
Carl Lagoze, Dean Krafft, Tim Cornwell,
Naomi Dushay, Dean Eckstrom,
and John Saylor

IBM Faculty Partnership Award
Keshav Pingali

Election to Fellow, American Association
for the Advancement of Science
Joe Halpern

Sloan Research Fellowship
Steve Marschner

Best Paper Award, Fifth International
Conference on Information
Processing in Sensor Networks 2006
Andreas Krause, Carlos Guestrin,
Anupam Gupta, and Jon Kleinberg

Best Paper Award, Third Symposium
on Networked Systems Design
and Implementation 2006
Kevin Walsh and Gun Sirer

Honorary Fellowship, National College
of Ireland IEEE Harry M. Goode Award
John Hopcroft

First Charles F. and Barbara D. Weiss
Director of Information Science program
Claire Cardie

First Kenneth J. Bissett Professor
of Communication
Geri Gay

NSF CAREER Award
IBM Faculty Award
Jose Martinez

Best Paper Award, Sixteenth Annual
IEEE International Symposium on Personal
Indoor and Mobile Radio Communications
Zygmunt Haas and Chuayan Zou

NSF CAREER Award
Hod Lipson

National Science Digital Library at Cornell

The National Science Digital Library (NSDL) program was established by the National Science Foundation's Division of Undergraduate Education in 2000 as a free, online library that directs users to exemplary resources for science, technology, engineering, and mathematics (STEM) education and research. Since 2001, the NSDL team in CIS at Cornell has been funded to develop the technical infrastructure and run the production facilities of the NSDL. Cornell works together with two other partners, the University Corporation for Atmospheric Research (UCAR), which deals with outreach and overall program coordination, and Columbia University, which handles publisher relations and authentication, to provide the core integration for the entire NSDL program. Through the efforts of Cornell and the many other NSF-funded NSDL projects, the NSDL is now a production library of well over a million carefully selected STEM resources from over 100 collections.

Over the past year, the NSDL team at Cornell has been building a new version of the library. Based on the Fedora repository architecture (also developed in CIS), NSDL 2.0 is a new kind of digital library, one that allows users to become contributors, adding new resources, metadata, annotations, and organizational structure to the library. In addition to the new repository and infrastructure, the NSDL team is also developing a set of tools that enable this two-way flow of information between the library and its users. NSDL 2.0 and its tools will allow scientists, mathematicians, teachers, engineers, librarians, and students to create a unique web of context, contribution, and collabora-

tion around the high-quality STEM education resources at the core of the NSDL.

The main portal of the NSDL is available at <http://nsdl.org/>.



Computer Systems Laboratory

The Computer Systems Laboratory (CSL) in the School of Electrical and Computer Engineering brings together faculty with common interests from the Departments of Electrical and Computer Engineering (ECE) and Computer Science (CS) at Cornell.

The field of computer systems is both experimental and theoretical, having grown out of computer architecture, parallel computer architecture, operating systems and compilers, computer protocols and networks, programming languages and environments, distributed systems, very large scale integration (VLSI) design and fabrication, and system specification and verification.

Graduate students are admitted to either ECE or CS. Usually students with primary interest in computer architecture, multi-processor design, VLSI, computer-aided design (CAD), and circuit design enroll in ECE, while students with interest in compilers, operating systems, and programming environments enroll in CS. There are no rigid student classifications; ECE students can have a thesis advisor in CS and vice versa. Indeed, the interdisciplinary composition of the research teams is a strength of the Computer Systems Laboratory.

For further information, see <http://www.csl.cornell.edu/>.

Ozalp Babaoglu, Paul Pritchard,
Dale Skeen, Tom Coleman join.

David Gries
becomes chair.

CS grows to
twenty faculty.

The 1982 NRC Assessment of Research-
Doctorate CS programs places Cornell
fifth out of fifty-eight departments.

Gerry Salton receives the first SIGIR Award for
outstanding contributions to information retrieval.

David Gries publishes *The Science of Programming*
(Springer-Verlag), which brings ideas on the formal
development of programs to the undergrad level.

Kevin Karplus,
Ken Birman join.

Bob Constable, with students Johnson and Eichenlaub, publishes
a book on their verifier, *Introduction to the PL/CV Programming
Logic* (Springer-Verlag).

Research Focus: Computer Science

Computer Graphics

Cornell is a leader in the field of computer graphics, a broad, interdisciplinary field that includes a wide and growing range of applications from science to communication to entertainment.

Research in computer graphics involves algorithms, physics, psychology, computation, computer vision, and architecture, among other fields. At Cornell, research and teaching in computer graphics are centered in the Computer Science Department and the closely affiliated Program of Computer Graphics (PCG), one of the world's leading computer graphics laboratories and a dominant force in the international computer graphics community for more than thirty years.

The interests of the PCG are broadly centered on the topic of high-quality rendering. Current research thrusts focus on the interrelated topics of improving the models of light scattering that underlie realism, deepening our understanding of how human viewers perceive computer-generated images, and developing scalable algorithms for high-quality rendering at interactive rates. Other areas of interest include image-based modeling and texturing, architectural modeling, animation, graphics hardware programming, and digital photography.

The PCG's state-of-the-art facility includes many tools for advanced research, including a sophisticated light measurement laboratory with unique capabilities for directional light measurement, a large PC cluster, and a high-resolution tiled projection display.

Security

Cornell is a leader in a broad range of research issues related to computer security and trustworthy computing. Under the aegis of the Information Assurance Institute located within CIS and as a partner in the newly funded National Science Foundation TRUST Science and Technology Center, we tackle both fundamental and applied problems associated with ensuring the security and reliability of the nation's critical computing infrastructure.

Many active research projects range from system and network security to reliability and assurance, spanning language-based security, trusted computing, secure online services, advanced type systems for mobile code, static information flow control, and policy specification and enforcement.

Overall, the breadth and depth of the projects undertaken at Cornell are a direct result of the well-integrated, diverse, and collegial environment that the Department of Computer Science provides. Our work draws its strength from the synergy between the groups working on security, programming languages, operating systems, logic, and formal methods.

For more information, see <http://www.cs.cornell.edu/Research/Security/>.

Bala's group is developing scalable algorithms for rendering realistic images of complex scenes; these algorithms eliminate the expensive simulation of light interactions that cannot be perceived by a viewer. On the left is a detailed simulation of a kitchen model.



Dina Bitton, Greg Johnson,
Abha Moitra join.

CS begins to move into interdisciplinary work,
helping to start a new graduate field of
"manufacturing systems engineering."

Gianfranco Bilardi, Alexandru Nicolau,
John Solworth, Vijay Vazirani join.

Tom Coleman publishes *Large
Sparse Numerical Optimization*
(Springer-Verlag LNCS 165).

Tom Reps receives the ACM Doctoral Dissertation Award for his Ph.D.
thesis, *Generating Language-Based Environments* (MIT Press). Reps, whose
advisor was Tim Teitelbaum, is now a Professor at Wisconsin, Madison.

Gene Golub and Charlie Van Loan publish
Matrix Computation (Johns Hopkins Press).

1 4 8 3

1984

New computational tools are being developed to analyze, understand, and manipulate newly available, richly-detailed information on the basic structures of life. Without advanced computing, biological databases with gigabytes of information would defy attempts to recognize patterns in them. Cornell has a university-wide initiative in the science of genomics, in which the Department of Computer Science and others are taking part. CIS oversees interdisciplinary teaching and research in many aspects of computational biology. The Department of Computer Science initiated a novel graduate program in computational biology and medicine (CBM) in collaboration with Rockefeller University and Sloan Kettering Research Institute. The Tri-institutional program in CBM, now part of the new field of computational biology, builds on the strengths in the medical sciences in the New York City campuses and on the strengths in the computer science at the Ithaca campus. For more information, see <http://www.triiprograms.org/cbm/>.

Within the Department of Computer Science, the focus is on computational molecular biology. This includes computational statis-

tic and algorithmic problems that arise in biological sequence analysis, such as motif finding; protein fold prediction; long-time simulation of protein dynamics and function; and structure comparison algorithms.

The Department of Computer Science is leading a new project, "The Library of Life of the Desert," in collaboration with the Bridging the Rift Foundation (BTR) that will integrate (and create) data from classical and molecular biology of life in the desert. The BTR project also aims to promote peace in the Middle East and is located on the border between Israel and Jordan.

For more details see <http://www.news.cornell.edu/features/BTR/>.

The Computational Biology Service Unit, overseen academically by the Department of Computer Science, was established as a high performance center for bioinformatic applications by Microsoft, with annual funding of \$400K.

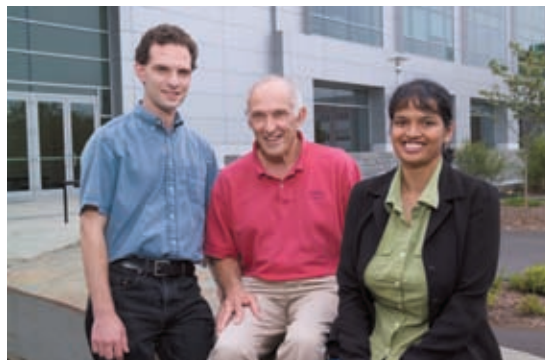
For more information on computational biology at Cornell, see <http://www.cs.cornell.edu/Research/compbio/> and <http://www.cis.cornell.edu/cb/>.

The digitization of our daily lives has led to an explosion in the collection of data. Experts estimate that the amount of data available online doubles every three years. Researchers in database systems and digital libraries are collaborating with colleagues in theory, machine learning, and operating systems to build systems and tools to manage and analyze large datasets.

The database systems research group is motivated by the increasing complexity of data and data-driven applications. The Cayuga project is developing a scalable system for processing high-speed data streams in real time. The goal of the Data Privacy project is to develop techniques that enable data mining, while limiting the disclosure of private information. The Hilda project is developing a high-level language for building data-driven web applications. The Pepper project's focus is on designing a query layer for large-scale, peer-to-peer systems. The Quark project is developing

a next-generation database system for managing both structured and unstructured data. Several eScience related projects concentrate on novel data management and analysis services for the sciences, e.g., mining of citizen science data and petabyte data management and mining.

Digital libraries research is an interdisciplinary activity within CIS at Cornell. The work is rooted in the practical problems of large-scale electronic publishing, Web information systems, scholarly communication, and the long-term preservation of digital information. The National Science Digital Library (NSDL) is a program of the National Science Foundation to enhance all aspects of education in science. Fedora is a digital repository management system with mechanisms for the storage, manipulation, access management, and dissemination of digital library content. The Open Archives Initiative is a project that uses metadata harvesting for digital library interoperability.



The Synthesizer Generator is distributed to over 330 institutions. Developed by Tim Teitelbaum and student Tom Reps, this tool for automating the construction of interactive language-based environments is based on Reps's 1983 thesis prototype. The Synthesizer Generator was subsequently commercialized and is still in use.

The CS computing facility serves as the gateway for the entire university to Arpanet and CSnet. CS is instrumental in the university's Project Ezra to increase the use of computers on campus, with a five-year, \$8 million grant from IBM.

The Cornell Theory Center, founded in 1984, becomes one of four NSF supercomputer centers. IBM provides an additional \$30 million in hardware, software, and staff.

**Prakash Panangaden,
Dexter Kozen join.**

1985

Artificial intelligence (AI) research at Cornell is both theoretical and experimental and covers a range of topics, including decision theory, information retrieval, knowledge representation, machine learning and data mining, natural language processing, planning, reasoning under uncertainty, search, and computer vision. Natural language processing, the ability to talk to machines in plain English, is an important research area in our Information Science program. Research in AI often involves collaboration with other disciplines such as biology,

economics, linguistics, medicine, operations research, physics, and psychology. A particular strength at Cornell is computer-intensive approaches to AI problems. Professors who work in AI are also key participants in the university-wide Cognitive Studies program and in CIS's Intelligent Information Systems Institute.

For more information, see <http://www.cs.cornell.edu/Research/ai/> and <http://www.cis.cornell.edu/iisi/>.

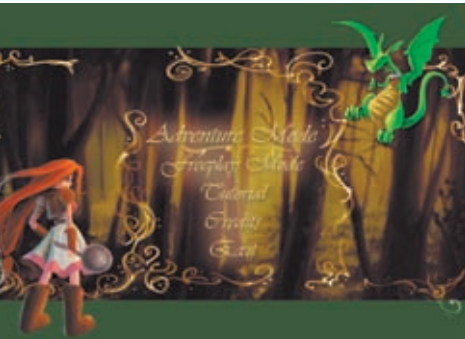
The systems group at Cornell is concerned with the design and implementation of the software systems that constitute the global computing infrastructure. Our interests span operating systems, networking, mobile computing, peer-to-peer systems, programming languages, and distributed computing. We build high-performance, reliable, and working systems based on a principled, scientific approach to practical, pragmatic prob-

lems. Past research by the group in fault-tolerance, peer-to-peer systems, distributed communication, extensible systems, and Internet networking is widely cited and used. Concrete software artifacts developed by Cornell researchers are used by the New York Stock Exchange and the French air traffic control system, form a part of all firewalls, and are deployed in commercial operating systems.

Cornell Women Take First Prize

An all-female team of Cornell students seized Cornell's first computer game-design prize with their interactive game "Green, Eggs, and Pan," which took first place at the Games 4 Girls programming competition. Voted best game in the competition by a panel of middle- and high-school-student judges, the two-player game requires only one computer, with the keyboard and mouse used as separate controllers. Members of the multidisciplinary team included: Lisa Marie Allen (junior, biological engineering); Sally Huang (senior, film); Dora Helen Fraeman (junior, independent major with a concentration in computer science); Brenda Chen (junior, biological engineering); and Pamela Chuang (senior, electrical and computer engineering). The Games 4 Girls team will use its \$1,000 prize to attract more women to game design at Cornell. For more information, see <http://gdiac.cis.cornell.edu/>.

Powerful student interest in game design and development has triggered an academic program at Cornell dedicated to the scientific study of games. A minor in game design will be available beginning fall 2006 to all students in the College of Engineering. The minor responds to the game industry's need for computer scientists who can communicate across disciplines and work well in teams and includes new and existing courses that straddle computer science and information science fields. For more information, contact David Schwartz (dis@cs.cornell.edu) or visit the Game Design Initiative at Cornell website at <http://gdiac.cis.cornell.edu/>.



Ken Birman develops the first version of Isis, the first system for fault-tolerance in distributed systems. Isis has impacted the theory and practice of distributed computing. Two years later, the virtual synchrony model is defined and incorporated.

Keith Marzullo, Alberto Segre, Keshav Pingali join.

CS receives its second five-year NSF CER (Coordinated Experimental Computing) grant.

David Gries receives the AFIPS Education Award for his contributions to computer science education.

The Nuprl work reaches a milestone: Bob Constable and his students publish *Implementing Mathematics with the Nuprl Proof Development System* (Prentice Hall).

Research in programming languages and compilers covers a diverse set of topics, ranging from theoretical and foundational aspects (such as logics and semantics of programming languages) to practical engineering issues (such as language design, optimizing compilers, program analysis, verification, security, and run time systems). Ongoing research includes theorem proving and logic-based tools to support programming, compiler technology for the development of adaptive software systems that automatically improve their efficiency and fault-tolerance, language-based security mechanisms based on advanced type systems and program transformations,

language design to support the development of extensible systems, and program analysis and compilation techniques for the automatic detection of software errors and for memory management optimizations. Strong synergies exist with researchers in other areas. For instance, the theorem-proving technology has been used by the systems group to verify communication protocols, and the work on language-based security spans the areas of computer security, systems, and programming languages.

For more information, see <http://www.cs.cornell.edu/Research/lang/>.

Scientists and engineers increasingly rely on computer models and simulation to buttress their experiments and designs. From the prevention of metal fatigue in engines to the design of new medicines, scientific and technological advances rely on powerful computers and the algorithms that run on them. The scientific computing group develops the algorithms that underlie simulation and optimization. Matrix computations are a recurring theme in the research. The focus is on efficient and robust algorithms with an eye toward modern, high-performance parallel and multi-threaded architectures.

For more information, see <http://www.cs.cornell.edu/Research/scientif/>.

Cornell is a world leader in the theory of computing with fundamental research that spans the breadth of the field. Our faculty and students have contributed to such diverse areas as the design and analysis of algorithms, combinatorial optimization, computational complexity, computational algebra, program logic and semantics, automated deduction, and computational geometry. Cornell is also at the forefront in applying theoretical ideas to practical problems in areas such as machine learning, data mining, software and hardware verification, reliable systems, computer vision and medical imaging, computer graphics, programming languages and compilers, information science, and the computational sciences. Yet, while the theory of computing is now recognized as a deep and foundational scientific discipline with broad impact, many of its central questions remain unanswered. As we enter the information age, continued progress on the fundamental theoretical questions will be essential for heightened understanding of complex systems and software, the nation's network and information infrastructure, and the physical and biological sciences.

For further information, see <http://www.cs.cornell.edu/Research/theory/>.

Wisdom Task Force

The digital age is fundamentally changing the ways in which people learn, work, play, and interact with one another, according to the provost's Task Force on Wisdom in the Age of Digital Information. Daniel Huttenlocher, the John P. and Rilla Neafsey Professor of Computing, Information Science, and Business, served as chair for the task force. Also representing CIS on the task force were Geri Gay, Juris Hartmanis, and Phoebe Sengers.

The task force has recommended the creation of a new, university-wide program in digital arts and culture, with its own dedicated laboratory and exhibition spaces, new faculty hires and other support. As part of the ongoing Computing and Information Science Initiative, the new task force was charged by Provost Biddy Martin to focus on the digital age as it relates to the humanities and social sciences. For more information, see <http://www.cornell.edu/provost/docs/WisdFinalRept.pdf>.

CS moves into 22,000 additional square feet of new space constructed on top of Upson Hall.

Former Ph.D. student Kurt Mehlhorn and frequent visitor Wolfgang Paul receive the German Leibniz Prize.

David Gries publishes the first of five years of *Taulbee Surveys*, which give data on Ph.D.-granting departments. The five years of surveys have an almost 100% completion rate.

John Hopcroft shares the ACM Turing Prize with Bob Tarjan, "for fundamental achievements in the design and analysis of algorithms and data structures." The work was Bob Tarjan's Ph.D. thesis at Stanford, advised by Hopcroft. Their major achievement was a linear algorithm for graph planarity testing, but many more ideas on algorithm design and data structures came out of their collaboration.

AI at Cornell:

A Banner Year

Outstanding Paper Award at AAAI. Best Paper Award at ICML. Best Research Paper Award at KDD. The list goes on: seven major best paper awards in twelve months, capping off a fantastic year for the artificial intelligence group at Cornell.

Our *annus mirabilis* truly highlights a radical “phase transition,” signaled by Cornell’s breaking into the *US News World Report*’s list of top ten AI departments this year. Indeed, within the Computer Science Department, almost all of the current AI faculty have been at Cornell for less than fifteen years, and roughly half have spent less than a decade here.

In this short time span, the Computer Science Department has created world-class groups in core artificial intelligence and in key sub-areas, such as machine learning, natural language processing, and computer vision. Interdisciplinary activities abound, facilitated by the larger umbrellas of CIS, cognitive studies, and related programs across campus, as well as the

Intelligent Information Systems Institute, a multi-million-dollar, decade-long effort supported by the US Air Force Office of Scientific Research.

Our students created a new conference this year, organizing the first Northeast Student Colloquium on Artificial Intelligence (NESCAI). This entirely graduate-student-run event, held at Cornell, attracted participants from eighteen



Bruce Donald,
Dave McAllester join.

John Hopcroft
becomes chair.

CS grows to twenty-five faculty
members and 200 computers.

John Hopcroft chairs the NSF Advisory
Committee for Computer Research.

David Gries chairs the Computer Science Board, the precursor to the Computing
Research Association (CRA). This Board was formed in 1972 to provide a forum for
the discussion of issues in research and education in computer science.

Gerry Salton receives the Distinguished Science Award from the
Humboldt Foundation. This foundation, created by the German
government in 1953, enables scholars to do research in Germany.

Don Greenberg receives the ACM Steven Coons Award. This
highest award in graphics honors lifetime contributions to
graphics and interactive techniques.

schools, including peer institutions in Boston, Montreal, Philadelphia, and Pittsburgh (see news article at <http://www.news.cornell.edu/stories/May06/NESCAI06.ws.html> or the conference website at <http://www.cs.cornell.edu/Conferences/nescai/schedule.php>). Based on the success of its initial outing, this meeting will surely become a very popular annual event.

All in all, a year of “firsts” and “bests.” Now we’re looking forward to what the “nexts” will be!

Interdisciplinary Collaborations: A Sampling

Claire Cardie is working with faculty in the Cornell Law School and the School of Hotel Administration to help citizens understand and participate, via the Internet, in the process of creating new government regulations.

Rich Caruana, Johannes Gehrke, Mirek Riedewald, and researchers at the Cornell Lab of Ornithology are tracking and analyzing changes in the environment by applying data mining to citizen-science data collected by the bird-monitoring community, one of the largest, longest-running sources of environmental time-series datasets in existence.

Joe Halpern is working with Cornell economists to create computational models of decision making.

Thorsten Joachims's work with researchers in the Communications Department and Information Science Program has led to a new understanding, via data collected from eyetracking experiments, of how people interact with search engines such as Google.

Hod Lipson and his group are developing novel active learning methods to infer hidden dynamical systems by intelligently perturbing them. These methods are being applied across a range of disciplines such as systems biology and robotics.

Ramin Zabih is bringing his expertise in computer vision to radiology, collaborating with doctors at the Weill Cornell Medical College to improve the analysis of MRI output.

Selected 05-06 AI Best Paper Awards

Best Paper Award, Twenty-second International Conference on Machine Learning (ICML 2005)
Thorsten Joachims

Distinguished Student Paper Award (of four), ICML 2005
Alexandru Niculescu-Mizil and Rich Caruana

Distinguished Student Paper Award (of four), ICML 2005
Thomas Finley and Thorsten Joachims

Best Research Paper Award, Eleventh ACM International Conference on Knowledge Discovery and Data Mining (KDD 2005)
Jure Leskovec, Jon Kleinberg, and Christos Faloutsos

Best Student Paper Award, KDD 2005
Filip Radlinski and Thorsten Joachims

Best Paper Award, Tenth International Conference on Principles of Knowledge Representation and Reasoning (KRR 2006)
Joseph Halpern, Larry Blume, and David Easley

Outstanding Paper Award, Twenty-first National Conference on Artificial Intelligence (AAAI 2006)
Carla Gomes, Ashish Sabharwal, and Bart Selman

Devika Subramanian,
Dan Huttenlocher join.

Gerry Salton is named a Pioneer of Computing in the *Annals of the History of Computing*. He receives the ACM Award for Best Review in Computing Reviews.

Don Greenberg receives the National Computer Graphics Association Academic Award.

1988

Ramin Zabih and David McAllester receive the Best Paper Award at the AAAI Conference.

Juris Hartmanis and John Hopcroft are elected to the National Academy of Engineering.

Corporate and Foundation Interactions

Cornell University is a dynamic growth center for advanced research and education in computing and information science. Its “faculty without boundaries” approach to science and digital technology enables unique and highly innovative cross-disciplinary collaborations—collaborations that often extend beyond the university and involve research groups from leading companies and various institutes around the world.

Computing and Information Science (CIS) is the broadest college-level computing and information unit at a major research university. CIS provides excellent recruiting opportunities for students skilled in core computer science and information science and in the intersections of these and other disciplines, such as the physical sciences, the life sciences, social sciences, digital arts, and engineering. There are more than 200 graduating majors each year, as well as 100 master of engineering students. These students are among the most heavily recruited college graduates on the planet.

Each spring the student research fair, “Bits On Our Minds” (or BOOM), provides a showcase of student technology projects. This showcase is funded by corporations and in 2005 **Bloomberg** and **Credit Suisse** provided \$25,000 to put on the fair. Representatives from other companies commonly attend in order to learn about developing technologies and to talk to the students who have developed these projects.

A new facility is being developed to house CIS and related disciplines at Cornell. This \$50+ million building will enable major programmatic and research advances that are currently in critical need of space. A lead gift by the **Bill and Melinda Gates Foundation** of \$25 million has helped this effort enormously. Additional funding is being sought to complete Gates Hall and to establish at least three new named professorships in CIS.

CIS at Cornell serves as an intellectual junction of dedicated scientists and researchers who work to solve hard problems in a rapidly growing digital universe. From face recognition and natural language processing to system-based security and research in information retrieval, Cornell researchers are finding new ways to

Eva Tardos receives the 1988 Fulkerson prize for the paper “A strongly polynomial minimum cost circulation algorithm.”

Fred Schneider takes over as editor-in-chief of *Distributed Computing*, and David Gries becomes a managing editor of *Information Processing Letters*.

Tim Teitelbaum and former student Tom Reps publish two books on the Synthesizer Generator, with Springer-Verlag.

Ken Birman starts a company based on Isis. Isis is used extensively on Wall Street and in telecommunications and VLSI FAB systems. Today, Isis is still the core technology in the New York Stock Exchange (every trade and every quote since 1993 ...), the Swiss Exchange, the French Air Traffic Control system, the US Navy's AEGIS warship, and the Florida Electric and Gas SCADA system.

Tom Coleman and Charlie Van Loan publish *Handbook for Matrix Computations* (SIAM).

evaluate and develop controls for human- and machine-based systems.

At Cornell collegial associations are commonplace, generating significant findings and advances in technology. For example, computational biologists at Cornell have developed methods for peering into living systems reluctant to reveal their critical secrets. Working with a cluster of statistics faculty, one group, under the leadership of Professor Ron Elber, has developed open-source molecular modeling software for the study of proteins.

Elsewhere, computer scientists working in deep artificial intelligence and computational theory are looking at medical informatics to evaluate decision-making systems. Other groups are analyzing computational finance and compute-intensive practices of large businesses. Yet another group is working with industry leaders to increase the trustworthiness of networked systems.

In Jordan, Cornell is providing leadership for the **Bridging the Rift Foundation**, which will facilitate modern research in biology on a wide range of sizes and time scales, from genomes to ecology and evolution. Working with the governments of Jordan and Israel, this initiative is designed to promote peace through science, while creating a "Library of the Desert." The project will provide a prototype for a larger, even more ambitious project in the future: the Library of Life.

The National Science Digital Library (<http://NSDL.org>) is forming educational partnerships with companies like **Yahoo!**, as well as State Departments of Education, **The National Science Teachers Association**, and **Net Day/Project Tomorrow**, to help effectively deliver a rapidly growing universe of digital resources to teachers and students. NSDL, along with a number of other major projects around the world, uses an open repository architecture called Fedora. Developed by Cornell and University of Virginia Researchers, Fedora was recently chosen by ESciDoc, a German educational project affiliated with the Max Planck Society, to form the foundation object storage layer for their core project.

Microsoft has funded Paul Ginsparg through its newly created Technical Computing Initiative (TCI) to investigate and implement new methods for scholarly research communication. The project will build on Ginsparg's arXiv.org, which holds more than 340,000 open-access articles in physics, mathematics,



The Bill & Melinda Gates Foundation awarded twenty-five million dollars to CIS in 2005 to support the construction of William H. Gates Hall. Gates Hall will be the signature building of the "information campus" at Cornell. The new building will connect with current CIS space in Upson and Rhodes Halls, while framing a new entrance to Cornell from Collegetown.

"We are ecstatic over the Gates Foundation gift," said Charles Van Loan, the Joseph C. Ford Professor of Engineering and chair of the Department of Computer Science. "Innovative space is vital to the success of a high-ranking CS program, and the planned facility will support a style of CS teaching and research that is unique in the world. We look forward to sharing the new space with students and colleagues from every corner of the campus—it doesn't get any better than that."

computer science, and related fields.

Microsoft has also renewed its funding for the Information Assurance Institute, which is investigating a broad set of research issues in security, reliability, and networking. This funding is particularly important for supporting the weekly systems-lunch seminar series in computer science as well as supporting research on language-based security, gossip protocols, and applied cryptography.

Google Research awards were given to three faculty members in Computing and Information Science. Jon Kleinberg received support for work he is doing to track the diffusion of ideas across the web. Claire Cardie was awarded funding in support of her work on extracting and summarizing opinions in text, and Thorsten Joachims received support for his work on learning retrieval functions from implicit feedback.

Xerox Foundation grants were given to Johannes Gehrke and Claire Cardie for online mining and processing of event streams as well as research on extracting opinion information from text.

Cisco is supporting Paul Francis's work in Internet Protocol (IP) anycast deployment and peer-to-peer models for establish-

Bard Bloom,
Steve Vavasis join.

John Hopcroft authors a report for the NSF Advisory Committee for Computer Research (with Ken Kennedy). "Computer Science: Achievements and Opportunities" helps set the direction of the NSF computing research funding.

The Computer Science Board, chaired by Gries, changes its name to the Computing Research Association (CRA), opens an office in Washington, and works to represent the national interests of computing research.

Gerry Salton is chair-elect of Section T of the AAAS (American Association for the Advancement of Science). Section T concerns Information, Computing, and Communication.

ing connections through firewalls over the Internet.

Emerging partnerships are also developing with game companies and large animation studios. **Electronic Arts**, the world's largest games company, is one of several companies that has chosen Cornell as a core recruiting school. EA has continued to provide expertise and funding for critical programs, like the Game Design Initiative at Cornell.

In the area of computational finance, Wall Street is looking to Cornell and CIS to help untangle a growing mountain of complex data and metadata. Rapidly developing analysis techniques and high-performance computing methodologies are providing aggressive market advantages for savvy firms who are taking the time to exploit the knowledge and expertise of Cornell development groups.

These are just a few examples of the numerous, on-going partnerships that have been established with Cornell.

Included in this report is a list of partners and contributors for 2005. Every effort was made to produce a comprehensive and accurate listing. However we welcome comments and corrections, which we would be happy to note on the web version of this publication. Please address questions relating to corporate interactions with CIS to:

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526 Rhodes Hall
CORNELL UNIVERSITY
Ithaca, NY 14853
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Fax: (607)254-8888
<http://www.cis.cornell.edu/>



Gifts and Grants

Among the various gifts from corporations this year were totals of: \$221,000 in gifts from Microsoft; \$298,000 from Cisco; \$230,000 from Google; \$56,000 from Intel; \$40,000 from Xerox; and \$30,000 from IBM.



(Above, left) Craig Mundie, head of Microsoft strategic planning, chats with Provost Biddy Martin. Mundie visited Cornell to explore research opportunities with Cornell faculty as a part of the new Microsoft Technical Computing Initiative (TCI).

(Left) Hello from Redwood Shores! Participants in the "Cornellians lunch" at Electronic Arts.

Tom Coleman becomes director of the Cornell Advanced Computing Research Institute, a unit of the Cornell Theory Center. The interdisciplinary institute is concerned with scientific computation research and its application to engineering and scientific problems.

Bob Constable and student Doug Howe publish *Implementing Metamathematics as an Approach to Automatic Theorem Proving* (Elsevier Science).

John Hopcroft receives an honorary doctorate from Seattle University.

Gerry Salton receives the ASIS Award of Merit, the American Society of Information Science and Technology's highest honor, bestowed annually to an individual who has made a noteworthy contribution to the field of information science.

Gerry Salton publishes *Automatic Text Processing* (Addison Wesley).

The Big BOOM:

Cornell Students Showcase the Products of the Future

by Blaine P. Friedlander Jr.
Cornell Press Relations Office

The future is now. Cornell University students showed off their digital technology research projects focusing on forward-thinking, cutting-edge innovations at the annual Bits On Our Mind (BOOM) 2006 showcase, at the Duffield Hall Atrium on campus, March 8.

BOOM 2006 featured dozens of projects from student researchers in engineering, computer science, materials science, veterinary science, art, biology, music, humanities—everything from game software, to robotics, to building autonomous airplanes—stretching across many disciplines on campus.

“Computing and information science are increasingly important across all disciplines. It is no longer just for computer scientists,” says Hod Lipson, Cornell assistant professor of mechanical and aerospace engineering and the faculty advisor of BOOM 2006. “This showcase demonstrates how computing and information technologies bridge gaps between disciplines and across the undergraduate and graduate levels. This is really a trend.”



David Gries receives the ACM SIGCSE Award
for Contributions to CS Education.

Juris Hartmanis is elected a
Foreign Member of the Academy
of Science of Latvia.

Tom Coleman and Yuying Li publish
Large-scale Numerical Optimization
(SIAM Publications).

• 1990 •

With completion of Rhodes Hall, CS
expands to 38,000 square feet of space.

David Gries receives the CRA
(Computing Research Association)
Award for Service to the CS Community.

John Hopcroft receives an honorary
doctorate from the University of
Seattle in Washington.

Alumni and External Relations

Last October, a number of distinguished alumni attended the Fortieth Anniversary Celebration of the founding of the Department of Computer Science at Cornell. Our alumni are helping to shape the computing field in remarkable ways. The following gave talks at the celebration:

Edmund Clarke, Ph.D. '76. Advisor: Bob Constable. In 1981, Ed and his student Allen Emerson first proposed the use of model checking as a technique for finite state verification, and that set Ed off on twenty-five years of pioneering research.

Allan Borodin, Ph.D. '69. Advisor: Juris Hartmanis. Allan planned to spend a year or so at his first academic position, computer science at Toronto, but he forgot to move and has been there for thirty-six years.

Zvi Galil, Ph.D. '73. Advisor: John Hopcroft. In 1982, Zvi joined Columbia. He has been the dean of Engineering & Applied Science since 1995.

Barbara Grosz, B.A. '69. After thirteen years out west, Barbara realized she would never turn into a Californian and took a professorship at Harvard.

Cynthia Dwork, Ph.D. '81. Advisor: John Hopcroft. Cynthia is a senior researcher at Microsoft Research, Silicon Valley Campus, and a consulting professor at Stanford.



Paul Pedersen, Carlo Tomasi,
Nick Trefethen join.

Don Greenberg is elected to the
National Academy of Engineering.

John Hopcroft is appointed to the National
Science Board, which oversees the National
Science Foundation.

John Hopcroft becomes chair of
the Board of Trustees of SIAM.

The CS research budget tops \$6 million. CS receives an NSF grant on Revitalizing the Computer Science Curriculum and acquires an 8000-node CM-200 data parallel computer.

Dexter Kozen publishes *The Design and Analysis of Algorithms* (Springer-Verlag).

Steve Vavasis publishes *Nonlinear Optimization: Complexity Issues* (Oxford Science).

Michael Reiter, Ph.D. '93. Advisor: Ken Birman. Mike joined Bell Labs in 1993, moved to AT&T Labs-Research during the breakup of AT&T, returned to Bell Labs in 1998, and joined CMU in 2001.

Randy Katz, B.A. '76. Randy joined EECS Berkeley in 1983, serving as chair from

1996-1999. While on leave in 1993-1994, he established whitehouse.gov and connected the White House to the Internet.

Kurt Mehlhorn, Ph.D. '74. Advisor: Bob Constable. In 1975, Kurt became full professor of computer science at the University des Saarlandes and in 1989, founding director of the Max Planck Institute of Computer Science.

Jennifer Widom, Ph.D. '87. Advisor: David Gries. After a few years at IBM Almaden, Jennifer joined computer science at Stanford in 1993.

Amitabh Singhal, Ph.D. Cornell, 1997. Advisors: the late Gerry Salton and Claire Cardie. After Cornell, Amit worked at AT&T labs as a senior member of the technical staff and then joined Google, where he is now a Distinguished Engineer.

Robert Schnabel, Ph.D. Cornell, 1977. Advisor: John Dennis. Bobby headed west to Colorado, where he discovered perpetual sunshine and his wife. The combination have conspired to keep him in Boulder ever since.

Elsewhere around the country, alumni were involved in gatherings of various sizes. A small group met in Palo Alto in March to hear about the future of Computing and Information Science at Cornell. A much larger group joined CIS Dean Robert Constable in Washington, D.C., where **Bill Nye '77** "the Science Guy" gave a talk on behalf of CIS. Also present was John Knight '98, one of the founders of Blackboard.com.

We also had well-attended alumni lunches at Google, Microsoft, and Amazon. There was lots

of talk about the new CIS building and about several new programs that are being developed at Cornell. Many of the alumni were glad to hear that the Game Design Initiative at Cornell (GDIAC) is still thriving. Several alums of that program rave about the impact their game design projects had on preparing them for development positions in industry.

On campus we were visited by Red Hat CEO, Matthew Szulik. Matt received a red lacrosse hat to commemorate the namesake "red hat" that inspired the name of the company. Marc Ewing, the company founder, reports that the original hat belonged to his grandfather, Frederick Wendnagel '33, who was a lacrosse player at Cornell. Although the hat was reputed to have been red and white striped, fellow students at Carnegie Mellon University often referred to Ewing as "that guy in the red hat." The name stuck, though the hat has been lost to the ages.

Meet the first woman to earn her PhD in Computer Science at Cornell

Marcia Davis Kerchner (Ph.D. '71) attended Cornell at a time when the field of computer science was newly forming. Originally a math major, in her junior year Marcia decided to enroll in one of the first programming courses offered at Cornell—a FORTRAN course that sparked her interest in computer science. Kerchner explains that she gravitated toward a topic that is today relevant to both computer science and information science—information retrieval. She studied under the late Gerald Salton, known as "father of information retrieval." Described by Kerchner as a man with a gruff exterior and soft heart, Salton guided Kerchner's dissertation study on "Dynamic Document Processing in Clustered Collections." Kerchner now works for the MITRE Corporation (mitre.org), a not-for-profit organization chartered to work in the public interest.



Juris Hartmanis becomes chair.

Dick Conway is elected to the National Academy of Engineering.

CS undergrads do well on the Putnam Math Competition. The team of Kleinberg, Munoz, and Krosky places fifth out of 284, and Zhang places in the top ten individuals.

Students Aravind Srinivasan and Alessandro Panconesi receive the Best Student Paper Award at the ACM Symposium on the Theory of Computing.

• 1992 •

Tom Henzinger, Ronitt Rubinfeld join.

John Hopcroft becomes dean of Engineering.

Dexter Kozen receives a Prize from the Polish Ministry of Education.

Juris Hartmanis is chair of the NRC Committee that produces Computing the Future (National Academy Press). This influential report assesses academic computer science and engineering. It advocates a broader research and educational agenda that builds on the field's impressive accomplishments.

At this year's Cornell Reunion, there were a record thirty-four alumni and guests attending the CS/CIS breakfast at Banfi's in the Statler Hotel. It was a wonderful event that included the return to campus of **Marcia Kerchner, Ph.D. '71**, one of our first doctoral graduates and the first woman to graduate with this degree in computer science from Cornell.

This year also marked the beginning of a new alumni resource exclusively dedicated to Cornell alumni with interests in computing and information science. In December, we launched a new Yahoo group called **CORNELL_CIS_ALUMS**.

The group's main page reads:

The main purpose of `cornell_cis_alums` is to enable alumni to connect with each other and Cornell.

All Cornell alumni are welcome if they have an interest in any of the following areas: computer science, digital technologies, computing related start-ups, Internet-related start-ups, software development, search/information technologies, high-performance computing, game design, knowledge-based systems, computational finance, human-computer interaction (HCI), digital arts, computer graphics, interactive media, or any area related to computing or information science.

[Cornellians: we ask that new registrants sign up by including some information about themselves—anonymous registration is possible, but all members need to be confirmed as Cornell grads by our moderator. Saying who you are will help other Cornellians find you more easily, if that is of interest to you.]

For more information, see http://groups.yahoo.com/group/cornell_cis_alums/.

Among our newest CIS alumni is a class of eighteen information science majors: ten from the College of Arts and Sciences, seven from the College of Engineering, and one from the College of Agriculture and Life Sciences. They went to work at Microsoft, Cigital, the Vanguard Group, Northrop Grumman, AT&T, Citigroup, Green Hills Software, and Teach for America. Two of this year's graduates are pursuing master degrees, one at Cornell and one at Stanford. Over sixty students are currently enrolled as information science majors.

This year's **Degenfelder Family Scholarship** was awarded to two students, **Sophia X Cui** and **Jingye Wang**. This \$5,000 award recognizes students who

are working at the boundary between computer science and biology. Joseph R. Degenfelder '60 and his wife Dr. Pauline Degenfelder '61 worked with Professor Ron Elber to establish an endowment for this scholarship.

