CS@CU

25 YEARS

NEWSLETTER OF THE DEPARTMENT OF COMPUTER SCIENCE AT COLUMBIA UNIVERSITY VOL.1 NO.3 WINTER 2005

At the 25th Anniversary Dinner (from left to right): SEAS Vice Dean Morton B. Friedman; SEAS Dean Zvi Galil, a former chair of the CS Department; Peter Likins, President of the University of Arizona and former SEAS dean under whose leadership the Department was founded; Professor Henning Schulzrinne; Professor Joseph Traub, the founding Chair of the Department; and keynote speaker Robert Kahn, President of the Corporation for National Research Initiatives (CNRI).

Message from the Chair

Henning Schulzrinne, Professor & Chair

This fall, the Department of Computer Science at Columbia University was proud to celebrate its 25th anniversary under the banner "Academic Excellence, Innovative Research." The celebration began with a dinner with Peter Likins, the current President of the University of Arizona.

In the late 1970's, Peter as provost of Columbia University was one of the principal individuals who helped create the Department. This was a bold move for Columbia because in those times computer science was not yet universally recognized as an academic discipline. The event was highlighted by a one-day symposium by current new faculty and alumni, with a keynote address by Bob Kahn and a retrospective from the first department chair, Joe Traub *(see pg. 7)*. The article on pg. 7 provides more details and links to photos and video recordings.

The Department has now 34 faculty, complemented by an increasing number of adjunct professors from local research laboratories teaching advanced graduate courses. Unlike most other departments, our PhD, MS and undergraduate student populations are of the same magnitude, with 124 PhD students, about 160 Masters students, and 145 undergraduate majors. The Department's research and teaching is supported by 16 administrative staff and 5 system administrators. Last year, we conducted research supported by almost $10 million of external funding.

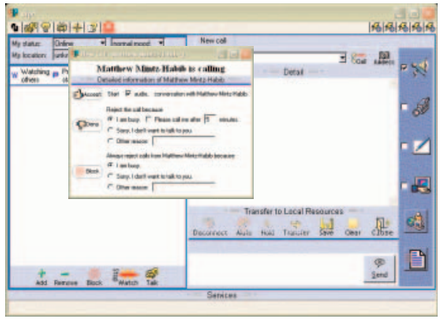
Since 1979, we have graduated more than 150 PhDs, now working in most of the major computer-science-related laboratories and in many universities, both in the United States and beyond. 1620 undergraduates have received a Columbia CS degree over the years, along with 1206 MS students. We want to continue to leverage our broad and deep coverage to provide more than just a textbook education to our students. For example, our low student-to-faculty ratio allows us to offer individually supervised research projects, with almost all MS students and many of the undergraduates taking part in at least one such project during their time at Columbia.

Despite the vastly wider scope and reach of computer science as a whole, the Department's faculty and students have continued to work together, in research groups, long-term collaborations and shorter-term research projects.

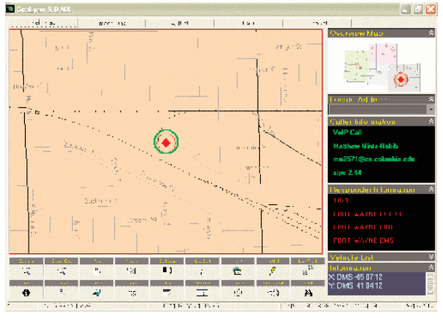
(continued on page 10)

Re-Engineering the Nation's **9-1-1 System**

In cooperation with the National Emergency Number Association (NENA), MapInfo and Texas A&M University, two Columbia Computer Science students, Matthew Mintz-Habib and Anshuman Rawat, together with Professor Henning Schulzrinne are working on **designing and prototyping the next generation of emergency calling ("9-1-1") for the United States and beyond.**



SIPc receives call



GeoLynx displays location

The existing 911 system has evolved slowly since its beginnings in the 1970s, often still using the same technology. For example, information about the caller is limited to eight or ten digit phone numbers which are then used to look up the street address of the caller based on telephone company subscriber data.

The proliferation of cell phones and, most recently, voice-over-IP (VoIP) technology is stretching the ability of the system to keep up. For example, despite investment of billions of dollars, only about 30% of the nation can currently receive caller location from mobile phones, leading to delays in dispatching emergency assistance. For VoIP, the old structure relying on mapping telephone numbers to locations fails completely.

This has led a number of organizations to work together to design and prototype a next-generation, packet-based infrastructure that is slated to slowly replace the existing analog, circuit-switched system over the next decade. The new system relies on the Session Initiation Protocol (SIP) for call signaling, carrying end system location information for stationary, nomadic and mobile callers. VoIP phones learn their location through network configuration protocols such as DHCP. The caller location is then used to locate the appropriate emergency call center for the area and to display the caller's location on a map at the call taker's work station.

Unlike the traditional telephone version, this system can easily migrate call handling should the primary call center be overloaded or disrupted. Longer term, still photos and live bidirectional video, e.g., from camera phones, can allow emergency personnel to better assess the nature and severity of the incident, as well as to provide pre-arrival first-aid instruction.

