COMPUTING RESEARCH NEWS

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Computing Research that Changed the World

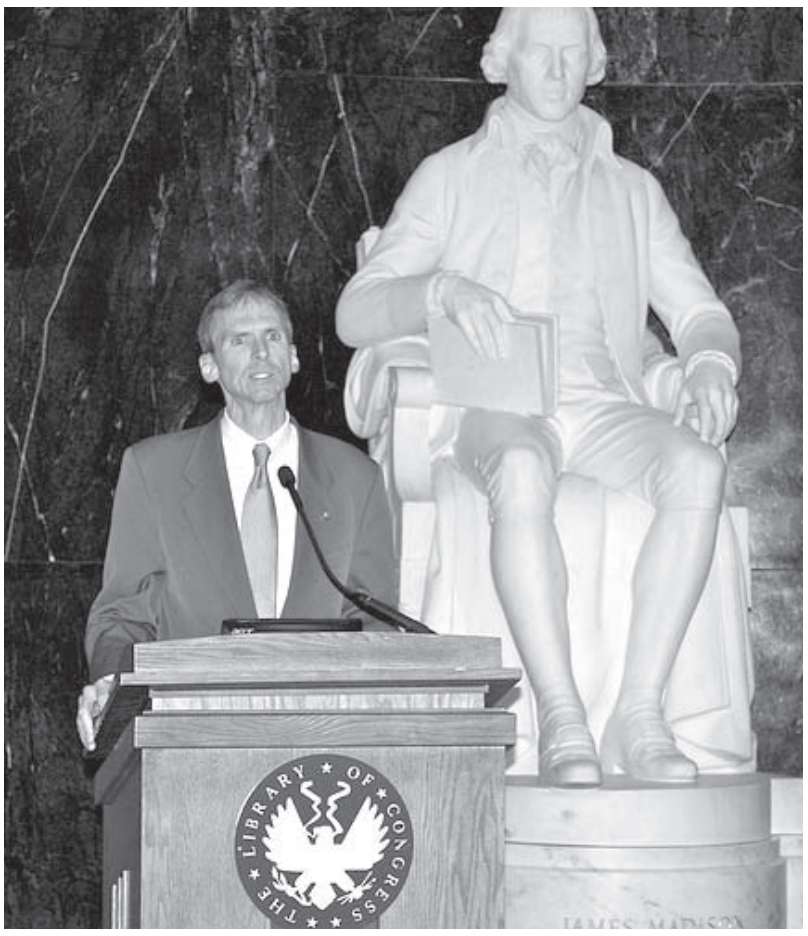
On March 25, federal policy-makers and computing researchers came together for the CCC-organized symposium "Computing Research that Changed the World: Reflections and Perspectives" (http://www.cra.org/ccc/locsymposium) to examine the game-changing computing research advances of the past two decades and to extract lessons for structuring future programs to sustain that remarkable track record.

Through the kind auspices of Congressman Bart Gordon (D-TN), Chair of the House Science Committee, the symposium was held in the Members Room of the Library of Congress, a spectacular venue. Other honorary co-sponsors included Congressman Ralph Hall (R-TX), Congressman Daniel Lipinski (D-IL), Congressman Vern Ehlers (R-MI), Congressman Rush Holt (D-NJ), and Senator Jay Rockefeller (D-WV). The invitation list consisted of policy-makers, agency directors, next-generation computing researchers, and a (very) few old-hand researchers.

Choosing the specific advances to feature was a difficult task. Many dozens of members of the computing research community made suggestions by posting comments in response to a solicitation on the CCC Blog (http://www.cccblog.org/). Ultimately, the symposium explored:

- **The Internet and the World Wide Web**
  - Alfred Spector outlined the technologies that enable us to Google.
  - Eric Brewer explained the emergence of the cloud.
  - Luis von Ahn showed how reCAPTCHAs are being used to build accurate digital archives of corpuses such as *The New York Times.*
- **Evolving Foundations**
  - Barbara Liskov explained the key ideas and challenges behind security in distributed systems.
  - Daphne Koller highlighted some of the

Computing Research Continued on Page 6



Rep. Dan Lipinski (D-IL) speaks at the CCC Symposium at the Library of Congress, with a statue of James Madison in the background. Lipinski, who joined five other Members of Congress as honorary co-sponsors of the event, serves as the Chair of the House Science and Technology Subcommittee on Research and Science Education, which has jurisdiction over the National Science Foundation.

Inside CRN

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CRA-Deans Committee Formed

By Robert L. Constable, Cornell University, and Debra J. Richardson, UC–Irvine

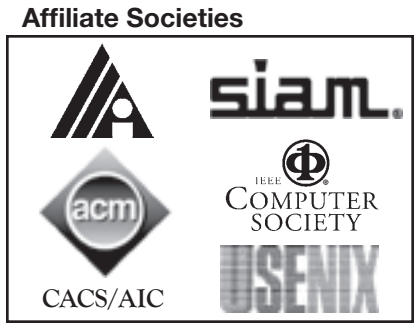
The CRA-Deans Committee has a perspective on computing research that it believes can help advance the work of the Computing Research Association. Formerly known as the IT-Deans Group, the colleges and schools we represent approach the field from two perspectives, one as college-level units that emerged from computer science, say C-schools, and the other as schools that emerged from information schools, say I-schools, some of which were originally library schools. We have seen many of the C-schools create information science programs or departments and many of the I-schools create computing programs or add computer science departments from elsewhere on campus. The result is a common intersection among the nearly forty college-level units we represent—each headed by a dean who reports directly to a provost—the C&I-schools (referring to C-schools, I-schools and schools that address both perspectives.)

From inside these C&I-schools we have come to see computing and digital information as two interrelated features of a common discipline. Most CRA member departments are computer science departments, and they understand the computational aspect deeply. However, some faculty and students are drawn to our units because they focus on the human interaction side of the symbiotic partnership of people and computers, attracted by web information services or digital libraries or information networks, and other topics central to I-schools. These individuals are often interested in social issues as well as the technical ones. They consider the societal needs addressed by computing and digital information and seek a holistic approach to them. This integrated view is taken in the C&I-schools. Several areas of study, such as human computer interaction (HCI), by their nature embody both computational and social aspects and are present in C-schools and I-schools.

The fundamental interplay between computing and digital information is apparent from inside the discipline, regardless of the entry path. That deep intellectual connection is a force that is expanding the scope and increasing the value of computing research, as it is also shaping our college-level units, units that are able to create departments and define new degrees. The deans have a view of this process that transcends specific departments, and we write from that viewpoint on our web pages. What may seem disruptive to established departments can be an opportunity to young colleges, and the C&I-schools will be young colleges for another fifty years.

A major force shaping C&I-schools is interaction with peer schools and colleges within the university. Our peers exert a pull when they need expertise and a push when their territory is threatened. The author's experience at Cornell is that all the other Cornell college-level units

Continued on Page 7



Expanding the Pipeline

Opportunities for Researchers at Government Labs

By Cecilia Aragon and Linda Vu, Lawrence Berkeley National Laboratory

Graduate students planning a research career in computer science are often asked, "Do you want to go into academia or industry after your Ph.D.?" However, there is a stealth third option for a researcher: a career at a government lab. This column sheds some light on this "hidden" career.

There are many government labs in the United States conducting computer science research (for a partial list, see: http://cra-w.org/govindresearch).

Although some of these institutions focus on classified or weapons research, most include unclassified or basic research in their missions, and a substantial minority work only on unclassified research. Lawrence Berkeley National Laboratory (Berkeley Lab), for example, is a member of the national laboratory system supported by the U.S. Department of Energy through its Office of Science. It is managed by the University of California and is charged with conducting unclassified research across a wide range of scientific disciplines, including studying how human activities will change global climate over the next few decades, sustainable energy, and the fundamental nature of the universe. All of these scientific disciplines are producing exponentially more data every year, leading to the need for novel computational approaches to compute, store, process, retrieve, visualize, and make sense out of vast amounts of data.

Advantages and Disadvantages of Government Lab Positions

There are both advantages and disadvantages to choosing a government lab position over one in academia. Some key distinctions are that starting salaries tend to be higher than those in academia, and there is no requirement to teach. If your primary goal is research, you will be able to devote more time to that work. In a government lab, however, you will be working on the projects your manager deems important to the lab's mission and that have successfully received funding. Until you apply for and receive your own grants, you will be working on others' ideas. As an assistant professor at a university, start-up funding gives you freedom to work on research of your choosing for the first couple of years, when you are not occupied with preparing for classes or serving on committees.

Government funding programs tend to be very large, multi-institution operations where principal investigators devote substantial amounts of their time to writing proposals, while a staff of researchers focuses on technical work. Thus, if you choose, at a government lab you can stay close to the technical work, and do not have to become exclusively a manager or proposal writer. Additionally, there is no question of not receiving summer salary; government lab appointments are full-time, year-round positions just as they are in industry.

Government researchers in computer science tend to write more software than university professors do. Depending on your career goals, this can be either an advantage or a disadvantage. On the other hand, you are subject to changing research directions mandated by program managers or political shifts. You have to be willing to change the direction of your research, possibly substantially, into whatever is being currently funded. Additionally, in computer science, you will typically be working on applied research in support of basic science, rather than fundamental computer science research itself.

Although there is no requirement to teach, if your lab is co-located with or near a university, you will have the option to teach classes (on your own time, of course) and interact with students. Your lab will likely have funding for summer students and research assistantships during the school year. This type of activity is more common at unclassified institutions.

Postdoctoral positions provide an option if you wish to spend a few years learning the ropes and developing your own research program before searching for a permanent position. Such positions are available at government labs as well as universities. However, they are often funded out of project money, and so may provide less freedom to pursue your own ideas. Before you accept a postdoctoral position at a government lab, make sure that you understand what the research requirements are, and whether you are committed to project deliverables in order to ensure continued funding. Additionally, such positions are generally time-limited and often do not provide a path into future employment as permanent staff at the lab.

Perhaps the major disadvantage of being a researcher at a government lab is the lack of tenure. Even what are known as "permanent" research positions are usually so-called "soft money" positions, meaning that if you cannot find funding—for example, if your program manager (the federal government employee who approved your funding proposal) retires or there are major cutbacks in government spending—you can be laid off. However, this is no different from life in private industry, where even the most successful researchers are subject to the whims of upper management. On the other hand, government funding tends to be somewhat more stable than that of private industry, and because government labs are working to develop science and technology for the general benefit of the U.S. taxpayers rather than to turn a profit, there is an overall understanding of the virtue of retaining talented staff, and less rapid changes in research directions. Lab management typically works very hard to retain funding for its existing staff, because they realize that once they lose that talent it can be very hard to build up a team again.

Relative to industry research, a possible advantage of working for the government is that your research goal is to benefit humanity, rather than make your CEO and shareholders a larger profit. As such, you can work on extremely interesting problems with substantial impact for the good of society, rather than worrying how next quarter's bottom line will be impacted by your research.

A Typical Day in a Government Researcher's Life

Xiaoye Li, Staff Computer Scientist

Staff computer scientist Dr. Xiaoye (Sherry) Li spends a typical day designing parallel numerical algorithms and mathematical software for large-scale, high-performance computing systems.

"One of the most rewarding aspects is to see that the software tools I am developing are actually used by the other scientists and engineers while they are doing scientific simulations using supercomputers, such as in fusion energy research, accelerator structure design, astrophysics, and quantum mechanics," says Li.

Li feels the government lab setting allows her to be more focused. At Berkeley Lab she does not need to juggle many things like teaching, writing papers and proposals, in addition to supervising students. She believes that the most valuable aspect of working in a government laboratory is the ability to collaborate with researchers in different disciplines.

"We often encounter real world problems that are much larger in scale and more difficult than those typically seen in academia. It is a big challenge to develop efficient algorithms and implement them in portable software to solve those problems," she adds.

Li's advice to women pursuing a computing sciences degree is to establish a broad foundation in school.

"I am somewhat regretful that I did not take many courses outside computer science areas when I was a Ph.D student. If I had taken more courses in physics and other engineering disciplines, I would have a better understanding of the applications problems that I am working with," says Li, who received a doctorate in Computer Science from the University of California, Berkeley.

Expanding the Pipeline
Continued on Page 7

CRA Elects Officers to Two-Year Terms

At its February 2009 meeting, the CRA board elected officers who will serve two-year terms. *Peter Lee* (Carnegie Mellon University) was elected Chair; *Laura Haas* (IBM Almaden Research Center) will serve as Vice Chair; and *Susanne Hambrusch* (Purdue University) was elected Secretary. *Phil Bernstein* (Microsoft Research) was re-elected CRA's Treasurer.

Peter Lee is a Professor and the Head of the Computer Science Department at Carnegie Mellon University. He has been a member of the CRA Board of Directors since 2005. During that time he was a key participant in developing the CCC proposal to NSF and currently serves on the CCC Council. Since 2007, he has chaired CRA's Government Affairs Committee. Lee helped to establish CRA's Education Committee in 2007, and has served on the Habermann Award Committee.

Professor Lee has a long history of service to various government advisory boards. He just recently completed a five-year term on the DARPA IXO Senior Advisory Group, and prior to that was a member of the Army Science Board. Today, Professor Lee serves as the Vice Chair of the DARPA ISAT committee and is a member of the National Academies' CSTB. He has served on study panels for the CSTB, the Defense Science Board, and Defense Threat Reduction Agency. From 2000-04, Professor Lee was Associate Dean for Undergraduate Programs in the School of Computer Science at Carnegie Mellon University, and then served as the university's Vice Provost for Research before returning to the CS Department. He has been involved in initiatives related to women and minorities in CS; has served on the ACM SIGPLAN Executive Committee; and was both Program Chair and Conference Chair for a number of major symposia. He is an ACM Fellow and has received a number of awards and honors for his research.

Peter Lee's research interests include programming language design and implementation; compiler design; static program analysis; and certified code, especially proof-carrying code. He is a graduate of the University of Michigan with a Ph.D. in Computer Science.

Laura Haas, Director of Computer Science at the IBM Almaden Research Center, joined the CRA board in 2007. She was a member of the Snowbird 2008 Planning Committee and currently serves on the Membership Committee.

Dr. Haas served as Vice Chair, ACM SIGMOD from 1989-97. Since 2000, she has been on the VLDB Endowment Board of Trustees, currently serving as Vice-President (2004-09). In addition, she is a member of the Advisory Board, CIPRES Tree of Life Project (NSF ITR grant, 2004-09). Other activities include Program Chair, SIGMOD 1989, and IIS track, VLDB 2005; Industrial Program Chair, SIGMOD 2007; and General Co-Chair, VLDB 2008. Awards and honors include ACM Fellow (2006), IBM Corporate Award for Federated Database Technology (2002), IBM Distinguished Engineer (2002), ACM SIGMOD Outstanding Contribution Award (2000), and YWCA TWIN (Tribute to Women in Industry) Award (1991).