The **Jonathan E. Marx Senior Prizes** were presented to **Lisa Ann Minich** and **Aaron Edward Max Kimball** as part of the Computer Science Graduation Ceremony on Hoy Field on May 28, 2006. Jonathan E. Marx '85 was a computer science major who died in a skiing accident shortly after his graduation in 1985. The Marx family established the Marx Senior Prizes to recognize students who have most demonstrated a positive spirit among their classmates, held significant leadership roles, and have been of service in the community. The Marx family also established a teaching award in the name of Jonathan's father, the late Alan S. Marx, J.D. '61. The **Alan Marx Memorial Prize for Excellence Supporting Undergraduate Education** was awarded to **Ariel Shemaiah Rabkin**, recognizing his efforts as a teaching assistant for COM S 414. The **Computer Science Prize for Academic Excellence**, given by the computer science faculty, was awarded to **Gregory Ross Bowman** and **Kevin Robert Canini**. A **Special Prize for Outstanding Leadership** was awarded to **Paul B. Lorah** for his commitment to the Association of Computer Science Undergraduates and the Department of Computer Science.

For more information about alumni or external relations in CIS or the Department of Computer Science, please contact Dan Jenkins at jenkins@cs.cornell.edu.

Charlie Van Loan publishes *Computational Frameworks for the Fast Fourier Transform* (SIAM).

Juris Hartmanis is elected to the American Academy of Arts and Sciences.

Monika Rauch Henzinger, Thorsten von Eicken join.

Bob Constable becomes chair.

Juris Hartmanis receives a Humboldt Foundation Award for Senior U.S. Scientists. This foundation, created by the German government in 1953, enables scholars to do research in Germany.

David Gries and Fred Schneider publish *A Logical Approach to Discrete Math* (Springer Verlag).

Stratus Computer acquires Ken Birman's Isis Distributed Systems, Inc.

Juris Hartmanis shares the ACM Turing Award with Dick Stearns, "in recognition of their seminal paper, which established the foundations for the field of computational complexity theory" (see the entry for 1965).

Researcher Yuying Li receives the 1993 Leslie Fox Prize in Numerical Analysis from the Institute of Mathematics and its Applications.

Salton Lecture Series

The GERARD SALTON Lecture Series

2005 - 2006



Shafi Goldwasser

Massachusetts Institute of Technology

*On the Impossibility of Obfuscation
with Auxiliary Input*

September 22, 2005



Susan Dumais

Microsoft

*Personal Information Management:
Helping Finders Become Keepers*

October 27, 2005



Raghu Ramakrishnan

University of Wisconsin

*Discovering Interesting Subsets
of Data in Cube Space*

February 2, 2006

Brought to you with the support of Amit Singhal, PhD '77

Presented by the Department of Computer Science
Cornell University
4130 Upson Hall, Ithaca, NY 14853
www.cs.cornell.edu/events/saltonseries

Distinguished Career Lecture Series



Daphne Koller came to Cornell in fall of 2005 to describe what she calls, "a journey through research." She began her work in distributed systems, which led to game theory, onto probability theory, and then to decision theory. She moved to probabilistic graphical models and statistical learning, gradually

shifting her focus to making sense of complex data in real-world applications, such as machine perception and systems biology. Koller teased out the common threads that connect these topics and shared the logic behind a seemingly random progression through research.

Daphne Koller received her BSc and MSc degrees from the Hebrew University of Jerusalem, Israel, and her PhD from Stanford University in 1993. After a two-year postdoc at Berkeley, she returned to Stanford, where she is now an associate professor in the Computer Science Department. She was awarded the Arthur Samuel Thesis Award in 1994, the Sloan Foundation Faculty Fellowship in 1996, the ONR Young Investigator Award in 1998, the Presidential Early Career Award for Scientists and Engineers (PECASE) in 1999, the IJCAI Computers and Thought Award in 2001, the Cox Medal for excellence in fostering undergraduate research at Stanford in 2003, and the MacArthur Foundation Fellowship in 2004.

Brian Smith, Claire Cardie,
Ramin Zabih join.

Ken Birman becomes editor-in-chief of the
ACM Transactions on Computing Systems.

Dan Huttenlocher is the CASE New York State Professor of the Year. The award covers all disciplines. It is given by the Council for Advancement and Support of Education for impact and involvement with undergraduates, scholarly approach to learning, and contributions to undergraduate education.

David Gries receives a Cornell Presidential Weiss Fellowship for his contributions to undergrad education. Three such awards are given each year; Cornell has 1600 faculty members.

Researchers Jim David, Dean Krafft, and Carl Lagoze release Dienst, which becomes the foundation for future digital library interoperability.

David Gries receives the IEEE Computer Society Taylor Booth Education Award for his "commitment to education in CS and Engineering as demonstrated by a record of outstanding teaching and mentoring, writing of textbooks, curriculum development..."

T.V. Raman receives the ACM Doctoral Dissertation Award for his Ph.D. thesis, *Audio System For Technical Readings* (Springer-Verlag, 1998). Raman's advisor was David Gries.

CIS, CS, and IS Courses

Computing and Information Science (CIS) Courses

121	Introduction to MATLAB
122	Applications of Fortran in EAS
165	Computing in the Arts
167	Visual Imaging in Electronic Age
300	Introduction to Computer Game Design
372	Playing with Space and Time
401	Applied Scientific Computing with MATLAB
402	Scientific Visualization with MATLAB
405	Effective Use of High-Performance Computing
409	Data Structures/Algor for Computational Science
490	Independent Study
504	Applied Systems Engineering I
629	Computational Methods for Nonlinear Systems
724	Computational Engineering using the Finite Elementary Methods
790	Independent Research
797	Topics in CIS/IGERT Seminar

Computer Science (CS) Graduate Courses

501	Software Engineering Technology and Technique
513	System Security
514	Intermediate Computer Systems
516	Parallel Computer Architecture
530	The Architecture of Large-Scale Information Systems
565	Computer Animation
578	Empirical Methods in Machine Learning/Data Mining
611	Advanced Programming Languages
612	Compiler Design for High-Performance Architecture
614	Advanced Systems
615	Peer-to-Peer Systems
616	Self-Stabilization
621	Matrix Computations
624	Numerical Solution of Differential Equations
626	Computational Molecular Biology
628	Biological Sequence Analysis
630	Representing and Accessing Digital Information
632	Advanced Database Systems
633	Advanced Database Systems
664	Machine Vision
667	Physically Based Rendering
672	Advanced Artificial Intelligence
677	Reasoning About Uncertainty
678	Advanced Topics in Machine Learning
681	Analysis of Algorithms
682	Theory of Computing
684	Algorithmic Game Theory
685	The Structure of Information Systems
709	Computer Science Colloquium
711	Seminar in Advanced Programming Languages
715	Seminar on PRL

Eva Tardos,
Joe Halpern join.

CS mourns the passing of Gerry Salton, a founding member of the department and the father of information retrieval.

David Gries receives the ACM Karlstrom Outstanding Educator Award. The citation reads, "His visionary emphasis on critical thinking and mathematical precision has dramatically changed the face of computer science education..."

Juris Hartmanis receives the Bolzano Gold Medal of the Academy of Sciences of the Czech Republic for Merit in the Field of Mathematical Sciences.

Neil Immerman (former student of Juris Hartmanis) and Róbert Szelepcsényi get the Gödel prize for their paper showing that nondeterministic logarithmic space is closed under complement.

Ken Birman chairs a DARPA ISAT study on survivability of critical infrastructure; Fred Schneider is on the committee. The study establishes a major DARPA effort in the area and lays the groundwork for a broader government engagement of the challenge.

David Gries receives an honorary doctorate from Daniel Webster College in New Hampshire.

Srinivas Keshav, Jon Kleinberg, Greg Morrisett, Praveen Seshadri, David Shmoys join.

Juris Hartmanis receives an honorary doctorate from the University of Dortmund.

Fred Schneider becomes Professor-at-Large at the University of Tromsø, Norway.

Don Greenberg receives the ASCA Creative Research Award in Architecture.

1995

1996

718	Seminar in Computer Graphics
719	Seminar in Programming Languages & Compilers
726	Problems & Perspectives in Computational Molecular Biology
733	Seminar in Database Systems
754	Systems Research Seminar
772	Seminar in Artificial Intelligence
775	Seminar in Natural Language Understanding
779	Seminar on Web Searching & Mining
789	Seminar in Theory of Algorithms and Computing
790	Independent Research
990	Doctoral Research

Computer Science (CS) Undergraduate Courses

099	Fundamental Programming Concepts
100H	Introduction to Computer Programming—Honors
100J	Introduction to Computer Programming
100M	Introduction to Computer Programming
101	Introduction to Cognitive Science
113	Introduction to C
114	Unix Tools
130	Introduction Design & Programming for the Web
165	Computing in the Arts
167	Visual Imaging in the Electronic Age
172	Computation, Information, and Intelligence
211	Computers and Programming
212	Java Practicum
214	Advanced Unix
215	Introduction to C#
230	Intermediate Web Design
280	Discrete Structures
305	Creative Problem Solving
312	Data Structures and Functional Programming
314	Computer Organization
321	Numerical Methods in Computational Molecular Biology
322	Introduction to Scientific Computation
324	Computational Linguistics
330	Applied Database Systems
381	Introduction to Theory of Computing
412	Introduction to Compilers and Translators
413	Practicum in Compilers and Translators
414	Systems Programming and Operating Systems
415	Practicum in Operating Systems
416	Computer Architecture
419	Computer Networks
421	Numerical Analysis
426	Introduction to Bioinformatics
430	Information Discovery
431	Architecture of Web Information Systems
432	Introduction to Database Systems



Bruce Land gets first place in the instructional materials (Web-based) competition of the ACM SIGUCCS Use Services Conference XXIV. The award was for the Web site for his graphics programming course: <http://instruct1.cit.cornell.edu/courses/cs418-land>.

Dan Huttenlocher receives a Cornell Presidential Weiss Fellowship for his contributions to undergraduate education. Three such awards are given each year; Cornell has 1600 faculty members.

**Graeme Bailey, Lillian Lee,
Bart Selman join.**

Joe Halpern shares the 1997 Gödel Prize with former student Yoram Moses. Their paper "Knowledge and Common Knowledge in a Distributed Environment," says the citation, "provided a new and effective way of reasoning about distributed systems."

Juris Hartmanis takes a two-year leave to serve as Assistant Director of the NSF for CISE. During his tenure, he effectively positions NSF and CISE to assume a leadership role in response to the PITAC report, and he is instrumental in shaping the discussion that lead to NSF's playing the lead role in the Information Technology Research (ITR) program.

The faculty publish six books:

Ken Birman, *Building Secure and Reliable Network Applications* (Prentice Hall).
Srinivas Keshav, *An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network* (Addison-Wesley).
Dexter Kozen, *Automata and Computability* (Springer-Verlag).
Fred Schneider, *On Concurrent Programming* (Springer-Verlag).
Nick Trefethen and student David Bau, *Numerical Linear Algebra* (SIAM).
Charlie Van Loan, *Introduction to Scientific Computing: A Matrix Approach Using MATLAB* (Prentice Hall).

1997

Joe Halpern becomes editor-in-chief of the *Journal of the ACM*.

CS grows to thirty faculty and has over 500 computers.

David Shmoys becomes editor-in-chief of the *SIAM Journal of Discrete Mathematics*.

433	Practicum in Database Systems
465	Computer Graphics I
467	Computer Graphics II
468	Practicum in Computer Graphics
472	Foundations of Artificial Intelligence
473	Practicum in Artificial Intelligence
474	Introduction to Natural Language Processing
475	AI: Uncertainty & Multi-Agent Systems
478	Machine Learning
480	Introduction to Cryptology
481	Introduction to Theory of Computing—Honors
482	Introduction to Analysis of Algorithms
483	Quantum Information Processing
485	Mathematical Foundations for the Information Age
486	Applied Logic
490	Independent Study

Information Science (INFO) Courses

130	Introduction Design & Programming for the Web
172	Computation, Information, & Intelligence
230	Intermediate Design & Programming for the Web
245	Psychology of Social Computing
292	Inventing an Information Society
295	Mathematical Models for Information Science
330	Applied Database Systems
345	Human-Computer Interaction
355	Computers: From Babbage to Gates
356	Computing Cultures
372	Explorations in AI
430	Information Discovery
431	Architecture of Web Information Systems
435	Seminar on Applications of Information Science
440	Research Human-Computer Interaction Design
445	Seminar in Computer-Mediated Communication
450	Language and Technology
490	Independent Study
491	Teaching in ISST
515	Culture, Law, and Politics of Internet
530	The Architecture of Large-Scale Information Systems
630	Representing & Accessing of Digital Information
635	Seminar on Applications of Information Science
640	Research Human-Computer Interaction Design
645	CMC Graduate Seminar
685	The Structure of Information Networks
790	Independent Research
990	PhD Research

Pedro Felzenszwalb is the CRA Outstanding Male Undergraduate Awards Runner-up.

David Liben-Nowell receives an Honorable Mention in the CRA Outstanding Male Undergraduate Awards competition.

Jon Kleinberg publishes his Web-search work on using hubs and authorities. The research is credited, together with the Brin-Page work on PageRank, with forming the basis for the current generation of Internet search tools.

With CS providing leadership, Cornell starts the Faculty of Computing and Information Science, to provide a home for interdisciplinary computing work of all kinds. CS, the Program for Computer Graphics, and Digital Libraries are part of it.

Joe Halpern is founder and administrator of CoRR (the ACM-sponsored Computing Research Repository).

Fred Schneider is chair of the NRC committee that produces the report *Trust in Cyberspace* (National Academy Press). This report assesses the state-of-the-art procedures for constructing trustworthy networked information systems and proposes directions for research in computer and network security, software technology, and system architecture.

Fred Schneider is associate editor-in-chief of the IEEE journal *Security and Privacy*.

Bill Arms, Andrew Myers, Ron Elber join.

David Gries receives an honorary doctorate from Miami University.

Juris Hartmanis receives an honorary doctorate from the University of Missouri.

Bill Arms becomes chair of the ACM Publications Board and editor-in-chief of *D-Lib Magazine*.

Tom Coleman becomes the director of the Cornell Theory Center.

Research Grants

Funded Research—Computing and Information Science/Computer Science

INVESTIGATOR	SPONSOR	AWARD	TITLE
Bala	PCCW	11,000	Constrained Texture Synthesis for Computer Graphics
Bala	NSF	75,000	Feature-based Rendering
Birman	Intel	180,000	Using QuickSilver to Support Autonomic Services in Clusters
Birman	AFRL sub of Vanderbilt	209,000	Prometheus: Enhancing the Quality of Service of the Joint Battlespace Infosphere
Birman / Gehrke / Demers	AFOSR	4,000,000	Scalable Technology for a New Generation of Collaboration Applications
Birman / Gehrke / Francis	DARPA	1,153,371	QuickSilver: Middleware for Scalable Self-Regenerative Systems
Birman	DARPA sub of Telcordia	955,286	Adaptive Cognition-Enhanced Radio Teams (ACERT)
Birman	AF sub of UC Berkeley	1,200,000	Partnership for Research Excellence and Transition (PRET) in Software and Security
Birman	AFRL	1,100,000	Widely Distributed Scalable Infospaces: CASTOR
Cardie	NSF	500,000	Reducing the Corpus Annotation Bottleneck for Natural Language Learning
Cardie	ARDA sub of U Pittsburgh	463,368	Opinions in Question Answering
Cardie	Xerox	20,000	Machine Learning in Natural Language Processing
Cardie	Google	80,000	Extracting and Summarizing Opinions in Text
Caruana	NSF	507,000	CAREER: Meta Clustering: Improving User Efficiency on Real-World Clustering Applications
Caruana	NSF	14,000	Student Poster Program and Travel Scholarships for the 23rd International Conference on Machine Learning (ICML 2006)
Caruana / Gehrke / Joachims	IBM	51,386	KDD Evaluation Proposal
Caruana / Joachims	NSF	270,000	Optimizing Classification Models to Application-Specific Performance Metrics
Constable	NSF	180,000	CSR-EHS: Developing a Theory of Events to Improve Distributed Systems
Constable	NSF	460,000	Enabling Large Scale Coherency Among Mathematical Texts in the NSDL
Constable	AFOSR	165,054	A Computation Infrastructure for Knowledge-based Development of Reliable Software Systems (DURIP)
Elber	ACS - PRF	80,000	Molecular Dynamic Simulations of EPR Spectra in Proteins
Elber	NIH	1,300,882	Long Time Dynamics of Biomolecules
Elber	NIH	500,000	A Computer Cluster for Computational Biology
Elber	NIH sub of U Pitt	58,305	Computational Prediction of Biomolecular Dynamics

Keshav Pingali and his students receive the Best paper Award at the International Conference of Supercomputing.

Bob Constable becomes dean of the Faculty of Computing and Information Science.

Charlie Van Loan becomes chair.

Dexter Kozen is the Class of 1960 Scholar, Williams College.

Juris Hartmanis receives the CRA Distinguished Service Award for his service in the areas of government affairs, professional societies, publications, conferences, and leadership, which had a major impact on computing research.

Joe Halpern is named the Milner Lecturer at the University of Edinburgh.

Greg Morrisett and students Steve Zdancewic and Dan Grossman receive the Best Paper Award in the European Association for Programming Languages and Systems Conference on Principles, Logics, and Implementation of High-Level Programming Languages.

Former students John Belizaire and Julian Pelenur sell their company, Theory Center, Inc. The one-year-old company, a leading provider of Java Beans, was sold to BEA Systems for \$100 million.

Bart Selman's work on phase transitions and complexity is featured in *The New York Times*.

Bill Arms becomes the series editor of the MIT Press series on *Digital Libraries and Electronic Publishing*.

David Schwartz publishes *Introduction to UNIX* (Prentice Hall) and *Introduction to Maple* (Prentice Hall).

Under the leadership of Tom Coleman, the Cornell Theory Center opens the Financial Solutions Center on Broad Street in Manhattan.

Johannes Gehrke, David Schwartz join.

Don Greenberg receives an honorary doctorate from the New Jersey Institute of Technology.

Johannes Gehrke publishes the second edition of *Database Management Systems* (McGraw Hill), with Ragu Ramakrishnan.

INVESTIGATOR	SPONSOR	AWARD	TITLE
Francis	NSF	496,421	SP: Very Fine-grained Proximity Addressing
Francis	ARDA sub of Telcordia	190,166	RapidTrace: Rapid Traceback of Cyber Attacks
Francis	Intel	25,000	Deployment of an NRL-based Anycast Service
Francis	Cisco	91,695	Next Generation NAT and Firewall Traversal
Francis	Cisco	206,465	Proxy IP Anycast Measurement and Deployment on NLR
Gehrke	NSF	340,000	CAREER: Towards Sensor Database Systems
Gehrke	NSF	500,000	SENSORS: Data-Driven Sensor Networks
Gehrke	Sloan	40,000	Sloan Research Fellowship
Gehrke	AFOSR	600,000	Stateful Publish-Subscribe for XML Data Streams
Gehrke / Demers	KD-D thru NSF	2,076,200	Distributed Mining and Monitoring
Gehrke / Sirer / Shanmugasundaram / Demers / Birman	NSF	913,320	ITR: Massively Convergent Distributed Computing
Gehrke / White	NSF	200,000	A Formal Approach to Data Stream Processing
Gehrke	IBM	100,000	Knowledge Dissemination and Discovery (KDD) Challenge Problem Experiment
Gehrke	Microsoft	35,000	Data Mining and Privacy for Medical Information Systems
Gehrke	Xerox	20,000	Trend and Sequence Mining
Ginsparg	NSF	796,395	Classification, Analysis, and Navigation Tools for Physics Research Communication
Ginsparg	Microsoft	1,259,869	TCI Proposal for Scholarly Communication Collaboration Between Cornell University and Microsoft Corporation
Gomes	AFRL	5,000,000	Intelligent Information Systems Institute
Halpern	ONR	526,058	Software Quality and Infrastructure Protection for Diffuse Computing
Halpern	NSF	300,000	Towards Improved Logics For Reasoning About Security
Halpern	ONR sub of U Penn	189,000	Trustworthy Infrastructure, Mechanisms, and Experimentation for Diffuse Computing
Halpern	AFOSR	429,816	Reasoning About Authorization and Security
Halpern	ONR sub of ITT	300,000	Designing a Policy Language
Halpern	NSF	394,733	Taking Awareness, Language, and Novelty into Account in Decision-Making and Game Theory
Hopcroft / Selman	NSF	300,000	ITR: Emerging Communities in Large Linked Networks: Theory Meets Practice
Hopcroft / Selman	NSF	475,000	The Analysis and Modeling of Large Linked Networks
Huttenlocher	NSF	100,000	SGER: Recognizing Objects by Simultaneously Combining Appearance and Geometry

Ramin Zabih receives a joint appointment with the Cornell Medical School, the first such joint appointment at Cornell.

Eva Tardos is elected to the American Academy of Arts & Sciences.

Jon Kleinberg receives the Best Paper Award, ACM Symposium on Principles of Database Systems.

Juris Hartmanis receives the Lielo Medal from the Latvian Academy of Sciences. This highest award given by the Academy to scientists of Latvia and of foreign countries is for outstanding creative contributions.

Fred Schneider chairs the International Review of UK Computer Science Research. The review was sponsored by The Engineering and Physical Sciences Research Council, the UK Government's leading funding agency for research and training in engineering and the physical sciences. The AFRL/Cornell Information Assurance Institute (IAI) is founded with a \$1M/year grant from AFOSR. See www.cis.cornell.edu/iai/about.htm.

Jon Kleinberg receives the 2001 National Academy of Sciences (NAS) Award for Initiatives in Research. Jon was cited for "his development of deep and innovative algorithms to solve fundamental problems in network, information extraction, and discrete optimization."

Former undergrads Greg Pass and Frank Wood sell their company, ToFish, to AOL.



Rich Caruana, Daisy Fan, Thorsten Joachims, Jai Shanmugasundaram, Jeanna Matthews, Radu Rugina join.

Gün Sirer, Golan Yona join.

Bart Selman is elected Fellow of the AAAI.

Bill Arms publishes *Digital Libraries* (MIT Press).

Intelligent Information Systems Institute (IISI) is established, with Carla Gomes as director.

Allegra Angus receives the CRA Outstanding Female Undergraduate Award.

INVESTIGATOR	SPONSOR	AWARD	TITLE
Joachims	NSF	400,000	CAREER: Improving Information Access by Learning from User Interactions
Joachims	NSF	14,000	Student Poster Program and Travel Scholarships for the 22nd International Conference on Machine Learning (ICML 2005)
Joachims	BSF	22,500	Efficient Non-Parametric Revelation of Ordinal Preferences
Joachims / Caruana	NSF	270,000	Discriminative Methods for Learning with Dependent Outputs
Joachims	Google	90,000	Robustly Learning Retrieval Functions from Implicit Feedback
Kleinberg	Packard	625,000	Algorithmic Methods for Networks
Kleinberg	Google	60,000	Tracking the Diffusion of Ideas Across the Web
Krafft	NSF sub of UCAR	320,000	National Science Digital Library Subcontract
Kreitz	NSF	285,000	Proof Automation in Constructive Type Theory
Lagoze	Mellon sub of U VA	794,553	The Open Source FEDORA Repository Development Project: Phase II
Lagoze / Warner	NSF	1,297,550	II: Pathways
Lee / Kleinberg	NSF	449,897	Graph-Based Approaches to Text Processing
Lee	Sloan	40,000	Sloan Research Fellowship
Marschner	NSF	412,000	CAREER: Modeling the Properties and Appearance of Materials
Marschner	Unilever	81,000	Scattering and Computer Visualisation of Human Hair
Marschner	NSF	300,000	Unifying Geometric and Volumetric Light Scattering for Accurate Rendering of Dense Geometry
Marschner	Sloan	45,000	Sloan Research Fellowship
Myers	NSF	349,999	CAREER: Practical Language-Based End-to-End Security
Myers	Sloan	40,000	Sloan Research Fellowship
Myers	NSF	330,000	End-to-end Integrity and Confidentiality for Distributed Systems
Myers / Birman / Schneider	NSF	1,600,000	Integrating Security and Fault Tolerance in Distributed Systems
Pingali	DARPA sub of IBM	255,000	PERCS: Phase II
Pingali	NSF	400,000	CSR-AES: Collaborative Research: Library Generators for Advanced Execution Systems
Pingali	NSF sub of U Illinois	590,000	ITR/SY: A New Framework for Program Optimization
Pingali	IBM	30,000	High-Performance Computing
Pingali / Rugina	NSF	850,000	NGS: A System for Semi-Automatic Application-Level Checkpointing of Parallel Programs
Pingali / Stodghill	NSF	100,000	CSR-AES: Mobile Applications in Computational Grids
Pingali / Stodghill	NSF	375,000	Mobile Applications in Computational Grids
Rugina	NSF	374,915	Compiler and Run-Time Support for Memory Management Using Explicit Memory Reclamation

The national organization Engineers for a Sustainable World is started at Cornell (with a different name) under the inspiration of Regina Clewlow (CS 2001). There are now chapters in twenty-one universities.

Andrew Myers and students Steve Zdancewic, Lantian Zhen, and Nathaniel Nystrom receive the Best Paper Award at SOSP 2001 for their paper on secure program partitioning.

**Kavita Bala,
Steve Marschner join.**

Tim Roughgarden receives honorable mention in the ACM Ph.D. thesis competition and receives the MPS Tucker Prize. His advisor was Eva Tardos.

Ph.D. student Ioannis Vetsikas and his software "whitebear" wins first place in the Trading Agent Competition. Programs compete by bidding in over twenty-five simultaneous electronic auctions.

Ramin Zabih and student Vladimir Kolmogorov receive the Best Paper Award in the European Conference in Computer Vision. Their paper dealt with minimizing energy functions via graph cuts.

Researcher Donna Bergmark receives the Best Paper Award for Collection Synthesis in the ACM Joint Conference on Digital Libraries.

Researcher Carl Lagoze, with three others, defines the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). The work has led to renewed interest in shared metadata and increased ability to locate relevant digital assets regardless of geographical location.

Ph.D. '92 Daniela Rus and B.A. '93 Sendhil Mullainathan win MacArthur "Genius Award."

2002

Student Tim Roughgarden wins the Danny Lewin Best Student Paper Award at STOC 2002.

Fred Schneider chairs the NSF ITR Program Review.

INVESTIGATOR	SPONSOR	AWARD	TITLE
Schneider	AFOSR	4,638,325	AFRL/Cornell Information Assurance Institute
Schneider	AFOSR	773,378	From Fault-tolerance to Attack Tolerance
Schneider / Morrisett	AFOSR	471,107	Trust in Security-Policy Enforcement Mechanisms
Schneider / Morrisett	AFOSR / PECASE	820,000	Next Generation Systems Languages
Schneider / Morrisett / Kozen / Myers	ONR	4,247,977	CIP—Language-Based Security for Malicious Mobile Code
Schneider	AFRL sub of Dolphin Technology	250,000	Secure Cross-Domain Information Sharing Basic Research Process
Selman	DARPA sub of SRI	171,000	Analyzing Heuristic Approaches to Real-time, Distributed Coordination Problems
Selman	DARPA sub of SRI	20,000	Analyzing Heuristic Approaches to Real-time, Distributed Coordination Problems
Selman / Gomes / Kreitz	DARPA	3,580,000	Boosting Reasoning Technology Through Randomization, Structure Discovery, and Hybrid Strategies
Sengers	NSF	500,000	CAREER: Using Cultural Theory to Design Everyday Computing
Sengers	NSF	300,000	Collaborative Research: Closing the Affective Gap
Sengers	NSF	11,963	The Open World—The World of Open Systems
Shanmugasundaram	NSF	406,750	CAREER: Towards Unifying Database Systems and Information Retrieval Systems
Shanmugasundaram / Demers	NSF	500,000	Hilda: A High-Level Language for Data-Driven Web Applications
Sirer	NSF	400,000	CAREER: Building Robust, High-Performance Infrastructure Services through Informed Resource Tradeoffs
Sirer	I3P	150,000	I3P Research Fellowship
Tardos	NSF	150,000	Approximation Algorithms and Applications in Network Games
Tardos	ONR	1,176,548	Algorithmic Issues in Network Design and in Information Access
Tardos	ONR	375,000	Network Games and Approximation Algorithms
VanRenesse	AFOSR	127,174	An Improved Testbed for Highly-Scalable Mission-Critical Information Systems
Yona	NSF	862,705	CAREER: Global Self-Organization of all Known Proteins— Toward a Complete Map of the Protein Space

TOTAL EXPENDITURES FOR FISCAL YEAR 2005-2006: \$16,975,558

Jon Kleinberg, Eva Tardos, and student David Kempe receive the Best Research Paper Award in the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. Their paper, "Maximizing the spread of influence through a social network," is one of a series of papers on social networks produced at Cornell.

Kavita Bala publishes *Advanced Global Illumination* (AK Peters) with Philippe Bekaert and Phil Dutre.

The CS Programming Team wins honorable mention in the world finals in the ACM meeting at the Czech Republic.

Eva Tardos becomes editor-in-chief of the *SIAM Journal on Computing*.

CS offers an undergrad Information Science major in Arts & Sciences.

Steve Marschner shares a Technical Achievement Award from the Academy of Motion Picture Arts and Science with Henrik Jensen and Pat Hanrahan for their model of subsurface scattering of light in translucent materials. The model has been used often, including for Gollum in *The Lord of the Rings* trilogy.

Lillian Lee's work with postdoc Regina Barzilay on a system that learns to paraphrase is featured in *The New York Times*.

David Gries becomes associate dean of Engineering.

Uri Keich joins.

Bob Constable is elected to the CRA Board.

Undergrad Eugene Lee takes first place in a national Intel Student Research Contest. Lee's project, supervised by Kavita Bala, tackled the challenge of producing high-quality, interactive rendering of sophisticated graphics, such as those used in movies or computer games.

Omar Khan receives the CRA Outstanding Male Undergraduate Award.

Joe Halpern publishes *Reasoning About Uncertainty* (MIT Press).

Fred Schneider receives an honorary doctorate from the University of Newcastle upon Tyne, U.K.

The Cornell Game Design Initiative is formed, under the direction of Dave Schwartz.

Fred Schneider co-chairs the Microsoft Trustworthy Computing Academic Advisory Board.

Collaborative Research at Cornell

INVESTIGATOR	SPONSOR	AWARD	TITLE
Birman / Sirer / ECE	NSF	1,250,000	NETS-NOSS: Ultra Low-Power Self-Configuring Wireless
Cardie / Law / Hotel	NSF	750,000	Natural Language Processing Support for eRulemaking
Caruana / Riedewald / Lab of Ornithology	NSF	2,701,622	ITR-(ASE+EVS)- (dmc+sim): Tracking Environmental Change through the Data Resources of the Bird-monitoring Community
Caruana / CTC	NSF	379,999	Multi-Algorithm Parallel Optimization of Costly Functions
Chew / Vavasis / MAE	NSF	1,393,410	Algorithms for Large-Scale Simulations of Turbulent Combustion
Demers / Huttenlocher / Kleinberg / Marschner / Astronomy	NSF	1,799,183	Petabyte Storage Services For Data-Driven Science
Elber / Joachims / CTC	NIH	1,031,013	Optimization of Folding and Threading Potential
Elber / Weill	CU seed grant	50,000	Allosteric Mechanisms and the Function of G Protein-Coupled Receptors
Elber / BSCB	DHHS sub of UC Santa Cruz	39,810	Development of a Web Interface for Mammalian Gene Collection Program Data
Elber / CTC	Microsoft	400,000	High Performance Computing for Bioinformatics on Windows
Elber / BSCB	anonymous	393,560	Two-Track Program in Computational Biology and Medicine (CBM) as a Part of the Tri-Institutional Research Program
Gehrke / EAS	NASA	239,188	Predicting Right Whale Distributions from Space: An Operational System for Marine Ecosystem Modeling
Guckenheimer / Math / Physics / CCB / MBG / Biomedical / Mole Med / Eng / Soc	NSF	3,436,000	IGERT: Program in Nonlinear Systems
Huttenlocher / Arms / Kleinberg / Soc / CTC	NSF	1,999,990	Very Large Semi-Structured Datasets for Social Science Research
Krafft / Arms / Lagoze / Eng Library / Comm	NSF	8,845,453	Collaborative Project: Core Integration—Leading NSDL Toward Long-Term Success
Pingali / CTC	NSF	1,500,000	CISE Research Infrastructure: A Two-tier Computation and Visualization Facility for Multiscale Problems
Pingali / Vavasis / Chew / CTC / Phy	NSF ITR	5,035,425	Adaptive Software for Field-Driven Simulations
Schneider / Birman / Sirer / ECE	NSF	3,040,000	Team for Research in Ubiquitous Secure Technology (TRUST)
Selman / Gomes / MAE	AFOSR MURI sub of UCLA	255,763	Cooperative Control in Uncertain Adversarial Environments
Sirer / Gehrke / Demers / ECE	NSF	410,000	The Ad Hoc Classroom: Integrating Emerging Wireless Communications and Networking Technologies into Mainstream Computer Science and Electrical Engineering Curricula

CS offers an undergrad degree in Information Science, Systems, and Technology in Engineering, joint with Operations Research & Industrial Engineering.

Researcher Carl Lagoze receives the LITA Frederick G. Kilgour Award. Lagoze's research, the citation says, "has lead to significant achievements in the areas of distributed digital collections, the harvesting of metadata, and establishment of open standards."

The new lab (CL)3, designed by David Schwartz, is inaugurated.

Lillian Lee shares the Best Paper Award at the Human Language Technology Conference, with Regina Barzilay. Their incorporation of context models in information ordering and extractive summarization yields substantial improvements.

David Gries publishes *Multimedia Introduction to Programming Using Java* (Springer-Verlag), with his son, Paul.

Juris Hartmanis becomes senior associate dean of CIS.

Dick Conway is honored by Management Science for his early, seminal research in computer simulation. The citation describes Conway's findings as "visionary" and says that they "established the research agenda for the simulation field for decades."

Carla Gomes and Bart Selman receive the Distinguished Paper Award at the Conference on Principles and Practice of Constraint Programming.

Once again, Ph.D. student Ioannis Vetsikas and his software "whitebear" wins first place in the Trading Agent Competition. From 2001 to 2005, his worst finish is third.

The Ph.D. program in Information Science is approved.

Johannes Gehrke receives a Cornell University Provost's Award for Distinguished Scholarship.

Collaborative Grant Proposals

INVESTIGATOR	SPONSOR	AWARD	TITLE
Tardos / Kleinberg / Huttenlocher / Halpern / ORIE / Econ	NSF-ITR	2,468,677	Networks of Strategic Agents: Theory and Algorithms
Vavasis / CEE	NSF	500,000	MSPA-MCS: Automatic Geometric Simplification

Submitted Grant Proposals

INVESTIGATOR	SPONSOR	AWARD	TITLE
Arms	NSF	120,000	Using the Cyberinfrastructure to build a Full Text Index to the Web
Cardie	ATC-NY	15,000	P-Rex, a Portable Concept-Based Event Extraction Tool
Cardie	DHS sub of U Pitt	842,145	Information Extraction of Events and Beliefs from Text
Constable	NSF	500,000	CT-ISG: Implementing a Formally Secure Secret Service
Constable	NSF	401,536	Foundations of Proof Technology Circa 2020
Constable	OSD sub of ATC-NY	15,000	A Software Hub for High Assurance Model-Driven Development and Analysis
Constable	AF sub of ATC-NY	225,000	Scores, A Logical Programming Environment for Distributed Systems, Phase II
Elber	NIH sub of MN	632,000	Exploring Reaction Pathways in Enzymes with Enhanced Sampling Methods
Elber	NIH	25,468	Long Time Dynamics of Biomolecules
Francis	NSF	377,426	NeTS-FIND: Towards Complexity Oblivious Network Management
Francis	NSF	246,350	NeTS-FIND: Towards a Theory of Tunneling
Gehrke	AFRL	400,000	Processing Huge Data Sets with Multiple Passes
Gehrke / Shanmugasundaram	MDA sub of ATC-NY	20,000	Highly Distributed and Fault Tolerant Data Management
Hopcroft	AFOSR	374,974	Information Forensics
Keich	NIH	1,326,521	Motif Finding and Statistical Evaluations of Genomic Scale Datasets
Kozen	ATC-NY	30,000	AppMon: Application Monitors for Not-Yet-Trusted Software
Kozen	NSF	407,737	Specialized Logics for Applications in Computer Science
Krafft	NSF sub of UC Berkeley	90,000	Science and Math Informal Learning Educators (SMILE)
Lust	NSF	250,000	CI-TEAM Demonstration Project: Transforming the Primary Research Process Through Cybertool Dissemination: A Demonstration Model from a Virtual Center for the Study of Language Acquisition

Thorsten Joachims
receives Best Paper
Award at ICML.

John Hopcroft receives the 2005 IEEE Harry Goode Memorial
Award for "fundamental contributions to the study of algorithms
and their applications in information processing."

Bobby Kleinberg
joins.

Technology Research News magazine, in its "Top Picks: Technology Research Advances of 2004," includes work by two CS groups: Jon Aizen, Dan Huttenlocher, Jon Kleinberg, and Tony Novak devised a way to measure the popularity of downloadable media description; and Lillian Lee and Regina Barzilay developed software that picks up the topic structure of whole documents to generate more accurate automatic summaries.

Fred Schneider is named chief scientist of
TRUST (Team for Research in Ubiquitous
Secure Technologies) a new five-university
NSF Science and Technology Center.

Student Alexandru Niculescu-Mizil receives a
Distinguished Student Paper Award at ICML.

Thomas Finley receives
Distinguished Student Paper
Award at ICML.

INVESTIGATOR	SPONSOR	AWARD	TITLE
Myers	NSF	350,000	CT-ISG: Diaspora: A Secure, Reliable Federated Execution Platform and Object Store
Pingali / Bala / Chew	NSF	765,000	CSR-AES: Parallelizing Irregular Applications for Multicore Processors
Schneider / Gehrke	iAd	659,571	Information Access Disruptions Enabling Technology and Emerging Services in the Information Age
Sirer	NSF	500,000	CT-ISG: Nexus: A New Operating System for Trusted Computing
VanRennesse	NSF	25,000	Student Travel Support for OSDI 2006
Vavasis	DoE	600,000	Dynamic Meshing Institute

Submitted Collaborative Research at Cornell

INVESTIGATOR	SPONSOR	AWARD	TITLE
Cardie / Ling / Comm	NSF	725,769	DHB—Dynamics of Deception in Computer-mediated Environments
Elber / Weill / CCB / Vet / Math / Bio Eng	Keck	2,760,000	Keck Senio Fellows
Francis / ECE	DARPA sub of BAE	500,000	CBMANET
Gehrke / CISER	NSF	1,100,000	CT-T: Collaborative Research: Preserving Utility While Ensuring Privacy for Linked Data
Gehrke / Physics	NSF	2,959,733	Workflow for GRID-Based Analysis of Extremely Large Datasets: CMS as a Case Study
Gehrke / Physics	DoE	6,799,738	Development and Deployment of a Dynamic, Grid-Award Analysis-Development and Interactive Data Analysis Site for CMS
Gehrke / EAS	NASA	1,032,883	Predicting Right Whale Distributions from Space: An Operational System for Marine Ecosystem Modeling
Gries / CTC	NSF	597,638	BPC Worlds for Information Technology and Science (WITS)
Pingali / CEE	Microsoft	900,000	Lazarus: a CPR System for Long-running Computational Science Programs
Pingali / CTC	NSF sub of U TX	260,558	World-Class Science Through World Leadership in HPC
Pingali / CTC	NSF sub of U TX	260,558	Accelerating US Science by Reestablishing NSF Leadership in HPC
Riedewald / Caruana / Lab of Ornithology	NSF	987,334	SEI+II: Ecological Discovery & Inference: Tools for Data-driven Exploration and Testing of Observational Data

Student Filip Radlinski receives the Best Student Paper Award at the ACM SIGKDD Conference.

Rafael Vinoly architects begin a feasibility study for a CIS information campus signature building.

Jon Kleinberg, Jure Leskovec, and Christos Faloutsos receive the Best Research Paper Award at the eleventh Conference on Knowledge Discovery and Data Mining.

Thorsten Joachims receives Best Paper Award at ICML.

