DEPARTMENT OF COMPUTER SCIENCE

UNIVERSITY OF PITTSBURGH

DEBORAH JEANNE GILLOTTI

A Pitt alumna has given the first gift to the University that will endow equipment in the planned Multi-Purpose Academic Complex (MPAC). Deborah Jeanne Gillotti has pledged $100,000 to the Department of Computer Science, which will be housed in the new academic building.

Scheduled to open in 2002, MPAC will be a six-story facility on Forbes Avenue, across South Bouquet Street from the Law Building.

The Deborah Jeanne Gillotti Endowed Equipment Fund will furnish the Interactive Learning Suite, providing the most sophisticated and up-to-date software and equipment available for student and departmental use.

Gillotti, a 1977 Pitt graduate who earned dual degrees in economics and history, has served as the Chief Information Officer for Starbucks Coffee Company and most recently as Chief Operations Officer for Viathan Corporation.

In announcing her gift, Gillotti said it's important for women in leadership positions to be active and visible, especially in high-tech fields. "I wanted to sponsor something physically tangible and accessible on campus - something that could really make a difference for students in the information technology field," she said. "I hope my gift will inspire other alumni to consider similar bequests."

Rami Melhem, chair of computer science, said, "Both undergraduate and graduate computer science students will benefit from this facility, which will be used for teaching Java and web-based networking, advanced computer graphics and interactive collaborative computing."

The Gillotti endowment is part of Pitt's capital campaign. The University hopes to raise $500 million by July 2003.

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Progress on the $35 million Multi-Purpose Academic Complex is progressing at a furious rate. After excavation was completed, the steel and concrete structure seemed to appear overnight! The Computer Science Department will occupy the fifth and sixth floors of the new building, which will include state-of-the-art laboratories, classrooms, and computing facilities.

The picture below was taken in February of this year:
CS401, Introduction to Computer Science, is the first course that prospective computer science majors take at the University of Pittsburgh (Pitt). Visit any section of CS401 and one of the first things you will notice is that most students, about 75%, are male. The vast majority of these young men are white, although a significant number are Asian or Asian-American. Very few are Afro-American or Hispanic. Visit one of the upper-level CS courses, like Programming Languages or Introduction to Compiler Design. You will most likely find an even smaller percentage of women and minorities.

Pitt is not alone among undergraduate institutions in its under-representation of women and minority students in computer science. Nor is it alone in witnessing a decline in the number of students from these groups who remain in CS, despite their apparent enthusiasm when they entered as freshmen. For example, the Computing Research Association’s (CRA) 1997 Taubbee Survey revealed that women’s share of the bachelor’s degrees in computer and information sciences, which peaked at 37% in 1984, was down to 27% by 1996. This drop occurred despite the fact that there are, overall, more female than male college students.

Why do women and minorities shy away from CS as an undergraduate major? And why do a large proportion of students from these groups enter as prospective CS majors, but then withdraw from college or transfer to other programs? What can be done to increase enrollment and retention of women and minorities in CS? With a recently funded grant from the National Science Foundation, Dr. Sandra Katz, a cognitive scientist at the University of Pittsburgh’s Learning Research and Development Center, and Dr. Mary Lou Soffa, a professor in Pitt’s CS Department, will address these important questions.

Katz and Soffa’s project, entitled "Learning Behaviors and Background Characteristics that Promote Retention of Women and Minorities in Undergraduate Computer Science Programs," was funded under the National Science Foundation’s Information Technology Workforce Program, which was established to understand and help resolve the shortage of information technology professionals—e.g., computer scientists, programmers, computer engineers, and systems analysts—that has been widely publicized (sometimes dramatically) in the popular media in recent years. For example, according to some estimates, several hundred thousand programming jobs need to be filled. In the CRA’s view, "if these groups [women and minorities] were represented in the IT workforce in proportion to their representation in the U.S. population, this country would have more than an adequate supply of workers to fill even the most dire estimates of a shortage."