The project is funded by a grant from the National Telecommunications and Information Administration (NTIA) and the Center for Advanced Telecommunication Technology (CATT).

http://www.cs.columbia.edu/IRT/sos

Nieh wins **Sigma Xi Young Investigator Award**

Jason Nieh

Professor Jason Nieh gave the seventh annual Young Investigator Lecture on "Let's Get Virtual: The New Wave in Computing" at the 2004 Sigma Xi Annual Meeting in November.

Nieh, Nobel laureate Murray Gell-Mann, and renowned Canadian scientist and broadcaster David Suzuki were the three invited speakers at the annual meeting. The Young Investigator Lecture is given each year by the winner of the Sigma Xi Young Investigator Award. The award, which includes a certificate of recognition and $5,000, alternates between the physical sciences, including engineering and mathematics, and the life sciences, including social sciences. It recognizes scientific achievement by individuals within 10 years of earning their highest graduate degree. Nieh is the first computer scientist to receive this national award.

Special Theory Day held at Columbia

Zvi Galil

The Columbia/IBM Research/NYU Theory Day is a semi-annual daylong conference which brings together researchers in the New York Metropolitan area for a day of interaction, discussion, and talks about computer science theory.

Theory Day was started in 1982 by Dean Zvi Galil (then a member of the Computer Science faculty at Columbia) and has grown to become a much-anticipated event among New York area theorists.

On May 14, 2004, a special Theory Day was held in Altschul Auditorium at Columbia to mark both the 25th anniversary of the CS department at Columbia and the 250th anniversary of Columbia University.

More than 280 attendees came from as far as Israel, Germany, California and Greece to participate in this special event. The day opened with Moti Yung presenting a plaque to Dean Galil "in recognition of his initiation and continued support of Theory Day over the years." Moti received his PhD under Zvi Galil and is a Senior Research Scientist in the Computer Science Department. The audience then heard talks by four world leaders in theoretical computer science: Professor Richard Karp of UC Berkeley spoke about "Current Challenges in Computational Genomics: Haplotyping," Professor Shafi Goldwasser of MIT spoke about "Proving Hard-Core Predicates using List Decoding," Professor Prabhakar Raghavan of Stanford University and Verity spoke about "Finding Information in Networks," and Professor Peter Shor of MIT spoke about "Quantum Error Correction and Fault Tolerant Quantum Computation."

The day ended with a panel discussion on "The Future of Computer Science Theory." Professor Avi Wigderson of the Institute for Advanced Study joined the four speakers for the panel, and Professor Mihalis Yannakakis of the Columbia Computer Science department moderated the discussion. The panel had a lively discussion on topics ranging from the role of CS theory in the undergraduate curriculum to the future status of the P versus NP question.

All Theory Day participants enjoyed a complimentary lunch in the Faculty House and received a stylish "Theory Lions" T-shirt. More importantly, attendees got a chance to hear from some of the most interesting and influential people in theoretical computer science today.

Bookmark http://www.cs.columbia.edu/theory/ for links to upcoming Theory Days!

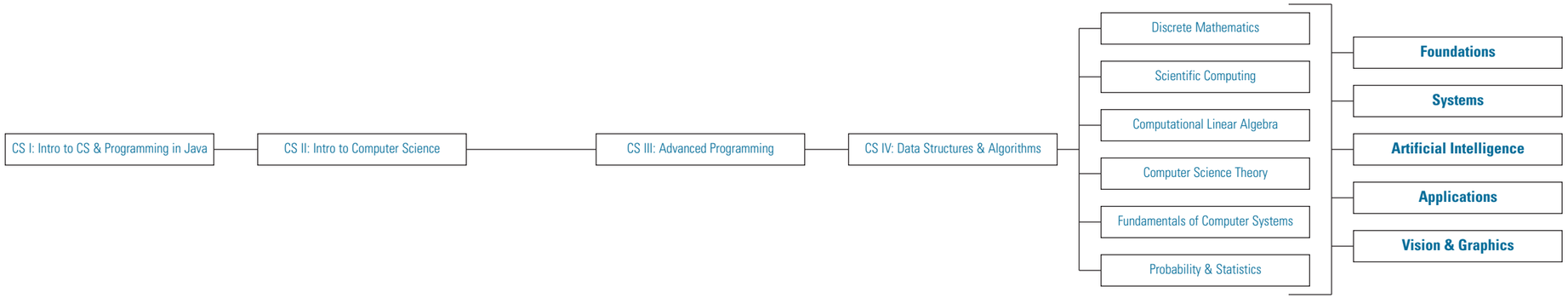
Yannakakis gives **Milner Lecture**

Mihalis Yannakakis

Professor Mihalis Yannakakis gave the ninth annual Milner Lecture at the University of Edinburgh in May.