Dr. Haas's research interests include: Information integration, information management (database management, content management, search), distributed systems, and scientific applications. She was awarded a Ph.D. in Computer Science from the University of Texas at Austin.

Susanne Hambrusch is Professor of Computer Science at Purdue University.

She joined the CRA Board in 2008. She has been an active member of CRA for a number of years, serving as a Member of the CRA-W

CRA Elects Officers
Continued on Page 7

Musings from the Chair

Extraordinary Times, Extraordinary Challenges, Extraordinary Opportunities

By Dan Reed, CRA Board Chair

The Danish philosopher, Søren Kierkegaard,[1] once remarked, "Life can only be understood backwards; but it must be lived forwards." So it is with economic and social crises; they can be understood retrospectively, but must be experienced in the moment. Without doubt, these are extraordinary times, with global socioeconomic transformations most of us have heretofore experienced only via historical accounts and the stories of our elders.

Public universities are experiencing state budget recisions and reductions, and private institutions have seen the market value and operating income from endowments decline precipitously. University staff positions are being eliminated, unpaid furloughs are common, and even tenured faculty members are worried, given the financial exigency clause in most contracts. Future students fret about the cost of a college education, current students are struggling to pay tuition, and graduates face bleak job prospects across diverse disciplines.

Reinventing the University

Although these extraordinary times bring extraordinary challenges, they also bring extraordinary opportunities. Because necessity really is the mother of invention, we have a generational occasion to rethink university programs, priorities and structures; refocus corporate governance, markets and priorities; and sharpen government policies, structures and strategies. Let's consider a few lessons, leavened by history.

The modern, American university has evolved from a finishing school for the male heirs of landed gentry to a much more inclusive engine of social change, intellectual discovery and economic growth. Each punctuated step in that evolution was triggered by social and economic upheaval, from the Morrill Act of 1862,[2] which created the land-grant institutions, through the Servicemen's Readjustment Act of 1944,[3] which opened college education to returning veterans, to the Great Society legislation of the 1960s,[4] which addressed odious injustice and further democratized educational access.

The nature and importance of colleges and universities and their relation to our future continue to change. The proximate skills acquired via the university experience may help land one's first job, convey the lifelong right to cheer for the athletic teams and forever encumber one with annual calls for donations from the alumni association. However, when technological change can dissolve entire industries within just a few years, and grim statistics highlight the demise of lifelong employment, those skills alone will not suffice to land one's fifth or eighth job.

This suggests that we must ask fundamental questions about the nature and role of universities, and we must renegotiate the social compact between citizens and educators. What is the appropriate balance between intellectual inquiry and practical engagement? What constitutes engaged scholarship? What are the "mechanical and industrial arts" for the 21st century? What are the verities, the intellectual and operational truths that now dance as shadows in Plato's Cave?[5] In short, what is the 21st century research university and its rightful role?

I humbly suggest that universities, government and industry must rethink the nature of university education and engagement, shifting aggressively to lifelong rather than punctuated education and fostering multilateral science and technology incubation and support. We are not imprisoned in the ivory tower, nor are we cloistered from personal engagement.

The American research university has changed radically and repeatedly over the past century. It emerged from the Cold War[6] as a government-funded instrument of social change, economic competitiveness and national security. There is no reason, indeed ample precedent to the contrary, to believe that it will not continue to evolve rapidly and radically. The current culture is not sacrosanct, nor should it be. We in computing should be at the vanguard, shaping the definitions and the future of education, research and service.

A Final, Personal Note

As a member of the CRA Board[7] for the past decade, it has been my pleasure to work with all of you on a topic near and dear to my heart—the future of computing research, education and policy. Whether on the Board or in the community, you have always answered the call to service, regardless of the task. It has also been a joy to work with the CRA staff[8] in

Musings from the Chair
Continued on Page 4

CRA Elects New Board Members

CRA has recently elected five new members to its board of directors. They will begin three-year terms on June 17, 2009, the first day of the summer board meeting.

Sarita Adve is a Professor of Computer Science and Director of Research at the Intel/Microsoft Universal Parallel Computing Research Center at the University of Illinois at Urbana-Champaign. She received the ACM SIGARCH Maurice Wilkes Award in 2008 and was named a University Scholar at UIUC in 2004. She was a member of the committee to recommend new members of the Computing Community Consortium (CCC) Council, and a core working group member of the cross-layer reliability visioning process approved by CCC in 2008. She is a member of the ACM SIGARCH Board of Directors. In 2007 she co-chaired the program committee and was guest editor for the IEEE Micro's Top Picks from Computer Architecture Conferences. She served on the Advisory Committee (2003-05) of the National Science Foundation's Computer and Information Science and Engineering (CISE) Directorate. Professor Adve has served as a panelist and speaker at CRA-W events, and in 2007 authored an article in *Computing Research News* to increase awareness for support for conference attendees with young children and for physically disabled researchers. Her research interests include computer architecture and systems, parallel computing, power and reliability-aware systems. She was awarded a Ph.D. in Computer Science from the University of Wisconsin-Madison.

Kathleen Fisher is a Principal Member of the Technical Staff at AT&T Labs Research Department of Computer Science. In 2008, she received a SIGPLAN CACM Research Highlights nomination, was appointed a Consulting Member of the faculty at Stanford University, and was an invited Technical Speaker at the Grace Hopper Conference. She was named ACM Distinguished Scientist in 2007. She is involved in the ACM SIG Governing Board Executive Committee, serving as Vice Chair for SIG Development (2008-10). She was SIGPLAN Chair (2007-09), Vice Chair (2003-07), and Member at Large (2001-03). Dr. Fisher initiated, organized, led, and raised funds for the first SIGPLAN Curriculum Workshop, which explored what, how, and why we should be teaching undergraduates about programming languages. Since 2005 she has served as Editor of the *Journal of Functional Programming*. Dr. Fisher has been very active in CRA-W—board member (2003-present), steering committee member (2006-present), and chair (October 2008-present)—and has an impressive array of accomplishments in that role. Her research interests include data description languages, type inference for data description languages, type systems, and domain-specific programming languages. She is a graduate of Stanford University with a Ph.D. in Computer Science.

H. V. Jagadish is Bernard A Galler Collegiate Professor of Engineering in the EECS Department at the University of Michigan, where he received the Research Excellence Award from the College of Engineering in 2008. He was a member of a Visiting Committee to the School of Computing at the National University of Singapore in 2008. Professor Jagadish was awarded the Department of Electrical Engineering and Computer Science Achievement Award at the University of Michigan in 2007. He is an ACM Fellow (2003). He participated in the CRA-NIH Workshop on Computing for Biomedical Sciences (2006). Other experience includes Trustee of the VLDB Foundation (2004-09); Member, ACM SIGMOD Advisory Committee (2001-05); Editor-in-Chief, *Proceedings of the VLDB Endowment*; and Founding Member of the Steering Committee for a new interdisciplinary undergraduate program in Informatics at the University of Michigan (2006-present). In 2003, he organized the NSF-NIH Workshop on Data Management for the Biological Sciences. Dr. Jagadish's research interests involve information management, web systems, database usability, and biomedical information. He was awarded a Ph.D. in Electrical Engineering from Stanford University.

Margaret Martonosi is a Professor of Electrical Engineering at Princeton University, where she was named to the School of Engineering Commendation List for Outstanding Teaching in each of the past three years. She was recognized for Best Paper at the 38th Annual International Symposium on Microarchitecture, Barcelona, Spain in 2005. A Princeton faculty member since 1994, Professor Martonosi was Associate Dean for Academic Affairs in the Princeton School of Engineering and Applied Science from 2005-07. She was Program Chair of the ACM SIGMETRICS Conference in 2002. She was an IBM Research Staff Member (sabbatical visitor, June-December 2004). Other activities include: Vice Chair of ACM SIGARCH, currently serving on the Board of Directors; Technical Program Chair, ACM ASPLOS Conference (2006); ACM SenSys Conference (2008); and HIPEAC European Conference on Embedded Systems (2009). Professor Martonosi has been a member of the CRA-W board since 2005, and currently co-chairs the CRA-W/CDC Discipline-Specific Workshops project. She has been a participant and organizer of numerous CRA-W events and workshops. Her research interests include computer architectures and the hardware/software interface, particularly power-efficient systems and, most recently, power-efficient wireless networks. Professor Martonosi received her Ph.D. in Electrical Engineering from Stanford University.

Jonathan Turner, Professor of Computer Science and Engineering at Washington University in St. Louis, has more than 25 years as a computing researcher, educator and academic administrator. He is a Member of the National Academy of Engineering (2007), a Fellow of both IEEE and ACM, and an IEEE Koji Kobayashi Award winner. Professor Turner has been Department chair (1992–97; 2007–08); Co-Founder and Chief Scientist of Growth Networks, (1998–2000); and Founder and Director of Applied Research Lab (1990–91; 2000–08). He was a participant in two of CRA's Conferences on Grand Research Challenges—the first on Research Directions for the Next Generation Internet in 1997, and the second on Information Systems in 2003. His research interests include high performance networking, multimedia applications, performance analysis, and analysis of algorithms. Professor Turner received a Ph.D. in Computer Science from Northwestern University.

Four current board members—**Annie Anton** (North Carolina State), **William Aspray** (University of Texas at Austin), **Eric Grimson** (Massachusetts Institute of Technology), and **Andrew Chien** (Intel Corp.)—were re-elected to serve additional three-year terms.

Members whose terms on the board will end in June 2009 include **Carla Ellis**, Duke University; **Dan Reed**, Microsoft Research; **Jeff Vitter**, Texas A&M University; **Marc Snir**, University of Illinois, Urbana Champaign; **Bob Sproull**, Sun Microsystems Laboratories; and **Bryant York**, Portland State University. We acknowledge with thanks their many contributions to CRA during their tenure as board members. ■

Musings from the Chair from Page 3

Washington, DC. They work tirelessly for our community, often with inadequate public acknowledgment of the importance of their contributions. On behalf of the entire computing research community, to them and to you, I want to say publicly and clearly—thank you!

In addition to being a member of the CRA Board, it has been my privilege to serve as CRA Chair for the past four years, and it is time for the inevitable and always beneficial changing of the guard. I am delighted that Peter Lee[9] has been elected as my successor. It has been my pleasure to work with Peter in a variety of roles over the past several years. In each case, I have seen him bring new ideas, passion and enthusiasm, and I know CRA will be in great hands under his leadership.

Although my term is ending, rest assured that I will continue to be an active partner and participant in computing research policy and strategy, working with CRA and other organizations to advance the cause of computing. Remember, it's the love, the passion and the wonder that make computing, indeed any calling, worthwhile and fulfilling.

Dan Reed, *CRA's Board Chair, is Microsoft's Scalable and Multicore Computing Strategist. Contact him at Daniel.Reed@microsoft.com or his blog at www.hpcdan.org.*

Notes:

1. http://en.wikipedia.org/wiki/Kierkegaard
2. http://en.wikipedia.org/wiki/Morrill_Land-Grant_Colleges_Act
3. http://en.wikipedia.org/wiki/GI_Bill
4. http://en.wikipedia.org/wiki/Great_Society
5. http://en.wikipedia.org/wiki/Plato%27s_cave
6. http://en.wikipedia.org/wiki/Cold_War
7. http://www.cra.org/main/cra.people.board.html
8. http://www.cra.org/main/cra.people.staff
9. http://www.cs.cmu.edu/~petel/ ■

Spafford Wins CRA Distinguished Service Award

CRA is pleased to announce that the Board of Directors has selected Eugene Spafford, Professor of Computer Sciences and Executive Director of CERIAS at Purdue University, to receive its 2009 Distinguished Service Award. The award will be presented at ACM's award banquet on Saturday, June 27, in San Diego.

Eugene Spafford has been an effective and tireless advocate for the cause of information security research. He has been instrumental in keeping public attention on this important research area. He has helped educate the research community, policy-makers, and the public on the impact that improved computer security can have on our lives, and he has shown exceptional leadership in promoting these ideas. Professor Spafford has been a frequent witness in congressional hearings and has influenced decisions in the Executive Branch through his membership on PITAC. He continues to exercise leadership through his membership in USACM.

CRA makes this award, usually annually, to someone who has made an outstanding service contribution to the computing research community. This award recognizes service in the areas of government affairs, professional societies, publications or conferences, and leadership that has a major impact on computing research. ▮

Awards and Honors

Women of Vision Awards were presented on April 30 to three leaders in technology—**Mitchell Baker**, Mozilla, **Yuqing Gao**, IBM Research, and **Jan Cuny**, National Science Foundation—for their accomplishments and contributions. Jan Cuny is a former Vice Chair of the CRA Board of Directors, and also co-chaired the CRA-Womens Committee.

ACM recently announced a number of awards honoring computer science innovators. **Barbara Grosz**, Harvard University, and **Joseph Y. Halpern**, Cornell University, were named winners of the ACM/AAAI Allen Newell Award (http://awards.acm.org/newell/).

John Hopcroft, Cornell University, was selected for the Karl V. Karlstrom Outstanding Educator Award (http://awards.acm.org/karlstrom/).

Harvey Mudd College President **Maria Klawe** has been chosen to serve on the board of directors of Microsoft Corp. Klawe becomes the 10th member and the second woman to serve on the current board.

ACM has named **Barbara Liskov**, MIT, the winner of the 2008 ACM A.M. Turing Award. The award cites Liskov for her foundational innovations to designing and building the pervasive computer system designs that power daily life. Liskov was the first U.S. woman to be awarded a Ph.D. from a computer science department (in 1968 from Stanford University). The award carries a US$250,000 prize, with financial support provided by Intel Corporation and Google Inc.

Kudos to **Telle Whitney**, CEO of the Anita Borg Institute, who will receive ACM's Distinguished Service Award "for her profound impact on the participation of women in computing" on June 27 at ACM's Awards Banquet in San Diego. Telle also recently received a Women of Influence Award from the Silicon Valley Business Journal. She was one of 100 women honored for making a difference in Silicon Valley. ▮

CNSF Holds Successful Science Fair on Capitol Hill

The Coalition for National Science Funding, of which CRA is an active member, held its annual Science Exhibition on Capitol Hill on March 24. It was once again a great success with a room full of hundreds of attendees and a number of Congressmen visiting exhibits. For the first time, the Speaker of the House Nancy Pelosi (D-CA) attended, spoke briefly on the importance of funding basic science research, and received many thanks from the community there for her efforts to see science funded as part of the stimulus bill and the FY 09 Appropriations. Other members of Congress who attended included Rep. Rush Holt (D-NJ) and Rep. Vern Ehlers (R-MI) pictured here. Overall, the event was very successful in spreading the message that federally funded science research makes important contributions and discoveries in all scientific fields.