Jon Kleinberg and Eva Tardos publish *Algorithm Design*. (Addison-Wesley).

Jon Kleinberg wins MacArthur "Genius" Award.

40 years of leadership in research and education

New Faculty

DOUG L. JAMES

ASSOCIATE PROFESSOR
DEPARTMENT OF COMPUTER SCIENCE

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James grew up in Canada where he obtained a B.Sc. in applied mathematics from the University of Western Ontario in 1995. He earned a M.Sc. (1997) and a Ph.D. (2001) in mathematics from The University of British Columbia (UBC), both via The Institute of Applied Mathematics, and was briefly a postdoctoral researcher in computer science at UBC. In fall 2002, he joined the School of Computer Science at Carnegie Mellon University as an assistant professor in the Robotics Institute and the Computer Science Department and was an active member of the Carnegie Mellon Graphics Lab. Doug James will join the Cornell computer science faculty as an associate professor in August 2006.

James's research and teaching interests are in computer graphics, physically based animation, computational geometry, scientific computing, dimensional model reduction, computational robotics, and haptic force-feedback rendering. Some typical application areas are computer animation (film and video games), virtual prototyping and assembly planning, and interactive soft-tissue simulation for virtual medicine.

James is currently interested in the design of geometric and physical algorithms that can exploit the structure and information content of physical phenomena to permit faster and better simulations. An important research theme has been the design of amortized algorithms that can leverage preprocessing to accelerate physical simulations for high-rate, multi-sensory feedback in emerging human-computer interaction applications. At present he is exploring algorithms to accelerate process-



ing of discrete deformable systems: fast integration of solid dynamics, output-sensitive collision detection techniques, fast contact resolution, force-feedback haptic rendering, real-time acoustic radiation, and appearance modeling. He is also interested in understanding how algorithms can reuse physical motion databases to enable interactive display and content creation and to provide animators with more powerful control over physical simulation content.

2005–2006 Publications

"Real-time subspace integration for St. Venant-Kirchhoff deformable models," *ACM Transactions on Graphics*, 24(3):982–990 (2005). (With J. Barbic.)

"Skinning mesh animations," *ACM Transactions on Graphics*, 24(3):399–407 (2005). (With C.D. Twigg.)

"Precomputed acoustic transfer: Output-sensitive, accurate sound generation for geometrically complex vibration sources," *ACM Transactions on Graphics* (SIGGRAPH 2006), 25(3) (2006). (With J. Barbic and D.K. Pai.)

2005–2006 Lectures

"Parameterizing Deformable Systems to Tame Complexity," (and related talks), Language, Learning, Vision and Graphics Seminar Series, CSAIL, M.I.T., (May 2005); Pixar Animation Studios, Emeryville, California, (June 2005); Computer Science Division, Electrical Engineering and Computer Sciences, U.C., Berkeley, (June 2005); Program of Computer Graphics, Cornell University, (November 2005); Broad Area Colloquium for Artificial Intelligence, Geometry, Graphics, Robotics and Computer Vision, Stanford University, (December 2005).

"Sub-linear Time Algorithms for Deformable Systems," Computer and Information Science Department, University of Pennsylvania, (May 2006); Computer Science Department (job talk), Cornell University, (May 2006).

"Precomputed Acoustic Transfer," Computer Science, Columbia University, (May 2006).

"Physically Based Modeling in Graphics," Invited panelist, ACM Symposium on Solid and Physical Modeling, Cardiff, Wales, UK, (June 2006).

2005–2006 Professional Activities

Associate Editor, *ACM Transactions on Graphics*

Member, Editorial Board, *Graphical Models*

Member, Program Committee, ACM SIGGRAPH; ACM SIGGRAPH Symposium on Computer Animation; Pacific Graphics

Awards and Honors

Fellow, Alfred P. Sloan Research (2006–2008)

Recipient, NSF CAREER Award, "Precomputing Data-driven Deformable Systems for Multimodal Interactive Simulation"

Citation, One of *Popular Science* magazine's "Brilliant 10" young scientists for 2005

RAFAEL PASS

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Rafael Pass obtained a bachelor's in engineering physics and a master's in computer science, both from the Royal Institute of Technology (KTH) in Sweden. He received a Ph.D. in computer science from the M.I.T. in 2006. Pass joins the Cornell computer science faculty as an assistant professor in July 2006.

Pass's research interests are in the field of cryptography and its interplay with computational complexity and game theory. His research addresses foundational questions, such as establishing and refining mathematical definitions of knowledge and security, and algorithmic questions, such as establishing feasibility of computational tasks. In particular, Pass's research has focused on obtaining more precise computational definitions of knowledge in interactive systems and on obtaining general feasibility results regarding the execution of secure cryptographic protocols in complex environments where many protocols are running concurrently, such as the Internet.

Prior to entering graduate school, Pass worked in the finance industry for J.P. Morgan and Price Waterhouse Coopers. He also studied logic and philosophy at the Sorbonne in Paris.



2005–2006 Publications

"Construction of a non-malleable encryption scheme from any semantically secure one," (to appear) *Advances in Cryptology*, (2006). (With A. Shelat and V. Vaikuntanathan.)

"Parallel repetition of zero knowledge proofs and the possibility of basing cryptography on NP-hardness," (to appear) *Proceedings of Conference on Computational Complexity*, (2006).

"Local zero knowledge," (to appear) *Proceedings of the Thirty-eighth Annual Symposium on Theory of Computing*, (2006). (With S. Micali.)

"Concurrent non-malleable commitments," *Proceedings of the Forty-sixth Annual IEEE Symposium on Foundations of Computer Science*, 563–572 (2005). (With A. Rosen.)

"Secure computation without authentication," *Advances in Cryptology*, 361–377 (2005). (With B. Barak, R. Canetti, Y. Lindell, and T. Rabin.)

"Unconditional characterizations of non-interactive zero-knowledge," *Advances in Cryptology*, 118–134 (2005). (With A. Shelat.)

"New and improved constructions of non-malleable cryptographic primitives," *Proceedings of the Thirty-seventh Annual Symposium on Theory of Computing*, 533–542 (2005). (With A. Rosen.)

2005–2006 Lectures

"Alternative Variants of Zero-Knowledge Proofs," Royal Institute of Technology, (January 2005).

"Secure Computation Without Authentication," *Advances in Cryptology*, (August 2005); IBM T.J. Hawthorn Research Center, (August 2005).

"New and Improved Constructions of Non-malleable Cryptographic Primitives," Thirty-seventh Annual Symposium on Theory of Computing, (May 2005).

"Concurrency and the Security of Protocols," Microsoft Silicon Valley Campus, (February 2006); IBM Almaden Research Center, (February 2006); University of Chicago, (March 2006); Georgia Tech, (March 2006); Cornell, (March 2006).

"Local Zero Knowledge," Thirty-eighth Annual Symposium on Theory of Computing, (May 2006).

"Parallel Repetition of Zero-Knowledge Proofs and the Possibility of Basing Cryptography on NP-Hardness," Conference on Computational Complexity, (July 2006).

Awards and Honors

Recipient, IBM Josef Raviv Memorial Fellowship (2006) (declined)

Recipient, M.I.T. Presidential Fellowship (2004)

Recipient, Sweden-America Foundation Fellowship (2004)

CIS Faculty and Senior Research Profiles

STUART ALLEN
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Stuart Allen received a bachelor's degree in computer science from the University of New Orleans in 1978 and a Ph.D. in computer science from Cornell University in 1987. He has held several positions at Cornell since and is currently a research associate in the Department of Computer Science.

Allen's principal interest is in making computer-manipulable formal data an adjunct to, and ideally a medium for, precise human expression, especially argument. This involves the design, justification, and employment of practical formal systems and notations.

The bulk of his work has been in relation to the PRL project (<http://www.nuprl.org>), which has traditionally focused on constructive theory of types and proof by means of tactics. In addition to theory, application, and explanation of type-theory based practice, he has been interested in formalizing and exploiting conventional mathematical notations, as well as the development of interfaces for user immersion in bodies of formal data.

Most recently, Allen's efforts (as part of the PRL project) have been directed at designing methods for implementing digital collections grounded in formal material, especially proof, emphasizing theoretical neutrality and anticipating the coexistence of material with distinct, possibly conflicting, formal bases, entailing the need for strict yet extensible logical accounting.

WILLIAM Y. ARMS

PROFESSOR

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William Arms received his B.A. in mathematics from Oxford University in 1966 and his M.Sc. in economics from the London School of Economics in 1967. He obtained his doctorate (D.Phil.) in operational research from the University of Sussex in 1973. He has been a professor in the Department of Computer Science since 1999. He was the first director of the Information Science program from 2002 to 2005.

Arms's interests concentrate on Web information systems, digital libraries, and electronic publishing. These fields integrate methods from many disciplines, so that the work ranges from technical topics, such as distributed computing and information representation, to the economic and social aspects of change.

Arms is a member of the Web Laboratory project, which is building a very large-scale testbed of snapshots of the Web going back to 1996, and using it for social science research. From 1996 to 2006, he was engaged with the National Science Foundation's project to build a large-scale digital library for science education (NSDL). The Cornell digital libraries research group has a major grant to build the core system for this library. One of Arms's principal interests is the change in scientific publication as online materials replace printed journals as the primary means of creating, storing, and distributing research information.

Professor Arms recently completed a period as chair of the ACM Publications Board. He is a member of the ERIC Steering Committee and an advisor to the American Law Institute's study, "Principles of the Law of Software Contracts." His book, *Digital Libraries*, was published by the M.I.T. Press in 2000.



2005–2006 Publications

"Building a research library for the history of the Web," *Joint Conference on Digital Libraries*, (2006). (With S. Aya, P. Dmitriev, B. Kot, and others.)

"Three case studies of large-scale data flows," *Proceedings of the IEEE Workshop on Workflow and Data Flow for Scientific Applications*, (2006). (With S. Aya, M. Calimlim, J. Cordes, and others.)

"A research library based on the historical collections of the Internet archive," *D-Lib Magazine*, (February 2006). <http://www.dlib.org/dlib/february06/arms/02arms.html>. (With S. Aya, P. Dmitriev, B. Kot, and others.)

"A viewpoint analysis of the digital library," *D-Lib Magazine Tenth Anniversary Issue*, (July/August 2005). <http://www.dlib.org/dlib/july05/arms/07arms.html>.

2005–2006 Professional Activities

Advisor, American Law Institute, Principles of the Law of Software Contracts

Member, ERIC Steering Committee

Series Editor, *M.I.T. Press Series on Digital Libraries and Electronic Publishing*

Member, Program Committee, Joint Conference on Digital Libraries

2005–2006 University Activities

Director, eCornell

Member, Cornell University Library Board

Member, Faculty Senate

Selected Publications

"A spectrum of interoperability: The site for science prototype for the NSDL," *D-Lib Magazine*, (January 2002). <http://www.dlib.org/dlib/january02/arms/01arms.html>.

Digital Libraries. M.I.T. Press (2000).

"Key concepts in the architecture of the digital library." *D-Lib Magazine*, (July 1995). <http://www.dlib.org/dlib/july95/07arms.html>.

GRAEME BAILEY

PROFESSOR

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Originally working in low-dimensional topology and combinatorial group theory, through an odd mixture of circumstances, Dr. Bailey has become actively involved in research in mathematics and medicine. One of two ongoing research projects in this area is the modeling of lung inflation, together with a research group at the Class One Trauma Center at the Upstate Medical University, Syracuse, New York. This project is in the early stages of a program to extend to various pathologies affecting elasticity and aimed towards effective clinical treatments. The group, having made some significant advances in answering questions that had remained unsolved for over thirty years, is now in the process of trying to obtain reliable mathematical models. This involves building computer simulations of dynamic packing results under constrained perturbations and deformations.

The other project is in understanding deformations of trans-membrane proteins used in cell-signaling processes. This is a carefully constrained version of the protein-folding problems that have been exciting the mathematical biology community in recent years; the application of a topological viewpoint in collaborating with molecular pharmacologists and structural biologists has already yielded some intriguing insights.

More recently, his interests have migrated to modeling perception and cognition issues relating to the human-machine interface. This cognitive modeling currently centers on ways of understanding the interactions between pairs of musicians and has a large experimental component, the eventual goal being to construct a musically exciting machine 'partner.' This involves research collaborations across the university and feeds very naturally into the growing program in 'Computing in the Arts' available as a concentration for students in the university (formally connecting music, psychology,

computer science, fine arts, film, and dance). Apart from the intellectual challenge, this has the additional appeal of connecting to one of his other main passions: Graeme is a classical cellist and pianist, who grew up in London, touring, and performing on the BBC.

2005–2006 Lectures

"Keeping and Sharing Secrets," Mathematical Association of America, (April 2006).

Invited panelist, National Academy of Engineering, (May 2006).

Invited computer music concert at Google, New York City, (May 2006).

2005–2006 Professional Activities

Member, Fellowship Selection Committee, Rhodes; Marshall; Churchill; Fullbright

Vice President of the Board of Directors of Engineers for a Sustainable World

Member, Advisory Board, CURIE

Member, Advisory Board, Health Careers

Member, Engineering Council Review Committee for Masters of Engineering

Faculty Advisor, Judo Club; Cornell Lunatics Club; MENGSA

Risley Faculty Fellow

2005–2006 University Activities

Director, Computer Science Masters of Engineering Program

Member, Masters of Engineering Committee

Member, Cornell EMS

Member, Cornell Concert Series Committee

Member, Search Committee, Music Department

Awards and Honors

Recipient, ACSU Faculty of the Year (2004)

Recipient, Ken Goldman Teaching Award

Recipient, Kendall Carpenter Advising Award

KAVITA BALA

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Kavita Bala's research is in the area of computer graphics. Graphics data sets are becoming increasingly complex, driven by user demand and new acquisition technology. Bala's research addresses the problem of scaling to these complex scenes. Guided by an understanding of the human visual system, her research aims to provide visual fidelity with high performance. Bala's research interests include scalable graphics for interactive rendering; perceptually-based rendering; image-based modeling and texturing; and feature-based rendering and texturing.

Bala received her Ph.D. and S.M. in computer science from the M.I.T.

2005–2006 Publications

"Multidimensional lightcuts," *Proceedings of SIGGRAPH 2006 Conference*, (2006). (With B. Walter, A. Arbre, and D.P. Greenberg.)

"Direct-to-indirect transfer for cinematic relighting," *Proceedings of SIGGRAPH 2006 Conference*, (2006). (With M. Hasan and F. Pellacini.)

"Accurate direct illumination using iterative adaptive sampling," *Proceedings of Transactions on Visualization and Computer Graphics*, (2006). (With M. Donikian, B. Walter, S. Fernandez, and D.P. Greenberg.)

"Information-preserving imaging for heterogeneous networked displays," *Workshop on Information Visualization and Interaction Techniques for Collaboration across Multiple Displays*, (2006). (With J. Ferwerda and B. Walter.)

"Implementing the render cache and the edge-and-point image on graphics hardware," *Proceedings of Graphics Interface*, (2006). (With E. Velázquez-Armendáriz, E. Lee, and B. Walter.)



2005–2006 Professional Activities

Member, Papers Program Committee, SIGGRAPH (2006)

Member, Program Committee, Eurographics Symposium on Rendering (2006); Eurographics Symposium on Point-based Computer Graphics (2006)

Co-chair, Eurographics Symposium on Rendering (2005)

2005–2006 University Activities

Curie Project Organizer (2005)

Awards and Honors

Recipient, PCCW Affinito/Stewart Grant

Selected Publications

"Lightcuts: A scalable approach to illumination," *Proceedings of SIGGRAPH 2005 Conference*, (2005). (With B. Walter, S. Fernandez, A. Arbre, and others.)

"Combining edges and points for interactive high-quality rendering," *Proceedings of SIGGRAPH 2003 Conference*, (2003). (With B. Walter and D.P. Greenberg.)

Advanced Global Illumination. A.K. Peters, Ltd., (2003). (With P. Dutre and P. Bekaert, Foreword by P. Shirley.)

"Adaptive shadow maps," *Proceedings of SIGGRAPH 2001 Conference*, (2001). (With R. Fernando, S. Fernandez, and D.P. Greenberg.)

KENNETH P. BIRMAN

PROFESSOR

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Ken Birman obtained a bachelor's degree in computer science at Columbia University in 1978 and a Ph.D. in computer science at the University of California, Berkeley in 1981. He joined the faculty of the Department of Computer Science in 1982.

Birman's research is concerned with scalability, reliability, and security in modern networked environments. In past work on the Isis system, software he developed became a central part of the New York Stock Exchange and Swiss Stock Exchange (in both settings, Isis runs the core messaging component used to distribute new stock quotes and information about trades reliably and securely), the French air traffic control system (Isis is used to keep clusters of three to five controller workstations synchronized and handles failures), the US Naval Aegis warship's radar system, and other mission-critical computer networks. The virtual synchrony computing model used by Isis was widely adopted and remains a dominant fault-tolerance option for systems that replicate data. For example, virtual synchrony is used as the basis for the CORBA fault-tolerance standard, and virtual synchrony technologies he helped design and build can be found today at the core of platforms offered by Microsoft and IBM.

Birman has also worked on peer-to-peer systems. Kelips, a one-hop DHT he helped develop, is the first such system to exploit peer-to-peer epidemics for stability and scalability. The Astrolabe platform, developed jointly with Van Renesse and Vogels, plays a key role in Amazon.com's massive datacenters. Bimodal Multicast, a scalable reliable multicast protocol, contributed ideas now used in a wide range of content delivery and overlay network architectures.

Birman's current focus is on multicast platforms aimed at large-scale distributed systems, particularly where the new Web Services standards are employed. Graduate student Krzys Ostrowski is the lead developer on the first of these, a scalable multicast platform called "QuickSilver." QuickSilver runs on PCs using features of the .net framework to integrate group communication into the runtime environment, offering unique scalability and throughput, and the flexibility to support



publish-subscribe or other popular interface standards. Mahesh Balakrishnan leads a second such effort. His "Ricochet" platform supports scalable time-critical multicast for clustered computing systems, slashing message delivery latencies while tolerating a wide range of disruptions. Finally, Tudor Marian is developing "Tempest," a programming tool that automates the transformation of a Web Services application into a scalable self-managed version for use on cluster platforms. All three are being distributed to the public (see <http://www.cs.cornell.edu/Info/Projects/QuickSilver>).

Birman also heads the Software Tools research area for TRUST, a new NSF Science and Technology Center. He was named an ACM Fellow in 1999 and won the Stephen '57 and Marilyn Miles Excellence in Teaching Award in 2000. He was editor-in-chief of *ACM Transactions on Computer Systems* from 1993 to 1997, founder and CEO of two companies (Isis Distributed Systems and Reliable Network Solutions), and has consulted extensively for the U.S. government and other organizations.

2005–2006 Publications

"Cognitive adaptive radio teams," (to appear) *Proceedings of the International Workshop on Wireless Ad-hoc and Sensor Networks*, (2006). (With R. Lau, S. Demers, Y. Ling, and others.)

"Network-aware adaptation techniques for mobile file systems," (to appear) *Proceedings of the the Fifth IEEE International Symposium on Network Computing and Applications*, (2006). (With B. Atkin.)

"Reliable multicast for time-critical systems," (to appear) *Proceedings of the First IEEE Workshop on Applied Software Reliability*, (2006). (With M. Balakrishnan.)

"How the hidden hand shapes the market for software reliability," (to appear) *Proceedings of the First IEEE Workshop on Applied Software Reliability*, (2006). (With C. Chandrasekaran, D. Dolev, and R. van Renesse.)

"Extensible Web Services architecture for notification in large-scale systems," (to appear) *Proceedings of the IEEE International Conference on Web Services*, (2006). (With K. Ostrowski.)

"Mistral: Efficient flooding in mobile ad-hoc networks," (to appear) *Proceedings of the Seventh ACM International Symposium on Mobile Ad Hoc Networking and Computing*, (2006). (With S. Pleisch, M. Balakrishnan, and R. van Renesse.)

"The untrustworthy services revolution," *Computer*, 39(2) 98–100 (February 2006).

"Can Web Services scale up?" *Computer*, 38(10) 107–110 (October 2005).

"Autonomic computing-A system-wide perspective," *Autonomic Computing: Concepts, Infrastructure, and Applications*, M. Parashar and S. Hariri (Eds.), CRC Press, (2006). (With R. van Renesse.)

"Slingshot: Time-critical multicast for clustered applications," *Proceedings of IEEE Network Computing and Applications*, (2005). (With M. Balakrishnan and S. Pleisch.)

"Decentralized schemes for size estimation in large and dynamic groups," *Proceedings of IEEE Network Computing and Applications*, (2005). (With D. Kostoulas, D. Psaltoulis, I. Gupta, and A. Demers.)

Reliable Distributed Systems Technologies, Web Services, and Applications. Springer, (2005).

2005–2006 Professional Activities

Member, Papers Program Committee, Chair, Program Committee, ACM Symposium on Operating Systems Principles (2005)

Area Leader, Secure Information Management Software Tools

Advisor, Enterprise Integration Strategy, Air Force CIO's Office, NSF TRUST Science and Technology Center (2005)

Member, Program Committee, World Wide Web Conference, Internet Protocol TV Workshop (2006); IEEE International Conference on Web Services (2006); IEEE International Symposium on Network Computing and Applications (2006); IEEE International Conference on Autonomic Computing (2006); IEEE International Conference on Web Services (2006); International Conference on Distributed Computing Systems (2006);

Co-Chair, Workshop on Hot Topics in System Dependability (2006)

2005–2006 University Activities

Chairman, CIS Building Committee

Member, Faculty Committee on Governance

Awards and Honors

Recipient, Stephen and Marilyn Miles Excellence in Teaching Award (2000)

Fellow, Association for Computing Machinery (1998)

Selected Publications

"Astrolabe: A robust and scalable technology for distributed system monitoring management and data mining," *ACM Transactions on Computer Systems*, 21(2):164–206 (2003). (With R. van Renesse and W. Vogels.)

"How to securely replicate services," *ACM Transactions on Programming Languages and Systems*, 16(3): 986–1009 (1994). (With M. Reiter.)



MARTIN BURTSCHER

ASSISTANT PROFESSOR

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING

MEMBER OF THE GRADUATE FIELD OF COMPUTER SCIENCE

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Martin Burtscher received his Ph.D. degree in computer science from the University of Colorado at Boulder in 2000 and his combined B.S./M.S. degree in computer science from the Swiss Federal Institute of Technology (ETH) Zurich in 1996. He is an assistant professor in electrical and computer engineering at Cornell.

Dr. Burtscher leads the High-performance Microprocessor Systems Group in the Computer Systems Laboratory at Cornell University. He currently performs research related to high-end microprocessor architecture and code optimization, high-performance computing, and data compression.

Ongoing projects include speeding up single program threads using multiple processors, designing self-optimizing computer systems, creating high-throughput data compressors, enhancing the performance and scalability of parallel message-passing programs at the library level, devising energy-efficient hardware accelerators, and developing portable high-speed processor simulators.

2005–2006 Publications

"Computational simulation and visualization of traumatic brain injuries," *Proceedings of the International Conference on Modeling, Simulation and Visualization Methods*, 101–107 (2006). (With I. Szczyrba.)

"Fast lossless compression of scientific floating-point data," *Proceedings of the Data Compression Conference*, 133–142 (2006). (With P. Ratanaworabhan and J. Ke.)

"Self-optimizing finite state machines for confidence estimators," *Proceedings of the Workshop on Introspective Architecture*, (2006). (With S.J. Jackson.)

"Bridging the processor-memory performance gap with 3D IC technology," *IEEE Design & Test of Computers*, 22(6):556–564 (2005). (With C.C. Liu, I. Ganusov, and S. Tiwari.)

"The VPC trace-compression algorithms," *IEEE Transactions on Computers*, 54(11):1329–1344 (2005). (With I. Ganusov, S.J. Jackson, J. Ke, and others.)

"Improving microprocessor performance through 3D IC technology," *Proceedings of the Semiconductor Research Corporation's TECHCON 2005 Conference*, (2005). (With C.C. Liu, I. Ganusov, and S. Tiwari.)

"Future execution: A hardware prefetching technique for chip multiprocessors," *Proceedings of the International Conference on Parallel Architectures and Compilation Techniques*, 350–360 (2005). (With I. Ganusov.)

"Tolerating message latency through the early release of blocked receives," *Proceedings of the Euro-Par Conference*, 19–29 (2005). (With J. Ke and E. Speight.)

2005–2006 Lectures

"Applying Value Speculation Techniques to New Domains," Department of Computer Science, Princeton University; Department of Computer Science, Harvard University; Department of Electrical and Computer Engineering, Northeastern University; Department of Computer Science and Engineering, University of California, San Diego; Department of Computer Science, University of Illinois at Urbana-Champaign.

2005–2006 Professional Activities

Associate Editor, *Journal of Instruction-Level Parallelism*

Member, Program Committee, IEEE International Symposium on Workload Characterization; Memory System Performance and Correctness Workshop

Reviewer: *ACM Transactions on Architecture and Code Optimization*; *International Conference on Architectural Support for Programming Languages and Operating Systems*; *ACM Transactions on Modeling and Computer Simulation*; *Journal of Instruction-Level Parallelism*; *IEEE International Parallel & Distributed Processing Symposium*; *Design, Automation and Test in Europe Conference*; *International Symposium on High-Performance Computer Architecture*; *IEEE International Symposium on Workload Characterization*.

2005–2006 University Activities

Member, General Recruiting Committee, Electrical and Computer Engineering

CLAIRE CARDIE

ASSOCIATE PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

CHARLES AND BARBARA WEISS DIRECTOR OF
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Claire Cardie obtained a B.S. in computer science from Yale University in 1982 and an M.S. and Ph.D. in computer science at the University of Massachusetts at Amherst in 1994. She has been a faculty member of the computer science department at Cornell since 1994.

Cardie's research is in the area of natural language processing. Her group both builds systems for large-scale natural language processing tasks like information extraction, question answering, and multidocument summarization, and develops machine learning techniques to address underlying problems in syntactic and semantic analysis of natural language. The group currently works on summarization and information extraction for opinion-oriented texts and weakly supervised algorithms for natural language learning. Cardie also leads an interdisciplinary project to improve the existing mechanisms for e-rulemaking by developing natural language processing techniques to organize, categorize, summarize, and extract information from public comments submitted in response to proposed rules.

Cardie is a recipient of an NSF Faculty Early Career and Development (CAREER) Award (1996–2000) and was program chair for the Second Conference on Empirical Methods in Natural Language Processing in 1997. She has been secretary of the Association for Computational Linguistics Special Interest Group on Natural Language Learning (1999–2001) and recently completed successive elected two-year terms as secretary of the North American Association for Computational Linguistics (2000–2003). She will be program chair of the joint ACL/COLING conference in 2006 in Sydney, Australia and was elected as a board member of the ACL executive committee (2006–2008).

2005–2006 Publications

"Annotating expressions of opinions and emotions in language," *Language Resources and Evaluation* (formerly *Computers and the Humanities*), 39:2–3 (2005). (With J. Wiebe and T. Wilson.)

"Identifying sources of opinions with conditional random fields and extraction patterns," *Human Language Technology Conference/Conference on Empirical Methods in Natural Language Processing*, (2005). (With Y. Choi, E. Riloff, and S. Patwardhan.)

"Multi-perspective question answering using the OpQA corpus," *Human Language Technology Conference/Conference on Empirical Methods in Natural Language Processing*, (2005). (With V. Stoyanov and J. Wiebe.)

"Optimizing to arbitrary NLP metrics using ensemble selection," *Human Language Technology Conference/Conference on Empirical Methods in Natural Language Processing*, (2005). (With A. Munson and R. Caruana.)

"OpinionFinder: A system for subjectivity analysis," *Proceedings of HLT/EMNLP 2005 Interactive Demonstrations*, (2005). (With T. Wilson, P. Hoffmann, S. Somasundaran, and others.)

2005–2006 Lectures

"Machine Learning for Natural Language Processing (and Vice Versa?)," Invited plenary talk, Sixteenth European Conference on Machine Learning and Ninth European Conference on Principles and Practice of Knowledge Discovery in Databases, (October 2005).

2005–2006 Professional Activities

Board Member, Executive Committee of the Association for Computational Linguistics

Program Co-chair, COLING-ACL 2006, The Joint Twenty-first International Conference on Computational Linguistics and Forty-fourth Annual Meeting of the Association for Computational Linguistics

Round Table Member, Judiciary Hearing on Electronic Rulemaking, U.S. House of Representatives

Participant, first Google Faculty Summit

Action Editor, *Journal of Machine Learning Research*

Associate Editor, *Journal of Artificial Intelligence Research*

Editorial Board Member, *Machine Learning*

Executive Board Member, SIGDAT, Special Interest Group of the Association for Computational Linguistics for Linguistic Data and Corpus-based approaches to NLP

Member, North American Association for Computational Linguistics Nominating Committee



Member, Program Committee, Computational Approaches to Analyzing Weblogs, AAAI Spring Symposium; Human Language Technology Conference/Conference on Empirical Methods in Natural Language Processing; Sentiment and Subjectivity in Text, Workshop at the Annual Meeting of the Association of Computational Linguistics

Journal Referee, *Machine Learning*; *Computational Linguistics*

2005–2006 University Activities

Charles and Barbara Weiss Director, Information Science

Co-director of Undergraduate Studies, Information Science, Systems and Technology

Member, Computer Science Chair Search Committee

Member, CIS Council

Member, Information Science Curriculum Committee

Member, Cornell Presidential Research Scholars Board

Member, Provost's Advisory Group of Women in Science and Engineering (WISE)

Member, College Scholar Advisory Board

Member, Independent Major Advisory Board

College Scholar Advisor

Awards and Honors

Recipient, Google Gift (2005–2006)

Recipient, Xerox Foundation Gift (2004–2005, 2005–2006)

Recipient, National Science Foundation Faculty Early CAREER Development Award (1996–2000)

Recipient, Ralph S. Watts College of Engineering Excellence in Teaching Award, Cornell University (1996)

Fellow, Lilly Teaching, Cornell University (1996–1997)

Recipient, Best Written Paper Award, Ninth National Conference on Artificial Intelligence, Honorable Mention (1991)

Graduate Fellow, University of Massachusetts (1993–1994)

Recipient, Massachusetts Regents Fellowship, University of Massachusetts (1992–1993)

RICH CARUANA

ASSISTANT PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

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http://www.cs.cornell.edu/~caruana

Rich Caruana obtained his Ph.D. in computer science from Carnegie Mellon University in 1998. He is an assistant professor in computer science, where he does research in machine learning and data mining. His current focus is on adaptive clustering, ensemble learning, inductive transfer, and applications of these to problems in bioinformatics and medical and ecological decision-making.

Inductive transfer is a subfield of machine learning where better performance is achieved by learning many related problems together—it is easier to learn 100 related problems than to learn one of those problems in isolation. Caruana helped create this subfield of machine learning with the first paper on multitask learning ten years ago.

In 2000 through 2001 Caruana led a team of researchers that developed the first automated system for early detection of bioterrorist releases of anthrax. The system applies data mining to consumer purchases in supermarkets to look for unexplained increases in the sales of products such as cough syrup that may signal the onset of symptoms from a recent attack. Because consumers tend to self-medicate using easily available products such as cough syrup and throat lozenges before consulting physicians, the system can detect the onset of flu-like symptoms 24–48 hours before these can be detected by visits to hospitals and doctors' offices.

Caruana's work in clustering and ensemble learning are new focuses for him. His interest in clustering arose from limitations he discovered when applying traditional clustering methods to a motif discovery protein-folding problem. Caruana received an NSF Career Award to pursue this research in clustering. The research in ensemble learning arose from an empirical comparison of machine learning methods he and students were performing where an ensemble of different learning methods outperformed all other learning methods. The ensemble selection method they are developing may be the first high-performance machine learning method that can be optimized to almost any performance metric and currently outperforms all other learning methods to which they have compared it.



A theme that runs through all of Professor Caruana's work is the importance of developing methods that are effective on real-world problems. He likes to mix algorithm development with applications work to insure that the methods he develops are useful in practice.

2005–2006 Publications

"Efficiently exploring architectural design spaces via predictive modeling," *Proceedings of the Twelfth International Conference on Architectural Support for Programming Languages and Operating Systems*, (2006). (With E. Ipek, S. McKee, B. de Supinski, and M. Shulz.)

"An empirical comparison of supervised learning methods," *Proceedings of the 2006 International Conference on Machine Learning*, (2006). (With A. Niculescu-Mizil.)

"Predicting dire outcomes of patients with community acquired pneumonia," *The Journal of Biomedical Informatics*, (2006). (With G.F. Cooper, V. Abraham, C.F. Aliferis, and others.)

"Predicting good probabilities," *Proceedings of the 2005 International Conference on Machine Learning*, (2005). (With A. Niculescu-Mizil.) Best student paper award. Also an oral presentation at the 2005 Snowbird Workshop on Machine Learning.

"Obtaining calibrated probabilities from boosting," *Proceedings of the International Conference on Uncertainty in Artificial Intelligence*, 413–420 (2005). (With A. Niculescu-Mizil.)

2005–2006 Lectures

Multi-Task and Complex Outputs Meeting, University of London, UK, (July 2006).

Josef Stefan Institute, Slovenia, (May 2006).

Atomic Workshop, Toyota Technical Institute, Chicago, (March 2006).

American Meteorology Conference, (January 2006).

Toyota Technical Institute, Chicago, (November 2005).

University of Illinois, (November 2005).

Microsoft Research, Redmond, WA, (October 2005).

Toyota Technical Institute, Chicago, Machine Learning Summer School, (May 2005).

Rensselaer Polytechnic Institute, Troy, NY, (April 2005).

University of California at San Diego, (January 2005).

Yahoo! Research Labs, Pasadena, CA, (January 2005).

Fair Isaac Research, San Diego, CA, (January 2005).

American Meteorology Conference, (January 2005).

2005–2006 Professional Activities

Program Co-Chair, 2007 ACM SIGKDD International Conference on Knowledge Discovery and Data Mining

Funding Chair, International Conference on Machine Learning

Board Member, International Machine Learning Society

Member, Program Committee, National Conference on Artificial Intelligence; International Conference on Machine Learning

Co-Chair, Workshop on Inductive Transfer, Neural and Information Processing Systems (December 2005); KDD-CUP for the 2004 ACM SIGKDD International Conference on Knowledge Discovery and Data Mining; Workshop on Predicting Probabilities, Neural and Information Processing Systems (December 2004)

Awards and Honors

Member, Merrill Presidential Scholars, Cornell University (2005)

Recipient, NSF Career Award (May 2004)

Recipient, Sonny Yau Excellence in Teaching Award, Cornell University (2003–2004)

Recipient, Best Paper Nomination, "Evaluating the C-section rate of different physician practices: Using machine learning to model standard practice," American Medical Informatics Conference, (November 2003). (With S. Niculescu, B. Rao, and C. Simms.)

Recipient, Outstanding Research Contribution Award, Philips Labs (1988)

Selected Publications

"Learning from libraries of models with ensemble selection," *Proceedings of the 2004 International Conference on Machine Learning*, (2004). (With A. Niculescu-Mizil, G. Crew, and A. Skikes.)

"Data mining in metric space," *Proceedings of the 2004 International Conference on Knowledge Discovery and Data Mining*, (2004). (With A. Niculescu-Mizil.)

"KDD Cup 2004: Results and analysis," *SIGKDD Explorations*, 6(2):95–108 (2004). (With T. Joachims.)

"Benefitting from the variables that variable selection discards," *Journal of Machine Learning Research*, 3:1245–1264 (2003). (With V. de Sa.)

"Early statistical detection of anthrax outbreaks by tracking over-the-counter medication sales," *Proceedings of the National Academy of Sciences*, 99:5237–5240 (2002). (With A. Goldenberg, G. Shmueli, and S. Fienberg.)

"(Not)Bounding the true error," *Neural and Information Processing Systems*, 14 (2002). (With J. Langford.)

"A non-parametric EM-style algorithm for imputing missing values," *Artificial Intelligence and Statistics*, (January 2001).

"Overfitting in artificial neural nets trained with back-propagation, conjugate gradient, and early stopping," *Neural and Information Processing Systems*, 13 (2001). (With S. Lawrence and L. Giles.)

"Bridging the lexical chasm: Automatic FAQ answer finding," *Special Interest Group on Information Retrieval*, (2000). (With A. Berger, D. Cohn, D. Freitag, and V. Mittal.)

"Case-based explanation of artificial neural nets," *Artificial Neural Nets in Medicine and Biology*, (2000).

L. PAUL CHEW

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Paul Chew received his Ph.D. in computer science from Purdue University in 1981. He served as a faculty member at Dartmouth College until 1988 when he joined CS at Cornell as a senior research associate.

Chew's primary research interest is in geometric algorithms with an emphasis on practical applications. These practical applications have included placement, motion planning, shape comparison, vision, sensing, mesh generation, molecular matching, and protein shape-comparison. The work on protein shape-comparison has been used as part of the evaluation scheme for CAFASP (Critical Assessment of Fully Automated Structure Prediction), a "competition" held every two years to evaluate the performance of fully automatic servers for protein-structure prediction. Chew developed backwards analysis, a method now widely used for analyzing randomized algorithms. Chew's work on mesh generation has been motivated by the finite element method, a technique for finding approximate solutions to partial differential equations. The first step of this method is to create a mesh, i.e., to divide the given problem region into simple shapes called elements. For complex geometries, mesh generation can be difficult. Chew has developed methods for automatically generating a high-quality mesh.

Chew is an associate editor for the *Pattern Recognition: The Journal of the Pattern Recognition Society*.

**2005–2006 Publications**

"Exact computation of protein structure similarity," (to appear) *Proceedings of the Twenty-second ACM Symposium on Computational Geometry*, (2006).

2005–2006 Professional Activities

Associate Editor, *Pattern Recognition: the Journal of the Pattern Recognition Society*

Member, Program Committee, ACM Symposium on Computational Geometry (2005)

Selected Publications

"Finding the consensus shape for a protein family," *Algorithmica*, 38(1):115–129 (October 2003). (With K. Kedem.)

"Guaranteed-quality mesh feneration for curved surfaces," *Proceedings of the Ninth Symposium on Computational Geometry*, 274–280, (1993).

"There are planar graphs almost as good as the complete graph," *Journal of Computer and System Sciences*, 39(2):205–219 (1989).

ROBERT CONSTABLE

PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

DEAN OF THE FACULTY OF COMPUTING AND
INFORMATION SCIENCE



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Robert Constable is the dean of the Faculty of Computing and Information Science and a professor in computer science. He obtained his Ph.D. in mathematics from the University of Wisconsin in 1968. He served as chair of the Department of Computer Science from 1994 to 1999 and acting chair from 1993 to 1994.

For the past several years his research has focused on formal methods, automated reasoning, type theory, and programming logics. His interests range from foundational issues through implementation and application to software system verification and formally assisted design. Along with several colleagues and students forming the PRL research group, he has developed a type theory called Computational Type Theory (CTT), which has been implemented in two proof development systems, Nuprl ("new pearl") and MetaPRL. This work has benefited over the years from Cornell's strength in logic and applied logic.

The Nuprl and MetaPRL systems are among the most expressive and flexible interactive theorem provers in use today. Nuprl was a partner in solving two open problems in theoretical computer science and has been an essential tool in the verification and synthesis of software. Currently, Nuprl is used by the ATC-NY corporation. In addition, these provers handle some of the automated reasoning tasks for the Cornell AI group, exploring real world reasoning. Both provers include JProver, a fully automatic first order Intuitionistic logic prover jointly developed with Professor Kreitz at Potsdam and also used in the Coq proof system.

Nuprl and MetaPRL are each the core of a logical programming environment (LPE) which offers substantial automated assistance in design, coding, verification, and evolution of large software systems. Generally an LPE will integrate programming languages and logics and will provide an editor (program writer) and a library of modules and theories. The LPEs based on Computational Type Theory integrate the ML programming language and a programming logic based on type theory.

Reasoning about ML programs is founded on type theoretic semantics for ML. The LPE also integrates a compiler, a theorem prover, a formal digital library, and an editor. At Cornell, the LPE uses version five of Nuprl as the prover. Cornell work on LPEs has benefited over the years from strong collaboration with the programming languages group, and graduates of the PRL group have gone on to advance the role of type theory and formal reasoning in programming language semantics.