The Milner Lecture is given each year "by someone from outside the University who has done or is doing excellent and original theoretical work which has a perceived significance for practical computing." In July, Yannakakis gave a joint invited lecture on "Testing, Optimization, and Games" at the 31st EATCS International Colloquium on Automata, Languages and Programming (ICALP) and the Twentieth IEEE Symposium on Logic and Computer Science (LICS) which were held in Turku, Finland. Yannakakis, who is the Percy K. and Vida L. W. Hudson Professor of Computer Science, joined Columbia January 2004 after a year at Stanford University and more than twenty years at Bell Labs Research.

The New Undergraduate Computer Science Program at Columbia University



Al Aho,
Vice Chair for Undergraduate Education

In the fall of 2004, the Computer Science Department at Columbia University launched a new undergraduate program in Computer Science.

The department spent the previous two academic years planning and designing the new program. It was felt that in an era in which computers, networks, software, and digital information are pervading society an integrated curriculum was needed to prepare Columbia students for a rapidly evolving world in which exponential advances in information technology are continuously transforming every area of human endeavor.

The new program provides students with three complementary kinds of knowledge: contemporary information technology skills, fundamental concepts of computer science, and most importantly algorithmic problem-solving capabilities that can be applied to virtually any field. These three kinds of knowledge were advocated for all graduates (not just CS graduates) of four-year colleges and universities in the National Research Council report, "Being Fluent with Information Technology", National Academy Press, 1999. (I was a member of the committee that created this report.)

- **Contemporary skills** give students the ability to apply today's information technology immediately. These skills also provide students with a store of practical knowledge on which to build new competencies.
- **Fundamental concepts** give students the ability to understand the basic principles and ideas underpinning computers, networks, and information. Concepts explain the how and why of the technology and provide insights into its opportunities and limitations. Concepts also provide a foundation for understanding the new technologies as Computer Science evolves.
- **Algorithmic problem-solving** capabilities give students the ability to apply their skills and concepts to design solutions in complex interdisciplinary situations arising in scientific, engineering, and business applications. These capabilities allow students to create and implement new technologies to meet the challenges of future applications.

The new program has a core Computer Science curriculum that is taken in the first two and a half years to provide the basic skills and concepts underlying modern Computer Science. The core courses are

- **CS I: Intro to CS and Programming in Java** (COMS W1004)
- **CS II: Intro to Computer Science** (COMS W1007 or W1009)
- **CS III: Advanced Programming** (COMS W3157)
- **CS IV: Data Structures and Algorithms** (COMS W3137 or W3139)
- **Discrete Mathematics** (COMS W3203)
- **Scientific Computing** (COMS W3210)
- **Computational Linear Algebra** (COMS W3251)
- **Computer Science Theory** (COMS W3261)
- **Fundamentals of Computer Systems** (CSEE W3827)
- **Probability and Statistics** (IEOR W4150 or SIEO W3600)

The first course, COMS W1004, has been designed for students with little or no programming background making it easy for high school students of all backgrounds to enter and study Computer Science. If a student has taken AP CS in Java in high school and gotten a 4 or 5, the student can go directly into the second course, COMS W1007, and on successful completion of COMS W1007 also get credit for COMS W1004. The first two courses (COMS W1004 and 1007) are taught in Java. The second two courses (COMS W3157 and COMS W3137) are taught in C/C++. In this way, Columbia computer science students become fluent in more than one programming language.

In the junior year students select one of five tracks in which they then learn an important field of computer science close to its technical frontiers. Each track has a set of required courses, breadth courses, and a large selection of elective courses. The tracks are

- **Foundations** - for students wishing to pursue graduate work in theory, security, or scientific computing
- **Systems** - for students interested in the design and implementation of hardware and/or software systems
- **Artificial Intelligence** - for students interested in machine learning, robotics, or systems capable of "human-like" intelligence
- **Applications** - for students interested in the design and implementation of interactive multimedia applications
- **Vision and Graphics** - for students interested in how visual information is captured, manipulated, experienced

In addition, there is an Advanced Track in which a student can study one of these tracks at an accelerated level. Admission to the Advanced Track is by invitation of the faculty.

See "*ACADEMICS*" under the departmental website *http://www.cs.columbia.edu* or the SEAS Bulletin for the details of the new program.

The intermingling of skills, concepts, and algorithmic problem-solving capabilities pervades the entire program, starting with the first course. Students quickly discover that computer science is full of deep, interesting, and important ideas that can be applied to many different fields. Many senior-level courses such as Programming Languages and Translators (COMS W4115) and Operating Systems (COMS W4118) have semester-long projects in which students work in small teams to create and implement innovative new languages and systems of their own design. Through such projects students can exercise their own creativity and learn valuable project management, teamwork, and communications skills.

In short, the new Computer Science program has been designed to educate Columbia students to become leaders in the new Information Age.

CS 25th Anniversary Celebration!

The festivities opened with a dinner reception the evening of Thursday October 21 with Peter Likins, President of the University of Arizona, reminiscing about the trials and joy of starting the CS department during his tenure as Dean of the Engineering School.

Friday began with an opening address by Robert Kahn, President of the Corporation for National Research Initiatives, who was Director of DARPA's Information Processing Techniques Office (IPTO) and was responsible for significant funding of our department's research in our formative years. Dr. Kahn was introduced by Joseph Traub, the inaugural Chairman of the department.