Gillian R. Hayes, University of California, Irvine; and Gregory D. Abowd, Georgia Institute of Technology, represented CRA with an exhibit on "Behavior Imaging and Autism" that drew a great deal of interest. It showcased research on using sensors in toys and video imaging to monitor the developmental progress of children with autism and other developmental disorders. ▮

Rep. Vern Ehlers (R-MI) and Gregory D. Abowd, Georgia Institute of Technology, in conversation at the Science Fair.

Pictured above are (l to r) Rep. Rush Holt (D-NJ); Gillian R. Hayes, University of California, Irvine; and Gregory D. Abowd, Georgia Institute of Technology.

CRA Chair Receives Parting Gift

Dan Reed, who in June will complete two terms as CRA board chair, was recently presented a gift from CRA in appreciation for all his efforts on behalf of CRA and the many contributions he has made to the computing research community. He was presented with a framed historic map of his home state, "A New Map of Arkansas with its Canals Roads & Distances . . .1847." Presenting the gift is CRA's Executive Director, Andrew Bernat. ▮

CRA-W Career Mentoring Workshop

CMW-R and CMW-L
July 11-12, 2009
Pasadena, California

http://www.cra-w.org/mentorWrkshp/cmwrl-2009

Computing Research from Page 1

myriad applications enabled or enhanced by machine learning.
  - Jon Kleinberg explored the ways in which online communities are enabling never-before-possible studies of social phenomena.
- **The Transformation of the Sciences via Computation**
  - Larry Smarr showed some of the major achievements fostered by the nation's investments in high-performance computing, and highlighted the importance of huge amounts of data and ultra-high-bandwidth networking for future progress.
  - Chris Johnson showed the rapid evolution of visualization techniques for the biomedical sciences.
  - Gene Myers gave a fast summary of genome sequencing past and future and the opportunities to drive progress in molecular biology as a data-driven science.
- **Computing Everywhere!**
  - Deborah Estrin showed the wondrous new applications that are being enabled by the ubiquity of sensors, and the research challenges that must be met.
  - Pat Hanrahan highlighted the remarkable evolution of digital media from text to audio to video to photography to HDTV.
  - Rod Brooks summarized the stunning advances in robotics.

Each talk lasted 20 minutes, and each session concluded with a panel discussion of future research challenges. Following the four technical sessions, the symposium turned to a session on **Moving Forward**, a panel with all presenters addressing questions from the audience.

The day began with an introductory presentation by Ed Lazowska, and ended with a **Closing Session** where Ed summarized both the content and the messages of the day, and four demonstrations highlighted active research:

- Autonomous Flying Robots: A Bird's Eye View; from MIT.
- Information Technologies to Support the Challenges of Autism and Related Developmental Disorders; from Georgia Tech.
- Personal Environmental Impact Report (PEIR); from UCLA.
- Scientific Computing and Visualization for Medical Image Analysis; from Utah.

In addition, Congressman Daniel Lipinski (D-IL), Chair of the House Science Committee Sub-Committee on Research and Science Education, discussed his views of the importance of computing research.

The speakers did an outstanding job in making their talks accessible to the diverse audience. Consequently, these are great talks to share with student and other audiences to show them what computing is really about. The proceedings were videotaped, and full video of each presentation is available on the symposium website, as well as pdfs of each speaker's transparencies (or transparency videos for the two presentations with substantial animations). Permission is given to use all materials for non-commercial purposes with appropriate credit to the presenter and to CRA/CCC.

And the lessons the participants extracted?

- Computing research truly has changed the world.
- A rich and complex ecology—involving government, academia, and industry—has made America the world leader.
- Research has laid the foundation—you can find federally funded, university-based research at the heart of essentially every billion-dollar sector of the IT industry.
- It consistently takes 10 or 15 years from "research breakthrough" to "billion-dollar sector." So you need patience—there's no such thing as "just-in-time research."
- Often, "products" in IT are created by synthesizing multiple advances—unlike biomedicine where a single patent can yield a blockbuster drug.
- Often, old ideas gain new life. We've had recent breakthroughs in search and in machine learning, but each traces its roots back at least 40 years.
- While computing research often is motivated by a "strategic objective"—we see a practical value if the research succeeds—we're often not very good at predicting what the greatest impact of our innovations will be. Serendipity plays a huge role. Any attempt to decide early on what research is "important" is likely a losing proposition.
- While much of the exciting computing research today is interdisciplinary and collaborative, it is important to have a balanced portfolio: core + interdisciplinary, single-investigator + team, and so on.

And the bottom line: We have an extraordinary track record—America has an IT R&D ecosystem that again and again leads to massive transformations. And the next ten years can be our golden age: on March 25 we heard about some amazing recent accomplishments, and we heard from some extraordinary young people (as well as some extraordinary not-so-young people) who are driving the field forward. The opportunities for impact are greater than they have ever been. Check out the symposium website and then go out and change the world! ■

Ed Lazowska, University of Washington; Marcy Gallo, House S&T Committee; and Bob Sproull, Sun Microsystems Labs, at the CCC symposium.

Shown with moderator Susan Graham, UC Berkeley, are symposium speakers (l to r): Larry Smarr, UC San Diego; Luis von Ahn, Carnegie Mellon University; Jon Kleinberg, Cornell; Pat Hanrahan, Stanford; and Gene Myers, Howard Hughes Medical Institute.

Speakers at the CCC research event at the Library of Congress included (l to r) Daphne Koller, Stanford; Barbara Liskov, MIT; Rodney Brooks, MIT and Heartland Robotics; and at the far right, Alfred Spector, Google.

CRA-Deans Committee from Page 1

need access to academic programs in computing and information science. Responsible presidents and provosts encourage colleges to avoid duplication and rely on units which can best identify and attract high-quality faculty. As it becomes clear to more universities that computing and information science is about new ways of knowing and about accelerating discovery in all fields, administrators will demand high quality C&I-schools to ensure that all the other schools and colleges are competitive. Administrators also need an academic dean who is responsible for the highest intellectual quality in this fundamentally enabling discipline. They need a unit that lives or dies based on this quality and which is big enough and intellectually deep enough to support the university. Otherwise there will be a vacuum that swallows resources college by college.

Another force that shapes our colleges is interaction with industry. The computing and information technology industry has a large appetite for students from computer science and information science. Their job classifications such as programmer, software engineer, system analyst, information architect, web designer, game designer, product manager, system administrator, database designer, chief information officer, chief privacy officer, data analyst, data miner, usability engineer, and others match our graduates well. Building excellent relations with the computing and information technology companies is a key function of the colleges, and our advisory boards keep us regularly in touch with industrial leaders whose support is helpful in winning state approval of new degree programs, validating parts of our curriculum, and partnering in research. The fact that CRA deans spend time with high-level industrial leaders will help CRA be more effective, perhaps expanding the number of affiliated industrial labs.

We suspect that most CRA deans believe as we do that our C&I-schools will continue to expand and be populated with additional departments beyond the computer science and information science departments we already have. There will be new departments created, and at each university we will see special strengths and joint departments arise. We already face a broad potential range that includes robotics, computational science & engineering, bioinformatics, digital arts, new media, and statistics and/or machine learning. Some C&I-schools already have created new departments. Whatever the next common core department is in our C&I-schools, we will see it emerge, and the CRA deans will see it coming.

About the CRA-Deans: The CRA-Deans Committee is a programmatic committee established by the CRA with the expressed mission of dealing with those issues specific to CRA academic units that are organized as schools or colleges (defined to be CRA academic units with a head who reports to a campus-wide executive, such as Provost, Chancellor or President). The mission includes issues such as: organization of schools and colleges focused on computing and related fields; image and public relations of such schools and colleges; interdisciplinary programs and major research initiatives that are relevant to such schools and colleges; and educational programs that are relevant to such schools and colleges. The CRA-Deans Committee was formed out of the IT Deans group, which was established in July 2000 and has been meeting biannually since then.

The CRA-Deans Committee is chaired by Debra Richardson, Dean of the Donald Bren School of Information and Computer Sciences, University of California–Irvine, who can be contacted for further information (djr@ics.uci.edu). Membership is open to deans of C-schools and I-schools, and visitors who are thinking of establishing a C-school, I-school or C&I-school or college within their university are welcome to attend meetings upon request.

Robert L. Constable *is Dean of the Faculty of Computing & Information Science at Cornell University.* **Debra J. Richardson** *is Dean of the Donald Bren School of Information and Computer Sciences at UC–Irvine, and chair of the CRA-Deans Committee.* ■

Expanding the Pipeline from Page 2

Daniela Ushizima, Postdoctoral Researcher

For Daniela Ushizima, a postdoc in Berkeley Lab's Computational Research Division (CRD), a typical day is spent collaborating with researchers from a wide range of scientific disciplines, and using her computer science background to investigate potential areas to apply pattern recognition to their large datasets. Ushizima works in CRD's Analytics and Visualization group, as well as its Math and Bioimaging group.

"The government laboratory has provided me with wonderful opportunities to develop new research on important topics like energy and health," says Ushizima, who was an Assistant Professor of Intelligent Systems at the Catholic University of Santos, Brazil, before arriving at Berkeley Lab.

"Women pursuing computing sciences degrees and hoping to work in a national lab setting should enjoy challenges, multidisciplinary and collaborative work, and frequently recycling research. My advice would be to search for ongoing research projects while getting a degree and try to help," says Ushizima.

Opportunities to Learn More

For undergraduates, the Science Undergraduate Laboratory Internship (SULI) program sponsored by the DOE's Office of Science lets students participate in a research project at a national laboratory. Likewise, the Office of Science and the National Science Foundation's Faculty and Student Teams Program provides hands-on summer research opportunities for teachers and students at national laboratories. In addition, individual national labs offer undergraduate and graduate internships in specific research areas. For example, DOE offers a Computational Science Graduate Fellowship and Berkeley Lab awards the Luis W. Alvarez Postdoctoral Fellowship in Computational Science.

Cecilia Aragon *has been a Staff Scientist in the Computational Research Division at Lawrence Berkeley National Laboratory since 2005. Linda Vu has been a writer with the Lawrence Berkeley National Laboratory's Computing Sciences Communications Group since August 2008.* ■

CRA Elects Officers from Page 3

Board, co-director of the CAPP and CMW workshops, and co-director of the CREU and MRO-W programs. She was a panelist on CRA's New Department Chairs Workshop (Snowbird 2006); and at Snowbird 2008 she co-chaired both a session on "Practical Solutions to a Continuing Problem: Sexual Harassment and Gender Discrimination" and the New Department Chairs Workshop.

From 2002-07, Susanne Hambrusch was Head of the Department of Computer Science at Purdue University. She is a member of the editorial board for Parallel Computing and Information Processing Letters, and she serves as a co-chair for CACM's Viewpoints section. Her research interests are in query management in high update database environments, data management and data dissemination in mobile and sensor environments, parallel and distributed computation, and analysis of algorithms. She also leads an interdisciplinary project on "Science Education in Computational Thinking," which develops a two-course sequence introducing science majors to computational thinking and the role of computation in scientific discovery. She received a Ph.D. in Computer Science from Pennsylvania State University.

Philip A. Bernstein, a CRA Board Member since 2001, is a Principal Researcher at Microsoft Research. He has been a member of the CRA Executive Committee since 2002, CRA's Treasurer since 2003, and Chair of the Finance Committee since 2004. He served as Liaison to the Coalition to Diversify Computing from 2005-08, and was a Member of the CCC Nomination Committee. From 2002-03, he co-chaired the Industry-University Relations Committee, and was a committee member during 2003-04. He has served on the Industry, Elections, and Communications committees, and co-chaired Snowbird 2002.

Bernstein has been an Affiliate Professor at the University of Washington since 1996, and has served on the Advisory Board at the University of Washington, Tacoma since 2003. He has served as a member of the National Academies Board on Mathematical Sciences and Applications since 2005; he has been a member of the ACM SIGMOD Advisory Board since 2006. He is an editor-in-chief of *The TLDB Journal*. On the SIGMOD Awards Committee, he was a member from 1998-2000, and Chair in 2001. From 2000-05, he was a Member of the Board of Trustees, VLDB Endowment. Honors and awards include: Member, National Academy of Engineering (2003); ACM Fellow (2001); and ACM SIGMOD Innovations Award (1994).

Dr. Bernstein's research interests include database systems, meta-data management, and transaction processing. He is a graduate of the University of Toronto with a Ph.D. in Computer Science. ■

2007-2008 Taulbee Survey

Upward Trend in Undergraduate CS Enrollment; Doctoral Production Continues at Peak Levels

By Stuart Zweben

The CRA Taulbee Survey[1] is conducted annually by the Computing Research Association to document trends in student enrollment, degree production, employment of graduates, and faculty salaries in Ph.D.-granting departments of computer science (CS), computer engineering (CE) and information (I)[2] in the United States and Canada. This article and the accompanying figures and tables present the results of the 38th annual CRA Taulbee Survey.

Information is gathered during the fall. Responses received by January 5, 2009 are included in the analysis. The period covered by the data varies from table to table. Degree production and enrollment (Ph.D., Master's, and Bachelor's) refer to the previous academic year (2007-2008). Data for new students in all categories refer to the current academic year (2008-2009). Projected student production and information on faculty salaries and demographics also refer to the current academic year. Faculty salaries are those effective January 1, 2009.

We surveyed a total of 264 Ph.D.-granting departments. Included in this count are 19 I-school departments, which were surveyed for the first time. Of the 264 departments surveyed, 192 departments returned their survey forms, for a response rate of 73%. This is down from last year's 79%, but is still quite comprehensive (see Figure 1) and is negatively influenced by the 47% response rate from the new I departments and the typical low response rate (38%) from CE programs. We had a good response rate from U.S. CS departments (151 of 183, or 83%), and a reasonable response rate (20 of 30, or 67%) from Canadian departments, although the response rate in both U.S. CS and Canadian departments was lower this year than last year.[3]

The survey form itself is modified slightly each year to ensure a high rate of return (e.g., by simplifying and clarifying), while continuing to capture the data necessary to understand trends in the discipline and also reflect changing concerns of the computing research community. In addition to including I departments, this year's survey modified the specialty areas within the Ph.D. (see Table 4 and the accompanying discussion). The ethnicity categories also were modified to conform to those used by the National Center for Educational Statistics.