Katz and Soffa chose computer programming as their focal IT domain. "Programming is one of the first skills that computer science students learn, and a stumbling block for many," said Soffa. "Our main goals are to identify learning strategies that successful CS students have, and unsuccessful students lack, and to develop instructional materials such as lab exercises that will help students replace ineffective learning behaviors with effective ones," Katz stated. "Although we hope that our intervention will benefit all students, regardless of sex or race, we are also interested in finding out if particular ways of approaching programming problems are more typical of some groups than others. This may shed some light on the causes of poor retention in CS among women and minorities. It may be the case that environmental factors or the learning strategies of women and minorities make them less effective in picking up programming concepts and skills, which leads to frustration and failure, which in turn leads to withdrawal from a CS program."

How will Katz and Soffa go about describing how “successful” and “unsuccessful” students approach programming tasks, and identify learning strategies? "It won’t be easy!" commented Katz. "But we will rely heavily on a commonly used technique in cognitive science called ‘think-aloud protocol analysis.’ Basically, this will involve videotaping students as they carry out programming tasks. We will prompt them to say everything they are thinking throughout the task, and record a history log of their actions while they work at the computer. Analysis of the tapes and history logs will allow us to determine whether ‘successful’ and ‘unsuccessful’ students, and students from various groups, differ with respect to how they go about understanding a programming problem; planning, implementing, and testing a solution. For example, it is possible that successful students are more likely to experiment with the programming examples they were given in class or in their text, modifying and testing them using various inputs."

Katz and Soffa will also use surveys and interviews with students to fill in gaps in the portrait of learning and programming strategies that the protocol analyses paint. "As you can imagine, verbal protocol analysis is artificial, like many laboratory methods in psychology," Katz said. "The protocols open a narrow window from which to peer into students’ minds, under controlled conditions. But they leave out a lot of other things that make up students’ experience with learning to program—for example, talking to friends or their instructor about an assignment; sitting in a coffee shop and ‘mulling over’ the problem for awhile. Surveys and interviews will give us another view of what resources and strategies students use to accomplish programming tasks. They will also allow us to validate the results of the protocol analysis. Since protocol analysis is a very time and labor-intensive technique, it can only be done using small samples." Katz and Soffa are pilot testing their protocol analysis procedure and surveys in one CS401 section this semester.

Katz and Soffa view their emphasis on cognitive factors as the primary feature that distinguishes this project from most...
other research aimed at understanding the low enrollment and retention of women and minorities in computer science. "A great deal has been written about the complex array of forces that interact to discourage both groups from choosing a CS major in college, from persisting through graduation, and from continuing through the master’s and PhD levels," Katz remarked. "These include social, cultural, personality, experiential, and affective factors. For example, in their study of undergraduate CS students at Carnegie Mellon University, Jane Margolis and Allan Fisher described the myths and stereotypes that discourage women from pursuing a career in CS -- a field purported to substitute social contact with 'staring at a machine,' and dominated by male 'geeks' who 'dream in code.' Although we recognize the importance of socio-cultural factors in affecting enrollment and retention, we believe that more attention needs to be paid to cognitive factors. Some good work in this area was done in the early 90's. For example, Mimi Recker and Peter Pirolli found that successful students who were learning to program in LISP explained programming concepts to themselves, in their own words, more often than unsuccessful students. But not much work has been done since then on the cognitive aspects of learning to program, and even less work has been devoted to comparing different groups according to their programming learning strategies."

Katz and Soffa feel that they are in an excellent position to address these questions, not only because Pitt is a large university with many prospective CS majors, but because their project can interface closely with a program for women and minority CS students that Dr. Soffa directs, called Link-to-Learn. Funded by the Commonwealth of Pennsylvania, the Link-to-Learn program consists of activities designed to attract high school female and minority students into computer science, and to increase retention of prospective majors from these groups within Pitt's CS Dept. Sample Link-to-Learn recruitment and retention efforts include a summer workshop series whose goal is to excite and stimulate students in the study of CS, a dedicated computer lab, and a mentoring program staffed by Pitt CS department faculty. Soffa predicts that the new project will benefit the supplemental instruction and teacher training components of Link-to-Learn. "Our investigation of effective and ineffective learning strategies will provide guidance about specific strategies and behaviors that instructors and lab TA's should help students to acquire," Soffa commented.