The rest of the day was framed by technical talks from five current faculty members who have recently joined the department, followed by a dozen former PhD, MS and undergraduate students who returned home to share their life and professional experiences, some from as far away as Australia, others from California and Texas.

That evening we enjoyed another reception, with a chance for attendees to see posters and demos of current department research.

Our celebration was capped off on Saturday with a "family and friends" barbeque. Even though the temperatures were uncharacteristically chilly that final day, the department's alumni, students, friends, and faculty celebrated with great cheer and warm regards for a department that has grown in stature, and has become an integral and important part of life at Columbia University.

See http://www.cs.columbia.edu/25th/ for more information and videos from the celebration!

Dean Zvi Galil

Friday, October 22nd, 2004

Part I: Opening Remarks, Retrospective & Introduction, Keynote Address

Opening Remarks
Professor Henning Schulzrinne
Dean Zvi Galil

Retrospective & Introduction
Professor Joseph Traub

Keynote Address
Dr. Bob Kahn, President, Corporation for National Research Initiatives

Part II: Faculty from the Department speak

Session Chair:
Professor Kathleen McKeown

Mihalis Yanakakis
Testing, Optimization and Games

Rocco Servedio
Influences of Variables in Decision Trees

Ravi Ramamoorthi
Computer Graphics at Columbia

Jason Nieh
Secure Remote Computing Services

Julia Hirschberg
Recognizing Emotional Speech

Part III: Lunch Speaker

Introduced by
Professor Yechiam Yemini

Don Ferguson
The Convergence of Web Services, Grid Service and Business Process Management

Part IV: PhD Alumni Speakers I

Session Chair: Professor Gail Kaiser

Dannie Durand
Evaluating Genome Evolution

David Kurlander
Trials and Tribulations Bringing Research to Product

James Kurose
From Queues to QoS to Querying Sensors: What I Learned at Columbia 25 Years Ago Finds New and Continuing Application Every Day

David Lee
Life at Columbia and Beyond

Part V: PhD Alumni Speakers II

Session Chair: Professor Steven Feiner

Daniel Miranker
Metric-Space Database Management to Support Molecular Biology

Cecile Paris
From New York to Sydney, from Language Technology to Multi-disciplinary Research

Michael Reed
Lead Character Modeling for Feature Animation

Part VI: Undergraduate & Masters Alumni Speakers

Session Chair: Professor Peter Allen

Joshua Bloch
Has it Really Been 25 Years?

Seth Haberman
What I Learned at Columbia

Christy Lauridsen
University Technology Transfer

Wilfredo Marrero
Brutus: A Model Checker for Security Protocols

Departmental **Retrospective**

Joseph Traub

Before the establishment of the Computer Science Department in 1979, there were computer science efforts in the Mathematical Statistics Department in Arts and Sciences, and in the Electrical Engineering Department in the School of Engineering.

In the academic year 1978-79 Peter Likins, the Dean of the School of Engineering (now President of the University of Arizona) persuaded the University to eliminate both these efforts and to create a Computer Science Department. The creation of the new Department was strongly supported by Columbia's central administration.

At the time I headed the Computer Science Department at Carnegie Mellon University, universally ranked together with Stanford and MIT as one of the premier departments in the world. Peter approached me to be the founding chair of the new department at Columbia. I agreed to come under certain conditions which included a new building for the Department, thirteen faculty positions, and a teaching load competitive with leading computer science departments at private universities.

Likins agreed to all requests and I came to Columbia University on July 1, 1979. The new Department had four tenured professors (Theodore Baskow, Jonathan Gross, Stephen Unger and myself). The decision was made to recruit the best possible new PhDs, as well as a few outstanding senior faculty, which required that the existing non-tenured faculty had to be asked to leave.

The following people, who are now all senior faculty joined the Department in the early years: Peter Allen, Steven Feiner, Zvi Galil, Gail Kaiser, John Kender, Kathy McKeown, Sal Stolfo, Henryk Wozniakowski, and Yechiam Yemini.

Much had to be accomplished in the creation of the new department. Peter Likins was marvelously supportive at all times. Here are some of the things we had to do.

The faculty had to be built almost from scratch. One of the characteristics of computer science, as opposed to many other disciplines, is that there are many more available positions than absolutely top people to fill them. It was true at Carnegie in 1971; it's true today. That is healthy for the discipline but makes it difficult for faculty recruiting. For every appointment, the new Department had to compete with top academic departments and top research labs. Nonetheless, superb new faculty were hired.

At the same time there was huge student demand for courses. Two thousand students took courses in the first year, 2600 the next year, and 4200 a few years later. There were as many as 200 students per course. We were trying to hire the top young PhDs and yet they had to teach classes of 200 students. The Department started to hire lecturers to help with teaching, especially for the beginning courses. We hired lecturers who loved to teach and who interacted well with undergraduates.

The Department started Bachelor's, Master's and PhD programs. It taught computer science to all of Columbia University so there were majors from the Engineering College, Columbia College, Barnard, General Studies and the Graduate School. Jonathan Gross served as Vice-Chair. Among his responsibilities were creation of the curricula and oversight of the various Bachelor's programs.