Departments that responded to the survey were sent preliminary results about faculty salaries in December 2008; these results included additional distributional information not contained in this report. The CRA Board views this as a benefit of participating in the survey.

We thank all respondents who completed this year's questionnaire. Departments that participated are listed at the end of this article.

CRA's Taulbee Survey and the Media

The Taulbee Survey has always been a rich source of data for the computing community. Frequently, the news media also have shown great interest in the results—particularly the student enrollment and degree production data—and have used them as a way of taking the pulse of the field. Unfortunately, given the complexity of the results we present and the number of caveats that surround certain trends, reporters have, in the past, misreported the survey's findings or simply missed the most noteworthy aspects.

This year, for the first time, CRA attempted to manage the media aspects of this release by putting together a special version of the report focused on just the student enrollment and degree production statistics, along with an executive summary that detailed what we thought were the most noteworthy findings. In addition, we partnered with a communications strategy firm to help put together an official "media rollout" of the report, complete with pitches to national and regional press and a well-developed message that accurately conveyed the results of this year's survey.

Because of this plan, and because the results from this year's survey were largely positive, the rollout garnered a significant amount of media attention. The Taulbee Survey received coverage in the *New York Times, USA Today*, *The Chronicle of Higher Education*, *ZDNet*, *NetworkWorld*, *Ars Technica*, *Scientific American*, *U.S. News and World Report*, *KCBS Radio* and *Computerworld*, as well as a large number of regional and university news publications. Almost without exception, the stories that appeared presented accurate summaries of the noteworthy results from the survey, with none of the confusion experienced with coverage in past years.

For a list of press coverage of CRA's Taulbee Survey, see: http://www.cra.org/reports/news/index.html

Ph.D. Degree Production, Enrollments and Employment *(Tables 1-8)*

Total Ph.D. production among the responding departments grew to 1,877 for the period between July 2007 and June 2008 (Table 1). This represents a 5.7% increase over last year. However, it includes 77 who graduated with I degrees (see Tables 2 and 3). Nearly all I degree graduates would not have been counted in previous years (though a small number may have been reported among CS department graduates). Subtracting the I degree graduates yields a total of 1,800 for a 1.4% increase over last year. This year's production of more than 1,800 is well below the nearly 2,000 predicted last year. The "optimism

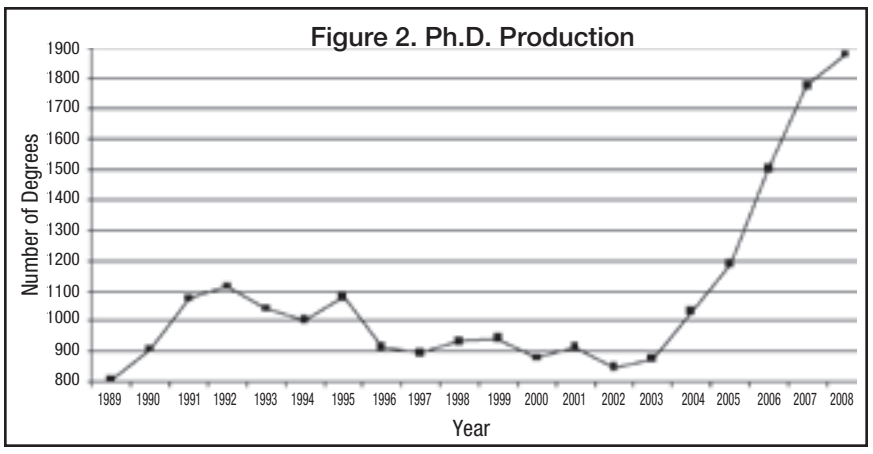
Figure 1. Number of Respondents to the Taulbee Survey

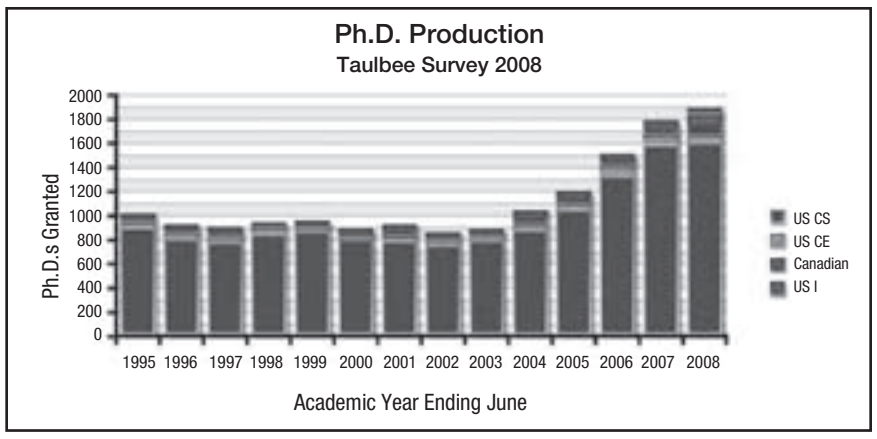
Year	U.S. CS Depts.		U.S. CE Depts.		Canadian		U.S. Information		Total	
1995	110/133	(83%)	9/13	(69%)	11/16	(69%)			130/162	(80%)
1996	98/131	(75%)	8/13	(62%)	9/16	(56%)			115/160	(72%)
1997	111/133	(83%)	6/13	(46%)	13/17	(76%)			130/163	(80%)
1998	122/145	(84%)	7/19	(37%)	12/18	(67%)			141/182	(77%)
1999	132/156	(85%)	5/24	(21%)	19/23	(83%)			156/203	(77%)
2000	148/163	(91%)	6/28	(21%)	19/23	(83%)			173/214	(81%)
2001	142/164	(87%)	8/28	(29%)	23/23	(100%)			173/215	(80%)
2002	150/170	(88%)	10/28	(36%)	22/27	(82%)			182/225	(80%)
2003	148/170	(87%)	6/28	(21%)	19/27	(70%)			173/225	(77%)
2004	158/172	(92%)	10/30	(33%)	21/27	(78%)			189/229	(83%)
2005	156/174	(90%)	10/31	(32%)	22/27	(81%)			188/232	(81%)
2006	156/175	(89%)	12/33	(36%)	20/28	(71%)			188/235	(80%)
2007	155/176	(88%)	10/30	(33%)	21/28	(75%)			186/234	(79%)
2008	151/183	(83%)	12/32	(38%)	20/30	(67%)	9/19	(47%)	192/264	(73%)

Table 1. Ph.D. Production by Type of Department and Rank

Department, Rank	Ph.D.s Produced	Avg. per Dept.	Ph.D.s Next Year	Avg. per Dept.	Passed Qualifier	Avg. per Dept.	Passed Thesis Ex. (# Depts)		Avg. per Dept.
U.S. CS 1-12	338	28.2	326	27.2	236	19.7	151	(7)	21.6
U.S. CS 13-24	246	20.5	237	19.8	223	18.6	176	(11)	16.0
U.S. CS 25-36	162	13.5	202	16.8	197	16.4	110	(10)	11.0
U.S. CS Other	842	7.5	972	8.7	878	7.8	721	(96)	7.5
U.S. CS Total	**1,588**	**10.7**	**1,737**	**11.7**	**1,534**	**10.4**	**1,158**	**(124)**	**9.3**
U.S. CE	63	5.2	113	9.4	114	9.5	54	(9)	6.0
U.S. Information	56	8.0	57	8.1	68	9.7	38	(7)	5.4
Canadian	170	8.5	200	10.0	232	11.6	159	(17)	9.4
Total	**1,877**	**10.0**	**2,107**	**11.3**	**1,948**	**10.4**	**1,409**	**(157)**	**9.0**

2007-2008 Taulbee Survey





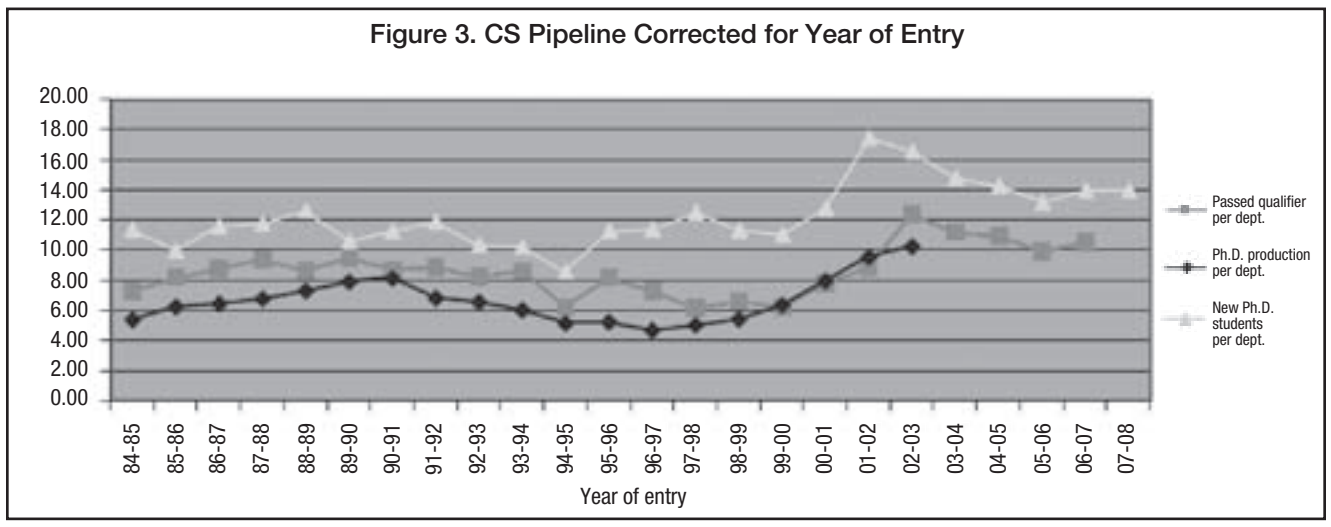
ratio," defined as the actual number divided by the predicted number, was 0.90, as opposed to last year's 0.95. If this year's optimism ratio holds again next year, there will be approximately 1,900 new Ph.D.s produced in 2008-09. However, it also may be that we are nearing a peak production rate. Changing hiring conditions resulting from the weak economy also may delay graduation for some Ph.D. students.

The number of new students passing thesis candidacy exams (most, but not all, departments have such exams) rose 7%, although more departments reported such exams this year. When the I departments are subtracted, the increase is only 4%. On a per department basis, the numbers are down slightly, whether I departments are included or not. The number of students passing the qualifier also rose significantly (13%) to its level of two years ago if I departments are included. Without I departments, the increase still was a healthy 9%.

The total number of new CS Ph.D. students (Table 5) rose by 10%, following a 4% increase last year. This year, the increase was due to the admission of a larger class of new students, while last year it was due to Master's students becoming Ph.D. students. More departments reported new student data this year, so the 10% increase is somewhat misleading. The number of new CS Ph.D. students per department reporting actually is almost the same this year as last. Figure 3 shows a graphical view of the pipeline for computer science programs. The data in this graph are normalized by the number of departments reporting. The graph offsets the qualifier data by one year from the data for new students, and offsets the graduation data by five years from the data for new students. These data have been useful in estimating the timing of changes in production rates. They suggest that we have peaked in CS Ph.D. production for a few years, and expect a slight decline during the next couple of years. However, the turnaround in the number of students who passed qualifiers makes it difficult to forecast longer-term trends.

Table 5a reports the data for new students in fall 2008 from outside North America. Top 12 U.S. departments continue to have a somewhat higher fraction of domestic students than do lower-ranked departments, and Canadian departments continue to have a lower percentage of Ph.D. students from outside North America than do their U.S. counterparts. The range of new

Continued on Page 10



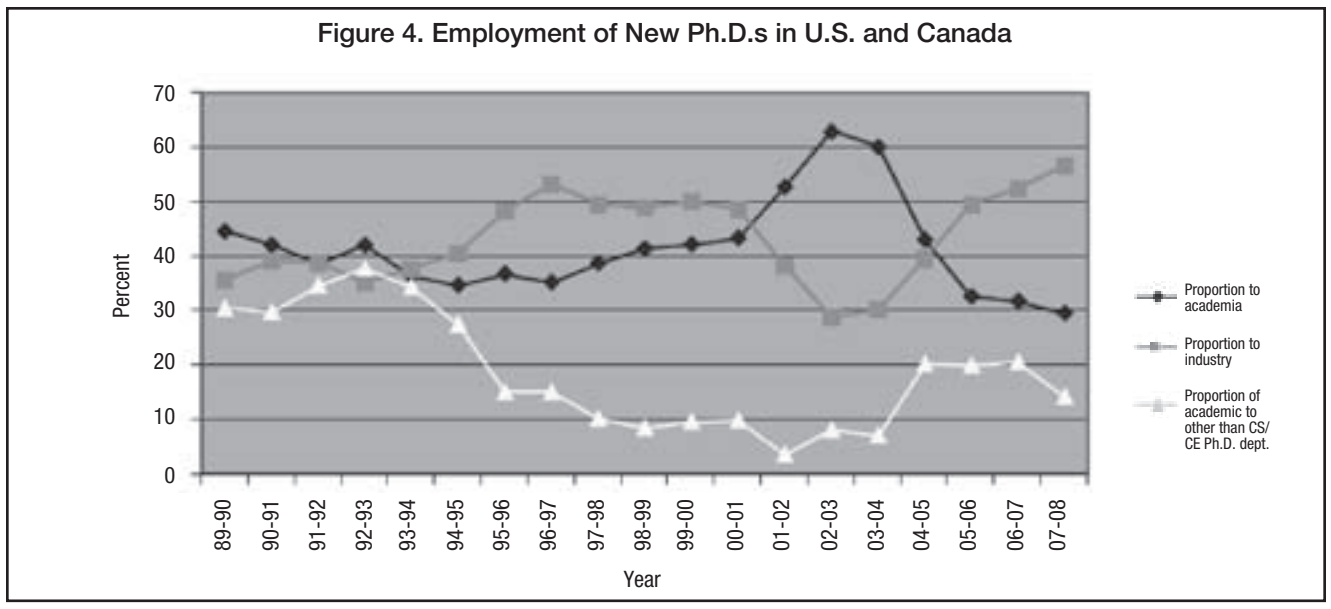


Table 2. Gender of Ph.D. Recipients by Type of Degree

	CS		CE		I		Total	
Male	1,255	79.4%	153	83.2%	44	71.0%	1,452	79.5%
Female	325	20.6%	31	16.8%	18	29.0%	374	20.5%
Total known Gender	**1,580**		**184**		**62**		**1,826**	
Unknown	17		19		15		51	
Total	**1,597**		**203**		**77**		**1,877**	

Table 3. Ethnicity of Ph.D. Recipients by Type of Degree

	CS		CE		I		Total	
Nonresident Alien	807	55.5%	133	66.5%	38	50.0%	978	56.5%
American Indian or Alaska Native	5	0.3%	1	0.5%	0	0.0%	6	0.3%
Asian	178	12.2%	20	10.0%	5	6.6%	203	11.7%
Black or African-American	22	1.5%	2	1.0%	3	3.9%	27	1.6%
Native Hawaiian or Pacific Islander	0	0.0%	0	0.0%	1	1.3%	1	0.1%
White	419	28.8%	42	21.0%	29	38.2%	490	28.3%
Multiracial, not Hispanic	2	0.1%	0	0.0%	0	0.0%	2	0.1%
Resident Hispanic, any race	21	1.4%	2	1.0%	0	0.0%	23	1.3%
Total have Ethnicity Data for	**1,454**		**200**		**76**		**1,730**	100.0%
Resident, race/ethnicity unknown	26		1		0		27	
Residency unknown	117		2		1		120	
Total	**1,597**		**203**		**77**		**1,877**	

2007-2008 Taulbee Survey

Ph.D. students in U.S. programs who are not North American is 50% to 64% across the ranking strata. I departments are at the lower end of this range. Among U.S. programs ranked 25-36, the fraction of new Ph.D. students from outside North America increased from 59% to 64%. In Canadian programs, the fraction of new students who were not North American declined from 43% to 36%. Overall, the fraction of non-North American new Ph.D. students (54.0%) is comparable to last year's 54.8%.