Lately, Constable and Mark Bickford extended CTT to include a logic of events which Bickford has implemented in Nuprl. This theory captures many concepts developed at Cornell for the past decade in joint work with the systems group in verifying and optimizing distributed systems. Together the formal methods group and the systems group have experimented with formal protocol design, verification, and optimization. They have worked together on security properties and adaptive protocols. This work would not have been possible without the abiding interest of the Cornell systems group in reliability, security, and correctness.

Constable is also working with colleagues to build a Formal Digital Library (FDL) that will allow interactive access to theorems, proofs, and programs from Coq, Nuprl, MetaPRL, HOL, PVS, and other major theorem provers. The library includes over ten thousand theorems. Many of these are used in system verification, but a large number are from general mathematics. This work benefits from Cornell's strength in information science and digital libraries.

Constable is the director of the PRL Project, a member of the Computing Research Association Board, and the LICS general committee. He serves as editor for the *Journal of Logic and Computation*; *Formal Methods in System Design*; and *The Computer Journal*. He is a co-director of the Marktoberdorf NATO summer school.

2005–2006 Publications

"Innovations in Computational Type Theory using Nuprl," *Journal of Applied Logic*, (2006). (With S. Allen, M. Bickford, R. Eaton, and others.)

"Knowledge-based synthesis of distributed systems using event structures," *Logic for Programming, AI, and Reasoning*, LNCS 3452, 449–465 (2005). (With M. Bickford and J. Halpern.)

2005–2006 Lectures

"The Logical Basis of System Correctness, Four Lectures," Marktoberdorf NATO Summer School, (2005).

"Process Extraction in the Logic of Events," Tel Aviv University Semantics Workshop, Israel, (December 2005).

"An Abstract Theory of Events," The Technion, Israel, (January 2006).

"Transforming the Academy: Knowledge Formation in the Age of Digital Information," Distinguished Lecture Series, Northeastern University, (February 2006).

"Process Extraction in the Logic of Events," Microsoft Research, (April 2006).

"Thirty Years of Progress in Formal Methods," Celebrating Edmund M. Clarke's Sixtieth Birthday, Carnegie Mellon University, (April 2006).

2005–2006 Professional Activities

Member, Advisory Council, Computer Science Department, Princeton University Member, Review Committee, Computer Science Department University of Colorado

Member, Advisory Board, Computer Science Department, Johns Hopkins University

2005–2006 University Activities

Dean, Computing and Information Science

Member, Life Sciences Deans Committee

Awards and Honors

Fellow, Association for Computing Machinery (1995)

Fellow, Guggenheim (1991)

Recipient, Cornell Outstanding Educator Award (1989)

ALAN J. DEMERS

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DEPARTMENT OF COMPUTER SCIENCE

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Alan J. Demers received his bachelor's degree in physics from Boston College in 1970. He obtained his Ph.D. degree in computer science from Princeton University in 1975. Demers was at Cornell between 1974 and 1985, a principal scientist at Xerox Parc from 1985 to 1995, and architect at Oracle from 1995 to 2000, and he returned to Cornell in 2000.

Demers's research concerns aspects of databases and distributed systems.

With J. Gehrke, M. Riedewald, W. White, and others, he is studying complex event processing systems. The Cayuga group is studying efficient query evaluation and multi-query optimization for extensions of publish-subscribe systems that support stateful and parameterized continuous queries. The group is also considering the formal underpinnings of event systems, developing an algebra of event streams to express such queries, and studying the properties of temporal models for events.

With J. Shanmugasundaram and J. Gehrke, he is studying languages and systems for data-driven Web applications. The Hilda project is developing a high-level language for such applications. Hilda uses a declarative language with a uniform data model at all tiers of an application, enabling it to automatically detect conflicts resulting from concurrent updates and to automatically migrate functionality between application layers to optimize performance.

**2005–2006 Publications**

"Hilda: A high-level language for data-driven Web applications," *Proceedings of IEEE International Conference on Data Engineering*, (2006). (With F. Yang, J. Gehrke, M. Riedewald, and J. Shanmugasundaram.)

"Towards expressive publish/subscribe systems," *Proceedings of International Conference on Extending Database Technology*, (2006). (With J. Gehrke, M. Hong, M. Riedewald, and W. White.)

"Correctness of a gossip based membership protocol," *ACM Conference on Principles of Distributed Computing*, (2005). (With A. Alavena and J. Hopcroft.)

"Decentralized schemes for size estimation in large and dynamic groups," *Proceedings of the Fourth IEEE International Symposium on Network Computing and Applications*, (2005). (With K. Birman, I. Gupta, D. Kostoulas, and D. Psaltoulis.)

"Research issues in mining and monitoring of intelligence data," *Data Mining: Next Generation Challenges and Future Directions*, H. Kargupta, A. Joshi, K. Sivakumar, and Y. Yesha (Eds.), M.I.T./AAAI Press (2005). (With J. Gehrke and M. Riedewald.)

SHIMON EDELMAN

PROFESSOR

CIS, JOINT WITH THE DEPARTMENT OF PSYCHOLOGY
MEMBER OF THE GRADUATE FIELDS OF PSYCHOLOGY,
COMPUTER SCIENCE, AND INFORMATION SCIENCE



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Shimon Edelman received his Ph.D. in computer science from the Department of Applied Mathematics and Computer Science at the Weizmann Institute, Rehovot, Israel, in 1988. He taught and conducted research at M.I.T., the Weizmann Institute, and the University of Sussex (U.K.), before assuming his current position at Cornell, where he is professor of psychology and member of the graduate fields in psychology, computer science, and information science.

Professor Edelman has been the recipient of the Yigal Alon Fellowship and of the Levinson Prize in Mathematics, the latter for his contributions to the computational study of human vision. Over the years, Edelman has taught courses and led seminars that matched his wide range of interests in cognitive sciences. His research in the past dealt with motor control, reading, perceptual learning, visual recognition and categorization, and computational linguistics. His present interests focus on vision (scene perception) and language (acquisition and processing).

Edelman works on developing mathematical solutions to the problems at hand, on experimental assessment of these solutions as models of human cognition, and on bringing the theoretical understanding of cognition to bear on data from neurobiological studies of the brain.

Publications stemming from this research appeared in journals ranging from computational (such as the *IEEE Transactions on Pattern Analysis and Machine Intelligence*) to empirical (*Neuron*), spanning the fields of vision (*International Journal of Computer Vision*; *Vision Research*) and language (*Journal of Computational Linguistics*; *Journal of Linguistics*). Edelman's book, *Representation and Recognition in Vision*, was published by M.I.T. Press in 1999. He is currently writing a new book on computational cognitive psychology for Oxford University Press.

2005–2006 Publications

"The interaction of shape- and location-based priming in object categorisation: Evidence for a hybrid what+where representation stage," *Vision Research*, 45:2065–2080 (2005). (With F.N. Newell, D. Sheppard, and K. Shapiro.)

"Unsupervised learning of natural languages," *Proceedings of the National Academy of Science*, 102:11629–11634 (2005). (With Z. Solan, D. Horn, and E. Ruppín.)

"Motif extraction and protein classification," *Proceedings of the Fourth IEEE Computational Systems Bioinformatics Conference*, (2005). (With V. Kunik, Z. Solan, E. Ruppín, and D. Horn.)

"Mostly harmless," (review of *Action in Perception*, A. Noe, M.I.T. Press, 2005), *Artificial Life*, 12:183–186 (2006).

"Experience-induced effects on the representation of scene structure," *Proceedings of the Annual Workshop on Object Perception, Attention, and Memory*, (2005). (With A.S. Warlaumont and C.M. Hunter.)

"Why are natural scenes so easy to remember, but artificial stimuli so hard?" *Vision Sciences Society Meeting*, (2006). (With C.M. Hunter.)

2005–2006 Lectures

"Visions of Language: Through a Mirage to an Oasis," Excellence Program Seminar, Tel Aviv University, (October 2005); Scientific Forum, Tel Aviv University, (December 2005).

"Effective Learning of High-precision, Lexicalized Grammars from Raw Corpus Data," Linguistics Colloquium, Tel Aviv University, (December 2005).

"A Practical Algorithm for Learning Construction Grammars and Its Implications," Interdisciplinary Program Seminar, Hebrew University, (December 2005).

"Rationalists Do It by the Rules; Empiricists Do It to the Rules," Keynote address at the Fifth International Conference on Development and Learning, (June 2006).

2005–2006 University Activities

Sabbatical leave

Member, Steering Committee (and past director), Cornell Cognitive Studies Program

2005–2006 Professional Activities

Associate Editor, *Cognitive Science* (2005); *Behavioral and Brain Sciences*

Awards and Honors

Recipient, Levinson Prize in Mathematics (1996)

Recipient, Sir Charles Clore Career Development Chair (1994–1998)

Recipient, Yigal Alon Fellowship (1992–1995)

Recipient, Koret Foundation Postdoctoral Fellowship (1990–1992)

Recipient, Chaim Weizmann Postdoctoral Fellowship (1988–1990)

RON ELBER

PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

DIRECTOR OF BIOINFORMATIC PROJECT,

BRIDGING THE RIFT

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Ron Elber obtained a bachelor's degree in chemistry and physics in 1981 and a Ph.D. in theoretical chemistry in 1984 at the Hebrew University of Jerusalem. He was a postdoctoral fellow in theoretical biophysics from 1984 to 1987 at Harvard University. Ron was on the chemistry faculty of the University of Illinois (1987-1992) and on the chemistry and biology faculty at Hebrew University (1992-1999). Since 1999, he has been on the computer science faculty at Cornell where he is currently a full professor.

Ron's research is in computational biology and bioinformatics. His group is developing novel tools (MOIL) to simulate dynamics of biological macromolecules. His current research focuses on algorithms to extend the time scales of simulations and to study complex processes, such as the kinetics of protein folding. Ron's techniques for path following and enhanced sampling are in wide use and motivated the development of related algorithms. His bioinformatic investigations focus on protein annotation using sequence-to-structure matches (LOOPP). LOOPP linked a gene that influences the size of the tomato fruit with a human protein that controls cell growth and may cause cancer. He currently investigates the network created by sequence structure relationship in proteins.

2005–2006 Publications

"Calculation of point-to-point short time and rare trajectories with boundary value formulation," *Journal of Chemical Theory and Computation*, 2:484–494 (2006). (With D. Bai.)

"Sequence-structure relationships in proteins," *Soft Condensed Matter Physics in Molecular and Cell Biology*, W.C.K. Poon and D. Andelman (Eds.), (2006). (With J. Qiu, L. Meyerguz, and J. Kleinberg.)

"Learning to align sequences: A maximum-margin approach," *Springer Verlag Notes in Computational Science and Engineering*, 49:57–58 (2005). (With T. Joachims and T. Galor.)

"SSALN: An alignment algorithm using structure-dependent substitution matrices and gap penalties learned from structurally aligned protein pairs," *Proteins: Structure, Function and Bioinformatics*, (2006). (With J. Qiu.)



"Revisiting and parallelizing SHAKE," *Journal of Computational Physics*, (2005). (With Y. Weinbach.)

"Atomically detailed potentials to recognize native and approximate protein structures," *Proteins, Structure, Function, and Bioinformatics*, (2005). (With J. Qiu)

"Long-timescale simulation methods," *Current Opinion in Structural Biology*, 15:151–156 (2005).

2005–2006 Lectures

"Boundary Value Approach to Molecular Dynamics," School in Computational Physics, Leri, Italy, (July 2005).

"Computations of Rates Using Milestones," School in Computational Physics, Leri, Italy, (July 2005).

"Long Time Dynamics of Proteins," Workshop on Multiscale Approaches in Biophysics, Snowbird, Utah, (October 2005).

"Boundary Value Approach to Molecular Dynamics," ETHZ Workshop on Multiscale Modeling and Simulation, Zurich, Switzerland, (October 2005).

"Computations of Rates Using Milestones," ETHZ Workshop on Multiscale Modeling and Simulation, Zurich, Switzerland, (October 2005).

"Approaches to Long Time Simulations of Biological Molecules," Invited lecture at Bioinformatics Institute, Agency for Science, Technology and Research, Singapore, (January 2006).

"Protein Folding and Evolution," Invited lecture at Bioinformatics Institute, Agency for Science, Technology and Research, Singapore, (January 2006).

"Enhanced Sampling in Space and Time for Biophysical Simulations," Invited lecture at Bioinformatics Institute, Agency for Science, Technology and Research, Singapore, (January 2006).

"Long Time Dynamics of Proteins," Mathematical Biology Seminar, Iowa State University, (February 2006).

"Computing Rates with Milestones," Harvard-BU-M.I.T. Theoretical Chemistry Lecture Series, (March 2006).

"Computational Molecular Biophysics at Broad Range of Time Scales," Computer Science and Engineering Seminar, University of Notre Dame, (April 2006).

"Computations of Rates with Milestones," Invited lecture, University of Notre Dame, (April 2006).

"Approaches to Long Time Simulation of Complex Systems," Mechanical Engineering Seminar Series, Stanford University, (April 2006).

"Sequence-structure Relationships in Proteins," Computational Science and Engineering Seminar, Georgia Technical Institute, (May 2006).

"Long Time Dynamics of Proteins," Invited lecture, Georgia Technical Institute, (May 2006).

2005–2006 Professional Activities

Member, Editorial Board, *Biophysical Journal*; *Theoretical Chemistry Accounts*; *Computer Physics Communications*; *Multiscale Modeling and Simulation*

Specialist Editor, *Computer Physics Communications*

2005–2006 University Activities

Director, Ithaca campus of the Tri-Institutional Program in Computational Biology
 Director, Computational Biology Service Unit
 Director, The Library of the Desert

Awards and Honors

Recipient, The Bergman Award (1994)
 Recipient, The Alon New Faculty Award (1992–1994)
 Recipient, University of Illinois Scholar (1991–1992)
 Recipient, The Camille and Henry Dreyfus New Faculty Award (1987–1990)
 Recipient, The Stein Award for Ph.D. Studies (1984)

Selected Publications

"Cloning, transgenic expression and function of fw2.2: A quantitative trait locus key to the evolution of tomato fruit," *Science*, 289:85–88 (2000). (With A. Frary, C. Nesbitt, A. Frary, and others.)

"Anharmonic wave functions of proteins: Quantum self-consistent field calculations of BPTI," *Science*, 268:1319–1322 (1995). (With A. Roitberg, R.B. Gerber, and M.A. Ratner.)

"Multiple conformational states of proteins: A molecular dynamics analysis of myoglobin," *Science*, 235:318 (1987). (With M. Karplus.)

K-Y. DAISY FAN

ASSISTANT PROFESSOR
DEPARTMENT OF COMPUTER SCIENCE

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Daisy Fan obtained her B.Sc. and M.Sc. in civil engineering at the University of Manitoba, Canada, in 1994 and 1997, respectively, and her Ph.D. in civil and environmental engineering at Cornell University in 2002. She is currently an assistant professor in computer science. Her research interests include the application of systems-analysis techniques for water resources and environmental problems. Problems she has investigated include optimal control of multiple-reservoir operation using stochastic dynamic programming and river basin water quality management. She researches and applies collaborative learning strategies and is developing a robotics control module to teach programming concepts in an introductory programming course. Along with colleague David Schwartz, Fan develops the CS100/211 Academic Excellence Workshops which use collaborative strategies and classroom technologies to enhance student learning in programming.

Fan is active in the engineering outreach programs for high school students. As a Faculty Fellow, she organizes activities to link the academic and residential lives of students who live on campus.

Fan is the recipient of the Cornell Society of Engineers Achievement Award (2004) and several graduate teaching assistant awards (1999–2001).

**2005–2006 Publications**

"A comparison and evaluation of personal response systems in introductory computer programming," *Proceedings of the 2006 American Society for Engineering Education Annual Conference and Exposition*, (2006).

2005–2006 Professional Activities

Participant, American Society for Engineering Education Annual Conference and Exposition, (June 2006); SIGCSE Technical Symposium, (March 2006)

2005–2006 University Activities

Reviewer, Center for the Environment (Cornell)
Graduate Research Grant Program
Member, College of Engineering Admissions Committee (spring 2005)
Faculty Advisor, FIRST Robotics Club, Cornell
Faculty Panel, Hosting Event, Engineering admission
Faculty Fellow

Awards and Honors

Recipient, Cornell Society of Engineers Achievement Award (2004)
Recipient, Graduate Teaching Assistant Award (Computer Science, Cornell University, 2000, 2001)
Recipient, New York State American Water Works Association Russell L. Sutphen Scholarship (2000)
Recipient, John E. Perry Teaching Assistant Prize (Civil and Environmental Engineering, Cornell University, 1999)
Recipient, Natural Sciences and Engineering Research Council (Canada) Postgraduate Scholarship (1994–96)

PAUL FRANCIS

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DEPARTMENT OF COMPUTER SCIENCE

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Paul Francis received his Ph.D. from the University College London (UCL) in 1994. Dr. Francis is one of the industry's foremost scientists in large-scale routing and addressing, and internetworking. He has nearly twenty years of research experience in network routing and addressing, large-scale self-configuring networks, and distributed peer-to-peer search.

Francis has done research at MITRE Corporation, Bellcore, NTT Software Labs, and ACIRI (now ICIR), and was chief scientist at two startups, FastForward Networks and Tahoe Networks. Dr. Francis's innovations include NAT (Network Address Translation), multicast shared trees (used in PIMSM and CBT), shortcut routing, and landmark routing. His work anticipated two key IPv6 concepts: the unique host identifier (from Pip) and the use of multiple addresses for multihomed sites.

Dr. Francis's research interests looking forward are in the areas of network management (configuring, provisioning, debugging), Internet scaling and addressing (IP anycast deployment, scalability of Internet routing, IP-level DDoS architectures), IP connectivity (NAT and secure firewall traversal), P2P networks (overlay multicast, organization of unstructured overlays, host proximity) and TCP performance.

Dr. Francis has chaired two IETF working groups and has published numerous RFCs, U.S. and international patents, and research papers.

**2005–2006 Publications**

"On heterogeneous overlay construction and random node selection in unstructured P2P networks," *Proceedings of Infocom 2006*, (2006). (With V. Vishnamurthy.)

"Characterization and measurement of TCP traversal through NATs and firewalls," *Proceedings of Internet Measurement Conference*, (2005). (With S. Guha.)

"Chunkyspread: Multi-tree unstructured end system multicast," *Proceedings of the Fifth International Workshop on Peer-to-Peer Systems*, (2006). (With V. Venkataraman.)

"Towards a global IP anycast service," *Proceedings of SIGCOMM 2005*, (2005). (With H. Ballani.)

"NAT behavioral requirements for unicast TCP," Internet Draft: draft-hoffman-behave-tcp-02, (July 2005). (With P. Hoffman and S. Guha.)

2005–2006 Lectures

"Network Issues in P2P," First keynote, IEEE Tenth International Workshop on Web Content Caching and Distribution, (September 2005).

"Deep-4D: A New Architecture for Network Management," Microsoft Summit on Self-Managing Networks, (June 2005).

2005–2006 Professional Activities

Invited Participant, Cisco Summit on Network Management; Microsoft Summit on Edge Networks Participant, NSF GENI Townhall Meeting

Awards and Honors

Co-PI, ARDA/NSA, Stepping-stone Traceback
 PI, Cisco, Internet Signalling
 PI, Cisco, Anycast Deployment

ERIC FRIEDMAN

ASSOCIATE PROFESSOR
SCHOOL OF OPERATIONS RESEARCH AND
INDUSTRIAL ENGINEERING
MEMBER OF THE GRADUATE FIELD OF
COMPUTER SCIENCE

ejf27@cornell.edu
<http://www.people.cornell.edu/pages/ejf27/>

Eric Friedman received an A.B. in physics from Princeton (1985) and an M.A. in physics (1987) and M.S. and Ph.D (1993) in operations research from Berkeley. He was on the faculty at Duke (decision sciences) and Rutgers (economics) before joining the faculty of ORIE at Cornell in 2001.

Eric's research is at the intersection of game theory, computer science, and operations research. Current projects include: constructing reputation systems for peer-to-peer networks, web search, designing fair and efficient web-serving algorithms, and allocating bandwidth in heterogeneous wireless systems. He is also interested in self-organized-critical systems, learning in games, and the geometric structure of cost allocation methods.

2005–2006 Publications

"Manipulability of PageRank under Sybil strategies," (to appear) *Proceedings of the First Workshop on the Economics of Networked Systems*, (2006). (With A.Cheng.)

"Efficiency and Nash equilibria in a scrip system for P2P networks," (to appear) *Proceedings of the Seventh ACM Conference on Electronic Commerce*, (2006). (With J. Halpern and I. Kash.)

"Sybilproof reputation mechanisms," *Proceedings of Third Workshop on Economics of Peer-to-Peer Systems*, (2005). (With A. Cheng.)



2005–2006 Lectures

"Scaling, Renormalization, and Universality in Combinatorial Games," BIRS Combinatorial Game Theory Workshop, UC Berkeley CS.

"Sybilproof Reputation Mechanisms," Microsoft Research; Workshop on the Economics of Networked Systems; Rice University; Stanford.

2005–2006 Professional Activities

Participant, NSF Workshop

Member, Program Committee, ACM Conference on Electronic Commerce

Co-chair, Third Workshop on the Economics of Peer-to-Peer Systems (2005)

GERI GAY

KENNETH J. BISSETT PROFESSOR
CIS, JOINT WITH COMMUNICATION

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<http://www.hci.cornell.edu/people/gay.htm>

Geri Gay is the director of the Human Computer Interaction Group (HCI Group) and the Kenneth J. Bissett professor and chair of the Department of Communication. She received her Ph.D. from Cornell in 1985.

The HCI Group is an interdisciplinary research team investigating social, psychological, and design issues using an iterative, user-centered approach building multimedia environments that support involvement, experimentation, exploration, and collaboration. Dr. Gay's research interests focus on cognitive and social issues for the design and use of interactive communication technologies. Her research examines navigation issues, knowledge management, mental models and metaphors, social networks, collaborative work and learning, and design.

Professor Gay teaches courses in interactive multimedia design and research, computer-mediated communication, human-computer interaction, and the social design of communication systems.

2005–2006 Publications

"Focused activities and the development of social capital in a distributed learning community," *Information Society*, 22(1):25–39 (2006). (With Y. Yuan and H. Hembrooke.)

"Affective presence in museums. Ambient systems for creative expression," *Journal of Digital Creativity*, 16(2):7–89 (2005). (With K. Boehner and P. Sengers.)

"The effects of expertise and feedback on search term selection and subsequent learning," *Journal of the American Society for Information Science and Technology*, 56(8):861–872 (2005). (With H. Hembrooke, L. Granka, and E. Liddy.)

"How do communication and technology researchers study the internet?" *Journal of Communication*, 55(3):632–657 (2005). (With J. Walther and J. Hancock.)

"Drawing evaluation into design for mobile computing: A case study of the Renwick Gallery's handheld education project," *Journal of Digital Libraries, Special Issue on Digital Museums*, 5(3):219–230 (2005). (With K. Boehner and C. Larkin.)

**JOHANNES GEHRKE**

ASSOCIATE PROFESSOR,
DEPARTMENT OF COMPUTER SCIENCE
ASSOCIATE DIRECTOR,
CORNELL THEORY CENTER

johannes@cs.cornell.edu
<http://www.cs.cornell.edu/johannes>

Johannes Gehrke received his Ph.D. in computer science from the University of Wisconsin-Madison in 1999, and he is now an associate professor in computer science at Cornell. Gehrke is also an associate director of the Cornell Theory Center.

Gehrke's research interests are in the areas of data mining, data stream processing, and data privacy. In his current research, Gehrke's group is building a scalable system for stateful publish-subscribe of XML data streams for enterprise-wide information management. He is also working on data privacy with a focus on privacy-preserving data mining and on techniques for publishing data while controlling the amount of information that is released. His data mining research focuses on novel data mining algorithms, and his group has developed some of the fastest known algorithms for several important data mining tasks. He is also collaborating with several groups of scientists across campus to solve their data management and data mining problems.

Gehrke has given courses and tutorials on data mining and data stream processing at international conferences and on Wall Street, and he has extensive industry experience as technical advisor and consultant.

Activity-centered Design: An Ecological Approach to Designing Smart Tools and Usable Systems. M.I.T. Press (2004). (With H. Hembrooke.)

2005–2006 Professional Activities

Chair, Department of Communication (2004–)

Director of Graduate Studies, Information Science Ph.D. Program (2003–2004)

Director, Human Computer Interaction Group (2001–)

2005–2006 University Activities

Member, Wisdom in the Digital Age Task Force

Member, CIS Council Committee (2004–)

Member, CIS Building Committee (2003–)

Advisor, CALS Technology Committee (2003–)

Member, Founder's Board, Faculty of Computing and Information Science (1999–)

Awards and Honors

Recipient, Kenneth J. Bissett '89 Senior Professorship in Communication, Cornell University (2005)

Recipient, Stephen H. Weiss Presidential Fellowship Teaching Award, Cornell University (2004)

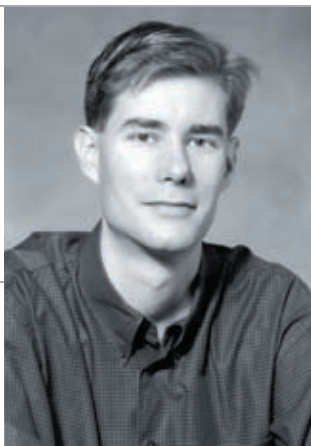
Recipient, Chancellor's Award for Excellence in Teaching, SUNY (2001)

Member, Merrill Presidential Scholar Faculty (2000)

Recipient, Innovative Teaching Award, College of Agriculture and Life Sciences (2000)

Recipient, Distinguished Teaching Award of the Cornell Chapter of Sigma Delta, the Honor Society of Agriculture and Life Sciences, Human Ecology, and Veterinary Medicine (1996)

IBM Consulting Scholar (1989–1992)



2005–2006 Publications

"Injecting utility into anonymized datasets," *Proceedings of the 2006 ACM SIGMOD International Conference on Management of Data*, (2006). (With D. Kifer.)

"On the efficiency of checking perfect privacy," *Proceedings of the Twenty-fifth ACM SIGMOD SIGACT-SIGART Symposium on Principles of Database Systems*, (2006). (With A. Machanavajjhala.)

"l-Diversity: Privacy beyond k-Anonymity," *Proceedings of the Twenty-second IEEE International Conference on Data Engineering*, (2006). (With A. Machanavajjhala, D. Kifer, and M. Venkatasubramanian.)

"Hilda: A high-level language for data-driven Web applications," *Proceedings of the Twenty-second IEEE International Conference on Data Engineering*, (2006). (With J. Shanmugasundaram, F. Yang, M. Riedewald, and A. Demers.)

"Trusted CVS," *Proceedings of the International Workshop on Security and Trust in Decentralized/Distributed Data Structures*, (2006). (With M. Venkatasubramanian, A. Machanavajjhala, and D. Martin.)

"Three case studies of large-scale data flows," *Proceedings of the IEEE Workshop on Workflow and Data Flow for Scientific Applications*, (2006). (With W. Arms, S. Aya, M. Calimlim, and others.)

"Towards expressive publish/subscribe systems," *Proceedings of the Tenth International Conference on Extending Database Technology*, (2006). (With A. Demers, M. Hong, M. Riedewald, and W. White.)

"Classification and regression trees," *Encyclopedia of Data Warehousing and Mining*, John Wang (Ed.), Information Science Publishing, (2005).

"Semantic approximation of data stream joins," *IEEE Transactions on Knowledge and Data Engineering*, 17(1) (2005). (With A. Das and M. Riedewald.)

"Automatic subspace clustering of high dimensional data," *Data Mining and Knowledge Discovery*, 11(1) (2005). (With R. Agrawal, D. Gunopulos, and P. Raghavan.)

"Directions in multi-query optimization for sensor network," *Advances in Pervasive Computing and Networking*, Springer Verlag, (2005). (With A. Demers, R. Rajaraman, N. Trigoni, and Y. Yao.)

2005–2006 Lectures

"Privacy and Background Knowledge," Keynote at the Twenty-second International Conference on Machine Learning, (August 2005).

"Privacy-Preserving Data Mining," Keynote at SAS M2005 Data Mining Conference, (October 2005).

"Models and Methods for Privacy-Preserving Data Mining and Data Publishing," Invited tutorial at the Fifth IEEE International Conference on Data Mining, (November 2005).

"Privacy Breaches in Privacy-Preserving Data Mining," Colloquium, Yale University, (November 2005).

"Models and Methods for Privacy-Preserving Data Publishing and Analysis," Invited Advanced Technology Seminar, Twenty-second International Conference on Data Engineering, (April 2006).

"Towards Stateful Publish/Subscribe," Invited Research Seminar, Google, (May 2005).

"Data Privacy and Background Knowledge," Harvard University Center for Research on Computation and Society Spring Workshop, (June 2005).

2005–2006 Professional Activities

Associate Editor, *Journal of Privacy and Confidentiality* (2006); *IEEE Transactions on Data Engineering* (2004–); *Knowledge and Information Systems* (2000–2006); *Journal of Database Management* (1999–2005)

Member, Editorial Board, *Foundations and Trends in Databases* (2006); *Journal of Privacy Technology* (2004–); *Machine Learning Journal* (2003–)

Member, Inaugural Editorial Board, *ACM Transactions on Data Mining* (2005–)

Action Editor, *Data Mining and Knowledge Discovery* (2003–)

Member, ACM SIGKDD Curriculum Committee

Member, Program Committee, Thirty-first International Conference on Very Large Data Bases (August 2005); Eleventh ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (August 2005); Fifth IEEE International Conference on Data Mining (November 2005); Tenth International Conference on Extending Database Technology (March 2006); Twenty-fifth ACM SIGMOD International Conference on Management of Data (June 2006)

Area Chair, Twenty-second International Conference on Machine Learning (August 2005); Twenty-second International Conference on Data Engineering (April 2006); Sixth SIAM International Conference on Data Mining (April 2006)

Best Paper Award Committee Member, Twenty-second International Conference on Data Engineering (April 2006); Twenty-fifth ACM SIGMOD International Conference on Management of Data (June 2006)

2005–2006 University Activities

Member, Department Chair Search Committee, Department of Computer Science, Cornell (2005–2006)

Awards and Honors

Recipient, Cornell University Provost's Award for Distinguished Scholarship (2004)

Recipient, Alfred P. Sloan Foundation Fellowship (2003)

Recipient, National Science Foundation CAREER Award (2002)

Recipient, James and Mary Tien Excellence in Teaching Award, Cornell College of Engineering (2001)

Recipient, IBM Faculty Development Award (2000 and 2001)

Selected Publications

"Limiting privacy breaches in privacy preserving data mining," *Proceedings of the Twenty-second ACM SIGACT-SIGMOD-SIGART Symposium on Principles of Database Systems*, (2003). (With A. Evfimievski and R. Srikant.)

"Query processing in sensor networks," *Proceedings of the First Biennial Conference on Innovative Data Systems Research*, (2003). (With Y. Yao.)

Database Management Systems, Third Edition, McGraw Hill, (2002). (With R. Ramakrishnan.)

TARLETON GILLESPIE

ASSISTANT PROFESSOR

CIS, JOINT WITH COMMUNICATION

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Tarleton Gillespie received his bachelor's degree (1994) in English from Amherst College, his master's (1997) and his Ph.D. in Communication (2002) from the University of California at San Diego. His research uses recent disputes over digital copyright to analyze the historical contest over the dynamics of information, law, and technology. These cases help him examine the cultural and institutional arrangements surrounding media and Internet technologies, consider how power and practice are woven into their use, and uncover how cultural notions of their value are contested and reinforced. In particular, he is interested in the way that the project of getting technologies to regulate users "by themselves" in fact requires the political mobilization of an array of institutions and the cultural legitimization of the project such these efforts seem the only reasonable approach.

His first book, *Wired Shut: Copyright and the Shape of Digital Culture*, slated to be published by M.I.T. Press in spring 2007, addresses this "legal turn to technology" and the political and cultural arrangements it requires. His article "Engineering a principle: 'end-to-end' in the design of the Internet," recently appeared in the June 2006 issue of *Social Studies of Science*; "'Designed to effectively frustrate': Copyright, technology, and the agency of users" appeared in the August 2006 issue of the journal *New Media and Society*. His essay "Autonomy and morality in DRM and anti-circumvention law," co-authored with cyberlaw scholar Dan Burk, is set to appear in the journal *Triple C: Cognition, Communication, Cooperation*. He has also written several opinion pieces on copyright issues for InsideHigherEd.com.



PAUL GINSPARG

PROFESSOR

CIS, JOINT WITH PHYSICS

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Paul Ginsparg received his A.B. in physics from Harvard University in 1977 and his Ph.D. in physics from Cornell in 1981 (Quantum Field Theory, thesis advisor: Kenneth G. Wilson). He was in the Harvard Society of Fellows from 1981 to 84, and a junior faculty member in the Harvard physics department from 1984 to 90. From 1990 to 2001, he was a technical staff member in the theoretical division at the Los Alamos National Laboratory.

Ginsparg came to Cornell in 2001, where he holds a joint appointment in the Department of Physics and the Faculty of CIS. He has been an A.P. Sloane Fellow and a Department of Energy Outstanding Junior Investigator, and has held visiting positions at C.E.N. Saclay, France; Princeton University; Stanford Linear Accelerator Center; the Institute for Advanced Studies, Princeton; the Institute for Theoretical Physics, University of California at Santa Barbara; the Mathematical Science Research Institute, University of California at Berkeley; and Hebrew University of Jerusalem. In 1991, Ginsparg initiated the "e-print arXiv" as a new form of communications research infrastructure for physics.

Ginsparg's current research in information science investigates the optimal combination of automated text classification, data mining, machine learning, human-computer interaction, quantum field theory, and related techniques for use in research communications infrastructure.

2005–2006 Lectures

Paul Evan Peters Award Lecture, Coalition for Networked Information Meeting, Washington, DC, (April 2006).

Keynote, American Institute of Physics Seventy-fifth Anniversary Meeting, College Park, MD, (May 2006).

Keynote, MacArthur Fellows Meeting, Racine, WI, (May 2006).

Keynote, Institute for Computer Policy and Law Annual Meeting, Ithaca, NY, (June 2006).



2005–2006 Professional Activities

Member, Advisory Board, Public Library of Science;
French CNRS Centre Communication Scientifique
Directe; Journal Club for Condensed Matter Physics

2005–2006 University Activities

Member, Cornell Faculty Advisory Board on
Information Technology

Member, Cornell Library Board

Member, CIS Council

Member, Graduate Field Committee, Cornell
Information Science

Awards and Honors

Recipient, Paul Evans Peters Award from Educause,
the Association of Research Libraries, and the
Center for Networked Information (2006)

Recipient, Council of Science Editors' Award for
Meritorious Achievement (2005)

Fellow, John D. and Catherine T. MacArthur
Foundation (2002)

Fellow, American Physical Society (2000)

Recipient, Lingua Franca "Tech 20" Award (1999)

Recipient, P.A.M. (Physics Astronomy Math) Award,
Special Libraries Association (1998)

Recipient, Distinguished Performance Award, Los
Alamos National Laboratory (1992)

Recipient, Department of Energy Outstanding
Junior Investigator (1986–91)

Fellow, A.P. Sloan Foundation (1986–90)

Fellow, Harvard Society (1981–84)

Fellow, A.D. White, Cornell University (1977–81)

CARLA P. GOMES

ASSOCIATE PROFESSOR

CIS, JOINT WITH APPLIED ECONOMICS AND
MANAGEMENT AND COMPUTER SCIENCEDIRECTOR, INTELLIGENT INFORMATION SYSTEMS
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http://www.cs.cornell.edu/gomes

Carla P. Gomes obtained a Ph.D. in computer science in the area of artificial intelligence and operations research from the University of Edinburgh in 1993. She also holds a M.Sc. in applied mathematics from the University of Lisbon.

Gomes is the director of the Intelligent Information Systems Institute (IISI) at Cornell. Her research has covered many areas in artificial intelligence and computer science, including planning and scheduling, integration of constraint and mathematical programming techniques for solving combinatorial problems, complete randomized search methods, and algorithm portfolios. Gomes's research spans the full range of theory to applications. Gomes's central research themes program are the integration of concepts from mathematical programming with constraint programming; the study of the impact of structure on problem hardness; and the use of randomization techniques to improve the performance of exact (complete) search methods.

Gomes's current projects focus on the interplay between problem structure and computational hardness, the use of approximation methods in large-scale constraint-based reasoning systems, and applications of constraint-based reasoning and optimization to combinatorial problems, such as those arising in combinatorial design, autonomous distributed agents, and most recently, combinatorial auctions. She is the program co-chair of the Ninth International Conference on Theory and Applications of Satisfiability Methods, and she was the conference chair of the Eighth International Conference on Principles and Practice of Constraint Programming. She was also a member of the Executive Council of the American Association for Artificial Intelligence (2002-2005).

2005-2006 Publications

"Model counting: A new strategy for obtaining good bounds," *Proceedings of the Twenty-first National Conference on Artificial Intelligence*, (2006). Best paper award. (With B. Selman and A. Sabharwal.)

"The impact of balancing on problem hardness in a highly structured domain," *Proceedings of the Twenty-first National Conference on Artificial Intelligence*, (2006). (With C. Ansotegui, R. Béjar, C. Fernández, and C. Mateu.)

"Randomness and structure," *Handbook of Constraint Programming*, P. van Beek, F. Rossi, and T. Walsh (Eds.), Elsevier, (2006).

"The power of semidefinite programming relaxations for MAXSAT," *Proceedings of Conference on Integration of AI/OR Techniques*, (2006). (With W. van Hoeve and L. Leahu.)

"Regular-SAT: A many-valued approach for solving combinatorial problems," *Discrete Applied Mathematics*, (2006). (With R. Béjar, A. Cabiscot, C. Fernandez, and F. Manyà.)

"Can get satisfaction," *Nature*, 435:751-752 (2005). (With B. Selman.)

"The Achilles' heel of QBF," *Proceedings of the Twentieth National Conference on Artificial Intelligence*, (2005). (With C. Ansotegui and B. Selman.)

"Approximation algorithms," *Introduction to Optimization, Decision Support and Search Methodologies*, Burke and Kendall (Eds.), Kluwer, (2005).

"Statistical regimes across constrainedness regions," *Constraints*, 10(4):317-337 (2005). (With C. Fernandez, B. Selman, and C. Bessière.)

"Streamlining local search for spatially balanced latin squares," *Proceedings of the Nineteenth International Joint Conference on Artificial Intelligence*, (2005).

2005-2006 Professional Activities

Tutorial Chair, Twenty-First National Conference on Artificial Intelligence, (2006)

Executive Council of the American Association for Artificial Intelligence, (2002-2005)

Member, Editorial Board, *Journal of Artificial Intelligence Research*; *Journal of Knowledge Engineering Review*; *Journal of Satisfiability*; *International Journal on Artificial Intelligence Tools*

Program Co-chair, Ninth International Conference on Theory and Applications of Satisfiability Methods (2006)

Member, Program Committee, Twentieth National Conference on Artificial Intelligence (2005); Nineteenth International Joint Conference on Artificial Intelligence (2005); Ninth International Conference on the Principles and Practice of Constraint Programming (2005-2006); Seventh International Conference on the Integration of AI and OR in CP for Combinatorial Optimization (2005-2006); International Conference on Automated Planning and Scheduling (2005-2006)

2005-2006 University Activities

Director, Intelligent Information Systems Institute

Member, Faculty Advisory Board on Information Technologies

Member, Committee on Support of Teaching & Learning

Awards and Honors

Recipient, Best Paper Award, "Model counting: A new strategy for obtaining good bounds," *Proceedings of the Twenty-first National Conference on Artificial Intelligence*, (2006). (With B. Selman and A. Sabharwal.)

Recipient, Distinguished Paper Award, "Statistical regimes across constrainedness regions," *Proceedings of the Tenth International Conference on the Principles and Practice of Constraint Programming*, (2004). (With C. Fernandez, B. Selman, and C. Bessière.)