Obtaining funds was crucial to building Departmental research. In the first year IBM gave the Department a six hundred thousand dollar gift. Pivotal to giving the Department a big push was a very large contract from DARPA, the Defense Advanced Research Projects Agency. DARPA

CS Building construction ongoing, February 1982.

monies had been critical to the building of the "big three": Carnegie-Mellon, MIT and Stanford. Bob Kahn, then the Director of DARPA's Information Processing Techniques Office, decided to give major funding to two more Departments, Berkeley and Columbia. The DARPA funding was crucial to the Department's early years. In addition to providing funds for research staff, research equipment, and PhD students, it provided funds for equipment and staffing of a computer facility. Furthermore, it gave the Department a vital connection to the Arpanet.

As I mentioned earlier, there was a University commitment to give the Department a new building. The boutique firm of Kliment and Halsband was chosen as architects. The building won the AIA Honors Award, which, for an architect, is the equivalent of an Oscar or a Pulitzer Prize. To celebrate the new building, a convocation was held in 1983. There were talks by distinguished leaders in computing and Herbert Simon received an honorary doctorate.

In 1979 Columbia University was fairly late in starting a Computer Science Department. The Department felt it was important to demonstrate to the University the centrality of the discipline. One of the ways this was accomplished was through the "Columbia University Lectures in Computer Science". The distinguished and diverse speakers included sociologist Sherry Turkle, computer animation pioneer John Whitney, and Douglas Hofstadter, author of the Pulitzer Prize winning book, "Goedel, Escher, Bach". The lectures always drew large audiences.

In 1984 the Department was five years old. It had twenty four faculty positions (Peter Likins' limit of thirteen had long been passed). The PhD program had 60 students and there were 6 to 7 million dollars a year in outside support. A state-wide competition led to Columbia's designation as the New York State Center for Computers and Information Systems. IBM gave a generous gift of 4 million dollars in money and equipment. The first stage in the building of the Computer Science Department had been completed.

Department News

Al Aho was appointed to the Advisory Board of the Computer and Information Sciences Directorate of the National Science Foundation.

Ricardo Baratto, Shaya Potter, Gong Su, and **Jason Nieh** received the 2004 ACM MobiCom Best Student Paper Award for their paper titled: "MobiDesk: Mobile Virtual Desktop Computing". The MobiCom PC Chairs noted that paper was also the highest rated paper of the conference.

Steve Feiner served as general chair for ACM UIST 2004 (User Interface Software and Technology), held in Santa Fe in October 2004.

Steve Feiner gave the keynote talk for ACM VRST 2004 (Virtual Reality Software and Technology), held in Hong Kong in November 2004.

Luis Gravano was Program Co-Chair for the 13th ACM Conference on Information and Knowledge Management (CIKM 2004), as well as Co-Chair of the WebDB 2004 workshop.

Tony Jebara was Program Chair for the International Conference on Development and Learning at the Salk Institute in La Jolla, California, October 20-22 2004, http://www.icdl.cc.

Tony Jebara won a National Science Foundation grant through the KDD Program for the project "Correspondence in Learning via Permutation Algorithms".

Gail Kaiser and **Angelos Keromytis** jointly were awarded a "Microsoft Research Trustworthy Computing Curriculum" grant of $50K, one of 10 "winners".

Tal Malkin, Jason Nieh, and **Dan Rubenstein** received 2004 IBM Faculty Awards. Nieh also received a 2004 IBM SUR Award.

Tal Malkin received $70K from the NY Software Industry Association for two projects on "Securing Financial Communication On-Line".

Vishal Misra, Dan Rubenstein, Nick Maxemchuk (EE) and **Predrag Jelenkovic** (EE) won an NSF award for their project "Funneling Impulses in Sensor networks".

Shree Nayar, Vlad Branzoi, and Terry Boult (Univ. of Colorado) received the Best Paper Award at the 2004 IEEE Conference on Computer Vision and Pattern Recognition (CVPR) for their paper titled "Programmable Imaging using a Digital Micromirror Array".

Jason Nieh received the 2004 Distinguished Faculty Teaching Award, given annually to recognize excellence in teaching in the School of Engineering and Applied Science at Columbia University.

Jason Nieh, Gail Kaiser, and **Angelos Keromytis** won a highly competitive 2004 ITR Award from the National Science Foundation for their project titled "Secure Remote Computing Services".

Ravi Ramamoorthi and **Shih-Fu Chang** (EE) won a three-year grant from the National Science Foundation CyberTrust program titled "Restore the Trustworthiness of Digital Photographs: Blind Detection of Digital Photograph Tampering".

Henning Schulzrinne served as co-chair for ACM Multimedia 2004, held at Columbia University in October 2004. PhD students Weibin Zhao and Ashutosh Dutta served as local arrangements and finance chairs.

Sal Stolfo won an NSF award for his project "Email Mining Toolkit Supporting Law Enforcement Forensic Analyses".