Figure 4 shows the employment trend of new Ph.D.s in academia and industry, and the proportion of those going to academia who took positions in departments other than Ph.D.-granting CS/CE departments. Table 4 shows a more detailed breakdown of the employment data for new Ph.D.s. The trend toward employment in industry over academia continues for the 2007-08 Ph.D. graduates. Of those for whom employment type is known, industry hired 56.6% of new Ph.D. graduates, compared to 52.3%, 49.4% and 39.6% in the previous three years. In contrast, about 30% took academic employment in North America (compared to 32%, 33%, 43% and 60%, respectively, in the previous four years). There also is a continued decline in the percentage who went into tenure-track positions in Ph.D.-granting programs (9.4% vs 11.4%, 12.8%, 17.5% and 27.5% in the previous four years) and to non-Ph.D.-granting CS/CE departments (4.2% vs. 4.7%, 5.2% and 7.0% in the previous three years). The decline in the number of persons going into tenure-track positions in Ph.D.-granting programs is almost exactly offset by an increase in the number of new Ph.D.s going to postdoctoral positions.

The unemployment rate for new Ph.D.s remains less than 1%. The proportion of Ph.D. graduates who were reported taking positions outside of North America, among those whose employment is known, decreased again this year to 9.2%, from 10% last year and 13.1% two years ago.

Table 4. Employment of New Ph.D. Recipients By Specialty

	Artificial Intelligence	Computer-Supported Cooperative Work	Databases /Information Retrieval	Graphics/Visualization	Hardware/Architecture	Human-Computer Interaction	High-Performance Computing	Informatics: Biomedica/ Other Science	Information Assurance/Security	Information Science	Information Systems	Networks	Operating Systems	Programming Languages/ Compilers	Robotics/Vision	Scientific/Numerical Computing	Social Computing/Social Informatics	Software Engineering	Theory and Algorithms	Other	Total	
North American Ph.D. Granting Depts.																						
Tenure-track	11	1	13	5	5	10	2	6	8	1	2	9	7	5	5	2	1	10	11	26	140	9.4%
Researcher	5	0	2	3	0	2	0	2	2	0	0	3	4	0	2	2	0	2	9	7	45	3.0%
Postdoc	25	1	2	9	1	7	5	17	5	2	0	6	2	5	7	5	0	5	16	28	148	10.0%
Teaching Faculty	4	0	1	4	2	1	0	2	1	2	0	3	0	3	3	1	0	5	4	6	42	2.8%
North American, Other Academic																						
Other CS/CE/I Dept.	6	0	4	9	0	3	4	4	4	2	0	8	0	2	2	0	1	4	6	3	62	4.2%
Non-CS/CE/I Dept.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
North American, Non-Academic																						
Industry	77	5	98	52	42	24	15	18	29	2	13	72	36	31	30	13	6	104	50	122	839	56.6%
Government	4	0	2	2	1	0	1	2	4	1	0	3	0	3	4	2	0	4	3	8	44	3.0%
Self-Employed	3	0	0	1	0	0	0	1	0	0	0	1	2	1	1	0	1	1	1	1	14	0.9%
Unemployed	0	0	1	0	0	2	0	0	0	0	0	0	0	2	0	1	1	0	2	3	12	0.8%
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total Inside North America																						
	135	7	123	85	51	49	27	52	53	10	15	105	51	52	54	26	10	135	102	204	1346	90.8%
Outside North America																						
Tenure-Track in Ph.D. Granting	6	1	2	0	1	0	1	0	1	0	1	4	1	0	0	0	1	0	3	0	22	1.5%
Researcher in Ph.D.	2	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	6	0.4%
Postdoc in Ph.D.	4	0	0	6	1	0	0	1	0	0	1	2	1	2	2	1	0	1	5	6	33	2.2%
Teaching in Ph.D.	1	0	0	0	0	1	0	0	0	0	1	1	1	1	0	1	0	1	0	1	9	0.6%
Other Academic	2	0	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	3	2	11	0.7%
Industry	4	0	4	4	4	4	0	0	1	0	2	8	5	3	0	1	0	4	2	2	48	3.2%
Government	0	0	1	0	0	0	0	1	1	0	0	1	1	0	0	0	1	1	1	0	8	0.5%
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total Outside North America	19	1	9	11	6	6	2	2	3	0	5	18	9	6	2	3	2	7	14	12	137	9.2%
Total with Employment Data, Inside North America plus Outside North America																						
	154	8	132	96	57	55	29	54	56	10	20	123	60	58	56	29	12	142	116	216	1483	100%
Employment Type & Location Unknown																						
	38	1	23	16	14	10	10	13	6	2	11	28	6	4	7	4	3	17	20	161	394	
Total																						
	192	**9**	**155**	**112**	**71**	**65**	**39**	**67**	**62**	**12**	**31**	**151**	**66**	**62**	**63**	**33**	**15**	**159**	**136**	**377**	**1877**	

2007-2008 Taulbee Survey

Table 5. New Ph.D. Students in Fall 2008 by Department Type and Rank

	CS				CE				I				Total	
Department, Rank	New Admit	MS to Ph.D.	Total	Avg. per Dept.	New Admit	MS to Ph.D.	Total	Avg. per Dept.	New Admit	MS to Ph.D.	Total	Avg. per Dept.	Total	Avg. per Dept
U.S. CS 1-12	379	26	405	31.6	0	0	0	0.0	2	0	2	0.2	407	33.9
U.S. CS 13-24	272	27	299	22.7	0	1	1	0.1	0	0	0	0.0	300	25.0
U.S. CS 25-36	292	22	314	24.3	6	0	6	0.5	34	6	40	3.3	360	30.0
U.S. CS Other	1,189	140	1,329	10.6	133	17	150	1.3	34	8	42	0.4	1,521	13.6
U.S. CS Total	**2,132**	**215**	**2,347**	**14.4**	**139**	**18**	**157**	**1.1**	**70**	**14**	**84**	**0.6**	**2,588**	**17.5**
U.S. CE	0		0	0.0	60	5	65	5.4	1	0	1	0.1	66	5.5
U.S. Information	0	0	0	0.0	0	0	0	0.0	62	10	72	10.3	72	10.3
Canadian	206	62	268	10.3	13	4	17	0.9	3	3	6	0.3	291	14.6
Total	**2,338**	**277**	**2,615**	**12.5**	**212**	**27**	**239**	**1.3**	**136**	**27**	**163**	**0.9**	**3,017**	**16.1**

Averages per department are computed for all reporting departments.

Table 5a. New Ph.D. Students from Outside North America

Department, Rank	CS	CE	I	Total New Outside	Total New	% Outside North America
U.S. CS 1-12	201	0	1	**202**	407	49.6%
U.S. CS 13-24	169	0	0	**169**	300	56.3%
U.S. CS 25-36	209	5	17	**231**	360	64.2%
U.S. CS Other	735	83	20	**838**	1,521	55.1%
Total U.S. CS	**1,314**	**88**	**38**	**1,440**	**2,588**	**55.6%**
U.S. CE	0	48	0	**48**	66	72.7%
U.S. Information	0	0	37	**37**	72	51.4%
Canadian	101	3	0	**104**	291	35.7%
Total	**1,415**	**139**	**75**	**1,629**	**3,017**	**54.0%**
Total New	2,615	239	163	3,017		
% Outside	54.1%	58.2%	46.0%	54.0%		

Table 4 also indicates the areas of specialty of new CS/CE Ph.D.s. Year-to-year fluctuations among these data are common and multi-year trends are difficult to discern. This year, there was an increase in the database/information systems area, which no doubt is influenced by the inclusion of I departments in this year's survey. On the other hand, the programming languages and OS/networks area showed declines. AI/robotics took over from OS/networks as the area with the largest number of graduates. In this year's survey, we refined the choice of areas that the departments could use to classify Ph.D. recipients, including categories of interest to I departments. We will review the data in comparison with those of previous years to see if this classification is proving useful. There still are a large number of graduates classified as having their degree in some area not specified.

The proportion of women among new Ph.D.s rose for the third straight year, to 20.5% in 2008 from 19.1% last year. This includes I departments, which graduated women Ph.D.s. in higher proportion that did CS and CE departments. However, subtracting the I departments still results in an increase to 20.2% among CS and CE departments (Table 2). Ethnicity characteristics of new Ph.D.s are similar to those reported last year (Table 3). This year, the ethnicity categories were modified to conform to those used by the National Center for Educational Statistics. Thus, the percentages may not all be entirely comparable. This year, we also broke out the reported data when residency status was known but ethnicity was not. Last year, we combined data for ethnicity unknown and residency unknown. Coupled with the inclusion of I departments this year, extra care therefore must be taken when comparing percentages in this year's ethnicity tables with those from last year. Nevertheless, among CS and CE departments, it appears there was an increase in the proportion of new Ph.D.s awarded to Whites this year, offset by a decrease in those to Asians (including Native Hawaiians and Pacific Islanders).

Current Ph.D. enrollment proportions show a slight decline in women among CS and CE departments (from 19.5% to 18.9%), although when I departments are included the proportion this year is 20.0% (Table 7). With respect to ethnicity breakdowns, there appears to be a larger proportion of Nonresident Aliens this year, offset by a decrease in the proportion of Whites and Asians, including Native Hawaiians and Pacific Islanders (Table 8).

Continued on Page 12

Figure 5. Nonresident Aliens as Fraction of Ph.D. Enrollments

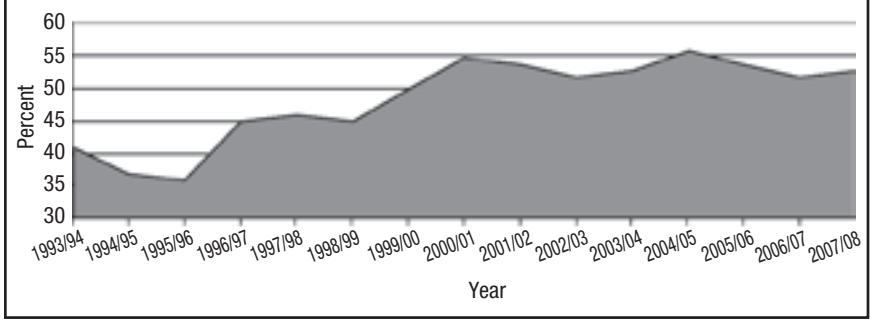


Figure 6. BS Production (CS & CE)

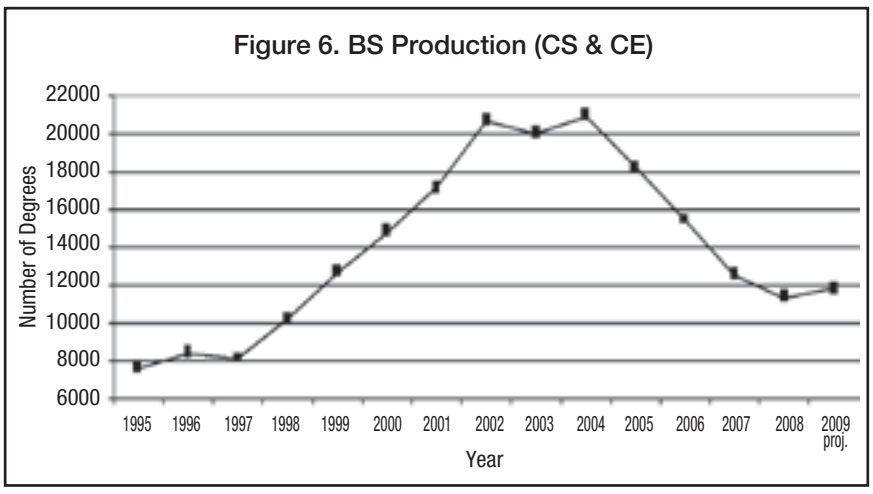
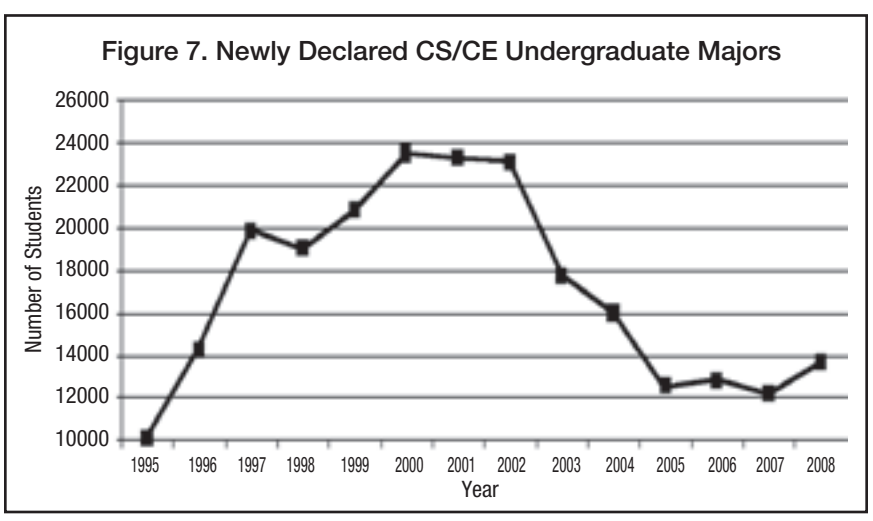