DONALD P. GREENBERG

JACOB GOULD SCHURMAN PROFESSOR
MEMBER OF CIS, THE JOHNSON SCHOOL OF
MANAGEMENT, THE DEPARTMENT OF ARCHITECTURE,
AND THE GRADUATE FIELD OF COMPUTER SCIENCE

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director.html](http://www.graphics.cornell.edu/people/director.html)

Dr. Greenberg joined the faculty of Cornell in 1968, with a joint appointment in the Departments of Architecture and Structural Engineering. His prior education was in both the architecture and engineering disciplines at Cornell University and Columbia University. From 1960 to 1965, he served as a consulting engineer with Severud Associates and was involved with the design of numerous building projects, including the St. Louis Arch, New York State Theater of the Dance at Lincoln Center, and Madison Square Garden. He has taught courses in structural analysis and design, architectural design, shell structures, reinforced concrete, and computer applications in architecture.

Of his two hundred plus graduate students, many have gone on to become leaders in the fields of computer graphics, computer animation, and computer-aided design for architecture. Five have now won Hollywood Oscars.

Since 1966, Dr. Greenberg has been researching and teaching in the field of computer graphics. During the last fifteen years, he has been primarily concerned with research advancing the state-of-the-art in computer graphics and with utilizing these techniques as they may be applied to a variety of disciplines. His specialties include real time realistic image generation, geometric modeling, color science, and computer animation. He presently teaches the computer graphics courses in computer science, computer-aided design in architecture, computer animation in art, and technology strategy in the Business School.

Working with the General Electric Visual Simulation Laboratory, he produced a sophisticated computer graphics movie, "Cornell in Perspective" as early as 1971. He is the author of hundreds of articles on computer graphics (including two published in *Scientific American*, May 1974 and February 1991, both of which have been highly publicized), and he has lectured extensively on the uses of computer graphics techniques in research applications.

He was the founding director of the

National Science Foundation Science and Technology Center for Computer Graphics and Scientific Visualization. He has been the director of the Program of Computer Graphics for thirty-one years and was the originator and former director of the Computer Aided Design Instructional Facility at Cornell University.

2005–2006 Publications

"Lightcuts: A scalable approach to illumination," *Proceedings of ACM SIGGRAPH*, (24)3:1098–1107 (2005). (With B.J. Walter, S. Fernandez, A. Arbree, and others.)

"Implementing lightcuts," *Proceedings of ACM SIGGRAPH*, (24)3 (2005). (With B.J. Walter, S. Fernandez, A. Arbree, and others.)

"Accurate direct illumination using iterative adaptive sampling," *IEEE Transactions on Visualization and Computer Graphics*, (12)3:353–364 (2006). (With M. Donikian, B.J. Walter, K. Bala, and S. Fernandez.)

2005–2006 Lectures

"Universities in the 21st Century," 1955 Reunion Panel, Cornell University, Ithaca, NY, (June 2005).

"Means of Architectural representation: The World is 3D," Cornell Alumni University, Cornell University, Ithaca, NY, (July 2005).

"Science and Technology Center for Computer Graphics and Scientific Visualization," National Science Foundation Talk, STC Class of FY 2005 Orientation Meeting, (November 2005).

"Strategies with Digital Systems," NBA 609, Guest Lecturer, Johnson Graduate School of Management, Cornell University, Ithaca, NY, (March 2005).

"Computer Animation," Lehman Alternative Community High School (High School Media Arts Class), Ithaca, NY, (May 2006).

Computer Animation Fest, Willard Straight Hall, Cornell Cinema, Ithaca, NY, (May 2006).

2005–2006 Professional Activities

Founding Director, National Science and Technology Center for Computer Graphics and Scientific Visualization

Technical Advisory Board, Intel Corporation

Member, Board of Directors, Interactive Data Corporation; Chyron

Member, Technical Advisory Board, Intel Corporation



Member, SIGGRAPH Awards Committee

Member, NSF Committee on the Future of Computer Graphics

2005–2006 University Activities

Professor, Architecture, Art, Computer Science, and Johnson Graduate School of Management

Member, Fields of Civil Engineering and History of Science and Technology

Member, Provost Committee, Digital Arts & Graphics

Member, Cornell University, Athletic Hall of Fame

Member, Computing and Information Science

Member, (CIS) Founders

Awards and Honors

Fellow, American Association for the Advancement of Science (2002)

Recipient, Honorary Doctoral Degree, New Jersey Institute of Technology (1999)

Recipient, Architectural Schools Computing Association Creative Research Award in Architecture (1997)

Fellow, Association for Computer Machinery (1994)

Founding Fellow, American Institute of Medical and Biological Engineering (1992)

Member, National Academy of Engineering (1991)

Recipient, NCGA Academic Award (highest educational award given by the National Computer Graphics Association) (1989)

Recipient, ACM SIGGRAPH Steven A. Coons Award for Outstanding Creative Contributions to Computer Graphics (1987)

DAVID GRIES

ASSOCIATE DEAN OF ENGINEERING FOR
UNDERGRADUATE PROGRAMS

PROFESSOR, COMPUTER SCIENCE DEPARTMENT
CORNELL WEISS PRESIDENTIAL FELLOW

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Professor Gries's research is aimed at gaining a better understanding of the programming process with respect to both sequential and concurrent (or parallel) programs. The work requires investigation of theories of program correctness and their application, as well as investigation of other concepts in the semantics of programming languages.

Education is also a strong interest for Gries, particularly the first few courses in computer science. Under the thesis that logic is the glue that binds together reasoning in all domains, colleague F.B. Schneider developed a text "A Logical Approach to Discrete Math," which makes a usable "calculational logic" the foundation for almost all the discrete math topics.

Gries and his son, Paul, have co-authored an introductory programming text using Java, which comes with a "livetext"-text that comes on a CD and has over 250 two to three minute recorded lectures with synched animation, as well as other innovative features.

2005–2006 Publications

Editor, *Computer Science Department Fortieth Anniversary Booklet*, (October 2005).

2005–2006 Lectures

"Programming and Software Engineering Education," Keynote address, Thirtieth Annual Software Engineering Workshop, (April 2006).

"Calculation Logic—A Logic for People," Math seminar, Ithaca College, Ithaca, NY, (April 2006).

"Teaching Program Development," Computer Science Department, IIT Kanpur, India, (November 2005).

"CS Education," Invited presentation, NSF Workshop on Integrative Computing Education and Research, (November 2005).

"Compiler Writing," Two-week practicum, Computer Science and Math Department, Sathya Sai Institute of Higher Learning, Puttaparthi, India, (July 2005).

"The Science of Programming," InfoSys, Bangalore, India, (July 2005).

2005–2006 Professional Activities

Editorial Board, *Acta Informatica*

Advisory Editor, *Information Processing Letters* (1972–)

Co-editor, Springer Verlag Texts and Monographs Series (1972–)

Member, IEEE Piore Award Committee

Participant, NSF Workshop on Integrative Computing Education and Research, Boston, MA, (November 2005)

Executive producer, "Biffie, You're Doing a Heck of a Job", Engineering Ethics Play, (December 2005)

2005–2006 University Activities

Associate Dean for Undergraduate Programs

Awards and Honors

Recipient, Doctor of Science (Honorary Degree), Oxford University, Miami, Ohio (1999)

Recipient, Doctor of Laws (Honorary Degree), Daniel Webster College, Nashua, New Hampshire (1996)



Recipient, ACM Karl V. Karlstrom Outstanding Educator Award (1996)

Recipient, Cornell University Computer Science Department Faculty of the Year (ACSU) (1995–1996)

Fellow, Weiss Presidential (for contributions to undergraduate education), Cornell University (1995)

Recipient, Taylor L. Booth Award Education Award, IEEE Computer Society (1994)

Fellow, Association for Computing Machinery (Charter member, among the first group to be inducted) (1994)

Recipient, ACM SIGCSE Award for Outstanding Contributions to Computer Science Education (1991)

Recipient, Computing Research Association Award for Service to the Computing Community (1991)

Fellow, American Association for the Advancement of Science (1990)

Chosen by a Cornell Merrill Presidential Scholar (Thomas Yan) as the faculty member who had the most positive influence on his education at Cornell (1990)

Recipient, Clarke Award for Excellence in Undergraduate Teaching, College of Arts and Science, Cornell University (1986–1987)

Recipient, Education Award, American Federation of Information Processing Societies (1986)

Fellow, Guggenheim (1983–1984)

Recipient, ACM Programming Systems and Languages Paper Award (With S. Owicki) (1977)

ZYGMUNT J. HAAS

PROFESSOR OF THE SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING
MEMBER OF THE GRADUATE FIELDS OF COMPUTER SCIENCE AND
THE CENTER FOR APPLIED MATHEMATICS

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Zygmunt J. Haas received his B.Sc. in 1979 and his M.Sc. in 1985. In 1988, after earning his Ph.D. from Stanford University, he joined the AT&T Bell Laboratories, where he pursued research on wireless communications, mobility management, fast protocols, optical networks, and optical switching. In August 1995, he joined the faculty of the School of Electrical and Computer Engineering at Cornell University, where he is now a professor and the Associate Director for Academic Affairs.

Dr. Haas is an author of numerous technical conference and journal papers, and holds sixteen patents in the areas of high-speed networking, wireless networks, and optical switching. He has organized several workshops, delivered numerous tutorials at major IEEE and ACM conferences, and serves as editor of several journals and magazines, including *IEEE Transactions on Wireless Communications*, *IEEE Communications Magazine*, and *Springer Wireless Networks*. He has been a guest editor of several special issues of *IEEE Communications Magazine*, the latest on the topic of "Public Safety." He has also edited three issues of *IEEE Journal on Special Areas in Communications* ("Gigabit Networks," "Mobile Computing Networks," and "Ad-Hoc Networks"). Dr. Haas served as a Chair of the IEEE Technical Committee on Personal Communications and is currently serving as the Chair of the Steering Committee of the *IEEE Pervasive Computing* magazine. His interests include mobile and wireless communication and networks, performance evaluation of large and complex systems, and biologically inspired networks.

The Wireless Network Laboratory (WNL) at Cornell (<http://wnl.ece.cornell.edu>) has been extensively involved in research into the various aspects of the Ad Hoc Networking Technology in areas such as routing, MAC design, security, multicast, scalability, and topology control. The ad hoc networking community has exhibited strong interest in the WNL research results, publications, and developed software, in particular, the release of the second version of WNL's scalable net-

work simulator, JIST (<http://jist.ece.cornell.edu>), which is capable of simulating hundreds of thousands of nodes, orders of magnitude larger than any other tool publicly available until now. Indeed, JIST's performance significantly advances the state-of-the-art simulation capability. In the area of stochastic routing, WNL has proposed and developed algorithms for "gossiping," a technique that allows highly efficient coverage of very large networks. These practical low-complexity algorithms are implementable with efficiency close to the theoretical bounds. The WNL's first paper on gossiping in wireless networks was the eighth most cited paper in the year 2003 according to CiteSeer, the Scientific Literature Digital Library. Professor Haas's research group also continues to study a number of biologically-inspired networks whose operations (e.g., routing, topology control) are inspired by phenomena from the biological world. In particular, WNL researchers have shown that animal mobility could be used to implement "delay-tolerant" networks with considerable efficiency by trading storage for delay and delay for energy. Several invited book chapters on this topic contributed by the WNL members demonstrate the interest of the scientific community in this new networking paradigm. WNL has also been involved recently in research into Large and Complex Systems and Networks.

2005–2006 Publications

"Securing data communication in mobile ad hoc networks," (to appear) *IEEE Journal on Selected Issues in Communications*, (2006). (With P. Papadimitratos.)

"On the scalability and capacity of single-user-detection based wireless networks with isotropic antennas," (to appear) *IEEE Transactions on Wireless Communications*, (2006). (With O. Arpacioğlu.)

"Analyzing split channel medium access control schemes," (to appear) *IEEE Transactions on Wireless Communications*, (2006). (With J. Deng and Y.S. Han.)

"A new networking model for biological applications of ad hoc sensor networks," *ACM/IEEE Transactions on Networking*, 14:1 (2006). (With T. Small.)

"Public safety applications of wireless communication and networking technologies," Editorial, *IEEE Communications Magazine*, (January 2006). (With L.E. Miller.)



2005–2006 Professional Activities

Editorial Board, *IEEE Transactions on Wireless Communications*; *IEEE Communications Magazine*; *Wireless Communications and Mobile Computing Journal*; *Journal of High Speed Networks*; *Springer Wireless Networks Journal*

Chair, Steering Committee, *IEEE Pervasive Computing*

Chair, Technical Program Committee, Third IEEE International Conference on Mobile Ad Hoc and Sensor Systems (2006)

General Co-Chair, Fifth Workshop on Applications and Services in Wireless Networks, (2005)

Member, IEEE TCPC Award Committee

Member, Steering Committee, ACM MobiCom

2005–2006 University Activities

Associate Director of Academic Affairs, School of Electrical and Computer Engineering, Cornell University

Policy Committee, School of Electrical and Computer Engineering, Cornell University

Recruiting Committee, School of Electrical and Computer Engineering, Cornell University

M.Eng Committee, School of Electrical and Computer Engineering, Cornell University

Review Board, Learning Initiatives For Engineers (LIFE), Undergraduate Research Program, College of Engineering, Cornell University

Admissions Advisory Committee, College of Engineering, Cornell University

Ad Hoc Promotion and Ad Hoc Tenure Promotion Committees, College of Engineering, Cornell University

Awards and Honors

Distinguished Lecturer, IEEE Communications Society (2004–2005)

Distinguished Lecturer Tour, Australia (September 26–October 3, 2005)

Recipient, Best Paper Award. "Optimal resource allocation for UWB wireless ad hoc networks," *IEEE Sixteenth International Symposium on Personal Indoor and Mobile Radio Communications*, (2005). (With C. Zou.)

JOSEPH HALPERN

PROFESSOR

DIRECTOR OF GRADUATE STUDIES



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<http://www.cs.cornell.edu/home/halpern/>

Joseph Halpern received a Bs.C. in mathematics from the University of Toronto in 1975 and a Ph.D. in mathematics from Harvard in 1981. In between, he spent two years as the head of the Mathematics Department at Bawku Secondary School, in Ghana. After a year as a visiting scientist at M.I.T., he joined the IBM Almaden Research Center in 1982, where he remained until 1996, also serving as a consulting professor at Stanford. In 1996, he joined the Department of Computer Science at Cornell.

Halpern's major research interests are in reasoning about knowledge and uncertainty, security, distributed computation, game theory, and decision theory. Together with his former student, Yoram Moses, he pioneered the approach of applying reasoning about knowledge to analyzing distributed protocols and multi-agent systems. He has coauthored five patents, two books (*Reasoning About Knowledge* and *Reasoning About Uncertainty*), and over 200 technical publications. He was formerly editor-in-chief of the *Journal of the ACM*.

2005–2006 Publications

"Probabilistic algorithmic knowledge," *Logical Methods in Computer Science*, 1(3) (2005). (With R. Pucella.)

"Causes and explanations: A structural-model approach-Part I: Causes," *British Journal for the Philosophy of Science*, 56(4):843–887 (2005). (With J. Pearl.)

"Causes and explanations: A structural-model approach-Part II: Explanation," *British Journal for the Philosophy of Science*, 56(4):889–911 (2005). (With J. Pearl.)

"Anonymity and information hiding in multiagent systems," *Journal of Computer Security*, 13(3):483–514 (2005). (With K. O'Neill.)

"Sleeping Beauty reconsidered: Conditioning and reflection in asynchronous systems," *Oxford Studies in Epistemology, Volume 1*, T. S. Gendler and J. Hawthorne (Eds.), 111–142 (2005).

"Evidence with uncertain likelihoods," *Proceedings of the Twenty-First Conference on Uncertainty in AI*, 243–250 (2005). (With R. Pucella.)

"Extensive games with possibly unaware players," *Proceedings of the Fifth International Joint Conference on Autonomous Agents and Multiagent Systems*, (2006). (With L.C. Rego.)

"Redoing the foundations of decision theory," *Proceedings of the Tenth International Conference on Principles of Knowledge Representation and Reasoning*, (2006). (With L. Blume and D. Easley.)

"Reasoning about knowledge of unawareness," *Proceedings of the Tenth International Conference on Principles of Knowledge Representation and Reasoning*, (2006). (With L. Rego.)

"Efficiency and Nash equilibria in a scrip system for P2P networks," *Proceedings of the Seventh ACM Conference on Electronic Commerce*, (2006). (With E. Friedman and I. Kash.)

2005–2006 Lectures

"Distributed Computing Meets Game Theory: Robust Mechanisms for Rational Secret Sharing and Multiparty Computation," Invited lecture, Gilles Lecture, University of Illinois, Champaign-Urbana, (May 2006); Brown Bag Lunch, Cornell University, Ithaca, NY, (April 2006).

"From Statistical Knowledge Bases to Degrees of Belief: An Overview," Invited lecture, Twenty-fifth ACM Conference on Principles of Database Systems, (June 2006).

"Redoing the Foundations of Decision Theory," Tenth International Conference on Knowledge Representation, (June 2006).

"Reasoning About Knowledge of Unawareness," Workshop on Unawareness, Stanford, (April 2006); Tenth International Conference on Knowledge Representation, (June 2006).

"Redoing the Foundations of Decision Theory," Microeconomics Workshop/CS Theory Seminar, Cornell University, Ithaca, NY, (November 2005).

"Intransitivity and Vagueness," Philosophy Seminar, (March 2006).

Awards and Honors

Fellow, American Association for Advancement of Science

Fellow, American Association of Artificial Intelligence

Fellow, Association for Computer Machinery

Fellow, Fulbright

Fellow, Guggenheim

Milner Lecturer at Edinburgh University

Gilles Lecturer at University of Illinois, Champaign-Urbana

Recipient, Best Paper Award, "Redoing the foundations of decision theory," *Conference on Principles of Knowledge Representation and Reasoning*, (2006)

Recipient, Godel Prize for outstanding paper in the area of theoretical computer science for "Knowledge and common knowledge in a distributed environment" (1997)

JEFF HANCOCK

ASSISTANT PROFESSOR
CIS, JOINT WITH COMMUNICATION

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<http://cucmc.comm.cornell.edu/jth34/index.html>

Dr. Hancock is interested in social interactions mediated by information and communication technology, with an emphasis on how people produce and understand language in these contexts. His research has focused on two types of language-verbal irony and deception-and on a number of cognitive and social psychological factors affected by online communication.

Dr. Hancock was recently awarded a Cornell University Institute for the Social Sciences seed grant for his project "Lying Online: The Effects of Communication Technology on Deception," and he recently received the Cornell Young Faculty Teaching Excellence Award.

2005–2006 Publications

"On lying and being lied to: An automated linguistic analysis of deception," (to appear) *Discourse Processes*. (With L. Curry, S. Goorha, and M. Woodworth.)

"The construction of away messages: A speech act analysis," (to appear) *Journal of Computer-Mediated Communication*. (With J. Nastri and J. Pena-Herborn.)

"Advancing ambiguity," *Proceedings of the Computer-Human Interaction Conference*, (2006). (With K. Boehner.)

"Digital deception: When, where, and how people lie online," *Oxford Handbook of Internet Psychology*, K. McKenna, T. Postmes, U. Reips, and A. Joinson (Eds.), Oxford University Press, (2006).

"An analysis of instrumental and socio-emotional content in online multi-player videogames," *Communication Research*, 33:92–109 (2006). (With J. Pena.)

"The role of politeness and humor in the asymmetry of affect in verbal irony," *Discourse Processes*, 41:3–24 (2006). (With J. Mathews and P.J. Dunham.)

"How do communication and technology researchers study the Internet?" *Journal of Communication*, (2005). (With J. Walther and G. Gay.)

"Realism, imagination, and videogames," *Playing Computer Games: Motives, Responses, and Consequences*, P. Vorderer and J. Bryant (Eds.), Lawrence Erlbaum Associates, (2006). (With M. Shapiro and J. Pena-Herborn.)

2005–2006 Lectures

"Deception: Methods, Motives, Contexts, and Consequences," Invited lecture, Santa Fe Institute, (April 2005).

"Language and Deception," Invited lecture, National Science Foundation, (June 2005).



"The Future of the Survey," Invited lecture, National Science Foundation, (November 2005).

"Beliefs About Cues to Deception in Face-to-face and Computer-mediated Interactions," Annual American Psychology and Law Society Conference, (March 2006). (With M. Woodworth.)

"Factors on the Fringes: Motivational and Potential Personality Factors Influencing Linguistic Cues To Deception," International Conference on System Science, (January 2006). (With M. Woodworth.)

"Linguistic Analysis of Deception Tutorial," Workshop on Surveillance Technologies, International Conference on System Science, (January 2006). (With M. Woodworth.)

"Looking for Lies in All the Wrong Places: Disfluencies and Discourse Markers in Deceptive Conversation," Annual Meeting of the Society for Text and Discourse, (June 2005). (With A. Gonzales, C. Toma, A. Gill, and M. Woodworth.)

2005–2006 Professional Activities

Member, American Psychological Association; International Communication Association; Psychonomics Society; Society for Text and Discourse; Association for Computing Machinery

Editorial Board Member, *Journal of Online Behavior*

Associate Chair, ACM Conference on Computer-Supported Cooperative Work (2006)

2005–2006 University Activities

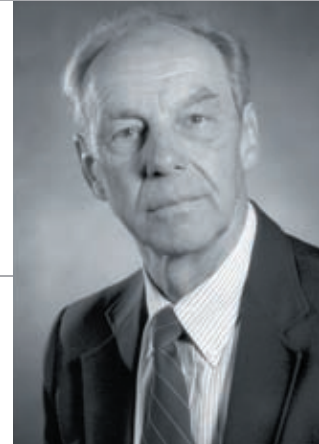
Member, Information Science Undergraduate Working Group

Member, Social Sciences Advisory Council

Coordinator, Information Science Colloquium Series

JURIS HARTMANIS

SENIOR ASSOCIATE DEAN FOR CIS
EMERITUS WALTER R. READ PROFESSOR OF
COMPUTER SCIENCE AND ENGINEERING
TURING AWARD WINNER



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Juris Hartmanis obtained his Ph.D. from the California Institute of Technology in 1955. In 1965, he founded the Department of Computer Science at Cornell and was its first chairman.

Hartmanis is also the founder of the field of computational complexity theory. He believes that computational complexity, the study of the quantitative laws that govern computation, is an essential part of the science base needed to guide, harness, and exploit the explosively growing computer technology.

Professor Hartmanis's current research interests are in computational complexity, structure, and management of research organizations. His main focus has been on understanding the structure of computational complexity classes and exploring how to view computation as construction of complex objects and relate computational complexity to the complexity of constructed objects.

2005–2006 Professional Activities

Member, Editorial Board, *Fundamenta Informatica*;
Journal of Computer and System Sciences

Member, Science Steering Committee, Santa Fe
Institute for Complex Systems

Member, Science Board, Santa Fe Institute for
Complex Systems

Member, Advisory Board, Foundations of Computer
Science; European Association for Theoretical
Computer Science Monographs on Theoretical
Computer Science; DIMACS; DAGSTUHL

2005–2006 University Activities

Senior Associate Dean, CIS

Member, CIS Council

Member, Presidential Search Committee

Awards and Honors

Recipient, Grand Medal, Latvian Academy of
Science (2001)

Recipient, CRA Distinguished Service Award (2000)

Recipient, Doctor of Science (Honoris Causa),
University of Missouri, Kansas City (1999)

Recipient, Doctor of Science (Honoris Causa),
University of Dortmund, Germany (1995)

Recipient, B. Bolzano Gold Medal of the Academy
of Science, Czech Republic (1995)

Recipient, Senior U.S. Scientist Humboldt Award,
Max Plank Institute, Saarbruecken, Germany,
(1993–94)

Fellow, Association for Computer Machinery (1993)

Recipient, ACM Turing Award (shared with R.E.
Stearns) (1993)

Fellow, American Academy of Arts and Sciences
(1992)

Member, Latvian Academy of Science (1990)

Member, National Academy of Engineering (1989)

Fellow, American Association for the Advancement
of Science (1981)

SHEILA HEMAMI

ASSOCIATE PROFESSOR

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING

MEMBER OF THE GRADUATE FIELD OF COMPUTER SCIENCE

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Sheila S. Hemami received her B.S.E.E (1990) from the University of Michigan and her M.S.E.E. (1992) and Ph.D. (1994) degrees from Stanford University.

Her research interests involve visual psychophysics, efficient and robust image processing, and compression algorithms, and the combination of the two. Current image and video processing and compression algorithms (e.g., JPEG-2000, H.264) provide very high efficiency compression and excellent quality at relatively high bit rates. These algorithms operate by treating images and video as traditional "signals," employing efficient transformations, correlation-based models, and entropy coding to exploit the statistical characteristics of these signals. However, incorporation of human visual system characteristics has been relatively simplistic, limited to models developed based on unrealistic, non-natural stimuli. As such, the performance of these algorithms is fundamentally limited.

Her research involves developing efficient representations of visual information using a bi-directional strategy, by simultaneously working to better understand the receiver characteristics and by developing signal processing techniques which can exploit these characteristics. To understand the receiver characteristics, we explore how the human brain perceives visual information by developing better models for low- and mid-level vision, as well as for higher-level vision which includes understanding and cognition. We then develop both theory and practice for signal processing techniques which can fully exploit the receiver characteristics to provide improved processing, higher efficiency, and/or better compression performance. This bi-directional strategy results in extreme gains when compared to more traditional approaches.

Hemami is a senior member of the IEEE and a member of Eta Kappa Nu and Tau Beta Pi. She has served as an Associate Editor for the *IEEE Transactions on Signal Processing* and is currently the Chair of the Image and Multidimensional Signal Processing Technical Committee of the IEEE.



2005–2006 Publications

"Convex programming formulations for rate allocation in video coding," (to appear) *IEEE Transactions on Circuits and Systems for Video Technology*, (2006). (With Y. Sermadevi.)

"Robust rate-control for wavelet-based image coding via bootstrapping with probability models," (to appear) *IEEE Transactions on Image Processing*, (2006). (With M.D. Gaubatz.)

"Efficient entropy estimation with double stochastic models for quantized wavelet image data," (to appear) *IEEE Transactions on Image Processing*, (2006). (With M.D. Gaubatz.)

"A wavelet-based scalable video quality metric and applications," *IEEE Transactions on Circuits and Systems for Video Technology*, (2006). (With M.A. Masry.)

"Visually optimized multiple description image coding," *Proceedings of IEEE International Conference on Acoustics, Speech and Signal Processing*, (2006). (With C. Tian.)

"Efficient, low complexity encoding of multiple burred noisy downsampled images via distributed source coding principles," *Proceedings of IEEE International Conference on Acoustics, Speech and Signal Processing*, (2006). (With M. Gaubatz, A. Vosoughi, and A. Scaglione.)

"Effects of spatial correlations and global precedence on the visual fidelity of distorted images," *Proceedings of Human Vision and Electronic Imaging*, (2006). (With D.C. Chandler and K.L. Lim.)

"Suprathreshold visual psychophysics and structure-based visual masking," *Proceedings of Visual Communication and Image Processing*, (2006). (With D.C. Chandler, B.G. Chern, and J.A. Moses.)

"Fast accurate rate control for low-rate wavelet-based image coding via bootstrapping," *Proceedings of IEEE International Conference on Image Processing*, (2005). (With M.D. Gaubatz.)

"A new class of universal multiple description lattice quantizers," *Proceedings of IEEE International Symposium on Information Theory*, (2005). (With J. Chen, C. Tian, and T. Berger.)

Awards and Honors

Recipient, Constance E. Cook and Alice H. Cook Recognition Award, Cornell University Advisory Council on the Status of Women (2005)

Recipient, Cornell University College of Engineering Faculty Diversity Award (2005)

Recipient, Joel and Ruth Spira Excellence in Teaching Award (2004)

Member, Elected senior member, IEEE (2003)

Finalist, Eta Kappa Nu Outstanding Young Electrical Engineer (2002)

Fulbright Distinguished Lecturer, Morocco (2001)

Recipient, HKN C. Holmes MacDonald Outstanding Teaching Award (2000)

Recipient, National Science Foundation CAREER Award (1997)

Kodak Term Professor of Electrical Engineering (1997, 1998, 1999)

Recipient, Lilly Teaching Fellowship (1996–19997)

Recipient, Cornell College of Engineering Michael Tien '72 Teaching Award (1996–1997, 1999–2000)

JOHN E. HOPCROFT

PROFESSOR

COMPUTER SCIENCE DEPARTMENT

TURING AWARD WINNER

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<http://www.cs.cornell.edu/jeh>

Professor Hopcroft's research centers on the study of information capture and access. This includes the study of large graphs, spectral analysis of structures, clustering, and queries. He has also been involved in the theoretical aspects of computing, especially analysis of algorithms, formal languages, automata theory, and graph algorithms. He has coauthored four books on formal languages and algorithms with Jeffrey D. Ullman and Alfred V. Aho.

From January 1994 until June 2001, he was the Joseph Silbert Dean of the College of Engineering. He was formerly the associate dean for college affairs and the Joseph C. Ford Professor of Computer Science. After receiving an M.S. (1962) and Ph.D. (1964) in electrical engineering from Stanford University, Professor Hopcroft spent three years on the faculty of Princeton University. In 1967, he joined the Cornell faculty, was named professor in 1972 and served as chair of the Department of Computer Science from 1987 to 1992. An undergraduate alumnus of Seattle University, Hopcroft was honored with a Doctor of Humanities Degree (*honoris causa*) in 1990.

2005–2006 Publications

"Correctness of a gossip based membership protocol," *Proceedings of the Twenty-fourth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing*, (2005). (With A. Allavena and A. Demers.)

"Error bounds for correlation clustering," *Proceedings of the Twenty-second International Conference on Machine Learning*, (2005). (With T. Joachims.)

"On learning mixtures of heavy-tailed distributions," *Proceedings of the Forty-sixth Annual IEEE Symposium on Foundations of Computer Science*, (2005). (With A. Dasgupta, J. Kleinberg, and M. Sandler.)

**2005–2006 Lectures**

"A Time of Change," Google, (October 2005); Tsinghua University, (November 2005).

"Computer Science for the Future," Microsoft, (January 2006).

"The Information Revolution: How it Will Change Your Life," IIT Kanpur, (January 2006)

"Computer Science Theory for the Future," IIT Kanpur, (January 2006); and IIT New Delhi, (January 2006).

"The Future of Theoretical Computer Science," University of Texas, Austin, (March 2006).

2005–2006 Professional Activities

Member, NRC Advisory Board for Vietnam Educational Assessment

Member, Board on Mathematical Science and Applications, National Academy of Sciences

Member, Science Advisory Board, Packard Foundation

Member, Financial Management Committee, Society of Applied Mathematics

Trustee, Boyce Thompson Institute

Editor and Member of Executive Committee, Algorithmica

Editor, *International Journal of Computational Geometry and Applications*; *Journal of Computer and System Sciences*

Associate Editor, Information Sciences

Chair, International Advisory Committee on Informatics and Engineering, National College of Ireland

2005–2006 University Activities

Member, Nominations and Elections Committee

Member, Provost's Minority Postdoc Committee

Awards and Honors

Recipient, IEEE Harry Goode Memorial Award, 2005

Fellow, Association for Computing Machinery, 1994

Member, National Academy of Engineering, 1989

Fellow, American Academy of Arts and Sciences, 1987

Fellow, American Association for the Advancement of Science, 1987

Fellow, Institute of Electrical and Electronics Engineers, 1987

Recipient, ACM Turing Award, 1986

DANIEL P. HUTTENLOCHER

JOHN P. AND RILLA NEAFSEY PROFESSOR OF
COMPUTING, INFORMATION SCIENCE, AND BUSINESS
CORNELL WEISS PRESIDENTIAL FELLOW
CS, JOINT WITH THE JOHNSON GRADUATE SCHOOL
OF MANAGEMENT

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Dan Huttenlocher received a dual degree in computer science and experimental psychology from the University of Michigan in 1980, and master's and Ph.D. degrees in computer science from M.I.T. in 1984 and 1988, respectively. He has been on the computer science faculty since 1988. He holds a joint appointment with the Johnson Graduate School of Management at Cornell.

Huttenlocher's research interests are in computer vision, computational geometry, electronic-collaboration tools, social and information networks, and financial-trading systems.

In addition to teaching and research, Dan has considerable experience managing software-development efforts in corporate and academic settings. He has been chief technical officer of Intelligent Markets, a leading provider of advanced trading systems. He also spent more than ten years at the Xerox PARC, directing work that led to the ISO JBIG2 image-compression standard and serving as part of the senior management team.

Huttenlocher has been recognized on several occasions for his teaching and research, including being named a Presidential Young Investigator by the NSF in 1990, the New York State CASE Professor of the Year in 1993, and a Stephen H. Weiss Fellow by Cornell in 1996. He holds twenty-four U.S. patents and has published more than fifty technical papers, primarily in the areas of computer vision and computational geometry.

**2005–2006 Publications**

"Weakly supervised learning of part-based spatial models for visual object recognition," *Proceedings of the European Conference on Computer Vision*, (May 2006). (With D. Crandall.)

"Efficient belief propagation with learned higher-order Markov random fields," *Proceedings of the European Conference on Computer Vision*, (May 2006). (With X. Lan, S. Roth, and M. Black.)

"Beyond trees: common-factor models for 2D human pose recovery," *Proceedings of the IEEE International Conference on Computer Vision*, 470–477 (October 2005). (With X. Lan.)

2005–2006 Professional Activities

General Chair, IEEE Conference on Computer Vision and Pattern Recognition

Member, National Academy of Sciences Study
"Assessing the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database"

2005–2006 University Activities

Director of Graduate Studies, Information Science

Chair, Provost's Task Force on Wisdom in the Age of Digital Information

Member, Business of Science and Technology Planning Group, Johnson Graduate School of Management

Member, CIS Council

Member, CIS Building Committee

Member, Information Science Undergraduate Major Committee

Awards and Honors

Presidential Young Investigator, NSF (1990)

New York State CASE Professor of the Year (1993)

Fellow, Stephen H. Weiss, Cornell (1996)

THORSTEN JOACHIMS

ASSISTANT PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

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http://www.cs.cornell.edu/People/tj/

Thorsten Joachims joined the Department of Computer Science as an assistant professor in 2001. Earlier that year, he completed his dissertation, "The Maximum-margin Approach to Learning Text Classifiers: Methods, Theory, and Algorithms," at the Universität Dortmund, Germany, advised by Professor Katharina Morik.

Joachims's research interests center on a synthesis of theory and system building in the field of machine learning, with a focus on support-vector machines, text mining, and machine learning in information access. In particular, he has worked on WebWatcher, an adaptive browsing assistant for the Web. He has developed and authored the SVM-Light algorithm and software for inductive and transductive support-vector learning. His most recent work is on learning from clickthrough data in search engines and on discriminative training for predicting complex multivariate objects.

Joachims taught the courses "Foundations of Artificial Intelligence" and "Introduction to Machine Learning."

2005–2006 Publications

"A support vector method for multivariate performance measures," *Proceedings of the International Conference on Machine Learning*, (2005).

"Accurately interpreting clickthrough data as implicit feedback," *Proceedings of the Conference on Research and Development in Information Retrieval*, (2005). (With L. Granka, B. Pang, H. Hembrooke, and G. Gay.)

"Unstructuring user preferences: Efficient non-parametric utility revelation," *Proceedings of the Conference on Uncertainty in Artificial Intelligence*, (2005). (With C. Domshlak.)



2005–2006 Lectures

"Support Vector Machines for Structured Outputs," Invited plenary talk, Conference of the German Classification Society, (2005).

"Structured Output Prediction with Support Vector Machines," Invited plenary talk, Structural and Syntactic Pattern Recognition (2006); and Statistical Techniques in Pattern Recognition, (2006).

Invited lectures, University of Alberta; University of Texas, Austin; Carnegie Mellon University; Microsoft Research.

2005–2006 Professional Activities

Action Editor, *Journal of Machine Learning Research*; *Data Mining and Knowledge Discovery Journal*

Associate Editor, *Journal of Artificial Intelligence Research*

Awards and Honors

Recipient, International Conference on Machine Learning Best Paper Award (2005)

Recipient, International Conference on Machine Learning Outstanding Student Paper Award (co-author of T. Finley) (2005)

Recipient, ACM SIGKDD Best Student Paper Award (co-author of F. Radlinski) (2005)

Recipient, CAREER Award, Improving Information Access using Implicit Feedback (2003)

Recipient, Dissertation Award, Universität Dortmund (2002)

KLARA KEDEM

PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

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<http://www.cs.cornell.edu/kedem/>

Klara Kedem obtained her Ph.D. in computer science at Tel-Aviv University in 1989. She is currently spending the summers as a professor in the Department of Computer Science at Cornell University and a professor in the computer science department at Ben-Gurion University in Israel.

Kedem's research is in computational geometry with applications to robotics, computer vision, and bio-information. She is known for devising the minimum Hausdorff distance for shape matching, a robust method which has had a strong impact and is still being investigated by followers.

Kedem and collaborators from the department have looked into shape comparison problems in life-science disciplines and their applications. In computational molecular biology they have come up with a new metric, the URMS, to measure substructure resemblance between proteins. This measure has been further applied to the analysis of molecular dynamics. Her consensus shape for protein families is now being applied to finding protein interaction sites. She also works on applying string matching algorithms to protein shape comparison and to RNA motif search.

Recently, she has been working on image processing problems involved in document analysis and recognition on ancient handwritten documents. Another topic in which she is interested in is geometric pattern matching under any linear transformation and applying GPU to approximate geometric pattern matching problems.



2005–2006 Publications

"Extraction of specified objects from binary images using object based erosion transform: application to hebrew calligraphic manuscripts," *Proceedings of the Eighth International Conference on Document Analysis and Recognition*, 878–882 (2005).

"Integration of RNA search methods for identifying novel riboswitch patterns in eukaryotes," *Computer Society Bioinformatics Workshops*, 193–195 (2005). (With A.N. Cohen, M. Shapira, and D. Barash.)

2005–2006 Professional Activities

Member, Editorial Board, Pattern Recognition Society Journal

Member, Steering Committee, Centers of Excellence in Computational Geometry, The Israeli Science Foundation

Awards and Honors

Recipient, Mary Upson Visiting Professorship, Cornell University (1997–1998)

URI KEICH

ASSISTANT PROFESSOR
DEPARTMENT OF COMPUTER SCIENCE

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<http://www.cs.cornell.edu/~keich>

Uri Keich received his Ph.D. in mathematics from the Courant Institute in New York City in 1996 and his M.Sc. in mathematics from Technion in Israel in 1991.

Before coming to Cornell, he was a project scientist at the Department of Computer Science and Engineering of the University of California, San Diego and assistant professor at the Department of Mathematics of the University of California, Riverside until 2000. He was also a Von Karman Instructor in the applied mathematics department of the California Institute of Technology.

Keich's research interests include computational statistic and algorithmic problems that arise in areas of bioinformatics, such as motif finding and sequence alignment.

2005–2006 Publications

"Apples to apples: improving the performance of motif finders and their significance analyses in the Twilight Zone," (to appear) *Intelligent Systems for Molecular Biology*, (2006). (With P. Ng, N. Nagarajan, and N. Jones.)

"A fast and numerically robust method for exact multinomial goodness-of-fit test," (to appear) *Journal of Computational and Graphical Statistics*, (2006). (With N. Nagarajan.)

"Checking for base-calling errors in repeats," (to appear) *IEEE Transactions on Bioinformatics and Computational Biology*, (2006). (With D. Zhim, P. Pevzner, S. Heber, and H. Tang.)

Submitted Publications

"Refining motif finders with E-value calculations." (With N. Nagarajan and P. Ng.)

"New algorithms offering improved efficiency-accuracy tradeoffs for the Mann-Whitney test." (With N. Nagarajan.)