Sal Stolfo won 3 DHS awards for his projects "Developing Collaborative Profiles of Attackers: A Longitudinal Study", "A New Generation of Collaborative Cross-domain Security Technologies: Worminator" and "Real-time Malicious Code Detection in Network Traffic: The PAYL Payload Anomaly Detector".

Alumni News

Regina Barzilay (PhD 2003), Assistant Professor at MIT, won a National Science Foundation CAREER Award.

Sara Calafell (BA 2001) writes "I'm doing well here at McGill. Not a whole lot of news though. I'm in Montreal, working on my PhD in Computer Science at McGill studying computational biology. Canada is great—I'm even starting to play hockey!"

Ravi Gadhia (MS 2003) lives in the Bay Area and works as a software engineer for a stealth-mode startup company in the area of thin client computing. In his free time, he is renovating a fixer-upper house and planning as many vacations as possible—next up, Vietnam in January 2005. Columbians are welcome to contact him at rg@cs.stanford.edu.

Tarun Kapoor writes "I started my own company this year. The company is called Pangean Technologies and we specialize in enterprise-based VoIP software solutions. Our web address is www.pangeantech.com".

Based on his numerous outstanding achievements in research, teaching, and service, **Jim Kurose** (PhD 1984) was appointed as a Distinguished Professor of Computer Science by the UMass Board of Trustees during their November 10, 2004 meeting: http://www.cs.umass.edu/csinfo/announce/kurose_distinguished.html

David Lee (PhD 1985) writes "I was traveling in the past two weeks and just returned to Columbus... I was invited to give a talk at OPODIS04 in Grenoble where I also visited HP. I spent more than a week in Beijing for ACM Sigcomm 05 and other business needs. The New Year's Day was spent in Nara for the Japanese National Treasure Show at the State Museum and also to see the traditional New Year's activities. It was quite a tour—exciting and exhausting."

Jonathan Rosenberg (PhD 2001) became Director of VoIP Service Provider Architecture at Cisco and was featured on the cover of Voice-on-the-Net Magazine.

Montek Singh (PhD 2001) is now an Assistant Professor of CS at UNC Chapel-Hill and just won an IBM Faculty Fellowship.

Xin Wang (PhD 2001), currently in the CSE department at SUNY Buffalo, received a National Science Foundation CAREER award.

Erez Zadok (PhD 2001), now Assistant Professor at Stony Brook University, has been working in the area of Information Assurance (IA) for the past few years. He is funded by an NSF Trusted Computing award, several industrial awards and gifts, and two NSF IA Education awards. For more information, see www.cs.sunysb.edu/~ezk/.

Hua Zhong (MS 2001) worked in Andiamo Systems on Storage Networks, which was then acquired by Cisco Systems in February 2004. He is now a software engineer at Cisco working on storage virtualization making extensive use of what he learned in operating systems courses at Columbia.

Michelle Zhou (PhD 1999) received the IUI 2005 (Int. Conf. On Intelligent User Interfaces) Outstanding Paper Award for "A Graph-Matching Approach to Dynamic Media Allocation in Intelligent Multimedia Interfaces" by Michelle X. Zhou, Zhen Wen, and Vikram Aggarwal.

New Faculty

Eitan Grinspun

Professor Eitan Grinspun joins Computer Science @ Columbia University

Brings focus on mathematical foundations of computer animation

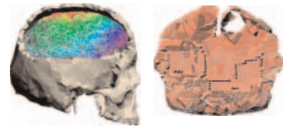
We are proud to welcome Professor Eitan Grinspun to the Columbia Vision and Graphics Center. Professor Grinspun's focus on the mathematical foundations of computer animation and scientific computing complements our strengths in the areas of graphics, vision, interfaces, learning, and robotics.

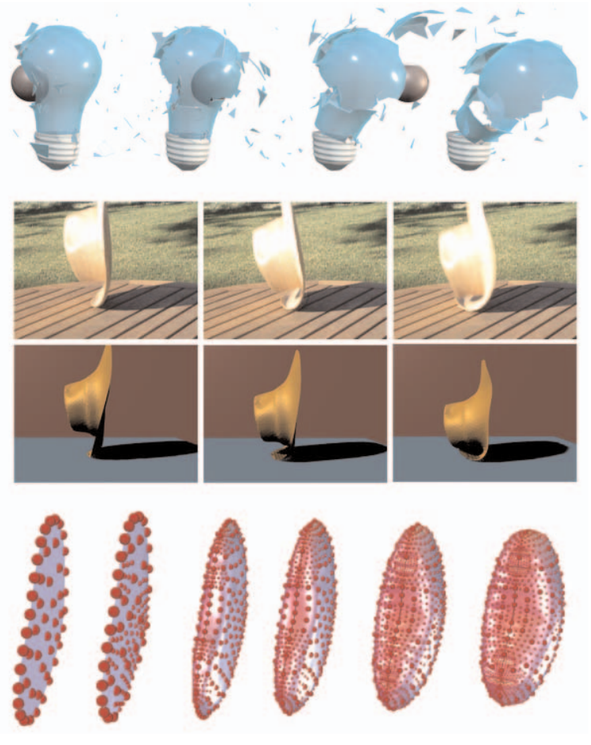
Professor Grinspun is interested in representations of physical systems on a computer. This includes modeling the **geometry** (shape) as well as mechanics (behavior) of everyday objects such as light bulbs, straw hats, air bags as well as tissues such as the human brain. Such physical simulations have applications ranging from video games and special effects to engineering design, medical training, and computer-aided surgery. He is particularly interested in elegant, efficient mathematical representations of such systems, thus explaining his focus on **adaptive computation** and on **discrete models**.