Although they will focus on the relationship between cognitive factors and CS instruction, Katz and Soffa will also try to increase our understanding of the characteristics of students’ home and school background that predict what learning behaviors students bring with them to college CS programs, and their vulnerability to failure. They will do this by administering a survey to prospective CS majors, as well as to women and minority CS professionals. "Previous research has shown that pre-college computing experience is important. We suspect that there are various other experiential factors that can impact CS learning behaviors and achievement," Soffa stated. "For example, these might include the amount of parental guidance the student received when he or she floundered in math and science courses; the extent to which the student participated in competitive activities and how they handled failure; perhaps even the types of play activities students engaged in. We might find, for example, that CS professionals and students who do well in CS courses were more likely to do puzzles or play with mechanical toys like Lego as children than students who do poorly. We hope that this part of the project will shed some light on what parents and teachers can do early on to foster the skills and dispositions that predict success in computer science."

### Industry Affiliate Program

In an effort to better foster its corporate relations, the Department of Computer Science at the University of Pittsburgh is seeking input in regard to establishing an Industry Affiliate Program starting in September 2001. The mission of the program will be to assist affiliate partners in meeting departmental relationship goals and assist the Computer Science Department in achieving its educational mission by providing expert opinions, modest funding and infrastructure support. As part of the program, the department will provide the affiliates with state-of-the-art research directions, personnel training and valuable recruiting assistance.

The Computer Science Day, which is held on campus every Fall, will be an important forum for interactions between the department and its partners. Specifically, the affiliates will be invited to have a complementary marketplace booth to directly interact with students, faculty and visitors as well as to give short presentations during an affiliate session. Affiliate members will also be invited to participate in panel sessions and in a reception and dinner with the faculty and honor students. In addition to the Computer Science Day activities, affiliate members will be invited to provide guest lecturers to the ACM student chapter seminar series.

Recruiting is an important area of cooperation between the department and its partners. By providing the affiliates with the resumes of the Computer Science outstanding and Honor students, the department will make sure that its best students will find challenging and rewarding career opportunities. The affiliates will also be provided space to post available internships opportunities on the departmental web site. In the spirit of rewarding excellence, the affiliates will be given the opportunity to sponsor student competitions in the Computer Science department at large and in specific Computer
erence courses. The winners of these competitions may be invited to visit the sponsoring affiliate where appropriate recognition may be given.

In the area of research cooperation, the department will annually provide its partners with a complete set of papers and technical reports published by the Computer Science faculty, as well as abstracts of all MS and Ph.D. thesis written by the graduate students. Visits of faculty to the affiliates sites and/or visit of the affiliates to the department can be planned to explore potential research collaborations. Qualified experts from the affiliate may be invited to give lectures in appropriate Computer Science courses, or even to teach an entire course in a visiting professor capacity. The department will also offer short courses on specific topics requested by its affiliates provided that appropriate faculty is available to offer such courses.

The above examples demonstrate the many ways that this program can benefit both the department and its partners. To show its appreciation, the department will recognize its partners on the department web page, in the departmental research review, in the departmental newsletter and on a department's main office recognition display. We, in the Computer Science Department, are very excited about this new program and are looking forward to its success. If you need more information or if you need to provide us with your input about this program, please contact Rami Ramirez, the department Chair, by phone at 412-624-8493 or by email at melhem@cs.pitt.edu.

**Computer Science Day 2000**

The first annual Computer Science Day, held at the University of Pittsburgh on December 2, 2000, was sponsored by the Department of Computer Science and the Link-to-Learn Program. Over 300 people attended, including Computer Science faculty, undergraduate and graduate students, alumni, high school students and teachers, representatives from industry, and department staff. One of the major goals of CS Day was to encourage more students to engage in the discipline of computer science. Currently there is concern about the critical shortage of information technology workers, which is projected to continue well into the 21st Century. Related to this concern is the lack of full participation of women and minorities in the field.