2005–2006 Lectures

Tri-Institutional Scientific Advisory Board Meeting, (October 2005)

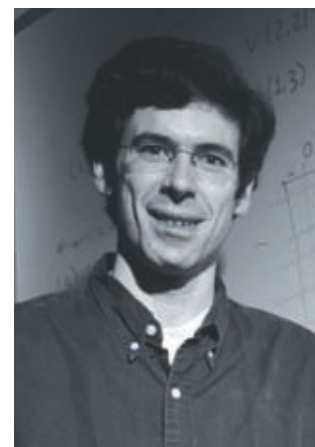
Bioinformatics Seminar, UCSD, (November 2005)

Bioinformatics Seminar, Waterloo University, (March 2006)



JON KLEINBERG

ASSOCIATE PROFESSOR
DEPARTMENT OF COMPUTER SCIENCE



Information Theory and Applications Workshop, Calit2 Inaugural Workshop, UCSD, (February 2006)

CS Department Seminar, Waterloo University, (March 2006)

CS Department Seminar, Carleton University, (March 2006)

CS Department Seminar, McGill University, (March 2006)

CS Department Seminar, Simon Fraser University, (March 2006)

Fourth Bertinoro Computational Biology Meeting, Bertinoro International Center for Informatics, Italy, (June 2006)

2005–2006 Professional Activities

Reviewer, *BMC Bioinformatics*; *Bioinformatics*; *IEEE Transactions on Bioinformatics and Computational Biology*

Conference Reviewer, ACM-SIAM Symposium on Discrete Algorithms (2005); Computational Systems Bioinformatics (2006); RECOMB Satellite Workshop on Regulatory Genomics (2006)

2005–2006 University Activities

Courses, CS426 Introduction to Bioinformatics, Cornell University, (Fall 2005); CS628 Biological sequence analysis, Cornell University, (Spring 2006); Problems and perspective in computational molecular biology, Cornell University, (Fall 2005)

Member, Admission Committee, Computer Science Department, Cornell University

Member, Computational Biology Search Committee, Computer Science Department, Cornell University

Member, Search Committee, Department of Biological Statistics and Computational Biology

Member, Program Committee, RECOMB Satellite Workshop on Regulatory Genomics (2005)

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<http://www.cs.cornell.edu/home/kleinber/>

Jon Kleinberg received his Ph.D. from M.I.T. in 1996. He subsequently spent a year as a visiting scientist at the IBM Almaden Research Center and is now a professor of computer science at Cornell University.

Kleinberg's research interests are centered around algorithmic issues at the interface of networks and information, with an emphasis on the social and information networks that underpin the Web and other on-line media. His work on network analysis using hubs and authorities helped form the foundation for the current generation of Internet search engines.

He is the recipient of an NSF Career Award, an ONR Young Investigator Award, research fellowships from the MacArthur, Packard, and Sloan Foundations, the Fiona Ip Li and Donald Li Teaching Award from the Cornell College of Engineering, and the 2001 National Academy of Sciences Award for Initiatives in Research.

2005–2006 Publications

"Near-optimal sensor placements: maximizing information while minimizing communication cost," *Proceedings of Information Processing in Sensor Networks*, (2006). (With A. Krause, C. Guestrin, and A. Gupta).

"Patterns of influence in a recommendation network," *Proceedings of Pacific-Asia Conference on Knowledge Discovery and Data Mining*, (2006). (With J. Leskovec and A. Singh.)

"The world at your fingertips," *Nature*, 440:279 (2006).

"Graphs over time: Densification laws, shrinking diameters and possible explanations," *Proceedings of the Eleventh ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, (2005). (With J. Leskovec and C. Faloutsos.)

"Query incentive networks," *Proceedings of the Forty-sixth IEEE Symposium on Foundations of Computer Science*, (2005). (With P. Raghavan.)

"An approximation algorithm for the disjoint paths problem in even-degree planar graphs," *Proceedings of the Forty-sixth IEEE Symposium on Foundations of Computer Science*, (2005).

"On learning mixtures of heavy-tailed distributions," *Proceedings of the Forty-sixth IEEE Symposium on Foundations of Computer Science*, (2005). (With A. Dasgupta, J. Hopcroft, and M. Sandler.)

"Metric embeddings with relaxed guarantees," *Proceedings of the Forty-sixth IEEE Symposium on Foundations of Computer Science*, (2005). (With I. Abraham, Y. Bartal, T-H. Chan, and others.)

"Realistic, mathematically tractable graph generation and evolution, using Kronecker multiplication," *European Conference on Principles and Practice of Knowledge Discovery in Databases*, (2005). (With J. Leskovec, D. Chakrabarti, and C. Faloutsos.)

"Influential nodes in a diffusion model for social networks," *Proceedings of the Thirty-second International Colloquium on Automata, Languages and Programming*, (2005). (With D. Kempe and E. Tardos.)

2005–2006 Lectures

"Tracking Complex Networks Across Time and Space," National Academy of Sciences Workshop on Statistics on Networks, (September 2005).

"Query Incentive Networks," IEEE Symposium on Foundations of Computer Science, (October 2005).

"An Approximation Algorithm for the Disjoint Paths Problem in Even-Degree Planar Graphs," IEEE Symposium on Foundations of Computer Science, (October 2005).

"Strategic Models for Information Flow in Social Networks and Peer-to-Peer Systems," Columbia University, (January 2006).

"Modeling Complex Networks," North East Student Colloquium on Artificial Intelligence, (April 2006).

2005–2006 Professional Activities

Program Chair, ACM Symposium on Theory of Computing, (2006)

Editorial board, Springer book series in Information Science and Statistics; *Springer Lecture Notes in Computer Science* (LNCS); *Journal of Internet Mathematics*; *Foundations and Trends in Theoretical Computer Science*

Member, Cornell CIS Council

Awards and Honors

Recipient, Best Paper Award, International Conference on Information Processing in Sensor Networks (2006)

Recipient, Best Research Paper Award, ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (2005)

Recipient, John D. and Catherine T. MacArthur Foundation Fellowship (2005)

Recipient, Best Research Paper Award, ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (2003)

Recipient, IBM Outstanding Innovation Award (2002)

Recipient, Cornell Association of C.S. Undergraduates, Faculty of the Year Award (2002)

Recipient, National Academy of Sciences Award for Initiatives in Research (2001)

Recipient, Fiona Ip Li '78 and Donald Li '75 Excellence in Teaching Award, Cornell College of Engineering (2000)

Recipient, Best Paper Award, ACM Symposium on Principles of Database Systems (2000)

Recipient, David and Lucile Packard Foundation Fellowship (1999)

Recipient, Office of Naval Research Young Investigator Award (1999)

Recipient, Alfred P. Sloan Research Fellowship (1997)

Recipient, NSF Faculty Early Career Development Award (1997)

Recipient, Machtey Award for Best Student Paper, IEEE Symposium Foundations of Computer Science (1996)

Recipient, George M. Sprowls Ph.D. Dissertation Prize, M.I.T. Department of Electrical Engineering and Computer Science (1996)

2005–2006 Selected Press Appearances

"Mapping the Internet," *SIAM News*, (June 2005).

"The birth of Google," *Wired*, (August 2005).

"This Year's 'Genius Awards' Reach Into Unusual Fields," *New York Times*, (September 20, 2005).

"MacArthur winner is search pioneer," *eWeek*, (September 22, 2005).

"Shrinking degrees of separation: MacArthur Prize winner connects people as well as disciplines," *ComputerWorld*, (October 24, 2005).

"Ask-a-Friend marketplaces," *Science News*, (October 31, 2005).

"View from the high ground: Cornell's Jon Kleinberg," *Technology Research News*, (December 5, 2005).

"One thing leads to another: The networked world of Jon Kleinberg," *Cornell Alumni Magazine*, (January/February 2006).

"Recent research provides new picture of router-level Internet," *IEEE Computing in Science and Engineering*, (March/April 2006).

Selected Publications

Algorithm Design. Addison-Wesley (2005). (With E. Tardos.)

"Navigation in a small world," *Nature*, 406:845 (2000).

"Authoritative sources in a hyperlinked environment," *Journal of the ACM*, 46 (1999).

ROBERT D. KLEINBERG

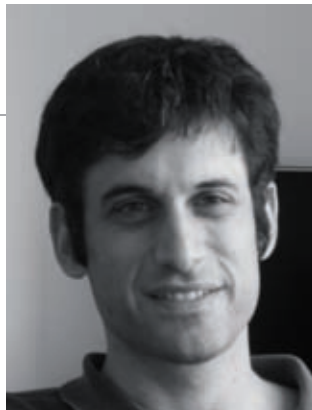
ASSISTANT PROFESSOR

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Robert Kleinberg earned a bachelor's degree in mathematics from Cornell in 1997 and a Ph.D. in mathematics from M.I.T. in 2005. He spent the 2005-2006 academic year on leave of absence from Cornell, while doing research as an NSF postdoctoral fellow at Berkeley.

Kleinberg's research focuses on the design and analysis of algorithms, especially randomized and on-line algorithms for networked systems and electronic markets. His work has applied online learning theory to electronic commerce (pricing and reputation systems), as well as routing (adaptively estimating shortest paths). Before receiving his doctorate from M.I.T., Kleinberg worked for several years at Akamai Technologies, developing systems for Internet mapping and measurement and for scalable delivery of live streaming media. This led to an ongoing interest in network optimization problems such as oblivious routing, in which a network must make routing decisions without global knowledge of the traffic distribution, and network coding, which studies the possibility of using network bandwidth more efficiently by mixing data from multiple sources. Recently, he has also studied group-theoretic approaches to designing algorithms for fast matrix multiplication.

**2005-2006 Publications**

"Group-theoretic algorithms for matrix multiplication," (to appear) *Proceedings of the Forty-sixth IEEE Symposium on Foundations of Computer Science*, (2005). (With H. Cohn, B. Szegedy, and C. Umans.)

"On the capacity of information networks," *IEEE Transactions on Information Theory*, 52:6 (June 2006). Extended abstract appeared in *Proceedings of the Seventeenth ACM-SIAM Symposium on Discrete Algorithms*, 241-250 (2006). (With M. Adler, N. Harvey, K. Jain, and A. Rasala Lehman.)

"Improved lower and upper bounds for Universal TSP in planar metrics," *Proceedings of the Seventeenth ACM-SIAM Symposium on Discrete Algorithms*, 649-658 (2006). (With M.T. Hajiaghayi and T. Leighton.)

"New lower bounds for oblivious routing in undirected graphs," *Proceedings of the Seventeenth ACM-SIAM Symposium on Discrete Algorithms*, 918-927 (2006). (With M. Hajiaghayi, T. Leighton, and H. Racke.)

"Anytime algorithms for multi-armed bandit problems," *Proceedings of the Seventeenth ACM-SIAM Symposium on Discrete Algorithms*, 928-936 (2006).

"Tighter cut-based bounds for k-pairs communication problems," Invited paper, *Proceedings of the Forty-third Annual Allerton Conference on Communication, Control, and Computing*, (2005). (With N. Harvey.)

"On the competitive ratio of the random sampling auction," *Proceedings of the First Workshop on Internet and Network Economics*, 878-886 (2005). (With U. Feige, A. Flaxman, and J. Hartline.)

2005-2006 Lectures

"Geographic Routing in Hyperbolic Space," UC Berkeley Theory Lunch, (November 2005); Workshop on Parallelism in Algorithms and Architectures, University of Maryland. (May 2006).

"Anytime Algorithms for Multi-Armed Bandit Problems," ACM-SIAM Symposium on Discrete Algorithms, (January 2006).

"Improved Lower and Upper Bounds for Universal TSP in Planar Metrics," ACM-SIAM Symposium on Discrete Algorithms, (January 2006).

"Group-Theoretic Algorithms for Matrix Multiplication," M.I.T. Computer Science Theory Seminar, (November 2005).

"Approximation Algorithms for Confluent Flow," Stanford Algorithms Seminar, (November 2005); UCLA Algorithms Seminar, (December 2005); Caltech Information Science and Technology Seminar, (December 2005).

"Temporally Strategyproof Online Mechanism Design," INFORMS Annual Meeting, (November 2005).

"On the Capacity of Information Networks," UC Berkeley Computer Science Theory Seminar, (October 2005); INFORMS Annual Meeting, (November 2005); USC Computer Science Seminar, (December 2005).

"The Value of Knowing a Demand Curve: Bounds on Regret for Online Posted-Price Auctions," Stanford Graduate School of Business, Operations and Information Technology Seminar, (October 2005).

"Adaptive Limited-Supply Online Auctions," DIMACS Workshop on Yield Management and Dynamic Pricing, Rutgers University, (August 2005); INFORMS Annual Meeting, (November 2005).

Awards and Honors

Recipient, Fannie and John Hertz Foundation Fellowship

Recipient, NSF Mathematical Sciences Postdoctoral Research Fellowship

DEXTER KOZEN

JOSEPH NEWTON PEW, JR. PROFESSOR OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE

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Dexter Kozen received his undergraduate degree from Dartmouth College in mathematics in 1974 and his Ph.D. in computer science from Cornell in 1977. After working as a research staff member at the IBM Thomas J. Watson Research Center for several years, he returned to Ithaca to join the computer science faculty in 1985.

Dexter's research interests include the design and analysis of algorithms, computational complexity theory, complexity of decision problems in logic and algebra, and logics and semantics of programming languages. He is currently involved in a research project involving efficient code certification and its application to malicious firmware. His most recent theoretical project is the development of the theory of Kleene algebra and Kleene algebra with tests, including results on complexity, deductive completeness, expressiveness, and applications to compiler correctness. He developed and taught a new course on this topic in spring 2002. Kozen is the author of four textbooks.

2004–2005 Publications

"Some results in dynamic model theory," *Science of Computer Programming*, 51(1–2):3–22 (May 2004).

"Computational inductive definability," *Annals of Pure and Applied Logic*, 126(1–3):139–148 (April 2004).

"Natural Transformations as Rewrite Rules and Monad Composition," Technical Report 2004-1942, Computing and Information Science, Cornell University (July 2004).

Proceedings of the Seventh International Conference on the Mathematics of Program Construction, D. Kozen (Ed.), Springer-Verlag Lecture Notes in Computer Science 3125, (July 2004).

"Toward the Automation of Category Theory," Technical Report 2004-1964, Computing and Information Science, Cornell University (September 2004).



"Supporting workflow in a course management system," *Proceedings of the Thirty-sixth Technical Symposium on Computer Science Education*, 262–266, (February 2005). (With C. Botev, H. Chao, T. Chao, and others.)

"Separability in Domain Semirings," Technical Report 2004-16, Institut fuer Informatik, University of Augsburg, Germany (December 2004). (With B. Moeller.)

"Second-order abstract interpretation via Kleene algebra," Technical Report 2004-1971, Computing and Information Science, Cornell University (December 2004). (With L. Kot.)

"Kleene algebra and bytecode verification," *Proceedings of the First Workshop on Bytecode Semantics, Verification, Analysis, and Transformation*, 201–215, (April 2005). (With L. Kot.)

"Publication/Citation: A Proof-theoretic Approach to Mathematical Knowledge Management," Technical Report 2004-1985, Computing and Information Science, Cornell University (March 2005). (With G. Ramnarayanan.)

"Coinductive Proof Principles for Stochastic Processes," Technical Report 2004-1986, Computing and Information Science, Cornell University (March 2005).

2005–2006 Lectures

Mathematical Foundations of Computer Science, (August 2006).

2005–2006 Professional Activities

Member, Program Committee, Mathematical Foundations of Computer Science (2006); International Conference on the Mathematics of Program Construction (2006)

Editorial Board, *Science of Computing Programming*, special issue (2006); *Journal of Relational Methods in Computer Science* (2000–); *Theory of Computing Systems* (2001–)

External Committee/Advisory Board, Centre for Basic Research in Computer Science, Aarhus University; IEEE Symposium on Logic in Computer Science (1999–)

2005–2006 University Activities

Faculty Advisor, Cornell Men's Rugby Club; Cornell Women's Rugby Club; Absolute A Cappella Student Chorus

University Appeals Committee

Awards and Honors

Fellow, Association of Computing Machinery (2003)

Recipient, Research Prize, Polish Ministry of Education (2001)

Recipient, Stephen and Margery Russell Distinguished Teaching Award, College of Arts and Sciences, Cornell (2001)

Recipient, Class of 1960 Scholar, Williams College (2000)

Recipient, Faculty of the Year Award, Association of Computer Science Undergraduates, Cornell (1994)

Recipient, Research Prize, Polish Ministry of Education (1993)

Fellow, John Simon Guggenheim Foundation (1991)

Recipient, Outstanding Innovation Award, IBM Corporation (1980)

Recipient, John G. Kemeny Prize in Computing, Dartmouth College (1974)

Selected Publications

"Alternation," *Journal of the Association for Computing Machinery*, 28(1):114–133 (1981). (With A. Chandra and L. Stockmeyer.)

"Results on the propositional Mu-calculus," *Theoretical Computer Science*, 27:333–354 (1983).

"Kleene algebra with tests," *Transactions on Programming Languages and Systems*, 19(3):427–443 (May 1997).

DEAN KRAFFT

SENIOR RESEARCH ASSOCIATE
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DIRECTOR OF INFORMATION TECHNOLOGY, CIS

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Dean Krafft received his Ph.D. in computer science from Cornell University in 1981. He serves as both a researcher and administrator at Cornell. On the research side, he is the principal investigator for the National Science Digital Library Project (<http://nsdl.org>) at Cornell. Krafft leads the effort to develop key components of the Core Integration Technology for the library and manages the team that maintains the production library services. He works with the other institutions involved in the Core Integration effort to specify, develop, and provide new digital library technologies to the over one hundred NSF-funded projects involved in the NSDL program.

As an administrator, he serves as Director of Information Technology for Computing and Information Science. He helps provide oversight for the Computing Facilities Support group, represents CIS to the campus-wide IT Managers Council, and focuses on a number of issues including IT policy, software acquisition, and computer security.

Krafft's own particular interests focus on ensuring the availability in the digital world of pre-digital published and manuscript materials, as well as related issues on copyright, the public domain, and public access to older and out-of-print materials.



2005–2006 University Activities

Member, IT Managers Council
Chair, ITMC Software Acquisition Committee
Member, Disaster Recovery Planning Task Force
Member, IT Policy Advisory Group

Selected Publications

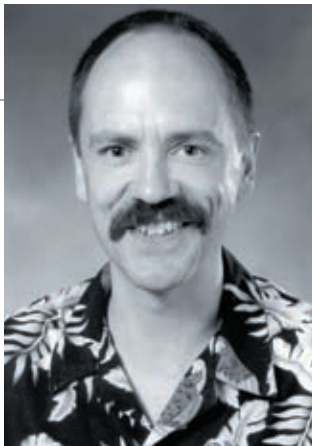
"Representing contextualized information in the NSDL," *Proceedings of European Conference on Research and Advanced Technology for Digital Libraries*, (2006). <http://arxiv.org/abs/cs.DL/0603024>. (With C. Lagoze and others.)

"Metadata aggregation and 'automated digital libraries': A retrospective on the NSDL experience," *Proceedings of Joint Conference on Digital Libraries*, (2006). <http://arxiv.org/abs/cs.DL/0601125>. (With C. Lagoze and others.)

"What Is a digital library anyway? Beyond search and access in the NSDL," *D-Lib Magazine*, 11(12), (2005). <http://www.dlib.org/dlib/november05/lagoze/11lagoze.html>. (With C. Lagoze and others.)

"Dienst: Building a production technical report server," *Proceedings of Advances in Digital Libraries*, 211–223 (May 1995). (With J. Davis and C. Lagoze.)

"The challenge of robotics for computer science," *Advances in Robotics, Vol. 1: Algorithmic and Geometric Aspects of Robotics*, J. Schwartz and C. Yap (Eds.), Lawrence Erlbaum Associates, Inc., 7–42 (1986). (With J. Hopcroft.)



CHRISTOPH KREITZ
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Christoph Kreitz is a senior research associate at Cornell University and a professor of computer science at the University of Potsdam, Germany. He obtained his Ph.D. in computer science at the FernUniversitaet Hagen, Germany in 1984. His research has focused on computational models for infinite objects and on the application of automated theorem proving to the design, verification, and optimization of software systems.

In collaboration with researchers of Robert Constable's Nuprl and Ken Birman's Ensemble groups, he has built logic-based tools that automatically improve the code of fault-tolerant communication systems and guarantee that the improvements do not introduce errors. He has also developed techniques for the formal design and verification of adaptive distributed systems. He currently investigates the validation of end-to-end Quality-of-Service behavior of networked systems.

Christoph Kreitz also works on enhancing the automatic reasoning capabilities of theorem proving environments. Together with his former students and colleagues from Germany, he has developed and implemented proof search procedures for classical intuitionistic, modal, and fragments of linear logic and algorithms that transform the machine-found proofs into the proof calculus of other systems. His theorem prover JProver has been connected to the interactive proof assistants Nuprl, MetaPRL, and Coq and is being used to guide the development of proofs in these systems. Current investigations focus on boosting reasoning technology through hybrid theorem provers, creating a benchmark library for theorem provers for intuitionistic logic and automating reasoning in category theory.

2005–2006 Publications

"Innovations in Computational Type Theory using Nuprl," (to appear), *Journal of Applied Logic*, (2006). (With S. F. Allen, M. Bickford, R.L. Constable, and others.)

"The ILTP Library: Benchmarking automated theorem provers for intuitionistic logic," *Proceedings of the International Conference on Automated Reasoning with Analytic Tableaux and Related Methods*, LNAI 3702:333–337, (2005). (With J. Otten and T. Rath.)

"Automating proofs in category theory," (to appear) *International Joint Conference on Automated Reasoning*, (2006). (With D. Kozen and E. Richter.)

2005–2006 Professional Activities

Editorial Board, *Journal of Applied Logic*

Editorial Board, DISKI Book series

Member, Program Committee, Third International Verification Workshop; International Workshop on Empirically Successful Automated Reasoning in Higher-Order Logic

2005–2006 University Activities

Head, Faculty Search Committee, Department of Computer Science, University of Potsdam

Chairman, Development and Planning Committee, University of Potsdam

CARL LAGOZE

SENIOR RESEARCH ASSOCIATE
DEPARTMENT OF COMPUTER SCIENCE



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<http://www.cs.cornell.edu/lagoze/>

Carl Lagoze obtained his master's degree in software engineering from Wang Institute for Graduate Studies in 1987. He is currently a senior research associate in the Faculty of Computing and Information Science at Cornell University.

Lagoze's research investigates web information systems, specifically digital libraries and new models of scholarly communication. His work focuses primarily on interoperability protocols and architectures, digital object models, and metadata frameworks.

Lagoze's research is recognized for a number of advances in distributed information systems. These include the Dienst architecture for distributed digital libraries, the FEDORA digital-object model for complex digital content, and the Open Archives Initiative Protocol for Metadata Harvesting that has been widely adopted as a foundation for information systems interoperability. His role as a scientist in the NSF-funded NSDL project provides the opportunity to realize these advances in a major national resource for science and mathematics education.

2005–2006 Publications

"Fedora: An architecture for complex objects and their relationships," *International Journal of Digital Libraries*, 6(2) (2006). (With S. Payette, E. Shin, and C. Wilper.)

"Representing contextualized information in the NSDL," *Proceedings of the Tenth European Conference on Research and Advanced Technology for Digital Libraries*, (2006). (With D. Krafft, T. Cornwell, D. Eckstrom, and others.)

"Metadata aggregation and automated digital libraries: A retrospective on the NSDL experience," *Proceedings of the Joint Conference on Digital Libraries*, ACM, (2006). (With D. Krafft, T. Cornwell, N. Dushay, and others.)

"Automatically constructing descriptive site maps," *Proceedings of the Eighth Asia Pacific Web Conference*, (2006). (With P. Dmitriev.)

"What are digital libraries for anymore, anyway: beyond search and access in the NSDL," *D-Lib Magazine*, 11(12) (2005).

2005–2006 Lectures

"National Science Digital Library: Building a Knowledge Base for Science, Math, and Engineering Education," *Building the Info Grid*, Copenhagen, Denmark, (2005).

"Information Network Overlay Architecture: Adding Value to Digital Content," *Information Science Colloquium*, University of Pittsburgh, (2005).

"Adding Value to Digital Content Using Fedora," *Fedora User's Group Meeting*, Rutgers, (2005).

2005–2006 Professional Activities

Member, Advisory Committee, NSF National Virtual Observatory

Editorial Board, *Journal of Digital Curation*

Executive Team, NSF National Science Digital Library; Open Archives Initiative

External Advisory Board, Los Alamos National Laboratory Library

Guest Editor, *EEE Internet Computing*

Member, Digital Curation Centre Digital Curation Manual Peer Review Panel

National Advisory Board, University of Texas Utopia Project

Member, Program Committee, Tenth European Conference on Research and Advanced Technology for Digital Libraries; Joint Conference on Digital Libraries (2006); Eighth International Conference on Asian Digital Libraries

LILLIAN LEE

ASSOCIATE PROFESSOR
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Lillian Lee (A.B., Cornell University, 1993; Ph.D., Harvard University, 1997) is an associate professor of computer science. Her main research interests are natural language processing and machine learning, concentrating on the development of “knowledge-lean” statistical methods allowing computers to automatically learn linguistic and domain knowledge directly from text. Current joint projects with her students include using graph-based methods for sentiment analysis (for instance, automatically determining whether an unlabeled movie review is “thumbs up” or “thumbs down”) and applying statistical language models to information-retrieval applications. She and her colleagues have also considered applications ranging from finding word boundaries in streams of Japanese to creating English versions of computer-generated mathematical proofs. A major focus of previous work was the study of distributional similarity and distributional clustering.

2005–2006 Publications

“PageRank without hyperlinks: Structural re-ranking using links induced by language models,” *Proceedings of SIGIR*, (2005). (With O. Kurland.)

“Better than the real thing? Iterative pseudo-query processing using cluster-based language models,” *Proceedings of SIGIR*, (2005). (With O. Kurland and C. Domshlak.)



2005–2006 Lectures

“Sense and Sensibility,” Invited talk, HLT-NAACL Workshop on Graph-based Algorithms for Natural Language Processing, (2006).

2005–2006 Professional Activities

Secretary, The North American chapter of the Association for Computational Linguistics, (2006–2007)

Member, Organizing Committee, ACL SIGDAT and Corpus-Based Approaches to NLP, (2001–)

Area Chair, COLING-ACL, (2006)

Member, Editorial board, *Journal of Artificial Intelligence Research* (2005–2008); *Machine Learning Journal* (2006–2008)

Member, Program Committee, joint meeting of the Human Language Technology conference and the NAACL, (2006); Twenty-ninth Annual International Conference on Research and Development on Information Retrieval (SIGIR), (2006); HLT-NAACL Workshop on Graph-based Algorithms for Natural Language Processing, (2006)

Reviewer, Senior Members Papers Track, Twenty-first National Conference on Artificial Intelligence (AAAI), (2006)

2005–2006 Press Mentions

“Two thumbs up,” *Forbes.com*, (November 15, 2005).

Awards and Honors

Recipient, Alfred P. Sloan Research Fellowship (2002–2004)

Recipient, Best Paper Award, HLT-NAACL 2004 (joint with R. Barzilay.)

Citation, “Top picks: Technology Research Advances of 2004,” *Technology Research News* (joint with R. Barzilay.)

Recipient, James and Mary Tien Excellence in Teaching Award (2002)

Recipient, Stephen and Marilyn Miles Excellence in Teaching Award (1999)

Selected Publications

“Thumbs up? Sentiment classification using machine learning techniques,” *Proceedings of the Annual Conference on Empirical Methods in Natural Language Processing*, (2002). (With B. Pang and S. Vaithyanathan.)

“Fast context-free grammar parsing requires fast Boolean matrix multiplication,” *Journal of the ACM*, 49(1):1–15 (2002).

“Distributional clustering of English words,” *Proceedings of the Thirty-first Annual Meeting of the ACL*, (1993). (With F. Pereira and T. Tishby.)

HOD LIPSON

ASSISTANT PROFESSOR CIS, JOINT WITH
MECHANICAL AND AEROSPACE ENGINEERING

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Hod Lipson joined the Faculty of Computing and Information Science and the faculty of the Sibley School of Mechanical and Aerospace Engineering in 2001 as an assistant professor. Prior to this appointment, he was a postdoctoral researcher at Brandeis University's computer science department working on evolutionary computation and evolutionary robotics. He was also a lecturer at M.I.T.'s Department of Mechanical Engineering, where he taught design and conducted research in design automation. Professor Lipson's Ph.D. (Technion, 1998) research was on the reconstruction of a three-dimensional object from a single freehand sketch, as a means for human-computer interaction for CAD. Before joining academia, Lipson spent several years as a design engineer in the mechanical, electronic, and software industries, and co-founded a company in GPS tracking, which is active to date.

Lipson's research focuses on robotics, exploring new methods for autonomous adaptation in both the behavior and morphology, with broader impacts to design automation and manufacturing technologies. Lipson's group has pioneered new computational methods in automated open-ended design, co-evolutionary search, and symbolic system identification of nonlinear dynamical systems. Some of the new technologies developed in Lipson's group include robotic self-assembly and self-replication, as well as printable machines. Lipson's work uses primarily biologically-inspired approaches, as they bring new ideas to engineering and new engineering insights into biology.

**Selected 2005–2006 Publications**

"Self-reproducing machines," *Nature*, 435(7038):163–164 (2005). (With V. Zykov, E. Mytilinaios, and B. Adams.)

"Homemade: The future of rapid prototyping," *IEEE Spectrum*, (May 2005).

"Active coevolutionary learning of deterministic finite automata," *Journal of Machine Learning Research*, 6(10):1651–1678 (2005). (With J.C. Bongard.)

"Nonlinear system identification using coevolution of models and tests," *IEEE Transactions on Evolutionary Computation*, (2005). (With J.C. Bongard.)

"Design and control of tensegrity robots for locomotion," *IEEE Transactions on Robotics and Automation*, (2005). (With C. Paul and F. Valero Cuevas.)

"A pen-based freehand sketching interface for progressive construction of 3D objects," *Journal of Computers and Graphics*, (2005). (With M. Masry and D. Kang.)

"Spontaneous emergence of periodical patterns in a biologically-inspired simulation of photonic structures," *Physical Review Letters*, (2006). (With A. Gondarenko, S. Preble, J. Robinson, and others.)

"3D direct printing of heterogeneous tissue implants," *Tissue Engineering*, (2006). (With D.L. Cohen, E. Malone, and L. Bonassar.)

RAJIT MANOHAR

ASSOCIATE PROFESSOR OF THE SCHOOL OF ELECTRICAL
AND COMPUTER ENGINEERING
MEMBER OF THE GRADUATE FIELD OF COMPUTER SCIENCE

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Rajit Manohar received his B.S. (1994), M.S. (1995), and Ph.D. (1998) in computer science from the California Institute of Technology. He has been a member of the Cornell faculty since 1998, where he co-founded its Computer Systems Laboratory. His group conducts research on efficient asynchronous computation structures.

Research in Professor Manohar's group combines formal methods, algorithms for design automation, and the VLSI design of asynchronous circuits and systems. His group introduced a new class of high-performance asynchronous programmable logic structures, the first ultralow-power processor for sensor networks, and an asynchronous event-based architecture for discrete-event simulation. His work introduced the notion of slack elasticity and projection, which provides the theoretical foundation for fine-grained pipelining in asynchronous circuits.

2005–2006 Publications

"Yield enhancement of asynchronous logic circuits through 3-dimensional integration technology," *Proceedings of the ACM Great Lakes Symposium on VLSI*, (2006). (With S. Peng.)

"Self-healing asynchronous arrays," *Proceedings of the Twelfth International Symposium on Asynchronous Circuits and Systems*, (2006). (With S. Peng.)

"A level-crossing flash asynchronous analog-to-digital converter," *Proceedings of the Twelfth International Symposium on Asynchronous Circuits and Systems*, (2006). (With F. Akopyan and A. Apsel.)

"Self-timed thermally aware circuits," *IEEE Computer Society Annual Symposium on VLSI*, (2006). (With D. Fang and F. Akopyan.)

"Efficient failure detection in pipelined asynchronous circuits," *Proceedings of the IEEE Symposium on Defect and Fault Tolerance in VLSI Systems*, (2005). (With S. Peng.)

"Fault tolerant asynchronous adders through dynamic self-reconfiguration," *Proceedings of the IEEE International Conference on Computer Design*, (2005). (With S. Peng.)

"Dense sensor networks are also energy-efficient: when 'more' is 'less'," *Proceedings of the Military Communications Conference*, (2005). (With Y.-W. Hong, B. Sirkeci-Mergen, and A. Scaglione.)

"Mapping multimedia applications to 3-D system-on-chip," *Proceedings of the IEEE International Symposium on Circuits and Systems*, (2005). (With C.-C. Liu, J.-H. Chen, and S. Tiwari.)

2005–2006 Lectures

"Self-timed Systems," M.T.L., M.I.T., (December 2005).

"Reconfigurable Asynchronous Logic," Columbia University, (December 2005).

"Asynchronous FPGAs," Air Force Rome Labs, Rome, NY, (October 2005).

"Reconfigurable Asynchronous Logic," Olin College, MA, (October 2005).

"Architectures for Cognitive Systems," AFRL Workshop, Ithaca, NY, (July 2005).

"Hardware/software co-design for Sensor Networks," Workshop on Networked Sensing Systems, San Diego, CA, (June 2005).

"Asynchronous Logic for Extreme Environments," University of Central Florida, (May 2005).

2005–2006 Professional Activities

Member, Program Committee, IEEE/ACM Symposium on Asynchronous Circuits and Systems (March 2006); International Conference on Computer Aided Design (November 2005)

Awards and Honors

Recipient, Best Paper Award, ASYNC (2006)

Recipient, Ellersick Award for best unclassified paper at MILCOM (2005)

Citation, *M.I.T. Technology Review's* Top 35 Young Innovators under 35

Recipient, NSF CAREER award

Recipient, Joel and Ruth Spira Excellence in Teaching Award

Recipient, Cornell IEEE Teacher of the Year Award

Recipient, College of Engineering Sonny Yau Excellence in Teaching Award

Recipient, College of Engineering Michael Tien Excellence in Teaching Award

Recipient, Tau Beta Pi and Cornell Society of Engineers Excellence in Teaching Award



STEVE MARSCHNER

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Steve Marschner obtained his Sc.B. degree in mathematics and computer science from Brown University in 1993 and his Ph.D. from Cornell in 1998. He held research positions at Hewlett-Packard Labs, Microsoft Research, and Stanford University before joining the computer science faculty in 2002.

Marschner's research is in computer graphics, particularly realistic rendering, and focuses on modeling the optics of materials. His research aims to develop new material models, grounded in physics and supported by measurements of real materials that can represent the complex natural materials, we encounter every day. These models will allow computer graphics practitioners to achieve goals, such as creating realistic virtual human actors, that are currently hampered by the limitations of existing material models. Marschner is also exploring related areas of computer graphics, from image-based modeling and 3D scanning to visual perception and mechanics.

Recent projects include models for light scattering and propagation in hair and wood, as well as an efficient method for rendering translucent materials that has been widely implemented by the film-effects industry and resulted in an Academy Award for Technical Achievement.

2005–2006 Publications

"Simulating multiple scattering in hair using a photon mapping approach," *Proceedings of SIGGRAPH*, (2006). (With J.T. Moon.)

"Perceptually based tone mapping of high dynamic range image streams," *Proceedings of Eurographics Symposium on Rendering*, 2005. (With P. Irawan and J.A. Ferwerda.)

Awards and Honors

Recipient, NSF CAREER Award

Recipient, Academy Award for Technical Achievement (2003)

Recipient, Sloan Research Fellowship

Selected Publication

"A practical model for subsurface light transport," *Proceedings of SIGGRAPH*, (2001). (With H.W. Jensen, M. Levoy, and P. Hanrahan.)

**JOSÉ F. MARTÍNEZ**

ASSISTANT PROFESSOR
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MEMBER OF THE GRADUATE FIELD
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José Martínez is an assistant professor of electrical and computer engineering and a graduate field member of computer science. He leads the M3 Architecture Research Group at Cornell, whose interests include parallel architectures, microarchitecture, reconfigurable hardware, and hardware-software interaction. His teaching responsibilities at Cornell include the junior/senior computer architecture class, ECE 475/COM S 416, and the senior/graduate parallel computer architecture class, ECE 572/COM S 516. He organizes the Computer Engineering Lecture Series, and co-hosts with Professor Alyssa Apse the Electrical and Computer Engineering sessions of the CURIE Workshop for future women engineers and the CATALYST Workshop for future minority engineers.

Professor Martínez graduated in computer science in 1996 from the Universidad Politécnica de Valencia and earned M.S. (1999) and Ph.D. (2002) degrees in computer science from the University of Illinois at Urbana-Champaign. He is a member of the Computer Systems Laboratory and the Intelligent Information Systems Institute at Cornell, as well as the IEEE and the ACM professional societies.

2005–2006 Selected Publications

"Dynamic power-performance adaptation of parallel computation on chip multiprocessors," *International Symposium on High-Performance Computer Architecture*, (February 2006). (With J. Li.)

"Power-performance implications of parallel computation in chip multiprocessors," *ACM Transactions on Architectures and Code Optimization*, (December 2005). (With J. Li.)

"Cherry-MP: Correctly integrating checkpointed early recycling in chip multiprocessors," *International Symposium on Microarchitecture*, (December 2005). (With M. Kirman and N. Kirman.)

Awards and Honors

Recipient, NSF CAREER Award

Recipient, IBM Faculty Award (2006)

Recipient, Kenneth A. Goldman '71 Excellence in Teaching Award, College of Engineering (2005)

Recipient, Best Paper Award, International Symposium on High-performance Computer Architecture (2005)

Citation, IEEE Micro's Top Picks from Microarchitecture Conferences, "The Most Industry-relevant and Significant Papers of the Year in Computer Architecture" (2003)

Member, Phi Kappa Phi Honor Society (1999)

Recipient, Bank of Spain Fellowship for Advanced Studies (1995–1999)

Recipient, National Award for Academic Excellence, Ministry of Education, Spain (1995, 1997)



SALLY MCKEE

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Sally McKee received her bachelor's degree in computer science from Yale University (1985), master's from Princeton University (1990), and doctorate from the University of Virginia (1995). Before graduate school, she worked for Digital Equipment Corporation's Personal Computer Division and Microsoft Corporation. She has also held internships at Digital Equipment Corporation's Systems Research Center and AT&T Bell Labs. McKee was a post-doctoral research associate in the University of Virginia computer science department from May of 1995 through May of 1996.

Her research is primarily in the area of computer architecture and performance analysis and prediction, particularly in memory-system design and analysis. She worked at Intel's Oregon Microcomputer Research Lab from 1996 through 1998, during which time she also taught at the Oregon Graduate Institute of Science and Technology and Reed College. In 1998, she moved to the University of Utah, where she worked on the Impulse Adaptable Memory System Project and her own memory system design and analysis projects (partly in collaboration with colleagues at Lawrence Livermore National Laboratories [LLNL]) for four years. She was a participating guest at LLNL during much of 2001–2002.

In 2002, she moved to the School of Electrical and Computer Engineering at Cornell University, where she works with eight Ph.D. students and one postdoctoral research associate (shared with Professor Keshav Pingali). Her research encompasses infrastructure for efficient design space exploration for computer systems design, performance prediction for parallel applications for high-end computing, intelligent memory system design, and introspective (ultimately autonomic) computing.

2005–2006 Publications

"Predicting parallel application performance via machine learning approaches," (to appear) *Concurrency and Computation: Practice and Experience*, (2006). (With K. Singh, E. Ipek, B.R. de Supinski, and others.)

"Specializing cache structures for high performance and energy conservation in embedded systems," (to appear) *Transactions on High Performance Embedded Architectures and Compilers*, (2006). (With M.J. Geiger and G.S. Tyson.)

"Efficiently exploring architectural design spaces via predictive modeling," (to appear) *Proceedings of the Twelfth ACM International Conference on Architectural Support for Programming Languages and Operating Systems*, (2006). (With E. Ipek, B.R. de Supinski, M. Schulz, and R. Caruana.)

"Beyond region caching: Specializing cache structures for high performance and energy conservation," *HiPEAC International Conference on High Performance Embedded Architectures and Compilers*, 102–115 (2005). (With M.J. Geiger and G.S. Tyson.)

"An approach to performance prediction for parallel applications," *Euro-Par Conference Series*, (2005). (With E. Ipek, B.R. de Supinski, and M. Schulz.)

"Improving the computational intensity of unstructured grid applications," *ACM International Conference on Supercomputing*, (2005). (With B.S. White, B.R. de Supinski, B.J. Miller, and others.)