Adaptive computation is using computational resources where they are most needed. For example, in the simulation of an inflating air bag *(right)*, the computer can allocate more variables *(shows as red dots)* at the positions where wrinkles are likely to form.

Discrete models refers to simple, elegant descriptions of physical systems drawn from first-principles in a "discrete world" consisting of points, lines, and triangles. For example, a straw hat may be represented as a collection of triangles (a mesh) and the bending of the hat may be computed from the angles formed by adjacent triangles.

Eitan Grinspun completed the Engineering Science program at the University of Toronto, Ontario, Canada in 1997, a Masters in Science for his work on Asynchronous VLSI at the California Institute of Technology (Caltech) in 2000, and a PhD for his development of a general method for adaptive physical simulation, also at Caltech, in 2003. While at Caltech, he received an NVIDIA fellowship in 2001, and was chosen as an Everhart Distinguished Graduate Lecturer in 2003. Following graduation he joined the Courant Institute of Mathematical Sciences at New York University as a research scientist. He serves on various program committees including the ACM/Eurographics Symposium on Geometry Processing and the ACM Siggraph/Eurographics Symposium on Computer Animation. His research, published in both the engineering and graphics literature, covers a diverse agenda spanning simulation, discrete differential geometry, geometric modeling, subdivision surfaces, parallel architectures for interactive simulation applications, and streaming computation using graphics hardware.





Luis Gravano Receives Tenure

Luis Gravano

The Computer Science Department is extremely happy to announce that, in May 2004, Professor Luis Gravano was awarded tenure at Columbia.

Professor Gravano is a leader in the field of web search, an interdisciplinary area sitting at the intersection of database systems and information retrieval. His early work on database selection exploits statistical summaries of databases to allow a metasearcher to select the most relevant databases to search for a query. It has been widely used and cited within the database and digital library communities.

His more recent research addresses a critical limitation of current web search, the inability to automatically access the hidden web (also known as the "deep web"). The hidden web contains petabytes of unindexed online data lying behind proprietary interfaces; research that facilitates online access of this large, and for the most part untapped, repository of data will have tremendous impact on both the commercial and the personal world. Professor Gravano has done pioneering work on automatic classification by topic of hidden web sites and on automatic extraction of content summaries to facilitate automatic database selection. This aspect of his work provides techniques for accessing unstructured data behind the hidden web. He also contributed to more traditional database problems by showing how top-k techniques from information retrieval can be extended to database querying and in developing techniques to create structured data from unstructured data, populating online databases.

Professor Gravano's research is characterized by rigorous experimental design to validate results, demonstrating accurate results at low computational cost; it has provided dramatic speed-ups over previously known algorithms, sometimes as much as a ten-fold improvement. For example, the system QProber, developed by Professor Gravano and his team, is the most scalable and efficient state-of-the art text database classification strategy in the literature. His work fuses theoretical results with a systems approach, a methodology that yields sound and scalable results. This approach has led to an impressive publication record in extremely selective conferences and journals.

Since coming to Columbia in September 1997, Professor Gravano has received several honors in recognition of his excellence. He received an NSF CAREER Award, was appointed as Associate Editor of ACM Transactions and of ACM Transactions on Database Systems on Information Systems, and was selected to co-chair both the WebDB 2004 International Workshop and the 13th ACM Conference on Information and Knowledge Management. He has served on the program committee of over 20 leading conferences in databases, information retrieval, and related fields.

Professor Gravano has obtained substantial funding for his research from sources such as Microsoft Research, the National Science Foundation, and Lucent Technologies. He has participated in many large scale multi-PI (and often multi-disciplinary) grants. These include an NSF DLI2-Phase2 project on personalized medical digital libraries where his research involved access to distributed, heterogeneous databases, along with an NSF Digital Government Grant also involving research into access to heterogeneous databases. He has recently collaborated with natural language researchers at Columbia on a large scale project where he is looking at efficient search of summarized resources, providing the ability for up-to-date, incremental provision of summarized news.

Professor Gravano has graduated three PhD students: Nicolas Bruno (now at Microsoft Research), Panagiotis Ipeirotis (now at NYU), and Eugene Agichtein (now also at Microsoft Research).

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As computer science and its products become an integral part of most human activities, we have now completed our "renovation" of our academic house. Prof. Al Aho describes *(pg. 4)* how we see the future of undergraduate education and how we can best educate students to succeed is characterized by a need to have marketable skills and practice-based insight, as well as to master the foundations of computer science that will keep students current throughout their technical careers. We had earlier revised We had earlier revised our Master's program to focus on advanced topics and allow specialization in tracks including foundations of computer science, computer security, machine learning, natural language processing, network systems and software systems.