Figure 7. Newly Declared CS/CE Undergraduate Majors



2007-2008 Taulbee Survey

Table 6. Ph.D. Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE		I		Total	
U.S. CS 1-12	2,291	18.4%	0	0.0%	0	0.0%	2,291	15.7%
U.S. CS 13-24	1,600	12.9%	25	1.8%	0	0.0%	1,625	11.2%
U.S. CS 25-36	1,241	10.0%	19	1.4%	137	19.4%	1,397	9.6%
U.S. CS Other	5,851	47.0%	798	56.8%	194	27.4%	6,843	47.0%
Total U.S. CS	**10,983**	**88.3%**	**842**	**60.0%**	**331**	**46.8%**	**12,156**	**83.5%**
U.S. CE	0	0.0%	477	34.0%	13	1.8%	490	3.4%
U.S. Information	0	0.0%	0	0.0%	363	51.3%	363	2.5%
Canadian	1,462	11.7%	85	6.1%	0	0.0%	1,547	10.6%
Total	**12,445**		**1,404**		**707**		**14,556**	

Table 7. Ph.D. Program Total Enrollment by Gender

	CS		CE		I		Total	
Male	9,896	80.7%	1,182	84.2%	431	60.1%	11,509	80.0%
Female	2,364	19.3%	222	15.8%	286	39.9%	2,872	20.0%
Total have Gender Data for	**12,260**		**1,404**		**717**		**14,381**	
Unknown	185		0		0		185	
Total	**12,445**		**1,404**		**717**		**14,566**	

Table 8. Ph.D. Program Total Enrollment by Ethnicity

	CS		CE		I		Total	
Nonresident Alien	5,958	54.7%	916	71.8%	308	45.1%	7,182	55.9%
American Indian or Alaska Native	12	0.1%	22	1.7%	8	1.2%	42	0.3%
Asian	859	7.9%	58	4.5%	60	8.8%	977	7.6%
Black or African-American	194	1.8%	17	1.3%	27	4.0%	238	1.9%
Native Hawaiian or Pacific Islander	38	0.3%	1	0.1%	1	0.1%	40	0.3%
White	3,610	33.2%	236	18.5%	265	38.8%	4,111	32.0%
Multiracial, not Hispanic	43	0.4%	8	0.6%	2	0.3%	53	0.4%
Resident Hispanic, any race	173	1.6%	18	1.4%	12	1.8%	203	1.6%
Total have Ethnicity Data for	**10,887**		**1,276**		**683**		**12,846**	
Resident, race/ethnicity unknown	679		22		22		723	
Residency unknown	879		106		12		997	
Total	**12,445**		**1,404**		**717**		**14,566**	

Master's and Bachelor's Degree Production and Enrollments (Tables 9-16)

Master's degree production in CS and CE was negligibly different from last year, although there was a slight decline in CS and an increase in CE. The large number of Master's degrees in I departments and I degrees from CS departments added considerably to the total count of degrees awarded from the departments responding to this year's survey. This year, the Master's degree production numbers are displayed by department type and rank (Table 11b). Curiously, the prediction of the number of CS Master's degrees to be awarded in 2008-09 is higher than it was last year, while the enrollment in CS Master's programs is slightly lower. However, last year the departments did a poor job predicting the number of CS Master's degree recipients (5,883 predicted last year, and 7,383 awarded); therefore the increased prediction of 6,394 this year (Table 12b) appears to be justified.

The fraction of CS Master's degrees awarded to women was down slightly compared to last year's survey. In

Table 9a. Gender of Bachelor's Recipients

	CS		CE		I		Total	
Male	7,939	88.2%	1839	89.3%	1263	86.3%	11,041	88.2%
Female	1,061	11.8%	221	10.7%	201	13.7%	1,483	11.8%
Total have Gender Data for	**9,000**		**2,060**		**1,464**		**12,524**	
Unknown	217		62		12		291	
Total	**9,217**		**2,122**		**1,476**		**12,815**	

Table 9b. Gender of Master's Recipients

	CS		CE		I		Total	
Male	5,565	78.8%	636	78.1%	919	51.0%	7,120	73.6%
Female	1,500	21.2%	178	21.9%	882	49.0%	2,560	26.4%
Total have Gender Data for	**7,065**		**814**		**1,801**		**9,680**	
Unknown	318		0		0		318	
Total	**7,383**		**814**		**1,801**		**9,998**	

2007-2008 Taulbee Survey

Table 10a. Ethnicity of Bachelor's Recipients

	CS		CE		I		Total	
Nonresident Alien	423	6.2%	154	8.3%	60	4.2%	637	6.3%
American Indian or Alaska Native	56	0.8%	7	0.4%	6	0.4%	69	0.7%
Asian	998	14.7%	368	19.8%	205	14.3%	1,571	15.5%
Black or African-American	273	4.0%	100	5.4%	118	8.2%	491	4.9%
Native Hawaiian or Pacific Islander	54	0.8%	10	0.5%	1	0.1%	65	0.6%
White	4,483	65.8%	1,073	57.6%	922	64.4%	6,478	64.1%
Multiracial, not Hispanic	108	1.6%	0	0.0%	2	0.1%	110	1.1%
Resident Hispanic, any race	414	6.1%	151	8.1%	117	8.2%	682	6.8%
Total have Ethnicity Data for	**6,809**		**1,863**		**1,431**		**10,103**	
Resident, race/ethnicity unknown	1,125		125		30		1,280	
Residency unknown	1,283		134		15		1,432	
Total	**9,217**		**2,122**		**1,476**		**12,815**	

Table 10b. Ethnicity of Master's Recipients

	CS		CE		I		Total	
Nonresident Alien	3,469	55.8%	420	57.1%	380	22.7%	4,269	49.5%
American Indian or Alaska Native	14	0.2%	17	2.3%	7	0.4%	38	0.4%
Asian	665	10.7%	56	7.6%	197	11.7%	918	10.6%
Black or African-American	110	1.8%	14	1.9%	109	6.5%	233	2.7%
Native Hawaiian or Pacific Islander	14	0.2%	0	0.0%	0	0.0%	14	0.2%
White	1,783	28.7%	211	28.7%	915	54.6%	2,909	33.7%
Multiracial, not Hispanic	32	0.5%	0	0.0%	6	0.4%	38	0.4%
Resident Hispanic, any race	129	2.1%	18	2.4%	63	3.8%	210	2.4%
Total have Ethnicity Data for	**6,216**		**736**		**1,677**		**8,629**	
Resident, race/ethnicity unknown	655		38		91		784	
Residency unknown	512		40		33		585	
Total	**7,383**		**814**		**1,801**		**9,998**	

2007-08, 21.2% of the degrees went to women, while in the previous year 22.7% went to women. The CE numbers were within one-half of one percent of the previous year's data. Note that I departments awarded 49% of their Master's degrees to women (Table 9b). The ethnicity of I department Master's graduates also is more diverse than in CS or CE departments (Table 10b). In CS and CE departments, there is a slight increase in the fraction of graduates who are Nonresident Aliens, and a corresponding decrease in those who are Asian or Native Hawaiians/Pacific Islander.

Bachelor's degree production (Tables 9a and 10a) in CS was down 10% this year, compared to a decline of nearly 20% last year. The slowing of the decline in degree production is consistent with an increase in overall enrollment in U.S. CS programs. The average number of new students per department in U.S. CS programs is up 1.7% over last year, and if only majors are considered, the increase is 9.5% (however, the latter number is influenced by departments that no longer use pre-majors, and hence all of their new students now are counted as majors). During the last three years, the cumulative increase in average number of new students per department is 9.4%, and is 15.8% if only majors are considered. Furthermore, some of the CS departments that now are able to report I majors reported these majors among their CS majors in previous years. So the number of CS majors this year actually grew even more than is represented in the tabulated data. It definitely appears that U.S. CS departments are replenishing the freshman and sophomore ranks with larger groups than they are graduating as seniors. Total enrollment per department by majors and pre-majors in U.S. CS programs is up 6.2% over last year, and if only majors are considered, the increase is 8.1%. This is the first increase in total enrollment in CS programs in six years. We should see this reflected in Bachelor's degree production soon.

New CS student data are similar in Canadian schools, though total Canadian CS enrollment is lower for both majors and pre-majors this year. As mentioned at the beginning of this report, the Canadian data are much more sensitive to the particular departments that responded to the survey, although this also may suggest that Canadian departments are a year

Table 11a. Bachelor's Degree Recipients by Department Type and Rank

Department, Rank	CS		CE		I		Total	
U.S. CS 1-12	1,016	11.0%	180	8.5%	27	1.8%	1,223	9.5%
U.S. CS 13-24	722	7.8%	145	6.8%	0	0.0%	867	6.8%
U.S. CS 25-36	823	8.9%	91	4.3%	162	11.0%	1,076	8.4%
U.S. CS Other	4,708	51.1%	1,185	55.8%	610	41.3%	6,503	50.7%
Total U.S. CS	**7,269**		**1,601**		**799**		**9,669**	
U.S. CE	0	0.0%	423	19.9%	0	0.0%	423	3.3%
U.S. Information	0	0.0%	18	0.8%	677	45.9%	695	5.4%
Canadian	1,948	21.1%	80	3.8%	0	0.0%	2,028	15.8%
Total	**9,217**		**2,122**		**1,476**		**12,815**	

Table 11b. Master's Degree Recipients by Department Type and Rank

Department, Rank	CS		CE		I		Total	
U.S. CS 1-12	735	10.0%	45	5.5%	0	0.0%	780	7.8%
U.S. CS 13-24	1,181	16.0%	0	0.0%	0	0.0%	1,181	11.8%
U.S. CS 25-36	460	6.2%	1	0.1%	56	3.1%	517	5.2%
U.S. CS Other	4,343	58.8%	548	67.3%	684	38.0%	5,575	55.8%
Total U.S. CS	**6,719**	**91.0%**	**594**	**73.0%**	**740**	**41.1%**	**8,053**	**80.5%**
U.S. CE	0	0.0%	149	18.3%	9	0.5%	158	1.6%
U.S. Information	0	0.0%	3	0.4%	1052	58.4%	1,055	10.6%
Canadian	664	9.0%	68	8.4%	0	0.0%	732	7.3%
Total	**7,383**		**814**		**1,801**		**9,998**	

Continued on Page 15

2007-2008 Taulbee Survey

Table 12a. Bachelor's Degree Candidates for 2008-2009 by Department Type and Rank

Department, Rank	CS		CE		I		Total	
U.S. CS 1-12	1,113	11.3%	213	11.0%	38	2.9%	1,364	10.4%
U.S. CS 13-24	790	8.0%	194	10.0%	0	0.0%	984	7.5%
U.S. CS 25-36	893	9.1%	62	3.2%	222	16.8%	1,177	9.0%
U.S. CS Other	4,606	46.9%	935	48.2%	699	52.9%	6,240	47.7%
Total U.S. CS	**7,402**		**1,404**		**959**		**9,765**	
U.S. CE	0	0.0%	459	23.6%	0	0.0%	459	3.5%
U.S. Information	0	0.0%	0	0.0%	363	27.5%	363	2.8%
Canadian	2,427	24.7%	78	4.0%	0	0.0%	2,505	19.1%
Total	**9,829**		**1,941**		**1,322**		**13,092**	

Table 12b. Master's Degree Candidates for 2008-2009 by Department Type and Rank

Department, Rank	CS		CE		I		Total	
U.S. CS 1-12	743	11.6%	75	8.6%	0	0.0%	818	9.3%
U.S. CS 13-24	1,070	16.7%	2	0.2%	0	0.0%	1,072	12.2%
U.S. CS 25-36	588	9.2%	2	0.2%	84	5.4%	674	7.6%
U.S. CS Other	3,462	54.1%	530	60.9%	592	38.1%	4,584	52.0%
Total U.S. CS	**5,863**	**91.7%**	**609**	**70.0%**	**676**	**43.5%**	**7,148**	**81.1%**
U.S. CE	0	0.0%	216	24.8%	7	0.5%	223	2.5%
U.S. Information	0	0.0%	4	0.5%	872	56.1%	876	9.9%
Canadian	531	8.3%	41	4.7%	0	0.0%	572	6.5%
Total	**6,394**		**870**		**1,555**		**8,819**	

Table 13. New Master's Students in Fall 2008 by Department Type and Rank

Department, Rank	CS		CE		I		Total		Outside N America	
	Total	Avg. per Dept.	Total	Avg. per Dept.	Total	Avg. per Dept.	Total	Avg. per Dept.	Total	%
U.S. CS 1-12	646	64.6	67		0		713	71.3	343	48.1%
U.S. CS 13-24	736	61.3	3		0		739	61.6	522	70.6%
U.S. CS 25-36	380	34.6	3		110	39.7	493	44.8	330	66.9%
U.S. CS Other	3,078	29.0	372	13.8	468	58.5	3,918	37.0	2,244	57.3%
U.S. CS Total	**4,840**	**34.8**	**445**	**14.8**	**578**	**48.2**	**5,863**	**39.3**	**3,439**	**58.7%**
U.S. CE	0		189	15.8	2		191	15.9	116	60.7%
U.S. Information	0		5		911	151.8	916	130.9	200	21.8%
Canadian	524	26.2	21	7.0	0		575	28.8	214	37.2%
Total	**5,364**	**33.7**	**690**	**15.0**	**1,491**	**135.6**	**7,545**	**42.6**	**3,969**	**52.6%**

Table 14. New Undergraduate Students in Fall 2008 by Department Type and Rank

Department, Rank	CS			CE			I			Total	
	Pre-Major	Major	Avg. Major per Dept.	Pre-Major	Major	Avg. Major per Dept.	Pre-Major	Major	Avg. Major per Dept.	Major	Avg. Major per Dept.
U.S. CS 1-12	147	861	86.1	0	156		0	15		1,032	103.2
U.S. CS 13-24	122	830	69.2	0	379		0	0		1,209	85.8
U.S. CS 25-36	197	989	89.9	0	106		12	146	36.5	1,241	90.0
U.S. CS Other	1,927	6,054	63.7	457	1,755	48.8	11	773	45.5	8,582	90.3
Total U.S. CS	**2,393**	**8,734**	**68.2**	**457**	**2,396**	**54.5**	**23**	**934**	**42.4**	**12,064**	**94.2**
U.S. CE	0	0		108	378	42.0	0	0		378	42.0
U.S. Information	0	0		0	5		0	334	66.8	339	56.5
Canadian	186	2,041	113.4	0	69		0	0		2,110	117.2
Total	**2,579**	**10,775**		**565**	**2,848**		**23**	**1,268**		**14,891**	

Averages per department are computed for departments with nonzero values, when there are 3 or more in a cell.