2005–2006 Professional Activities

Member, Steering Committee, ACM International Conference on Computing Frontiers (2006–2008)

Guest Editor, *Journal of Instruction Level Parallelism*, (2006); *ACM Transactions on Emerging Technologies*, (2006); *EC Transactions on High Performance Embedded Architectures and Compilers*, (2006)

Officer, ACM Micro Special Interest Group on Computer Microarchitecture (2002–)

Editorial Board, *Elsevier International Journal of Parallel Programming*

Chair, Program Committee, Computing Frontiers (2006)

Treasurer/Registration Chair, ACM International Conference on Computing Frontiers (2005)

Member, Program Committee, International Conference on High Performance Embedded Architectures and Compilers (2007); Fourth Workshop on Memory Performance Issues, with IEEE Symposium on High Performance Computer Architecture (2006); First Workshop on Introspective Architectures, with IEEE Symposium on High Performance Computer Architecture (2006); IEEE International Parallel and Distributed Processing Symposium, Architecture Track (2006); ACM Workshop on Memory Performance: Dealing with Applications, Systems, and Architecture, with IEEE/ACM Conference on Parallel Architectures and Compilation Techniques (2005); ACM International Conference on Supercomputing (2005); IEEE International Workshop on Interaction between Compilers and Architectures, with IEEE Symposium on High Performance Computer Architecture (2005); IEEE International Conference on Computer Design (2005)

ANDREW MYERS

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Andrew Myers received his Ph.D. in computer science from M.I.T. in 1999. He is currently an associate professor in computer science. Myers is particularly interested in using language-level information to make large systems more secure, reliable, and extensible.

A current focus is on information security, an important problem in our connected world. Methods are needed for guaranteeing that in real systems, information can be trusted and is not leaked. Myers has developed novel and efficient static analysis techniques to identify and control privacy violations in complex programs. These techniques have been employed in the Jif compiler and run-time system for writing secure programs. Jif has been applied to distributed systems containing untrusted components and to systems in which security requirements change dynamically, including web applications.

Myers is also exploring language-level support for building extensible and composable software systems in the J& language and has built a widely used extensible compiler front end for Java, called Polyglot.

**2005–2006 Publications**

- "Interruptible iterators," *Proceedings of the Thirty-third ACM Symposium on Principles of Programming Languages*, (2006). (With J. Liu and A. Kimball.)
- "End-to-end availability policies and noninterference," *Proceedings of the Eighteenth IEEE Computer Security Foundations Workshop*, (2005). (With L. Zheng.)
- "Belief in information flow," *Proceedings of the Eighteenth IEEE Computer Security Foundations Workshop*, (2005). (With M. Clarkson and F.B. Schneider.)
- "Language-based information erasure," *Proceedings of the Eighteenth IEEE Computer Security Foundations Workshop*, (2005). (With S. Chong.)

2005–2006 Lectures

- "Making Distributed Systems Secure with Program Analysis and Transformation," ACM Workshop on Program Analysis for Software Tools and Engineering, (September 2005).
- "Towards Distributed Systems Secure By Construction," University of Pittsburgh, (October 2005).
- "Programming with Explicit Security Policies," University of Illinois, Urbana-Champaign, (October 2005).
- "Programming with Explicit Security Policies," ACM Workshop on Formal Methods in Security Engineering: From Specifications to Code, (November 2005).
- "Expressing and Enforcing Security with Programming Languages," Tutorial at ACM Programming Language Design and Implementation, (June 2006).

2005–2006 Professional Activities

- Member, DARPA Information Science And Technology Study Group
- Member, Program Committee, Usenix Security Conference (2006); Computer Security Foundations Workshop; ACM Object-Oriented Programming Languages, Systems, Languages, and Applications (2006)
- Participant, NSF Workshop on Research Challenges in Distributed Systems (September 2005)

Software releases

- Jif 2.0 : Java + information flow
(<http://www.cs.cornell.edu/jif>)
- JMatch 1.6 : Pattern matching and interruptible iterators for Java
(<http://www.cs.cornell.edu/Projects/jmatch>)
- Polyglot 2.0 : an extensible compiler front end framework
(<http://www.cs.cornell.edu/Projects/polyglot>)

Awards and Honors

- Recipient, Alfred P. Sloan Research Fellowship (2002)
- Recipient, Abraham T. C. Wong Excellence in Teaching Award (2002)
- Recipient, NSF CAREER Award (2001)

ANIL NERODE

GOLDWIN SMITH PROFESSOR OF MATHEMATICS

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Anil Nerode obtained his Ph.D. in mathematics under Saunders MacLane from the University of Chicago in 1956. He was an NSF postdoctoral fellow with Kurt Gödel at the Institute for Advanced Study from 1957 to 1958; visiting assistant professor with Alfred Tarski, Berkeley from 1958 to 1959; brought to Cornell by J. Barkley Rosser in 1959; appointed professor in 1965; and named Goldwin Smith Professor in 1990.

He served as chair of the Department of Mathematics from 1982 to 1987 and was director of the Mathematical Sciences Institute from 1987 to 1996. He also served as director of the Center for Foundations of Intelligent Systems from 1996 to 2001.

Nerode's research areas include mathematical logic, computability theory, computer science, mathematics of AI, and control engineering. His principal research at present is in theorems and algorithms for extracting controls for hybrid systems using differential geometry and logic based controllers. Tools include the relaxed calculus of variations and connections on Finsler manifolds. He is also continuing work on other problems in logic, including computable model theory of nonstandard logics, foundations of logic programming, and multiple agent systems.

2005–2006 Publications

"Tableaux for constructive concurrent dynamic logic," *Annals of Pure and Applied Logic*, 135(1–3):1–72 (2005). (With D. Wijesekera.)

2005–2006 Lectures

Hour address, IEEE MAS&S Security and Survivability, Drexel University, (August, 2005).

Keynote address, Tennenbaum Symposium, CUNY, (April, 2006).

2005–2006 Professional Activities

Consultant, NTT, Japan; ClearSight Systems, Bellevue, Washington

Editor, *Mathematics and AI*; *Pure and Applied Algebra*; *International Hybrid Systems Journal*; *Documenta Mathematica*

Board Member, several math institutes in New Zealand and in Russia

Chair, International Advisory Board, ClearSight Corporation, Bellevue, Washington

International Advisory Board Computer Science, NTT, Japan; Centre for Discrete Mathematics and Theoretical Computer Science, University of Auckland, New Zealand

Member, Program Committee, IEEE MAS&S Security and Survivability Symposium (2005)

Chair, Logical Foundations of Computer Science, City University, New York (2007)

Co-Chair, IFAC Symposium, Hybrid Systems and Intelligent Control, Irkutsk (2007)

2005–2006 University Activities

Chair, University Benefits Committee

Member, CS Department Curriculum Committee

Member, Graduate Admissions Committee

ANDREW PERSHING

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Andrew Pershing holds a joint appointment as an assistant professor in the Department of Earth and Atmospheric Sciences and Cornell's Faculty of Computing and Information Science. He received his Ph.D. in ecology from Cornell in 2001.

His research interest is biological oceanography. Specifically, he is interested in how the physical environment influences animal populations in the ocean. Pershing's research has focused on the Gulf of Maine and has dealt with animals ranging from rice-grain-sized crustaceans called copepods to truck-sized right whales. Much of his work has concentrated on documenting the major modes of interannual and interdecadal variability in the physical and biological conditions in the Gulf of Maine and on developing numerical models to understand the processes driving the observed changes.

Due to the large spatial and temporal scales, understanding year-to-year changes in marine ecosystems requires creative use of models and observations. Models, whether conceptual models or complex computer programs, provide a representation of how important processes (as determined by the modeler) interact to produce patterns. A major theme of Pershing's research is to use models to investigate the processes that produce year-to-year changes in marine ecosystems. An important part of this research is to develop new techniques to compare models with observations.

With funding from NOAA and NASA, Pershing is leading a project to use models of plankton abundance to forecast possible feeding areas of the endangered right whale. He is working with the Cornell Theory Center to develop the computational tools to synthesize multiple data sources and deliver information in a timely manner to right-whale researchers and managers.

**2005–2006 Publications**

"Techniques for cetacean-habitat modeling: A review," *Marine Ecology Progress Series*, 310:271–295, (2006). (With J.V. Redfern, M.C. Ferguson, E.A. Becker, and others.)

"Interdecadal variability in the Gulf of Maine zooplankton community with potential impacts on fish recruitment," *ICES Journal of Marine Science*, 62:1511–1523, (2005). (With C.H. Greene, J.W. Jossi, L. O'Brien, and others.)

2005–2006 Presentations

"Evidence for Bottom-up Forcing of a Regime Shift in the NW Atlantic with Implications for Fisheries and Endangered Species," Oral presentation, AGU/ASLO Ocean Sciences Meeting, Honolulu, HI, (February 2006).

"Response of NW Atlantic Shelf Ecosystems to Basin-scale Climate Forcing," Poster presentation, Gordon Research Conference on Coastal Ocean Circulation, New London, NH, (June 2005).

"Right Whale, Wrong Time? Saving the Whales One Byte at a Time," Museum of the Earth's "Natural History at Noon" Seminar Series, Ithaca, NY, (March 2006).

"Linkages Between Northern Right Whales and Their Habitat," NOAA Fisheries Protected Species Stock Assessment Improvement Plan Tier III Workshop, Silver Spring, MD, (March 2006).

"Describing the Past and Predicting the Future of the Gulf of Maine Ecosystem," Virginia Institute of Marine Science, (December 2005); University of Maine, Orono, ME, (November 2005); Gulf of Maine Research Institute, Portland, ME, (November 2005).

"Climate, Copepods, and Calves: Enhancing Ecosystem-based Management Through Observing System Data," Gulf of Maine Ocean Observing System Board of Directors Meeting, Portland, ME, (June 2005).

2005–2006 Professional Activities

Participant, NOAA National Workshop on Passive Acoustics, (April 2006); NOAA Fisheries Protected Species Stock Assessment Improvement Plan Tier III Workshop, (March 2006); Regional Association for Research in the Gulf of Maine: Modeling Related to the Regional Observing System in the Gulf of Maine, (July 2005)

KESHAV PINGALI

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Keshav Pingali obtained a bachelor's degree in electrical engineering at the Indian Institute of Technology, Kanpur in 1978, and an Sc.D. in computer science at M.I.T., Cambridge in 1986. Since 1986, he has been on the faculty of the Department of Computer Science where he is currently a full professor. In 2003, he became the first India Chair of Computer Science at Cornell University. Pingali is also a professor in the Department of Electrical and Computer Engineering.

Pingali's research focuses on programming languages and compiler technology for program understanding, restructuring, and optimization. His group is known for its contributions to memory-hierarchy optimization; some of these have been patented. Algorithms and tools developed by his projects are used in many commercial products such as Intel's IA-64 compiler, SGI's MIPSPro compiler, and HP's PA-RISC compiler.

His current research focuses on the design of self-optimizing programs, improving the memory behavior of programs that use complex data structures, and programming techniques to make software resilient to hardware faults.

2005–2006 Publications

"Using transactions in Delaunay mesh generation," *Workshop on Transactional Memory Workloads*, (2006). (With M. Kulkarni and P. Chew.)

"A distributed system based on Web services for computational science simulations," *Proceedings of the International Conference on Supercomputing*, (2006). (With P. Stodghill.)

"Experimental evaluation of application-level checkpointing for OpenMP programs," *Proceedings of the International Conference on Supercomputing*, (2006). (With G. Bronevetsky and P. Stodghill.)

"Recent advances in checkpoint/recovery systems," *Workshop on NSF Next Generation Software*, (2006). (With G. Bronevetsky, R. Fernandes, D. Marques, and P. Stodghill.)

"Mobile MPI programs in computational grids," *Symposium on Principles and Practice of Parallel Programming*, (2006). (With R. Fernandes and P. Stodghill.)



"A language for the compact representation of multiple program versions," *Workshop on Languages and Compilers for Parallel Computing*, (2005). (With S. Donadio and others.)

"Automatic measurement of instruction cache capacity," *Workshop on Languages and Compilers for Parallel Computing*, (2005). (With K. Yotov, S. Jackson, T. Steele, and P. Stodghill.)

"Analytic models and empirical search: A hybrid approach to code optimization," *Workshop on Languages and Compilers for Parallel Computing*, (2005). (With A. Epshteyn and others.)

"X-Ray: A tool for automatic measurement of hardware parameters," *Conference on the Quantitative Evaluation of Systems*, (2005). (With K. Yotov and P. Stodghill.)

"Think globally, search locally," *International Conference on Supercomputing*, (2005). (With K. Yotov and P. Stodghill.)

"Optimizing checkpoint sizes in the C3 system," *Workshop on NSF Next Generation Software*, (2005). (With D. Marques, G. Bronevetsky, R. Fernandes, and P. Stodghill.)

2005–2006 Lectures

"Fractal Symbolic Analysis," Department Colloquium, Electrical and Computer Engineering Department, Cornell University, (September 2005).

"Application-level Checkpointing," Pittsburgh Supercomputing Center, Pittsburgh, PA, (September 2005).

"Think Globally, Search Locally," Workshop on Scalable Approaches to High Performance and High Productivity, Bertinoro, Italy, (October 2005); Department of Computer Science, Indian Institute of Technology, Kanpur, India, (January 2006).

"The Price of Cache-obliviousness," Computer Science and Artificial Intelligence Laboratory, M.I.T., (October 2005); IBM T.J. Watson Research Center, Yorktown Heights, NY, (December 2005).

"Programming Multicore Processors," Intel Multicore University Research Conference, Portland, OR, (December 2005).

"Who needs compilers when we have self-optimizing programs?" Distinguished Lecture, Department of Computer Science, Rice University, (February 2006); Intel Research Labs, Santa Clara, CA, (February 2006); Workshop on EDGE Computing, Department of Computer Science, University of North Carolina, (May 2006).

2005–2006 Professional Activities

Member, Program Committee, Symposium on Architectural Support for Programming

Languages and Operating Systems (2006); International Conference on Supercomputing (2006); Parallel Architectures and Compiler Technology (2006)

2005–2006 University Activities

Associate Director, Cornell Theory Center

Director of Undergraduate Studies, Department of Computer Science

Awards and Honors

Recipient, India Chair of Computer Science at Cornell University (2003–)

Distinguished Lecturer, Texas A&M University (2003)

N. Rama Rao Professor, I.I.T. Kanpur (2000–2001)

Recipient, Best Paper Award, International Conference on Supercomputing (1999, 2000)

Recipient, Russell Teaching Award, College of Arts and Sciences, Cornell (1998)

Recipient, Ip-Lee Teaching Award of the College of Engineering, Cornell (1997)

Recipient, Best Paper Award, ACM Symposium on Architectural Support for Programming Languages and Operating Systems (1992)

Recipient, N.S.F. Presidential Young Investigator Award (1989–94)

Recipient, I.B.M. Faculty Development Award (1986–88)

Recipient, President's Gold Medal, I.I.T. Kanpur (1978)

Recipient, Lalit Narain Das Gold Medal, I.I.T. Kanpur (1978)

National Science Talent Scholar (1973)

Selected Publications

"Fractal symbolic analysis," *ACM Transactions on Programming Languages and Systems*, 25(6):776–813 (2003). (With V. Menon and N. Mateev.)

"Algorithms for computing the static single assignment form," *Journal of the ACM*, 50(3):375–425 (2003). (With G. Bilardi.)

"Optimal control dependence computation and the roman chariots problem," *ACM Transactions on Programming Languages and Systems*, 462–491 (1997). (With G. Bilardi.)

RACHEL PRENTICE

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Rachel Prentice is an assistant professor of the social, political, and ethical implications of information technology in the Department of Science and Technology Studies at Cornell. She obtained her A.B. in comparative literature from Columbia College, Columbia University, in 1987, and her Ph.D. in science, technology, and society from M.I.T. in 2004. Her dissertation, "Bodies of Information: Reinventing Bodies and Practice in Medical Education," is an ethnography about groups of physicians, engineers, and computer experts building computer applications and simulations for teaching anatomy and surgery.

She is interested in how interdisciplinary groups are creating new methods for representing and interacting with bodies. Before graduate school, she worked as a newspaper reporter in Washington state, New Mexico, and Rome, Italy, focusing on science, environment, and government issues.

Prentice taught "From Surgery to Simulation" and "Computers: From Babbage to Gates" in fall 2004. She also taught "Qualitative Research Methods for Studying Science" and "Exploring Cyberworlds: Thinking With and About Machines" in spring 2005.

Awards and Honors

Recipient, Hugh Hampton Young Fellowship (2003–04)

Recipient, Jacob K. Javits Fellowship, U.S. Department of Education (1998–2002)

Recipient, Siegel Prize for Best Paper on Science and Technology Studies for "Calculating Women, Calculating Machines: The Rise of Scientific and Technical Computation in England, 1920–1945" Science, Technology, and Society Program, M.I.T. (1998)

Recipient, Ida M. Green Fellowship, M.I.T. (1997–98)

**MIREK RIEDEWALD**

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Mirek Riedewald obtained his undergraduate degree in computer science from the University of the Saarland, Saarbrücken, Germany in 1998 and his Ph.D. in computer science from the University of California, Santa Barbara in 2002. Currently, Dr. Riedewald's research interests are centered around mining and monitoring of massive data streams and developing data management and analysis services for the sciences.

The data stream research focuses on building a highly scalable system to support a broad variety of applications, including monitoring of large computer clusters and discovery of complex patterns in real-time in stock ticker streams, news feeds, blogs, and RSS feeds in general. This work includes the design of novel query languages with formal semantics, aiming at a sweet spot where both expressiveness and scalable implementation can be achieved.

Dr. Riedewald also leads major efforts by the database group to provide new data management and analysis services for the sciences, and he is a member of the eScience Service Unit at the Cornell Theory Center. Together with Rich Caruana and scientists at Cornell's Lab of Ornithology, he investigates novel approaches to estimating the abundance of North American bird species based on citizen science data and to correlating change in bird abundance with changes in the environment. He is also exploring new approaches to improving the performance of complex scientific simulations by using index-based approaches to function approximation.



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2005–2006 Publications

"Automatic client-server partitioning of data-driven Web applications," *Proceedings of ACM SIGMOD International Conference on Management of Data*, (2006). (With N. Gerner, F. Yan, A. Demers, and others.)

"Towards expressive publish/subscribe systems," *Proceedings of the International Conference on Extending Database Technology*, (2006). (With A. Demers, J. Gehrke, M. Hong, and W. White.)

"Three case studies of large-scale data flows," *Proceedings of the IEEE Workshop on Workflow and Data Flow for Scientific Applications*, (2006). (With W.Y. Arms, S. Aya, and others.)

"Hilda: A high-level language for data-driven Web applications," *Proceedings of the IEEE International Conference on Data Engineering*, (2006). (With F. Yang, J. Shanmugasundaram, J. Gehrke, and A. Demers.)

Selected 2005–2006 Lectures

"Towards Expressive and Scalable Publish/Subscribe," Invited talk, Microsoft Research, Redmond, (October 2005).

"Three Case Studies of Large-Scale Data Flows," Presentation, SciFlow (2006).

2005–2006 Professional Activities

Member of ACM, ACM SIGMOD, and IEEE

Member, Program Committee, IEEE International Conference on Data Engineering (2006); ACM Conference on Information and Knowledge Management (2006); International Conference on Data Warehousing and Knowledge Discovery (2006); ACM International Workshop on Data Warehousing and OLAP (2006); IEEE International Conference on Intelligence and Security Informatics (2006); International Conference on Geosensor Networks (2006)

Reviewer, *ACM Transactions on Database Systems*; *IEEE Transactions on Knowledge and Data Engineering*; *Decision Support Systems*; *Information Systems*

Mats Rooth's research is concerned with theories and applications in linguistics and computational linguistics that combine theoretical-linguistic formalisms, knowledge, and problem statements with numerical modeling and parameter estimation techniques. Using current methodology, it is possible to create approximately complete grammars of human languages, and using parsing algorithms and the grammars, to map sentences to representations that represent their syntax and meaning. However, sentences of human languages are very ambiguous, to the extent that it would be possible know everything about the syntax of a language, without having any operative means of identifying the intended syntax and meaning of the sentences that people use. This problem is addressed by numerical models that put weights on possible representations. Numerical models and optimization algorithms also allow linguistic information (in particular, syntactic and semantic properties of individual words) to be learned from large data samples.

Rooth also works on the semantics of natural language, using logical methods and formalisms. He developed an approach to the meaning of intonation that is known as alternative semantics. Currently, he is working on interactions between the grammar of ellipsis and the grammar of intonation.

Rooth has a B.S. in mathematics from M.I.T. and a Ph.D. in linguistics from the University of Massachusetts at Amherst. Before joining the Cornell faculty, he was chair of theoretical computational linguistics at the University of Stuttgart and a member of the technical staff at AT&T Bell Laboratories.



2005–2006 Publications

"Scope disambiguation by ellipsis and focus without scope economy," *Proceedings of the Fifteenth Amsterdam Colloquium*, (2005).

"Topic accents on quantifiers," *Reference and Quantification: the Partee Effect*, G. Carlson and J. Pelletier (Eds.), CSLI Publications, (2005).

2005–2006 Professional Activities

Member, Editorial Board, *Natural Language Semantics*

2005–2006 University Activities

Director, Computational Linguistics Laboratory

RADU RUGINA

ASSISTANT PROFESSOR
DEPARTMENT OF COMPUTER SCIENCE

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Radu Rugina received a bachelor's degree in computer science from the University Politehnica of Bucharest in 1996 and a Ph.D. degree in computer science from the University of California at Santa Barbara in 2001. Between 1997 and 2001 he was a visiting scholar at the Laboratory for Computer Science at M.I.T.

His research interests are in programming languages and compilation techniques for program understanding, verification, transformation, and optimization. He is particularly interested in the area of program analysis, with emphasis on the analysis of complex, linked data structures. His current projects explore novel program analysis paradigms and techniques for detecting programming errors, for reasoning about the correctness of data structure manipulations, and for providing automatic, compiler-enabled explicit memory reclamation.

In his past work, Rugina has developed pointer and symbolic analyses for recursive and multithreaded programs that heavily manipulate pointers. These techniques have been used to enable the static detection of data races in pointer-based multithreaded programs and the automatic parallelization of complex divide-and-conquer programs.

2005–2006 Publications

"Compile-Time deallocation of individual objects," *Proceedings of the ACM SIGPLAN International Symposium on Memory Management*, (2006). (With S. Cherem.)

"Memory leak analysis by contradiction," *Proceedings of the Thirteenth International Static Analysis Symposium*, (2006). (With M. Orlovich.)

"Maintaining Structural Invariants in Shape Analysis with Local Reasoning," Cornell University Computing and Information Science Technical Report, (May 2006). (With S. Cherem.)

**FRED B. SCHNEIDER**

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Fred B. Schneider has studied concurrent and distributed systems since joining Cornell's faculty in 1978. His early work concerned programming methodology and formal methods, and he is known there for formalizing "safety" and "liveness" properties as well as for developing methods to reason about concurrent and distributed programs. His subsequent work in fault-tolerant distributed systems led to now well-known protocols and structures (including the "failstop processor" abstraction, a seminal survey on the state machine approach, hypervisor-based fault-tolerance, and protocols used in today's air-traffic control systems). Most recently, Schneider's attention has turned to questions related to computer security: exploiting insights from formal methods and programming languages as a basis for relocating trust and enforcing application-specific security policies, and designing systems and protocols to support both fault-tolerance and security in distributed systems.

His research efforts this year were focused on developing a prototype firewall that is trustworthy by virtue of proactive obfuscation for creating independence among servers and (jointly with postdoc Riccardo Pucella) on characterizing the class of attacks proactive obfuscation blunts. The firewall prototype has also led (jointly with Ph.D. student Tom Roeder) to new algorithms for efficient digital signatures that use shared key rather than public key cryptography and (jointly with Robbert van Renesse) to new algorithms for consensus in asynchronous systems.

Schneider is also involved with Professor Gün Sirer and his research group in constructing a trusted computing platform that leverages hardware primitives PC's support for attestation and sealed storage.

2005–2006 Lectures

"Static Reasoning about Dynamic Heap Structures," M.I.T., (December 2005).

"Using Static Analysis for Memory Error Detection and Memory Reclamation," Invited talk, Workshop on Semantics, Program Analysis, and Computing Environments for Memory Management, (January 2006).

2005–2006 Professional Activities

Member, Program Committee, International Static Analysis Symposium (2006); ACM SIGBED Conference on Embedded Software (2006); IEEE Symposium on Network Computing and Applications (2006)

Selected Publications

"Region-based shape analysis with tracked locations," *Proceedings of the Thirty-second ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, 310–323 (January 2005). (With B. Hackett.)

"Symbolic bounds analysis of pointers, array indices, and accessed memory regions," *ACM Transactions on Programming Languages and Systems*, 27(2):185–235 (2005). (With M. Rinard.)



2005–2006 Publications

"APSS: Proactive secret sharing in asynchronous systems," *ACM Transactions on Information and System Security*, 8(3):259–286 (2005). (With L. Zhou and R. van Renesse.)

"Implementing trustworthy services using replicated state machines," *IEEE Security and Privacy*, 3(5):34–43 (2005). (With L. Zhou.)

"Computability classes for enforcement mechanisms," *ACM Transactions on Programming Languages and Systems*, 28(1):175–205 (2006). (With K. Hamlen and G. Morrisett.)

"Certified in-lined reference monitoring on .NET," *Proceedings ACM SIGPLAN Workshop on Programming Languages and Analysis for Security*, pages 7–16 (2006). (With K. Hamlen and G. Morrisett.)

"Here be dragons," Editorial, *IEEE Security and Privacy*, 4(3):3 (2006).

2005–2006 Lectures

"Language-based Security for Malicious Mobile Code," MURI Project Review, Washington, DC, (July 2005).

"Implementing Fault-tolerant and Scalable Storage Services," AFOSR PI Meeting, Griffiss Institute, Rome, NY, (August 2005).

"Asynchronous Proactive Secret Sharing," Invited lecture, DosCoVeri: Distributed Algorithms meet Concurrency Theory, San Francisco, CA, (August 2005).

"Progress Towards Trustworthy Services," EECS Division Distinguished Lecture Series, Ann Arbor, MI, (November 2005).

"Implementing Security and Fault-tolerance," Keynote address, Second ITI Workshop on Dependability and Security, Champaign, IL, (December 2005).

"Implementing Security and Fault-tolerance," EECS Departmental Colloquium Distinguished Lecture Series, University of California at Berkeley, Berkeley, CA, (December 2005).

"The TRUST Agenda: Convergence of Technical and Policy Issues," TRUST 2006 Winter Meeting, Washington, DC, (January 2006).

"Cyber-terrorism: Yesterday, Today, and Tomorrow," Cornell ALS 481 (Global Conflict and Terrorism), Cornell University, Ithaca, NY, (February 2006).

"Non-Technical Impediments to Securing Cyberspace," Symposium on Fostering International Collaborations in Information Security, AAAS Annual Conference, Saint Louis, MO, (February 2006).

"Technical and Policy Issues for Trust," NSF Site Visit, University of California at Berkeley, Berkeley, CA, (April 2006).

"Progress in Language Based Security," MURI Principal Investigators Meeting, Washington, DC, (June 2006).

2005–2006 University Activities

Founders Committee, Faculty of Computing and Information

College of Engineering, ERC Advisory Committee

University Conflicts Committee

Chair, CS Department Recruiting Committee

2005–2006 Professional Activities

Director, AFRL/Cornell Information Assurance Institute

Chief Scientist, NSF TRUST Science and Technology Center

Associate Editor-in-Chief, *Distributed Computing; IEEE Security and Privacy*

Co-Managing Editor, *Springer Verlag Texts and Monographs in Computer Science*

Editor, *IEEE Transactions on Dependable and Secure Computing*

Technical Advisory Board, CIGITAL; Fast Search and Transfer; Fortify Software; Packet General Networks

Co-chair, Microsoft Trustworthy Academic Advisory Board

Member, National Research Council Computer Science and Telecommunications Board

Advisory Committee, NSF/CISE

Member, National Research Council Committee on Improving Cybersecurity Research

Member, University of Virginia Computer Science Department Advisory Board

Member, Program Committee, Tenth Colloquium for Information Systems Security Education

Member, IFIP Working Group 2.3 (Programming Methodology)

Awards and Honors

Doctor of Science (honoris causa), University of Newcastle-upon-Tyne, United Kingdom (May 2003)

Recipient, Daniel M. Lazar Excellence in Teaching Award (2000)

Professor-at-Large, University of Tromsø, Tromsø, Norway (1996–2006)

Fellow, Association for Computing Machinery (1994)

Fellow, American Association for Advancement of Science (1992)

Selected Publications

"Implementing fault-tolerant services using the state machine approach: A tutorial," *ACM Computing Surveys*, 22(4):299–319 (December 1990).

"Enforceable security policies," *ACM Transactions on Information and System Security*, 3(1):30–50 (February 2000).

DAVID I. SCHWARTZ

LECTURER

DEPARTMENT OF COMPUTER SCIENCE



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David I. Schwartz obtained his Ph.D. in civil engineering at the State University of New York at Buffalo in 1999. He is currently a lecturer in the Department of Computer Science and self-appointed Director of the Game Design Initiative at Cornell University (GDIAC).

Schwartz's research and interests involve educational technology, the support of undergraduate research, textbook writing, and multidisciplinary education. This year his work on developing multidisciplinary curricula for computer game design courses culminated with the development of a minor in game design. His work on GDIAC attracts the attention of the videogame industry, which continues to hire GDIAC students. He has also established game programming co-ops and internships. GDIAC also achieved national recognition in the Games4Girls contest. All-female design teams competed to make games that appeal to middle- and high-school girls. The GDIAC team won!

Schwartz's work on the Cornell Library Collaborative Learning Computer Laboratory (CL3) (<http://cl3.library.cornell.edu>) continues to facilitate the growing games education at Cornell. CL3 is a unique "shape-shifting" computer lab that hosts the game courses and other classes. Schwartz collaborated with Information Science and Ergonomics students both to evaluate CL3's effectiveness and to design the next generation of collaborative technology.

Schwartz also began planning for Cornell's first-ever American Society for Engineering Education section conference for November 2006.

2005–2006 Publications

"GameX: A platform for incremental instruction in computer graphics and game design," *Proceedings of ACM SIGGRAPH*, (2005). (With R. Hoetzlein.)

"Developing a virtual engineering curriculum via computer game design," *Proceedings of the St. Lawrence Section*, (2005). (With R. Rajagopalan and R. Hoetzlein.)

2005–2006 Lectures

"Teaching Technical Communication with Computer Game Design," ASEE National Conference, (June 2006). (With R. Rajagopalan.)

"Building Game Development Labs and Facilities in Academic Settings," (Moderator), Future Play Conference, (October 2005).

2005–2006 Professional Activities

Chair, St. Lawrence Section of the American Society of Engineering Educators

Member, Steering Committee, International Association of Game Educators and Researchers

2005–2006 University Activities

Member, Arts and Sciences Admissions Committee, Cornell University

Director, The Game Design Initiative, Cornell University

Selected Publications

Introduction to Maple, Second Edition. Prentice Hall (2003).

Introduction to Unix, Second Edition. Prentice Hall (2005).

BART SELMAN

PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

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Bart Selman obtained a Ph.D. in computer science from the University of Toronto in 1991. Currently a professor in computer science, he previously worked at AT&T Bell Laboratories in the principles of artificial intelligence-research department. His research has covered many areas in artificial intelligence and computer science, including tractable inference, knowledge representation, stochastic search methods, theory approximation, knowledge compilation, planning, default reasoning, and the connections between computer science and statistical physics (phase-transition phenomena). His current projects focus on planning, multi-agent systems, and the integration of learning and reasoning techniques.

2005–2006 Publications

"Model counting: A new strategy for obtaining good bounds," *Proceedings of the Twenty-First National Conference on Artificial Intelligence*, (2006). Best paper award. (With C.P. Gomes and A. Sabharwal.)

"Can get satisfaction," *Nature*, 435:751–752 (June 9, 2005). (With C.P. Gomes.)

"The Achilles' heel of QBF," *Proceedings of the Twentieth National Conference on Artificial Intelligence*, (2005). (With C. Ansotegui and C.P. Gomes.)

"Regular random k-SAT: Properties of balanced formulas," *Journal of Automated Reasoning*, (2005). (With Y. Boufkhad, O. Dubois, and Y. Interian.)

"A new approach to model counting," *Proceedings of the Eighth International Conference on Theory and Applications of Satisfiability Testing*, (2005). (With W. Wei.)

"Tracking evolving communities in large linked networks," *Proceedings of the National Academy of Science*, (2004). (With J. Hopcroft, B. Kulis, and O. Khan.)



Awards and Honors

Recipient, Best Paper Award, Twenty-first National Conference on Artificial Intelligence (2006)

Recipient, Distinguished Paper Award, Tenth International Conference on Principles and Practice of Constraint Programming (2004)

Fellow, American Association for the Advancement of Science (2003)

Recipient, Stephen '57 and Marilyn Miles Excellence in Teaching Award, College of Engineering, Cornell University (2002)

Fellow, American Association for Artificial Intelligence (2001)

Recipient, Cornell Outstanding Educator Award (selected most influential Cornell professor by a Merrill Presidential Scholar) (2001)

Member, Executive Council, American Association for Artificial Intelligence (1999–2002)

Recipient, Alfred P. Sloan Research Fellowship (1999–2000)

Recipient, NSF CAREER Award (1998–2002)

Recipient, Best Paper Award, Thirteenth National Conference on Artificial Intelligence (1996)

Recipient, Best Paper Award, Tenth National Conference on Artificial Intelligence (1992)

Recipient, Best Paper Award, First KR (1989)

Recipient, Best Paper Award, Seventh Biennial Conference of the Canadian Society for the Computer Studies of Intelligence (1988)

PHOEBE SENGERS

ASSISTANT PROFESSOR

INFORMATION SCIENCE, JOINT WITH SCIENCE AND TECHNOLOGY STUDIES

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Phoebe Sengers received her Ph.D. in artificial intelligence and cultural theory in 1998 from Carnegie Mellon University. She was a Fulbright Scholar at the Center for Art and Media Technology (ZKM) in Karlsruhe, Germany and spent two years as a research scientist at the German National Research Center for Information Technology (GMD). She joined the Faculty of CIS in October 2001 and has a joint appointment with the Department of Science and Technology Studies.

Sengers works in human-computer interaction, especially problems that bridge cultural issues and technology design. She develops culturally embedded systems, i.e., new kinds of interactive technology that respond to and encourage critical reflection on the place of technology in culture. Her current research, funded by a five-year NSF CAREER Award, explores everyday computing, or interactive media devices for non-work contexts, and draws on techniques from computer science, cultural analysis, design, and the arts. She uses insights from analysis of consumer culture to rethink the work-based assumptions underlying technologies for the home, developing both new application areas for everyday computing, including systems to support personal reflection on emotional and social experiences, and new techniques for designing systems, including the use of self-experiment in design and new forms of evaluation for open-ended systems.

**2005–2006 Publications**

"Staying open to interpretation: Engaging multiple meanings in design and evaluation," *Proceedings of Designing Interactive Systems*, (2006). (With B. Gaver.)

"Opening the frame of the art museum: Technology between art and tool," *Proceedings of Digital Arts and Culture*, (2005). (With K. Boehner, Y. Medynskiy, and G. Gay.)

"Affect: From information to interaction," *Proceedings of the Fourth Decennial Conference on Critical Computing*, (2005). (With K. Boehner, R. DePaula, and P. Dourish.)

"Reflective design," *Proceedings of the Fourth Decennial Conference on Critical Computing*, (2005). (With K. Boehner, S. David, and J. Kaye.)

2005–2006 Lectures

"Affect and Computing: From Quantification to Interpretation," University of Michigan School of Information and Program in Science, Technology, and Society, (March 2006).

"Closing the Affective Gap," Carnegie Mellon University Human-Computer Interaction Institute, (February 2006).

"Self-Reflective Technology?" Panel co-organization and presentation on "Self-Reflective Technical Practice," Conference of the Society for the Social Studies of Science (4S), (November 2005).

2005–2006 Professional Activities

Member, Editorial Board, *Interaction Studies*

Associate Chair for Notes, Conference on Human Factors in Computing Systems (2006)

Member, Program Committee, Conference on Designing Interactive Systems (2006)

2005–2006 University Activities

Member, Task Force on Wisdom in the Age of Digital Information

Faculty Senator, for Science and Technology Studies

Member, Visual Studies Steering Committee

Member, Information Science Undergraduate Working Group

Awards and Honors

Recipient, NSF CAREER Award (2002–2007)

Recipient, Fulbright Award (1998–1999)

Citation, *Lingua Franca*, Tech Top 20 (named one of the "top 20 researchers changing the way we think about technology") (1997)

Recipient, Cornell Faculty Innovation in Teaching Grant (for COM S/INFO 130, Web Design and programming)

JAYAVEL SHANMUGASUNDARAM
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DEPARTMENT OF COMPUTER SCIENCE

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Jayavel Shanmugasundaram obtained his Ph.D. degree in computer science from the University of Wisconsin at Madison in 2001. He is currently an assistant professor in computer science.

Shanmugasundaram's research interests include Internet data management, information retrieval, and query processing in emerging system architectures. His research group is currently working on three projects. The Quark project aims to unify the database and information retrieval worlds by developing a next-generation data-management system for handling both structured and unstructured data. The PEPPER project (jointly with Professor Gehrke) develops highly robust indexing and query-processing strategies for evaluating complex queries over large-scale, distributed peer-to-peer systems. The Hilda project (jointly with Professor Gehrke and Senior Research Associate Demers) develops a platform for developing data-driven web applications.

Shanmugasundaram's research ideas have been incorporated in commercial data-management products and have resulted in several patents.



2005–2006 Publications

"XQuery full-text extensions explained," *IBM Systems Journal*, 25(2), (2006). (With S. Amer-Yahia, C. Botev, and J. Doerre.)

"Quark: An efficient XQuery full-text implementation," *ACM SIGMOD Conference on Management of Data*, (2006). (With A. Bhaskar, C. Botev, M. Chettiar, and others.)

"Automatic client-server partitioning of data-driven Web applications," *ACM SIGMOD Conference on Management of Data*, (2006). (With N. Gerner, F. Yang, A. Demers, and others.)

"XQuery 1.0 and XPath 2.0 full-text," *World Wide Web Consortium*, (2006). (With S. Amer-Yahia, C. Botev, S. Buxton, and others.)

"Expressiveness and performance of full-text search languages," *International Conference on Extending Database Technology*, (2006). (With C. Botev and S. Amer-Yahia.)

"Hilda: A high-level language for data-driven Web applications," *International Conference on Data Engineering*, (2006). (With F. Yang, M. Riedewald, J. Gehrke, and A. Demers.)

2005–2006 Lectures

"XML Full-Text Search: Challenges and Opportunities," Tutorial, Thirty-first International Conference on Very Large Data Bases, (September 2005).

"Text Search over XML Documents," Computer Science Colloquium, University of Buffalo, (November 2005); Microsoft Silicon Valley Research Center, (December 2005); Yahoo Research Labs, (December 2005); Oracle, (December 2005); Google, (December 2005); BEA Systems, (December 2005).

"Text Search in XML," University of Washington-Microsoft Research Workshop on Managing Imprecision in Databases, (August 2005).

2005–2006 Professional Activities

Invited Expert, World Wide Web Consortium, XQuery Full-text Task Force

Member, Program Committee, International Conference on Very Large Data Bases (2006); International XML Database Symposium (2006); Very Large Data Base, Ph.D. Workshop (2006); ACM SIGIR Conference on Research and Development on Information Retrieval (2006); International Workshop on XQuery Implementation, Experience and Perspectives (2006); International Conference on Management of Data (2005); Symposium on String Processing and Information Retrieval (2005); Very Large Data Base, Ph.D. Workshop (2005)

Member, Industrial Program Committee, ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (2006)

Member, Demonstration Program Committee, ACM SIGMOD Conference on Management of Data (2006)

Awards and Honors

Recipient, James and Mary Tien Excellence in Teaching Award, Cornell College of Engineering (2005)

Recipient, NSF CAREER Award

Recipient, IBM Faculty Award

DAVID B. SHMOYS

PROFESSOR

OPERATIONS RESEARCH AND INDUSTRIAL ENGINEERING
AND DEPARTMENT OF COMPUTER SCIENCE

MEMBER OF THE GRADUATE FIELD OF COMPUTER SCIENCE

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David Shmoys obtained his Ph.D. in computer science at the University of California, Berkeley in 1984. He has faculty appointments in both the Department of Computer Science and the School of Operations Research and Industrial Engineering. Shmoys's research has focused on the design and analysis of efficient algorithms for discrete optimization problems.