The activities and events included a marketplace with industry representatives, and posters and demonstrations by students and faculty in the department. Gerard Pompa, the Vice President of Compunetix Inc., spoke about his successful career climb as a Pitt graduate who became a leader in the technology industry. Steve Rakas, a representative from Career Services at the University, addressed the participants regarding current opportunities in technology fields. There was also a panel addressing issues related to careers in computer technology. Participating in the panel were Paul Sesto from Northrop Grumman Electronic Sensors and Systems, Brian Goldfinger from Eli Lilly & Co., David Berson from Motorola/StarCore Technology, Joe Trost from Marconi Communications and Sanjay Jinkutar from Lucent.

CS Day is expected to be an annual event. The next CS day will occur sometime in November of 2001.

**Student ACM Chapter**

The recently reinstated Student Chapter of the ACM has already been quite active in the Computer Science Department, sponsoring three invited speaker seminars in recent months. Last December, the ACM welcomed back former faculty member Michael McCarthy for an interesting talk on XML and its place in the future of internet programming. A full room heard Mr. McCarthy, now a Senior Lecturer at Carnegie-Mellon University's Heinz School, extol the virtues of XML and its many uses in internet applications of today and of the future.

In January, Paul Sesto, a software engineering manager at Northrop Grumman, spoke about software engineering certifications and standards and how they are affecting corporations, especially those that do contract work for the government. Mr. Sesto conveyed to the audience that it is vital today that software projects are carefully monitored and controlled, and companies that do not maintain high standards in these areas are less likely to win government contracts than those that do.

For February the ACM listened to a current University of Pittsburgh student, Jonathan Rosenson, speak about Stargate, a local internet company that he helped to establish. Mr. Rosenson passed on to the students some of his more interesting experiences in turning a company with three initial employees into the area's largest local internet service provider (and now a provider for the University of Pittsburgh).

Prior to the seminars, the membership gathered to elect its officers for the 2001 academic year. Elected were Jason Putorti (Chairman), Jacob Vos (Vice-Chairman), Juliya Litman (Secretary), and Omri Ceren (Treasurer).

The chapter's web page is maintained at http://www.pitt.edu/~ascm. If you wish to contact the University of Pittsburgh Student Chapter of the ACM, please email Student Chairman, Jason Putorti at jason@cs.pitt.edu or the Faculty Advisor, John Ramirez at ramirez@cs.pitt.edu.
New Undergraduate Award

Undergraduate students are the core of our Computer Science Department, and, beginning next Fall term (02-1), we will recognize their achievements through two newly established undergraduate awards: the Computer Science Honors List and the Outstanding Undergraduate Computer Science Major.

The Computer Science Honors List is designed to honor and publicize the efforts of undergraduate Computer Science (CS) majors who have excelled in the previous academic year. The list will consist of all declared CS majors who, in the past academic year (Fall, Spring and Summer) have earned a superior grade-point average, both overall and in their upper level CS courses. The CS Honors List will be published once a year each Fall term.

The Outstanding Undergraduate Computer Science Major is an award designed to spotlight the advanced Computer Science major whose overall undergraduate career best demonstrates both academic and service excellence, and who would be a model for other students to emulate. The Outstanding Undergraduate CS Major will be selected based upon many criteria, including overall GPA, CS GPA, faculty recommendations and other CS contributions (including undergraduate research, undergraduate teaching, work in the Help Room, and participation in the ACM). Since this is a career award, only students who have earned at least 80 credits overall and at least 25 CS major credits are eligible, and a student may receive it only one time. It will be awarded once a year each Fall term. The recipient will not only be honored by the CS Department, but he/she will also take part in the Honors Convocation the following Spring term, where he/she will be honored in front of the entire University community.

CS People

Most Computer Science graduate students come directly from an undergraduate program or a job in the field. A few have an unrelated job history—military officers. Karl Gossett grew up in Laramie, Wyoming, a large town (in Wyoming scale) of 25,000 people. Since he wanted to go to college, and to serve in the military, he found the best of both worlds by attending the United States Military Academy at West Point (1987 to 1991), where he received a BS in Computer Science, and a commission as a Second Lieutenant in the U.S. Army.