2007-2008 Taulbee Survey

Table 15. Master's Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE		I		Total	
U.S. CS 1-12	1,206	7.8%	81	4.8%	0	0.0%	1,287	5.9%
U.S. CS 13-24	1,849	11.9%	4	0.2%	0	0.0%	1,853	8.5%
U.S. CS 25-36	893	5.8%	5	0.3%	182	3.9%	1,080	4.9%
U.S. CS Other	9,838	63.6%	1,150	67.7%	1,672	35.7%	12,660	57.9%
Total U.S. CS	**13,786**	89.1%	**1,240**	73.0%	**1,854**	39.5%	**16,880**	77.2%
U.S. CE	0	0.0%	359	21.1%	47	1.0%	406	1.9%
U.S. Information	0	0.0%	20	1.2%	2,789	59.5%	2,809	12.8%
Canadian	1,688	10.9%	79	4.7%	0	0.0%	1,767	8.1%
Total	**15,474**		**1,698**		**4,690**		**21,862**	

Averages per department are computed for departments with nonzero values, when there are 3 or more in a cell.

Table 16. Bachelor's Degree Program Total Enrollment by Department Type and Rank

Department,Rank	CS			CE			I			Total	
	Pre-Major	Major	Avg. Major per Dept.	Pre-Major	Major	Avg. Major per Dept.	Pre-Major	Major	Avg. Major per Dept.	Major	Avg. Major per Dept.
U.S. CS 1-12	779	2,874	239.5	0	648	162.0	0	77		3,599	291.9
U.S. CS 13-24	219	2,739	228.2	0	733	146.6	0	0		3,472	289.3
U.S. CS 25-36	405	3,173	264.4	0	220		16	672	168.0	4,065	369.5
U.S. CS Other	3,940	22,217	211.6	727	5,496	140.9	75	2,804	164.9	30,517	338.8
Total U.S. CS	**5,343**	**31,003**	**219.9**	**727**	**7,097**	**141.9**	**91**	**3,553**	**161.5**	**41,653**	**295.4**
U.S. CE	0	0		96	1,778	161.6	0	0		1,778	161.6
U.S. Information	0	0		0	18		0	1,677	335.4	1,695	282.5
Canadian	144	8,001	421.1	0	243		0	0		8,244	433.9
Total	**5,487**	**39,004**		**823**	**9,136**		**91**	**5,230**		**53,370**	

Averages per department are computed for departments with nonzero values, when there are 3 or more in a cell.

Table 17. Actual and Anticipated Faculty Size by Position

	Actual	Projected		
	2008-2009	2009-2010	2010-2011	Expected Two-Year Growth
Tenure-Track	4,776	4,936	5,086	310 6.5%
Researcher	589	593	614	25 4.2%
Postdoc	456	487	529	73 16.0%
Teaching Faculty	423	478	519	96 22.7%
Other/Not Listed	162	166	171	
Total	**6,406**	**6,660**	**6,919**	**513 8.0%**

or so behind U.S. CS departments in realizing the turnaround.

Diversity in our undergraduate programs remains poor. The fraction of Bachelor's degrees awarded to women held steady at a paltry 11.8% this year (Table 9a). As was the case last year, nearly two-thirds of those receiving Bachelor's degrees were White, non-Hispanics.

Faculty Demographics *(Tables 17-23)*

Total faculty sizes, as well as tenure-track faculty sizes, increased nearly 5% at U.S. CS departments during the past year. There was a 12% increase in the number of postdocs at U.S. CS departments this year compared to last year, although the number of researchers at these departments declined by nearly 14%; when combined, the total number is down 4%. With the increased opportunities for tenure-track positions, some of the people in the postdoc and researcher categories may have moved to tenure-track. Teaching faculty increased by almost 8% at U.S. CS departments.

The fraction of women hired into tenure-track positions was 21.9%, down from last year's 23.9% but still slightly above the fraction of new Ph.D.s who were women (20.5%). There was an increased percentage of new faculty members who are Nonresident Aliens and African Americans this year, offset by a decreased percentage of Asians, Native Hawaiians or Pacific Islanders. Although the African American

Table 18. Actual and Anticipated Faculty Size by Department Type and Rank

	Actual	Projected		
	2008-2009	2009-2010	2010-2011	Expected Two-Year Growth
U.S. CS 1-12	749	782	813	64 8.5%
U.S. CS 13-24	608	626	650	42 6.9%
U.S. CS 25-36	605	639	665	60 9.9%
U.S. CS Other	3,034	3,153	3,280	246 8.1%
U.S. CS Total	**4,996**	**5,200**	**5,408**	**412 8.2%**
U.S. CE	272	285	300	28 10.3%
U.S. Information	204	218	224	20 9.8%
Canadian	933	957	988	55 5.9%
Total	**6,405**	**6,660**	**6,920**	**515 8.0%**

percentage of new tenure-track hires this year rose to 3.4%, this still is a very low fraction, and since the total enrollment in Ph.D. programs currently is less than 2%, this one-year gain is a small contribution to our goal of improving faculty diversity.

Actual faculty size increases were fairly close to predicted values this year. For next year, reporting departments forecast a 3% to 4% growth in tenure-track faculty. These forecasts were made before many institutions announced actions associated with impending economy-related cuts for FY09 and/or FY10. We'll see if these hiring predictions are met.

Table 18b shows the recruiting results from last year's hiring cycle. During that cycle, roughly one of every four open tenure-track positions went unfilled. For each of the two previous years, one of every three positions went unfilled. This could be one consequence of the tightening job

Continued on Page 18

2007-2008 Taulbee Survey

Table 18a. Actual and Anticipated CS Faculty Size by Position and Department Rank

	Actual		Projected					
	2008-2009		2009-2010		2010-2011		Expected Two-Year Growth	
U.S. CS 1-12	Total	Average	Total	Average	Total	Average	#	%
TenureTrack	494	41.2	510	42.5	527	43.9	33	6.7%
Research	56	4.7	60	5.0	64	5.3	8	14.3%
Postdoc	62	5.2	68	5.7	72	6.0	10	16.1%
Teaching	101	8.4	106	8.8	111	9.3	10	9.9%
Other	36	3.0	38	3.2	40	3.3	4	11.1%
U.S. CS 13-24								
TenureTrack	387	32.3	401	33.4	415	34.6	28	7.2%
Research	50	4.2	52	4.3	56	4.7	6	12.0%
Postdoc	128	10.7	133	11.1	134	11.2	6	4.7%
Teaching	43	3.6	40	3.3	45	3.8	2	4.7%
Other	0	0.0	0	0.0	0	0.0	0	
U.S. CS 25-36								
TenureTrack	420	35.0	438	36.5	457	38.1	37	8.8%
Research	52	4.3	53	4.4	54	4.5	2	3.8%
Postdoc	55	4.6	63	5.3	67	5.6	12	21.8%
Teaching	42	3.5	49	4.1	51	4.3	9	21.4%
Other	36	3.0	36	3.0	36	3.0	0	0.0%
U.S. CS Other								
TenureTrack	2,371	20.4	2,447	21.1	2,525	21.8	154	6.5%
Research	324	2.8	320	2.8	331	2.9	7	2.2%
Postdoc	141	1.2	154	1.3	170	1.5	29	20.6%
Teaching	125	1.1	158	1.4	176	1.5	51	40.8%
Other	72	0.6	74	0.6	77	0.7	5	6.9%

Table 18b. Vacant Positions 2007-2008 by Position and Department Rank and Type

	Vacant Positions 2007-2008			
	Tried to fill	Filled	Unfilled	% Unfilled
U.S. CS 1-12				
TenureTrack	31	22	9	29.0%
Research	3	3	0	0.0%
Postdoc	12	12	0	0.0%
Teaching	28	28	0	0.0%
U.S. CS 13-24				
TenureTrack	23	11	12	52.2%
Research	2	1	1	50.0%
Postdoc	11	8	3	27.3%
Teaching	18	13	5	27.8%
U.S. CS 25-36				
TenureTrack	37	26	11	29.7%
Research	9	5	4	44.4%
Postdoc	23	19	4	17.4%
Teaching	18	12	6	33.3%
U.S. CS Other				
TenureTrack	320	247	72	22.5%
Research	95	95	0	0.0%
Postdoc	52	47	5	9.6%
Teaching	67	64	3	4.5%
U.S. CS Total				
TenureTrack	411	306	104	25.3%
Research	109	104	5	4.6%
Postdoc	98	86	12	12.2%
Teaching	131	117	14	10.7%
U.S. CE				
TenureTrack	15	11	4	26.7%
Research	33	33	0	0.0%
Postdoc	8	8	0	0.0%
Teaching	54	54	0	0.0%
U.S. Information				
TenureTrack	52	39	13	25.0%
Research	19	16	3	15.8%
Postdoc	6	6	0	0.0%
Teaching	0	0	0	
Canadian				
TenureTrack	27	13	14	51.9%
Research	4	4	0	0.0%
Postdoc	20	20	0	0.0%
Teaching	54	50	4	7.4%
Total				
TenureTrack	505	369	135	26.7%
Research	165	157	8	4.8%
Postdoc	132	120	12	9.1%
Teaching	239	221	18	7.5%

2007-2008 Taulbee Survey

Table 19. Gender of Newly Hired Faculty

	Tenure-track		Researcher		Postdoc		Teaching Faculty		Total	
Male	150	78.1%	53	76.8%	127	85.8%	63	68.5%	393	78.4%
Female	42	21.9%	16	23.2%	21	14.2%	23	25.0%	102	20.4%
	0		0		0		6		6	
Total	**192**		**69**		**148**		**92**		**501**	

Table 20. Ethnicity of Newly Hired Faculty

	Tenure-Track		Researcher		Postdoc		Teaching Faculty		Total
Nonresident Alien	39	21.8%	22	37.3%	52	41.9%	6	6.5%	**119**
American Indian or Alaska Native	2	1.1%	0	0.0%	0	0.0%	2	2.2%	**4**
Asian	37	20.7%	6	10.2%	17	13.7%	18	19.6%	**78**
Black or African-American	6	3.4%	0	0.0%	3	2.4%	3	3.3%	**12**
Native Hawaiian or Pacific Islander	3	1.7%	1	1.7%	2	1.6%	0	0.0%	**6**
White	88	49.2%	25	42.4%	44	35.5%	51	55.4%	**208**
Multiracial, not Hispanic	1	0.6%	1	1.7%	1	0.8%	0	0.0%	**3**
Resident Hispanic, any race	2	1.1%	2	3.4%	2	1.6%	2	2.2%	**8**
Resident, race/ethnicity unknown	1	0.6%	2	3.4%	3	2.4%	10	10.9%	**16**
Total have Residency Data for	**179**		**59**		**124**		**92**		**454**
Residency Unknown	13		10		24		0		**47**
Total	**192**		**69**		**148**		**92**		**501**

Table 21. Gender of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Male	1,879	88.3%	1,365	84.6%	882	78.3%	507	72.8%	354	82.7%	386	85.4%	**5,373**	83.4%
Female	248	11.7%	248	15.4%	245	21.7%	189	27.2%	74	17.3%	66	14.6%	**1,070**	16.6%
Total gender known	**2,127**		**1,613**		**1,127**		**696**		**428**		**452**		**6,443**	
Gender unknown	0		0		0		0		0		0		**0**	
Total	**2,127**		**1,613**		**1,127**		**696**		**428**		**452**		**6,443**	

Table 22. Ethnicity of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Nonresident Alien	10	0.5%	28	1.9%	166	15.8%	26	4.2%	55	14.4%	183	47.2%	**468**	8.0%
American Indian or Alaska Native	12	0.6%	10	0.7%	13	1.2%	2	0.3%	0	0.0%	0	0.0%	**37**	0.6%
Asian	407	20.9%	319	22.1%	313	29.8%	54	8.7%	37	9.7%	72	18.6%	**1,202**	20.6%
Black or African-American	14	0.7%	20	1.4%	21	2.0%	16	2.6%	1	0.3%	3	0.8%	**75**	1.3%
Native Hawaiian or Pacific Islander	24	1.2%	30	2.1%	10	1.0%	2	0.3%	11	2.9%	0	0.0%	**77**	1.3%
White	1,442	74.1%	999	69.2%	510	48.6%	513	82.6%	272	71.2%	124	32.0%	**3,860**	66.2%
Multiracial, not Hispanic	4	0.2%	0	0.0%	2	0.2%	1	0.2%	1	0.3%	0	0.0%	**8**	0.1%
Resident Hispanic, any race	32	1.6%	38	2.6%	14	1.3%	7	1.1%	5	1.3%	6	1.5%	**102**	1.7%
Total have Residency Data for	**1,945**		**1,444**		**1,049**		**621**		**382**		**388**		5,829	
Resident, race/ethnicity unknown	45		54		30		24		20		27		**200**	
Residency Unknown	137		115		48		51		26		37		**414**	
Total	**2,127**		**1,613**		**1,127**		**696**		**428**		**452**		**6,443**	

2007-2008 Taulbee Survey

Table 22a. Part-Time Faculty

	Total
Full Professor	104
Associate Professor	39
Assistant Professor	33
Teaching Faculty	191
Research Faculty	53
Postdoctorate	12
Total	**432**

Table 23. Faculty Losses

	Total
Died	8
Retired	71
Took Academic Position Elsewhere	97
Took Nonacademic Position	50
Remained, but Changed to Part-Time	10
Other	20
Unknown	19
Total	**275**

market. U.S. CS departments ranked 13-24 and Canadian departments filled only about half of their vacant positions.

There was a slight increase in the number of reported retirements this year, and in the number of faculty who went to other than an academic position. However, in general, the distribution of faculty losses was similar to last year (Table 23).

Research Expenditures and Graduate Student Support *(Tables 24-26)*

Table 24-1 shows the department's total expenditure (including indirect costs or "overhead" as stated on project budgets) from external sources of support. Table 24-2 shows the per capita expenditure, where capitation is computed two ways. The first is relative to the number of tenured and tenure-track faculty members. The second is relative to researchers and postdocs as well as tenured and tenure-track faculty. Canadian levels are shown in Canadian dollars. The data indicate that the higher the ranking, the more external funding is received by the department (both in total and per capita).