Last fall, we were delighted to be able to add two new faculty to strengthen core research areas in the Department, computer engineering as well as computer vision and graphics. Prof. Luca Carloni joined us after graduating from the University of California at Berkeley, with research interests in the fields of design technologies for electronic systems design methodologies for the deployment of embedded software on heterogeneous and distributed platforms, computer architecture, integrated circuits, and combinatorial optimization. During his PhD research, Luca has developed the theory of latency-insensitive design and the companion design methodology for integrated circuits. This is a correct-by-construction approach that handles the increasing impact of latency on nanometer technologies and facilitates the reuse of intellectual-property cores for building complex systems-on-chip, thereby reducing the number of costly iterations in the design process. The concept of latency-insensitive design is now under close investigation by major semiconductor companies for the design of the next generation integrated circuits.

Prof. Eitan Grinspun was previously a postdoctoral fellow at the Courant Institute, New York University, after graduating from Caltech. He strives to develop fundamental computational models for physical simulation, computer animation, and geometric modeling. One of his recent contributions has been CHARMS (Conforming Hierarchical Adaptive Refinement MethodS), a general, broadly-applicable framework for adaptive physical simulations. Computer simulations built on top of CHARMS are efficient because they can allocate compute power where it is most needed. Researchers are adopting CHARMS for simulations spanning several domains such as the special-effects industry, environmental, automotive, and materials engineering, as well as computer aided surgery.

You can keep abreast with Columbia Computer Science

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Digital Systems Group

The Digital Systems Group includes faculty members Luca Carloni, Stephen Edwards, and Steven Nowick.

Luca Carloni

Professor Luca Carloni joined Columbia University in Fall 2004 as an Assistant Professor of Computer Science after completing his PhD in Electrical Engineering and Computer Science at UC Berkeley. Luca also holds a Laureate in Electrical Engineering from the University of Bologna, Italy, and a MS in Engineering from UC Berkeley. His research interests include design technologies for electronic systems, embedded systems design, computer architecture and engineering, and combinatorial optimization. In particular, Luca is interested in deriving new design methods for high performance integrated circuits and for distributed embedded systems based on rigorous mathematical reasoning. During his PhD studies, Luca has developed the theory of latency-insensitive design and the companion design methodology for integrated circuits. This is a correct-by-construction approach that handles latency's increasing impact on nanometer technologies and facilitates the reuse of intellectual-property cores for building complex systems-on-chip, thereby reducing the number of costly iterations in the design process. The concept of latency-insensitive design is now under close investigation by major semiconductor companies for the design of the next generation integrated circuits.

http://www.cs.columbia.edu/~luca

Stephen Edwards

Professor Stephen Edwards is an Assistant Professor of Computer Science, who joined the department in 2001. His group works on applying compiler technology to problems in embedded system design. The long-term goal is to simplify the task of creating such systems by supplying tools that raise the level of abstraction presented to a designer. Recent projects include the first open-source compiler for the Esterel real-time language able to produce both hardware and software from the same specification, domain-specific languages and compilers for device drivers and hardware/software-interfaces, and program analysis algorithms for pointer analysis and incremental automata-based program verification.

http://www.cs.columbia.edu/~sedwards

Steven Nowick

Professor Steven Nowick is an Associate Professor of Computer Science, who joined the department in 1993. His research focuses on the development of asynchronous and mixed-timing digital systems. Asynchronous circuits are those which have no global clock. Unlike synchronous systems, which are governed by centralized control, asynchronous chips are fine-grained concurrent distributed systems: composed of separate hardware 'objects', which operate at their own rates, and which coordinate and synchronize through local channel communication. There has been a recent resurgence of interest in industry and academia in asynchronous design as a modular and scalable design style, as synchronous designers confront formidable challenges of managing chip design complexity, high-speed clock distribution, and power dissipation. Professor Nowick's research is supported by 2 medium-sized NSF ITR grants for $2.5 million (joint with Profs. Peter Beerel at USC and Kenneth Shepard at Columbia EE Department). His main research projects include: CAD tools for the synthesis and optimization of asynchronous systems, high-speed asynchronous pipelines, interface circuits for mixed-timing domains, and design issues in embedded systems.

http://www.cs.columbia.edu/~nowick

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news as it happens, by subscribing to our mailing list at *http://lists.cs.columbia.edu/mailman/listinfo/cucs-news*. We are also experimenting with a departmental blog to provide links and comments on topics of general interest in computer science (*http://columbiacs.blogspot.com*). Alumni can find our new portal at *http://alum.cs.columbia.edu*, where they can look up fellow alumni, see job listings received by the Department and share their current whereabouts and activities. We always look forward to hearing from our former students, faculty and staff. We plan to provide more opportunities to meet other alumni, as well as other alumni-oriented webservices. Please get in touch with me if you have ideas for alumni-related services and events.

Regards, and best wishes for 2005.

CS Building exterior construction completed, December 1982.

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