His work has highlighted the central role that linear programming plays in the design of approximation algorithms for NP-hard problems. In particular, he is known for his results on scheduling and clustering problems, including the first constant performance guarantees for several problems central to the literature, including the k-center and k-median problems, the generalized assignment problem, as well as scheduling problems in which the aim is to minimize the average job completion time. Furthermore, his work on polynomial-time approximation schemes for scheduling problems introduced techniques that have subsequently been applied to a variety of other settings. His current work is focused on the design of approximation algorithms with provable performance guarantees for stochastic optimization problems in such settings as inventory control and other logistics problems, as well as the application of these techniques to several issues in computational biology.

2005–2006 Publications

"Provably near-optimal sampling-based algorithms for stochastic inventory models," *Proceedings of the Thirty-eighth Annual ACM Symposium on the Theory of Computing*, (2006). 739–748, (With R. Levi and R. Roundy.)

"Sampling-based approximation algorithms for multi-stage stochastic optimization," *Proceedings of the Forty-sixth Annual IEEE Symposium on Foundations of Computer Science*, 357–366, (2005). (With C. Swamy.)

"Approximation algorithms for stochastic inventory control models," *Proceedings of the Eleventh MPS Conference on Integer Programming and Combinatorial Optimization*, 306–320, (2005). (With R. Levi, M. Pál, and R. Roundy.)

"Inventory and facility-location models with market selection," *Proceedings of the Eleventh MPS Conference on Integer Programming and Combinatorial Optimization*, 111–124, (2005). (With R. Levi, J. Geunes, and E. Romeijn.)

2005–2006 Lectures

"Sampling-based Approximation Algorithms for Multi-stage Stochastic Optimization Problems," Forty-sixth Annual IEEE Symposium on Foundations of Computer Science, (October 2005).

"Approximation Algorithms for Stochastic Optimization Problems," Aussois Workshop on Combinatorial Optimization, (January 2006).

"Approximation Algorithms for Discrete Stochastic Optimization," Distinguished Lecture series, Tsinghua University, (March 2006).

"Provably Near-optimal Sampling-based Algorithms for Stochastic Inventory Models." Thirty-eighth Annual ACM Symposium on the Theory of Computing, (May 2006).

"Approximation Algorithms for Stochastic Inventory Control Models," Invited plenary lecture at Sixth Annual Haifa Workshop on Interdisciplinary Applications of Graph Theory, Combinatorics, and Algorithms, (May 2006).

"Approximation Algorithms for 2-stage Stochastic Optimization Problems," Tutorial lecture at Sixth Annual Haifa Workshop on Interdisciplinary Applications of Graph Theory, Combinatorics, and Algorithms, (May 2006).

2005–2006 Professional Activities

Editorial Board, *SIAM Journal on Discrete Mathematics*

Associate Editor, *Mathematical Programming*

Member, Executive Council, Prize Coordinator, ACM SIGACT

Council Member for Publications, Mathematical Programming Society

Member, ACM Lawler Prize Committee

2005–2006 University Activities

Member, Ad Hoc Committee of the Dean of the Faculty on Course and Exam Scheduling

Awards and Honors

Fellow, Association for Computing Machinery (2002)

Recipient, Sonny Yau Award for Excellence in Teaching, Cornell College of Engineering (1995, 1998, 2003)

Recipient, National Science Foundation Presidential Young Investigator Award (1987)

Selected Publications

"Using dual approximation algorithms for scheduling problems: Theoretical and practical results," *Journal of the ACM*, 34:144–162 (1987). (With D.S. Hochbaum.)

"Scheduling to minimize the average completion time: On-line and off-line approximation algorithms," *Mathematics of Operations Research*, 22:513–544 (1997). (With L.A. Hall, A.S. Schulz, and J. Wein.)

"Improved approximation algorithms for the uncapacitated facility location problem," *SIAM Journal on Computing*, 33:1–25 (2003). (With F. Chudak.)

ADAM SIEPEL

ASSISTANT PROFESSOR

CIS, JOINT WITH THE DEPARTMENT OF BIOLOGICAL
STATISTICS AND COMPUTATIONAL BIOLOGY



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<http://www.bscb.cornell.edu/~siepel/>

Adam Siepel obtained a bachelor's degree in agricultural and biological engineering from Cornell in 1994, an M.S. degree in computer science from the University of New Mexico in 2001, and a Ph.D degree in computer science from the University of California in 2005. He joined the Faculty of Computing and Information Science in January 2006.

Siepel's research interests lie in the area where computer science, statistics, evolutionary biology, and genomics meet. His most recent work has been in comparative genomics, particularly of mammals, and has included a mixture of statistical modeling, algorithms development, software implementation, and scientific discovery. Siepel likes to tackle problems of practical importance in genomics, such as gene finding and conserved element identification, using methods from machine learning and statistics. He also strives to maintain an evolutionary perspective on comparative genomics and draws heavily from the field of molecular phylogeny. Siepel has written a popular program for conservation analysis called phastCons and a phylogenetic gene (exon) prediction program called ExoniPhy. He did his Ph.D. work with David Haussler, a leader in machine learning, computational biology, and comparative genomics.

2005–2006 Publications

"New methods for detecting lineage-specific selection," *Proceedings of the Tenth Annual International Conference on Research in Computational Molecular Biology*, 190–205, (2006). (With K.S. Pollard and D. Haussler.)

"A distal enhancer and an ultraconserved exon are derived from a novel retroposon," *Nature*, 441(7089):87–90, (2006). (With G. Bejerano, C.B. Lowe, D. Haussler, and others.)

"Identification and classification of conserved RNA secondary structures in the human genome," *PLoS Computational Biology*, 2(4):e33, (2006). (With J.S. Pedersen, G. Bejerano, D. Haussler, and others.)

"The UCSC genome browser database: Update 2006," *Nucleic Acids Research*, 34:D590–598, (2006). (With A.S. Hinrichs, D. Karolchik, D. Haussler, and others.)

"Evolutionarily conserved elements in vertebrate, insect, worm, and yeast genomes," *Genome Research*, 15:1034–1050, (2005). (With G. Bejerano, J.S. Pedersen, D. Haussler, and others.)

2005–2006 Professional Activities

Member, ENCODE Project Consortium

Reviewer, *Genome Research*; *Molecular Biology and Evolution*; *BMC Bioinformatics*, *European Conference on Bioinformatics* (2005); *Intelligence Systems for Molecular Biology* (2006)

Member, Program Committee, Workshop on Algorithms in Bioinformatics (2006)

Member, Graduate Fields of Computational Biology, Computer Science, and Biometry, Cornell University

Awards and Honors

Recipient, Graduate Research and Education in Adaptive bio-Technology (GREAT) Fellowship, University of California Biotechnology Research and Education Program (UCBREP) (2004–2005)

Recipient, Achievement Rewards for College Scientists (ARCS) Scholarship (2003–2004)

Recipient, Best Student Paper, Sixth International Conference on Research in Computational Molecular Biology (2002)

Recipient, UC Santa Cruz Chancellor's Fellowship (2002)

E. GÜN SIRER

ASSISTANT PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

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Emin Gün Sirer received his Ph.D. from the University of Washington in 2002. His research is focused on self-organization in peer-to-peer and mobile ad hoc networks and spans operating systems, networking, and distributed systems.

The recently emerging peer-to-peer paradigm enables novel distributed services. Sirer's group investigates peer-to-peer systems that combine high-performance with scalability and fault-tolerance. Sirer has developed a new distributed hash table with strong $O(1)$ performance guarantees called Beehive. The Cooperative Domain Name Service (CoDoNs) project provides a Beehive-based alternative to the Domain Name Service, the system used to translate Internet names to addresses, that achieves low latency, resilience against denial of service attacks, and security against active attackers. The Herbivore project has applied the peer-to-peer paradigm to anonymous communication and provides strong anonymity guarantees to its participants, even against attackers with unlimited wire-tapping power. The Meridian project is investigating a lightweight yet accurate peer-to-peer framework for solving location-based problems, such as finding the closest node, determining a geographically diverse set, and discovering a good overlay route that can serve as a building block for large-scale distributed systems.

Another emerging domain where self-organization plays a large role is mobile ad hoc and sensor networks. The MagnetOS project investigates operating system support for this new domain. Specifically, Sirer's group is designing and building a new operating system that improves the longevity and reliability of applications on ad hoc networks through energy-aware, adaptive object migration. The group previously investigated hybrid routing protocols and proposed the SHARP protocol, which automatically finds the optimal mix of proactive route dissemination and reactive route discovery for node-specific performance metrics. The Zoom project investigates cheap, software-based location-discovery



mechanisms that can determine the physical location of wireless nodes without expensive and power-consuming GPS receivers.

Sirer's past work focused on operating-system architecture. The SPIN kernel proposed language-based techniques for safely extending operating systems with application-specific code. The Kimera system introduced a new virtual machine architecture that enables Java systems of drastically higher manageability, security, and performance, while reducing their resource requirements. The techniques developed in the Kimera project have been adopted throughout the industry, including Hewlett-Packard, Microsoft, Sun, and Schlumberger, Inc.

2005–2006 Publications

"Design and implementation of a single system image operating system for ad hoc networks," *Proceedings of the International Conference on Mobile Systems, Applications, and Services*, (2005). (With H. Liu, T. Roeder, K. Walsh, and R. Barr.)

"Sextant: A unified node and event localization framework using non-convex constraints," *Proceedings of the International Symposium on Mobile Ad Hoc Networking and Computing*, (2005). (With S. Guha and R. Murty.)

"Trickles: A stateless network stack for improved scalability, resilience and flexibility," *Proceedings of Networked System Design and Implementation*, (2005). (With A. Shieh and A. Myers.)

"Meridian: A lightweight network location service without virtual coordinates," *Proceedings of the ACM SIGCOMM Conference*, (2005). (With B. Wong and A. Slivkins.)

"Perils of transitive trust in the domain name system," *Proceedings of Internet Measurement Conference*, (2005). (With V. Ramasubramanian.)

"Client and feed characteristics of RSS, a publish-subscribe system for Web micronews," *Proceedings of Internet Measurement Conference*, (2005). (With H. Liu and V. Ramasubramanian.)

2005–2006 Lectures

"CoDoNs: A High-performance, Fault-resilient Replacement for the Legacy Domain Name Service," Carnegie Mellon University, Computer Science Department, (November 2004).

"Eluding Carnivores: File Sharing with Strong Anonymity," European SIGOPS Workshop, Leuven, Belgium, (September 2004).

"The Design and Implementation of a Next Generation Name Service for the Internet," SIGCOMM, Portland, OR, (August 2004).

"Operating Services 7/24: Domain Name Service for the Next Generation Internet," Planetlab Workshop, Palo Alto, CA, (April 2004).

"Network Positioning for Wide-Area and Wireless Networks," Keynote Talk: LOCALITY Workshop, Cracow, Poland, (September 2005).

"Issues in Dependability for Self-Organizing Nomadic Systems," Invited Talk: IFIP 10.4 Workgroup Meeting, Hakone, Japan, (July 2005).

"Self-Organizing Systems for Robust, Large-Scale Infrastructure Services," University of Maryland, College Park, MD, (July 2005).

2005–2006 Professional Activities

Co-Chair, Third Workshop on Economics of Peer-to-Peer Systems (2005)

Member, Program Committee, ACM Symposium on Networked System Design and Implementation (2006)

Participant, ACM Symposium on Operating System Principles (2005); IEEE Communications Society Conference on Sensor and Ad Hoc Communications and Networks (2005); The Fourth International Workshop on Peer-to-Peer Systems (2005); International Conference on Distributed Computing Systems (2005); ACM/IEEE/SCS Workshop on Principles of Advanced and Distributed Simulation (2005)

Awards and Honors

Recipient, NSF CAREER Award (2005)

Recipient, Ralph S. Watts '72 Excellence in Teaching Award (2003)

PAUL STODGHILL

SENIOR RESEARCH ASSOCIATE

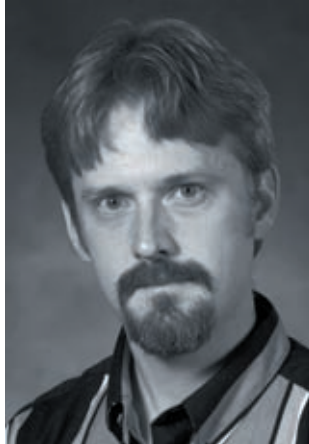
DEPARTMENT OF COMPUTER SCIENCE

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Paul Stodghill obtained his bachelor's degree in mathematics and computer science from Dickinson College in 1988. He obtained his Ph.D. in computer science from Cornell University in 1997. Since 1997, he has worked as a research associate in the department.

With deployment of high-bandwidth networks, computational science is entering a new era of distributed and collaborative computing. Stodghill's research interests focus on supporting this effort. For example, he has worked closely with a number of computational scientists to develop novel, high-performance distributed scientific applications.

Currently, he is developing fault-tolerant support for parallel applications and infrastructure for deploying scientific simulations as Web services. He is also helping to develop model-based and empirical optimization techniques that allows code to be migrated between platforms without loss of performance.



2005–2006 Publications

"Recent advances in checkpoint/recovery systems," *Workshop on NSF Next Generation Software*, held in conjunction with IPDPS, (2006). (With G. Bronevetsky and others.)

"Mobile MPI programs in computational grids," *ACM Principles and Practice of Parallel Computing*, (2006). (With R. Fernandes and K. Pingali).

"Automatic measurement of instruction cache capacity," *Workshop on Languages and Compilers for Parallel Computing*, (2005). (With K. Yotov and others.)

2005–2006 Professional Activities

Co-Chair, Working Group on Grid Checkpoint and Recovery, Global Grid Forum

EVA TARDOS

PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

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Éva Tardos received her Ph.D. at the Eötvös University in Budapest, Hungary in 1984. After teaching at Eötvös and at M.I.T., she joined Cornell in 1989. She is a member of the American Academy of Arts and Sciences, an ACM Fellow, and she received the Fulkerson Prize in 1988 (awarded jointly by the American Mathematical Society and the Mathematical Programming Society for a paper in discrete mathematics). She has research fellowships from the Guggenheim, Packard, and Sloan Foundations and teaching awards from the Cornell Engineering College and computer science department. She is the editor of several journals and editor-in-chief of the *SIAM Journal on Computing*.

Tardos's research interest focuses on algorithmic game theory and the design and analysis of algorithms. Her work in both contexts has focused on combinatorial-optimization problems on graphs or networks. Such problems arise in many applications, including the design and management of communication networks. She is most known for her work on network-flow algorithms, understanding the quality of selfish routing, and approximation algorithms for network problems.

2005–2006 Publications

"How much can coalitions hurt the price of anarchy," (to appear) *Proceedings of the ACM Symposium on the Theory of Computing*, (2006). (With A. Hayrapetyan and T. Wexler.)

"A network pricing game for selfish traffic," *Proceedings of the Twenty-fourth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing*, 284–291, (2005). (With A. Hayrapetyan and T. Wexler.)

"Facility location with hierarchical facility costs," *Proceedings of the Seventeenth Annual ACM-SIAM Symposium on Discrete Algorithms*, 153–161, (2006). (With Z. Svitkina.)



"Influential nodes in a diffusion model for social networks," *Proceedings of the Thirty-second International Colloquium on Automata, Languages and Programming*, 1127–1138 (2005). (With D. Kempe and J. Kleinberg.)

"Braess's Paradox, Fibonacci numbers, and exponential inapproximability," *Proceedings of the Thirty-second International Colloquium on Automata, Languages and Programming*, 497–512 (2005). (With H. Lin, T. Roughgarden, and A. Walkover.)

2005–2006 Lectures

"Network Games and the Price of Anarchy or Stability," Foundations of Computational Mathematics, (July 2005); The Twelfth International Conference on Random Structures and Algorithms, Poznan, Poland, (August 2005); Allerton, (September 2005); Sixth Heinz Nixdorf Symposium, Paderborn, Germany, (January 2006); Toyota Institute of Technology, Chicago, (January 2006); and Peking University, China, (February 2006).

"A Network Pricing Game for Selfish Traffic," Stony Brook Game Theory Festival, (July 2005).

"Local Search and Nash Equilibria for Facility Location Problems," Renyi Institute, Budapest, Hungary, (October 2005).

"Hungarian Method in Approximation Algorithms and Games," Fiftieth Anniversary of the Hungarian Method, Budapest, Hungary, (November 2005).

"Games in Networks: Routing, Network Design, Potential Games, and Equilibria and Inefficiency," Series of four talks, NHC Spring School and Workshop on Discrete Algorithms, Tokyo, Japan (March 2006).

"Solution Quality in Routing and Network Formation Games," University of Southern California, Los Angeles, (March 2006).

"The Effect of Collusion in Congestion Games," Stanford, (March 2006); Berkeley, (March 2006); and University of Washington, (May 2006).

"Approximation Algorithms, the Price of Anarchy, and Mechanisms Design," Microsoft Research, (May 2006).

2005–2006 Professional Activities

Editor-in-chief, *SIAM Journal on Computing* (since 2004)

Editor, *Journal of the ACM*; *Combinatorica*

Member, Advisory Board, Microsoft Technical Advisory Board ("ALT-TAB") on eCommerce and Auctions; Center for Discrete Mathematics and Computer Science (DIMACS) at Rutgers

Member, SIGACT Committee on TCS Funding

Program Chair, IEEE Symposium on the Foundation of Computer Science (2005)

Awards and Honors

ACSU Faculty of the Year (2005)

Fellow, American Academy of Arts and Sciences

Fellow, Association of Computing Machinery

Recipient, Guggenheim Fellowship

Recipient, Packard Fellowship

Recipient, Sloan Foundation Fellowship

Recipient, F.I. Li '78 and D. Li '75 Excellence in Teaching Award

Recipient, Fulkerson Prize (of AMS and MPS) (1988)

Selected Publications

Algorithm Design. Addison-Wesley (2005). (With J. Kleinberg.)

"How bad is selfish routing?" *Journal of the Association of Computing Machinery*, 49(2):236–259 (2002).

"Approximation algorithms for classification problems with pair-wise relationships: Metric partitioning and Markov random fields," *Journal of the ACM*, 49(5):616–639 (2002).

"A strongly polynomial algorithm for the minimum cost circulation problem," *Combinatorica*, 5:247–255 (1985).

TIM TEITELBAUM

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Tim Teitelbaum received a B.S. in mathematics from the M.I.T. in 1964 and his Ph.D. in computer science from Carnegie Mellon University in 1975. His research is concerned with the use of fine-grain dependence graphs for specification, development, and analysis of source and binary code. The objective is a new generation of tools that provide precise and complete information about the structure of complex software. He is working to improve the performance and functionality of generic dependence-graph technology, and also exploring the use of the technology in various application domains, including software development, maintenance and re-engineering of legacy code, security-assurance and safety-assurance inspection, and software anti-tamper protection. Teitelbaum's earlier work on programming environments and incremental computation resulted in the Cornell Program Synthesizer and the Synthesizer Generator, two of the earliest systems to have demonstrated the viability of integrated language-based programming environments and syntax-directed editors. He is a co-founder and chairman of GrammaTech, Inc.

Selected Publications

"A next-generation platform for analyzing executables," *Proceedings of the Third Asian Symposium on Programming Languages and Systems*, (2005). (With T. Reps, G. Balakrishnan, and J. Lim.)

"WYSINWYX: What You See Is Not What You eXecute," *Proceedings of the IFIP Working Conference on Verified Software: Theories, Tools, Experiments*, (2005). (With G. Balakrishnan, T. Reps, and D. Melski.)

"Model checking x86 executables with CodeSurfer/x86 and WPD5++," (tool-demonstration paper), *Proceedings of Computer-aided Verification*, (2005). (With G. Balakrishnan, T. Reps, N. Kidd, and others.)

Awards and Honors

Citation, Listed by Thomson ISI as one of the 238 most cited computer-science authors of 1981–1989



WILLIAM THURSTON

PROFESSOR
CIS, JOINT WITH MATHEMATICS

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Professor Thurston is a topologist, though his work impinges on many other areas of mathematics. He has discovered unexpected links between topology, hyperbolic geometry, and complex analysis.

Highlights of his career include his classification of foliations of codimension greater than one, his classification of surface automorphisms, his hyperbolization theorem in three-dimensional topology, and the theories of automatic groups and confoliations. Thurston has also made fundamental contributions to the theory of symplectic and contact manifolds, dynamics of surface diffeomorphisms, and the combinatorics of rational maps.

His current research includes random 3-manifolds and relations of knot theory to computational complexity. His main interest remains his geometrization conjecture, a far-reaching proposed generalization of his hyperbolization theorem.

Selected Publications

Confoliations. American Mathematical Society, (1998). (With Y. Eliashberg.)

"Three-dimensional geometry and topology," *Princeton Mathematical Series 35*, (1997).

Word Processing in Groups. Jones and Bartlett Publishers, (1992). (With D.B.A. Epstein, J.W. Cannon, D.F. Holt, and others.)

"Hyperbolic structures on 3-manifolds, I. deformation of acylindrical manifolds," *Annals of Mathematics*, 124:203–246 (1986).

"Three-dimensional manifolds, Kleinian groups and hyperbolic geometry," *Bulletin of the American Mathematical Society (N.S.)*, 6:357–381 (1982).

**CHARLES VAN LOAN**

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Charles Van Loan received his Ph.D. in mathematics from the University of Michigan in 1973. After being a post-doctoral research fellow at the University of Manchester, he joined the Department of Computer Science as an assistant professor in 1975.

Professor Van Loan works in the matrix computation field specializing in least-squares and eigenvalue problems that arise in control engineering and signal processing. Block matrix computations are a current interest, with a special emphasis on novel algorithms that exploit Kronecker product structure. Kronecker products are increasingly important because of the role that they play in fast transforms and various multilinear applications. He is currently focusing on low-rank approximations of high-dimensional tensors using the singular value decomposition.

Professor Van Loan is the author of five textbooks: *Matrix Computations* (with G.H. Golub); *Computational Frameworks for the Fast Fourier Transform*; *Introduction to Scientific Computation-A Matrix Vector Approach Using Matlab*; *Introduction to Computational Science and Mathematics*; and *Handbook for Matrix Computations* (with T. Coleman).

Awards and Honors

Recipient, McCormick Advising Award, College of Engineering (2003)

Recipient, Paul Advising Award, College of Arts and Sciences (1997)

Selected Publications

"Nineteen dubious ways to compute the exponential of a matrix, twenty-five years later," *SIAM Review*, 45:3–49, (2003). (With C. Moler.)

"The ubiquitous Kronecker product," *Journal of Computational and Applied Mathematics*, 123:85–100, (2000).

"The WY representation for products of householder transformations," *SIAM Journal of Scientific and Statistical Computing*, 8:s2–s13, (1987). (With C. Bischof.)

ROBBERT VAN RENESSE

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Robbert van Renesse received his M.Sc. in mathematics and computer science from the Vrije Universiteit (Amsterdam) in 1985, with the honorary addendum cum laude. He obtained his Ph.D. in computer science from the Vrije Universiteit in 1989. After a postdoctorate at Cornell and another at AT&T Bell Laboratories, he joined the computer science department in 1991.

His research focus is in large-scale, self-organizing network protocols and fault-tolerant and secure distributed systems. Van Renesse designed and built various systems that have been deployed in industry, including the Amoeba distributed operating system kernel and services, the Horus and Ensemble group communication systems, and the Astrolabe peer-to-peer aggregation service.

His current projects include scalable and Byzantine group membership and media streaming, scalable multicast and data center management (with Ken Birman), Byzantine agreement protocols (with Fred Schneider and visiting professor Danny Dolev), data dissemination in mobile ad hoc networks (with Ken Birman and Einar Vollset), large scale event distribution (with Dag Johansen of the University of Tromsø, Norway), and formal specification and verification of distributed algorithms (with Robert Constable and Mark Bickford).

2005–2006 Publications

"Mistral: Efficient flooding in mobile ad-hoc networks," *Proceedings of the Seventh ACM International Symposium on Mobile Ad Hoc Networking and Computing*, (2006). (With S. Pleisch, M. Balakrishnan, and K. Birman.)

"Fireflies: Scalable support for intrusion-tolerant network overlays," *Proceedings of Eurosys*, (2006). (With H. Johansen and A. Allavena.)

"Using randomized techniques to build scalable intrusion-tolerant overlay networks," *Proceedings of StoDis 2005, Workshop on Stochasticity in Distributed Systems*, (2005).

Peer-to-Peer Systems IV: Fourth International Workshop, Revised Selected Papers. Lecture Notes in Computer Science, (2005). (With M. Castro.)

"APSS: Proactive secret sharing in asynchronous systems," *ACM Transactions on Information and System Security (TISSEC)*, 8(3) (2005). (With L. Zhou and F. Schneider.)

2005–2006 Professional Activities

Member, Program Committee, Seventh Symposium on Operating Systems Design and Implementation (2006); International Conference on Dependable Systems and Networks (2006); Fifteenth IEEE International Symposium on High Performance Distributed Computing (2006)

STEPHEN A. VAVASIS

PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

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Stephen Vavasis received his Ph.D. in computer science from Stanford in 1989. Since then, he has taught at Cornell where he is currently a full professor. He has also held summer and sabbatical research positions at Sandia National Laboratories, RIACS, Xerox PARC, Bell Labs, and Argonne National Laboratory.

Vavasis's field is scientific computing. He is known for bridging the gap between theory and practice in numerical algorithms. His contributions include the first provably good mesh generator for three-dimensional finite element analysis (with former student S. Mitchell, now at Sandia), the first interior point method for linear programming whose polynomial running time does not depend on the objective function or constraint right-hand side (with Y. Ye of Stanford), and guaranteed-quality geometric mesh partitioning (with Miller, Teng, and Thurston).

More recently, in joint work with P. Ganguly and K. Papoulia of Cornell, he has developed meshing algorithms in which all spatial directions are represented equally in the mesh (important for fracture mechanics applications). In joint work with E. Boman and B. Hendrickson of Sandia, he has discovered new techniques to solve linear equations arising in partial differential equations in nearly linear time.

2005–2006 Publications

"Spatial convergence of crack nucleation using a cohesive finite-element model on a pinwheel-based mesh," *International Journal of Numerical Methods in Engineering*, online edition, (2006). (With K.D. Papoulia and P. Ganguly.)



2005–2006 Lectures

"Solving Elliptic Finite Element Systems in Nearly Linear Time using Support Graph Preconditioners," (joint work with E. Boman and B. Hendrickson), Theory Seminar, Carnegie Mellon University, (October 2005); Computer Science Colloquium, University of Illinois, (October 2005); Mathematics Colloquium, University of Minnesota, (February 2006).

"A Fully Sparse Algorithm for Semidefinite Programming Using Automatic Differentiation," Combinatorics and Optimization Colloquium, University of Waterloo, (March 2006).

2005–2006 Professional Activities

Member, NRC Board for Assessment of NIST

Co-organizer, Minisymposium on Iterative Solvers in Computational Mechanics, World Conference on Computational Mechanics (2006)

2005–2006 University Activities

Member, Faculty Senate

Member, Engineering Policy Committee

Member, Ph.D. Admission Committee, Computer Science

Awards and Honors

Recipient, Presidential Young Investigator Award (1990–1995)

Recipient, Guggenheim Fellowship (1996–1997)

SIMEON WARNER

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Simeon Warner works in the Information Science Program. He received his Ph.D. degree from the University of Manchester, U.K., in 1994.

Warner's current research interests are in Web information systems, interoperability, and open-access scholarly publishing. He works on the arXiv eprint archive and the Open Archives Initiative.



2004–2005 Publications

"The OAI data-provider registration and validation service," Abbreviated version to be published in *Proceedings European Conference on Research and Advanced Technology for Digital Libraries*, (2005).

"The transformation of scholarly communication," *Learned Publishing*, 18:177–185 (2005).

"Evaluating affect: Co-interpreting what 'works,'" *Proceedings of Workshop on Affective Evaluation Interfaces*, (2005). (With P. Sengers, K. Boehner, and T. Jenkins.)

"Resource harvesting within the OAI-PMH framework," *D-Lib Magazine*, 10(12) (2004). (With C. Lagoze, H. Van de Sompel, and M.L. Nelson.)

"Rethinking scholarly communication: Building the system that scholars deserve," *D-Lib Magazine*, 10(9) (2004). (With H. Van de Sompel, S. Payette, J. Erickson, and C. Lagoze.)

2004–2005 Lectures

"An Update from the OAI," Coalition for Networked Information Fall Forum 2004, Portland, OR, (December 2004). (Presented jointly with H. van de Sompel and M. Nelson.)

"arXiv: Eprint Repository and OAI Data-provider," Open Archives seminar "Facilitating Free and Efficient Scientific Communication," DEF/DTV/DTU, Copenhagen, Denmark, (February 2004).

"The Open Archives Initiative," Open Archives seminar "Facilitating Free and Efficient Scientific Communication," DEF/DTV/DTU, Copenhagen, Denmark, (February 2004).

STEPHEN WICKER

PROFESSOR AND ASSOCIATE DIRECTOR
SCHOOL OF ELECTRICAL AND COMPUTER
ENGINEERING
MEMBER OF THE GRADUATE FIELD OF
COMPUTER SCIENCE

wicker@ece.cornell.edu
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Stephen Wicker received his B.S.E.E. from the University of Virginia in 1982 and his Ph.D. from the University in Southern California in 1987. He was a system engineer for the Space and Communications Group of the Hughes Aircraft Company, in El Segundo, California from 1983 to 1987, designing and developing communication payloads for commercial, military, and NASA spacecraft. From 1987 through 1996, he was a member of the faculty of the School of Electrical and Computer Engineering at Georgia Tech. He left for Cornell in 1996 to help build the wireless research area and is now a professor of electrical and computer engineering.

Professor Wicker teaches and conducts research in wireless networks, with an emphasis on self-configuring sensor networks. He and his students use the tools of game theory, information theory, and mechanism design to develop local decision rules for networked agents that lead to desired global performance of the network.

Professor Wicker has written five books and over 150 papers on various aspects of wired and wireless links and networks. He is a former associate director for research in the School of Electrical and Computer Engineering and has won several teaching awards. He has supervised over thirty Ph.D. theses.

Professor Wicker is the Cornell Principal Investigator for the TRUST Science and Technology Center—a National Science Foundation center dedicated to the development of technologies for trusted systems and securing the nation's critical infrastructure.

2005–2006 Publications

"Link dynamics and protocol design in a multi-hop mobile environment," (to appear) *IEEE Transactions on Mobile Computing*, (2006). (With P. Samar.)

"Successive multiple description quantization and successive dirty paper coding," (accepted pending revision) *IEEE Transactions on Information Theory*. (With X. Zhang, J. Chen, and T. Berger.)



"On the Behavior of Communication Links in a Multi-Hop Mobile Environment," *Frontiers in Distributed Sensor Networks*, S.S. Iyengar and R.R. Brooks (Eds.), CRC Press, 2005. (With P. Samar.)

"On the optimal distribution of sensors in a random field," *ACM Transactions on Sensor Networks*, (2006). (With X. Zhang.)

"A one-shot random access game for wireless networks," *Proceedings of the International Conference on Wireless Networks, Communications, and Mobile Computing*, (2005). (With H. Inalketin.)

"Robustness vs. efficiency in sensor networks," *Proceedings of Information Processing in Sensor Networks*, (2005). (With X. Zhang.)

2005–2006 Professional Activities

Associate Editor, *ACM Journal on Sensor Networking*

Chair, Technical Program Committee, Fifth International Symposium on Information Processing in Sensor Networks (2006)

Member, Technical Program Committee, International Conference on Distributed Computing in Sensor Networks (2006); Fourth International Symposium on Information Processing in Sensor Networks (2005); Conference on Innovations and Commercial Applications of Distributed Sensor Networks (2005); Second IEEE International Conference on Sensor and Ad Hoc Communications and Networks (2005)

DAVID WILLIAMSON

PROFESSOR

CIS, JOINT WITH THE SCHOOL OF
OPERATIONS RESEARCH
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David Williamson received his Ph.D. in computer science from M.I.T. in 1993. He spent several years as a research staff member at the IBM T.J. Watson Research Center and then as a senior manager at the IBM Almaden Research Center. He joined Cornell University in January 2004, with a joint appointment in CIS and the School of Operations Research and Industrial Engineering.

His primary research interest has been in the design and analysis of polynomial-time algorithms for the approximate solution of hard problems in discrete optimization, especially problems arising in network design, scheduling, facility location, and routing. He focuses on the use of techniques from the area of mathematical programming for designing such algorithms, including such techniques as the primal-dual method and semi-definite programming.

2005–2006 Publications

"An adaptive algorithm for selecting profitable keywords for search-based advertising services," (to appear) *Proceedings of the ACM Conference on Electronic Commerce*, (2006). (With P. Rusmevichientong.)

"A simple GAP-canceling algorithm for the generalized maximum flow problem," *Proceedings of the Seventeenth ACM-SIAM Symposium on Discrete Algorithms*, (2006). (With M. Restrepo.)

"A general approach for incremental approximation and hierarchical clustering," *Proceedings of the Seventeenth ACM-SIAM Symposium on Discrete Algorithms*, (2006). (With G. Lin, C. Nagarajan, and R. Rajaraman.)

2005–2006 Lectures

"A General Approach for Incremental Approximation and Hierarchical Clustering," Workshop on Approximation Algorithms, IIT Delhi, New Delhi, India, (October 2005); and Cowles Workshop on Optimization, Yale University, New Haven, CT, (March 2006).



"A Simple GAP-canceling Algorithm for the Generalized Maximum Flow Problem," Mathematisches Forschungsinstitut Oberwolfach (Combinatorial Optimization), Oberwolfach, Germany, (November 2005).

2005–2006 Professional Activities

Area Editor, *Mathematics of Operations Research*

Associate Editor, *ACM Transactions on Algorithms*,
SIAM Journal on Discrete Mathematics, *SIAM Journal on Computing*

Awards and Honors

Recipient, IBM Faculty Partnership Award (2005)

Recipient, Fulkerson Prize from the Mathematical Programming Society (2000)

Recipient, SIAM Optimization Group Prize (1999)

Recipient, SIAM DiPrima Prize (1996)

Recipient, Mathematical Programming Society
A.W. Tucker Prize (1994)

RAMIN ZABIH

ASSOCIATE PROFESSOR

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Ramin Zabih received undergraduate degrees in computer science and in mathematics from M.I.T. and a Ph.D. in computer science from Stanford in 1994. He joined the Department of Computer Science in 1994 and was promoted to associate professor in 2001. In 2001, he was also given a joint appointment in the Department of Radiology at Cornell's Weill Medical College in New York City.

Zabih's research interests are in computer vision and its applications, especially in medical imaging. He is best known for the work his group has done in applying combinatorial-optimization methods, such as graph cuts, to computer-vision problems. He is currently supervising several Ph.D. students who are working on applying such methods to the automated analysis of magnetic resonance imagery. He has also done extensive consulting for Microsoft, where his work had a major impact on Internet Explorer.

2005–2006 Publications

"Graph cut algorithms for binocular stereo with occlusions," *Mathematical Models in Computer Vision: The Handbook*, Springer-Verlag (2005). (With V. Kolmogorov.)

"An automatic algorithm for correcting motion artifacts in time-resolved 2D MR angiography using convex projections," *Magnetic Resonance in Medicine*, 55(3):649–658 (2006). (With A. Raj, H. Zhang, M.R. Prince, and Y. Wang.)

"A comparative study of energy minimization methods for Markov random fields," *Proceedings of European Conference on Computer Vision*, 2:19–26 (2006). (With R. Szeliski, D. Scharstein, O. Veksler, and others.)



2005–2006 Lectures

"MRF's for MRI's: Bayesian Reconstruction of MR Images via Graph Cuts," University of Toronto, (May 2006); Stanford Broad Area Colloquium, (April 2006); RPI CS Colloquium, (April 2006); CMU Robotics Institute Seminar, (October 2005); Oxford Computing Lab, (August 2005).

Tutorial on Graph Cuts, SIAM Conference on Imaging Science; IEEE Conference on Computer Vision and Pattern Recognition.

2005–2006 Professional Activities

Area chair, IEEE Conference on Computer Vision and Pattern Recognition (2006); IEEE International Conference on Computer Vision (2005); IEEE Conference on Computer Vision and Pattern Recognition (2005)

COMPUTING
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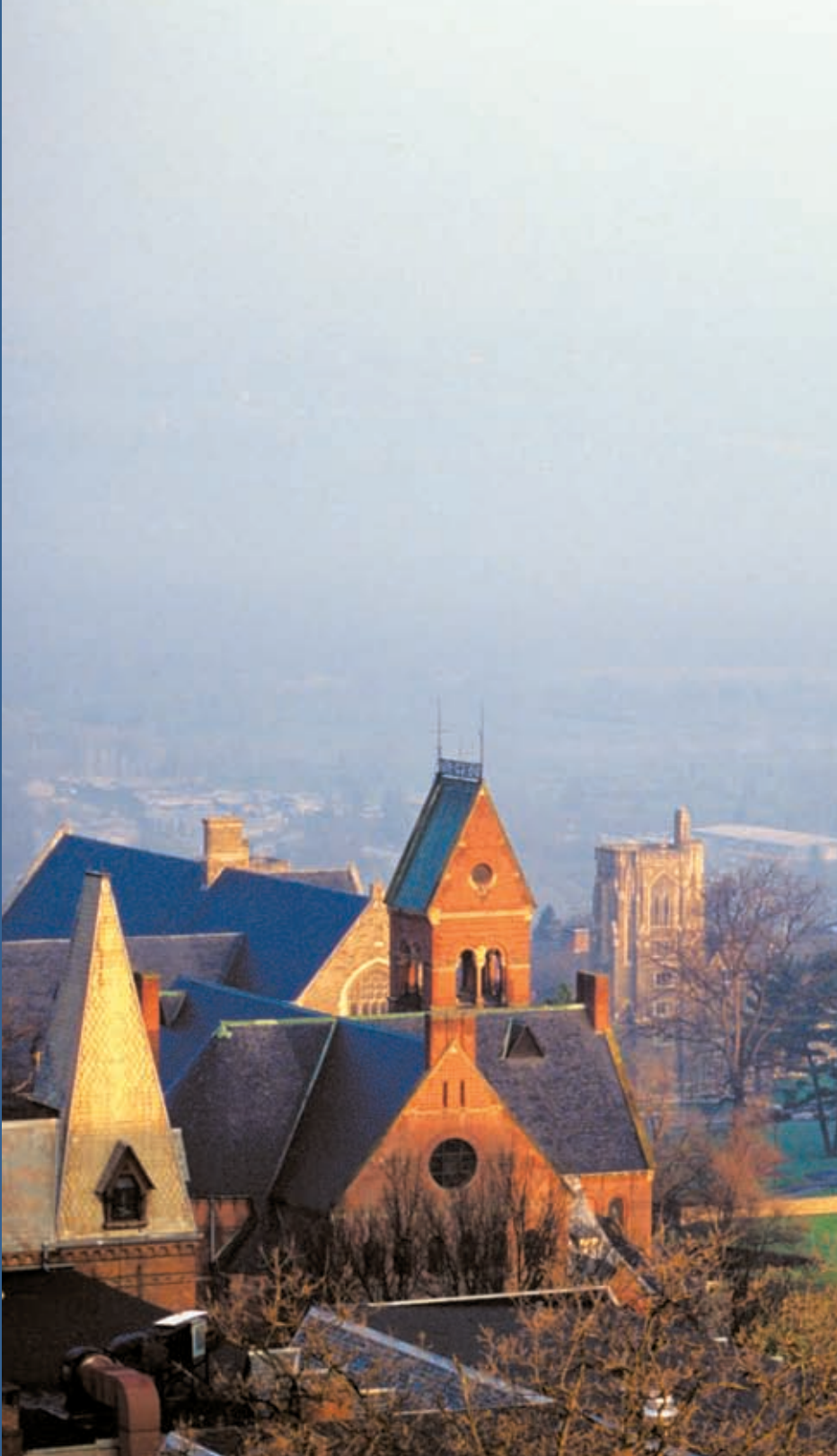
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