Entering service shortly after the Gulf War, he spent his first eight years of service primarily in Texas, Kentucky, and Kansas, with several minor deployments for domestic assistance or training (usually California’s National Training Center, and occasionally Germany). Prior to coming to the University of Pittsburgh, he was a Tank Company Commander (a captain with about 60 soldiers and 14 M1A1 Abrams tanks under his command). This field command is often the most enjoyable and rewarding part of an officer’s career.

After serving as a Company Commander, most officers in Capt. Gossett’s position are assigned to one of four administrative positions: liaison to the Reserves or National Guard, ROTC instructor at a University, technical support to the Army (languages, operations research, etc.), or a staff position. However, a few (who represent a cross-section of military skills) are selected to become instructors at one of the military academies. Officers selected for these positions are sent to graduate school to earn an advanced degree. Capt. Gossett was selected for this program, and chose to attend the University of Pittsburgh for a variety of reasons: the strong CS graduate program, military funding restrictions, and family ties in the area.

Upon completion of the MS program here, Capt. Gossett will teach Computer Science at the United States Military Academy at West Point. That Computer Science program is similar to our undergraduate program, with an additional emphasis on Computer Engineering. Capt. Gossett’s interests are in Artificial Intelligence and Machine Learning, with a special emphasis on vision and automated object (vehicle) recognition, and he may eventually teach advanced courses in those areas.

After three years of teaching, Capt. Gossett expects to be reassigned to a position in the Armor field. Although he may not use his Computer Science training in that capacity, there are opportunities and assignments later in a military career that rely heavily on the knowledge and skills represented by an advanced degree in Computer Science. And, even though his assignments may not utilize his Computer Science education directly, he intends to continue to pursue the use of Machine Learning techniques to enhance the capabilities of soldiers and their equipment.

Disclaimer: This reflects only the views of the author, and in no way reflects the views of the Army or the Department of Defense.

Foster Provost graduated in 1992 from Pitt’s Computer Science Ph.D. program. By day, Foster worked with Bruce Buchanan on machine learning and knowledge discovery for scientific applications. A product of his work with Bruce, John Aronis, and the Pittsburgh Poison Center reached the pinnacle of scientific achievement: it was the subject of a joke on the Tonight Show (after having been
reported in USA Today). The result showed that ingesting Christmas plants seldom has a bad outcome—so, it is more dangerous to kiss under the mistletoe than to eat it. By night, Foster wrote music and played for Barefoot Serpents, a band who performed regularly in local clubs.

In the fall of 1999, after a five-year stint as an industry researcher, Foster joined NYU’s Stern School of Business, where he teaches graduate classes and continues his research on machine learning and knowledge discovery. He recently edited a journal special issue on Applications of Data Mining to Electronic Commerce, and a prior Machine Learning editorial On Applied Research in Machine Learning has been used as a guide for authors of applied research papers. This year he is Program Chair for the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD-2001).

Foster says that although he learned a tremendous amount about Computer Science and research while at Pitt, the most memorable part of his graduate career is all the great people. His most important achievement while he was at Pitt? Successfully capturing the heart of the department’s own Karen Shalayda (now Karen Provost). They live happily in Manhattan’s Greenwich Village.

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**Accolades**

**Dr. John Ramirez**, a Senior Lecturer in the Computer Science Department, is one of four recipients of the Tina and David Bellet CAS Teaching Excellence Award. This award was established to acknowledge undergraduate teaching excellence in the College of Arts and Sciences. Selection for the Bellet Award is based upon many factors, including teaching philosophy, representative materials from undergraduate teaching settings, student teaching evaluations, and peer evaluation from other faculty. In addition to the honor of the award itself, Dr. Ramirez will receive a $2000 prize and a $3000 grant for further teaching development.

**Prof. Bruce Buchanan** has been invited to give the First Centennial Lecture at the National Institutes of Standards and Technology. His topic will be “The Quest for Creativity in Computers.” Prof. Buchanan is a University Professor of Computer Science with secondary appointments in Medicine, Philosophy, and Intelligent Systems. One of the founders of modern Artificial Intelligence, he was a principal developer of Dendral, MetaDendra, Mycin, and Protean.

**Prof. Mary Lou Soffa** will be the Conference Chair of ACM Foundations of Software Engineering 2002, which will take place in Charleston, SC. She is also serving on the program committee of the Static Analysis Symposium, which will take place in Paris.

**Prof. Bruce Childers** recently received a highly competitive Faculty Partnership Award from the IBM Austin Center for Advanced Studies. This award was given in response to his research on Power-Aware Information Appliances. Bruce is also Co-Organizer for the IEEE Workshop on Power Management for Real-Time and Embedded Systems, and guest co-editor for IEEE Transactions on Computers, Special Issue on Parallel Architectures and Compilation Techniques.

**Prof. Panos Chrysanthis** is serving on several program committees, including Fourth International DEXA Workshop on Mobility in Databases and Distributed Systems (Co-Chair), IEEE International Conference on Data Engineering, International Conference on Mobile Data Management, International Conference on Database and Expert Systems Applications, and Hellenic Conference on Informatics and Computer Science. He is also on the steering committee of the NSF Information and Data Management Program Workshop.

**Prof. Daniel Mosse** was appointed associate editor of IEEE Transactions on Computers. He also co-chairs the Program Committee of the Real-Time Technology and Applications Symposium 2001, which will take place in Taipei, Taiwan.

Thanks to the initiative of **Prof. Bruce Buchanan**, and the sponsorship of the American Association for Artificial Intelligence, students in search of basic, understandable information about artificial intelligence now have online access to an extensive collection of resources that covers over one hundred AI related subjects. You can check out the AI TOPICS website at www.aaai.org/aitopics and see for yourself why it’s getting over 1,000 hits per month.

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**Alumni News**

Frank Wimberly (Ph.D. ’78) has been made senior scientist and leader of the modeling and data analysis team at Bios Group in Santa Fe, NM. Founded by well-known evolutionary biologist and Santa Fe Institute faculty member Stuart Kauffman, Bios Group specializes in applying complexity science and agent-based models to problems like supply chain optimization, dynamic scheduling, market diffusion, and operational risk. The firm has been featured in recent articles in Wired, Scientific American and Fortune. Anyone interested in learning about how complexity science can be applied to these kinds of problems should see Kauffman’s new book Investigations (Oxford University Press, 2000).
Recent Ph.D.'s

Dr. Rastislav Bodik completed his Ph.D. in December 1999. His dissertation title was Path-Sensitive Value-Flow Optimizations.

Dr. Vanathi Gopalakrishnan completed her Ph.D. in December 1999. Her dissertation title was Learning Temporal Relationships Among Input Parameters. Her advisor was Bruce Buchanan.

Dr. Sridhar Komandur completed his Ph.D. in December 1999. His dissertation title was Multipoint-to-Multipoint Connection Support and Dynamic Management in ARM Networks.

Dr. Clara Jaramillo completed her Ph.D. in August 2000. Her dissertation title was Source Level Debugging Techniques and Tools for Optimized Code Programming Languages and Software Engineering. Dr. Jaramillo is now an Assistant Professor at Chatham College in Pittsburgh.

Dr. Sylvain Lauzac completed his Ph.D. in August 2000. His dissertation title was Multiprocessor Scheduling of Preemptive Periodic Real-Time Tasks with Error Recovery. He is now at Akamai Technologies, San Mateo, CA.

Dr. Libin Dong finished her Ph.D. in April 2001. Her dissertation title was Template-Based Scheduling Algorithms for Real-Time Tasks with Distance Constraints. She is now at Conexant.

Dr. Jae Oh completed his Ph.D. in August 2000. His dissertation title was Effects of Kinship Bias on Cooperation in Multi-Agent Environments. He is now an Assistant Professor at Syracuse University.

If you are in a position to consider making a contribution to support the programs of the Department of Computer Science, please contact the Department Chair, Dr. Rami Melhem, Department of Computer Science, University of Pittsburgh, Pittsburgh PA 15260, or email him at melhem@cs.pitt.edu.

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