Mean total expenditures increased this year in all CS ranking strata except U.S. departments ranked 25-36. Median total expenditures increased in all U.S. CS ranking strata. Canadian departments also showed strong increases in both mean and median expenditures. U.S. departments also generally improved with respect to median per-capita expenditures, as did Canadian departments, although median expenditures using the second capitation method declined in U.S. departments ranked 13-24.

Table 25 shows the number of graduate students supported as full-time students as of fall 2007, further categorized as teaching assistants (TAs), research assistants (RAs), fellows, or computer systems supporters, and split between those on institutional vs. external funds. The number of TAs in CS departments increased significantly this year, except in U.S. departments ranked 13-24. There also was an increase in the total number of RAs this year, except at U.S. departments ranked 1-12. However, the number of RAs supported on external funds declined at U.S. departments ranked 1-12 and 25-26, while the number increased at U.S. departments ranked 13-24 and departments not ranked in the top 36. Lower-ranked departments had more RAs on institutional funds this year compared to last year, while higher-ranked departments had fewer.

The number of externally supported, full-support fellows increased at U.S. departments ranked 1-12 and 25-36, and at Canadian departments (it had declined last year in these strata). This statistic held steady at U.S. departments not ranked in the top 36 and declined at U.S. departments ranked 13-24.

Respondents were asked to "provide the net amount (as of fall 2008) of an academic-year stipend for a first-year doctoral student (not including tuition or fees)." The results are shown in Table 26. Canadian stipends are shown in Canadian dollars. The data show another year of healthy stipend increases for TAs at U.S. departments ranked 1-36 and at Canadian departments, with flat stipend levels at U.S. departments not ranked in the top 36. RA stipends were higher across the board. Fellow stipends at U.S. CS departments showed very modest increases compared to last year.

Table 24-1. Total Expenditure from External Sources for CS/CE Research

Department, Rank	Total Expenditure			
	Minimum	Mean	Median	Maximum
U.S. CS 1-12	$2,500,000	$21,571,193	$15,740,448	$86,816,024
U.S. CS 13-24	$3,240,261	$10,379,856	$8,792,080	$23,010,127
U.S. CS 25-36	$191,795	$6,222,737	$5,354,924	$18,988,249
U.S. CS Other	$20,916	$3,595,794	$2,261,529	$41,862,000
U.S. CE	$17,086	$2,066,014	$2,132,428	$4,305,407
U.S. Information	$429,319	$2,545,944	$2,621,243	$5,422,000
Canadian	$277,064	$5,453,227	$2,435,888	$40,913,179

Table 24-2. Per Capita Expenditure from External Sources for CS/CE Research by Department Rank and Type

Department, Rank	Per Capita Expenditure (Tenure-Track Faculty Only)				Per Capita Expenditure (Tenure-Track, Research, and Postdoctorate Faculty)			
	Minimum	Mean	Median	Maximum	Minimum	Mean	Median	Maximum
U.S. CS 1-12	$166,667	$414,109	$384,427	$1,009,489	$151,515	$330,659	$367,347	$607,105
U.S. CS 13-24	$159,713	$300,398	$298,488	$500,220	$126,952	$217,539	$216,594	$296,958
U.S. CS 25-36	$11,987	$175,895	$169,447	$313,603	$11,987	$142,795	$141,761	$301,858
U.S. CS Other	$1,609	$160,152	$116,451	$1,610,077	$1,494	$134,470	$91,488	$1,268,638
U.S. CE	$4,272	$113,949	$110,664	$275,000	$4,272	$99,170	$90,355	$235,714
U.S. Information	$20,444	$99,245	$90,174	$209,546	$20,444	$81,363	$62,597	$198,972
Canadian	$12,594	$194,669	$67,880	$1,740,986	$11,083	$163,414	$61,399	$1,435,550

2007-2008 Taulbee Survey

Table 25. Graduate Students Supported as Full-Time Students by Department Type and Rank

Department, Rank	Number on Institutional Funds: Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other		Number on External Funds: Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other	
U.S. CS 1-12	538	21.5%	73	2.9%	210	8.4%	0	0.0%	78	3.1%	0	0.0%	1,329	53.0%	236	9.4%	0	0.0%	42	1.7%
U.S. CS 13-24	284	19.5%	56	3.8%	89	6.1%	0	0.0%	2	0.1%	58	4.0%	884	60.7%	64	4.4%	0	0.0%	20	1.4%
U.S. CS 25-36	438	33.5%	284	21.7%	69	5.3%	7	0.5%	1	0.1%	20	1.5%	429	32.8%	57	4.4%	0	0.0%	2	0.2%
U.S. CS Other	1,933	35.6%	790	14.6%	185	3.4%	57	1.1%	141	2.6%	17	0.3%	2,150	39.6%	118	2.2%	10	0.2%	27	0.5%
U.S. CS Total	**3,193**	**29.8%**	**1,203**	**11.2%**	**553**	**5.2%**	**64**	**0.6%**	**222**	**2.1%**	**95**	**0.9%**	**4,792**	**44.8%**	**475**	**4.4%**	**10**	**0.1%**	**91**	**0.9%**
U.S. CE	98	26.4%	59	15.9%	10	2.7%	0	0.0%	1	0.3%	1	0.3%	190	51.2%	12	3.2%	0	0.0%	0	0.0%
U.S. Information	65	23.7%	19	6.9%	18	6.6%	34	12.4%	2	0.7%	0	0.0%	112	40.9%	24	8.8%	0	0.0%	0	0.0%
Canadian	648	45.1%	331	23.1%	36	2.5%	2	0.1%	63	4.4%	4	0.3%	308	21.4%	42	2.9%	0	0.0%	2	0.1%
Total	**4,004**	**31.3%**	**1,612**	**12.6%**	**617**	**4.8%**	**100**	**0.8%**	**288**	**2.3%**	**100**	**0.8%**	**5,402**	**42.3%**	**553**	**4.3%**	**10**	**0.1%**	**93**	**0.7%**

Table 26-1. Fall 2008 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Teaching Assistantships: Minimum	Mean	Median	Maximum	Research Assistantships: Minimum	Mean	Median	Maximum
U.S. CS 1-12	10,400	19,564	20,025	33,274	16,029	22,380	20,124	44,640
U.S. CS 13-24	4,756	16,470	16,636	26,100	16,324	20,677	20,052	26,000
U.S. CS 25-36	14,000	16,954	16,373	19,547	14,000	16,977	16,373	19,759
U.S. CS Other	1,082	14,289	14,850	22,080	1,352	16,071	16,000	30,000
U.S. CE	1,372	11,219	13,333	18,800	1,372	12,016	13,300	22,320
U.S. Information	15,759	18,149	17,250	23,000	15,759	19,799	19,500	24,203
Canadian	2,000	10,978	12,640	19,233	5,500	15,220	14,930	25,000

Table 26-2. Fall 2008 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Full-Support Fellows: Minimum	Mean	Median	Maximum	Assistantships for Computer Systems Support: Minimum	Mean	Median	Maximum
U.S. CS 1-12	18,320	21,730	20,124	28,320	*	*	*	*
U.S. CS 13-24	16,324	21,452	20,600	26,673	*	*	*	*
U.S. CS 25-36	5,000	18,763	19,152	30,000	*	*	*	*
U.S. CS Other	5,500	18,703	18,236	30,000	1,439	12,648	13,950	18,000
U.S. CE	13,500	17,500	18,000	21,000	*	*	*	*
U.S. Information	15,759	21,427	19,902	30,000	*	*	*	*
Canadian	6,900	17,088	16,725	28,000	*	*	*	*

Table 26-3. Fall 2008 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Other Assistantships: Minimum	Mean	Median	Maximum
U.S. CS 1-12	18,320	22,940	23,220	27,000
U.S. CS 13-24	*	*	*	*
U.S. CS 25-36	*	*	*	*
U.S. CS Other	1,800	12,314	13,800	22,080
U.S. CE	*	*	*	*
U.S. Information	*	*	*	*
Canadian	*	*	*	*

Faculty Salaries *(Tables 27-34)*

Each department was asked to report individual (but anonymous) faculty salaries if possible; otherwise, the department was requested to provide the minimum, median, mean, and maximum salaries for each rank (full, associate, and assistant professors and non-tenure-track teaching faculty) and the number of persons at each rank. The salaries are those in effect on January 1, 2009. For U.S. departments, nine-month salaries are reported in U.S. dollars. For Canadian departments, twelve-month salaries are reported in Canadian dollars. Respondents were asked to include salary supplements such as salary monies from endowed positions.

The tables contain data about ranges and measures of central tendency only. Those departments reporting individual salaries were provided more comprehensive distributional information in December 2008. Again this year, 85% of those reporting salary data provided salaries at the individual level.

Last year, we began providing salary data based on time in rank. This year, we reduced the number of time-in-rank strata somewhat as our experience last year indicated that more strata did not provide additional meaningful information.

The minimum and maximum of the reported salary minima (and maxima) are self-explanatory. The

Continued on Page 20

2007-2008 Taulbee Survey

Table 27. Nine-month Salaries, 146 Responses of 183 U.S. CS Computer Science Departments

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	449	$77,750	$119,730	$188,000	$139,795	$137,415	$86,285	$165,660	$311,013
Full, in rank 8-15 years	458	$81,070	$120,714	$213,333	$136,823	$134,740	$92,847	$157,409	$254,667
Full, in rank 0-7 years	542	$83,343	$114,523	$210,000	$129,691	$127,396	$86,015	$152,633	$300,000
Full, yrs in rank not given	138	$90,900	$188,904	$191,304	$138,851	$134,754	$133,929	$170,451	$229,257
Full Professor: total	1,587	$77,750			$135,404				$311,013
Assoc, in rank 8 years +	310	$51,150	$90,680	$149,048	$97,589	$97,439	$60,618	$105,719	$198,187
Assoc, in rank 0-7 years	683	$71,753	$94,557	$147,109	$101,582	$100,632	$82,917	$111,766	$164,226
Assoc yrs in rank not given	164	$69,124	$88,494	$110,828	$101,318	$101,711	$94,950	$114,956	$139,740
Assoc Professor: total	1,157	$51,150			$100,475				$198,187
Assistant Professor	872	$56,962	$84,609	$130,267	$89,103	$88,769	$72,625	$94,404	$138,000
Non-Tenure-Track									
Teaching Faculty	508	$30,627	$59,535	$139,950	$68,730	$67,223	$35,929	$82,570	$182,550
Research Faculty	344	$24,780	$69,128	$138,000	$87,357	$84,894	$49,500	$113,521	$280,088
Postdoctorates	273	$23,435	$42,659	$75,000	$48,546	$48,500	$30,000	$56,771	$150,000

Table 28. Nine-month Salaries, 10 Responses of 12 U.S. Computer Science Departments Ranked 1-12

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	59	$104,922	$137,174	$184,625	$169,138	$165,405	$146,957	$211,083	$260,850
Full, in rank 8-15 years	80	$103,549	$123,035	$175,550	$153,348	$149,730	$134,676	$198,861	$224,887
Full, in rank 0-7 years	72	$96,075	$115,456	$152,900	$132,491	$131,310	$130,000	$159,600	$183,500
Full, yrs in rank not given	37	*	$120,300	*	$145,651	$144,100	*	$184,000	*
Full Professor: total	248	$96,075			$149,901				$260,850
Assoc, in rank 8 years +	5	*	*	*	$101,617	*	*	*	*
Assoc, in rank 0-7 years	85	$80,729	$99,156	$125,500	$111,692	$110,633	$110,000	$125,310	$147,500
Assoc yrs in rank not given	16	*	$97,000	*	$109,500	$106,700	*	$126,100	*
Assoc Professor: total	106	$80,729			$110,886				$147,500
Assistant Professor	86	$70,967	$87,677	$96,500	$95,010	$94,770	$94,150	$102,694	$137,543
Non-Tenure-Track									
Teaching Faculty	58	$37,331	$74,330	$139,950	$93,901	$93,479	$71,236	$114,755	$182,550
Research Faculty	50	$63,809	$76,629	$99,600	$107,632	$102,336	$91,629	$150,961	$238,770
Postdoctorates	71	$24,750	$43,941	$60,000	$53,072	$53,337	$50,456	$63,285	$75,000

* Values which are too revealing of individual department information, or which provide the distribution of fewer than 10 individuals, are not shown.

Table 29. Nine-month Salaries, 12 Responses of 12 U.S. Computer Science Departments Ranked 13-24

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	75	$82,051	$128,716	$180,613	$170,216	$165,280	$166,900	$217,858	$311,013
Full, in rank 8-15 years	70	$81,070	$139,620	$183,300	$168,074	$165,607	$160,000	$199,878	$254,667
Full, in rank 0-7 years	62	$98,400	$124,207	$160,000	$149,899	$146,340	$141,080	$185,311	$279,600
Full, yrs in rank not given	14	*	$115,533	*	$158,243	$156,540	*	$188,873	*
Full Professor	221	$81,070			$163,079				$311,013
Assoc, in rank 8 years +	21	$74,473	$109,845	$149,048	$115,266	$116,115	$89,100	$119,609	$149,048
Assoc, in rank 0-7 years	71	$92,000	$106,597	$147,109	$114,220	$112,192	$109,500	$127,699	$160,896
Assoc yrs in rank not given	9	*	$110,828	*	$122,694	$125,769	*	$134,312	*
Assoc Professor: total	101	$74,473			$115,193				$160,896
Assistant Professor	64	$87,400	$93,721	$130,267	$98,253	$97,980	$94,150	$102,694	$137,543
Non-Tenure-Track									
Teaching Faculty	42	$56,500	$74,505	$95,500	$85,319	$83,274	$73,862	$102,640	$164,404
Research Faculty	107	$28,917	$77,526	$129,348	$100,472	$97,832	$72,800	$280,088	$132,797
Postdoctorates	61	$31,122	$43,962	$54,500	$55,219	$55,185	$54,500	$67,393	$94,836

* Values which are too revealing of individual department information, or which provide the distribution of fewer than 10 individuals, are not shown.

range of salaries in a given rank among departments that reported data for that rank is the interval ["minimum of the minima," "maximum of the maxima"].

The mean of the reported salary minima (maxima) in a given rank is computed by summing the departmental reported minimum (maximum) and dividing by the number of departments reporting data at that rank. The "average of dept median salaries" at each rank is computed by summing the individual medians reported at each rank and dividing by the number of departments reporting at that rank. Thus, it is not a true median of all the salaries. Similarly, "average of dept. mean salaries" at each

Continued on Page 23

2007-2008 Taulbee Survey

Table 30. Nine-month Salaries, 12 Responses of 12 U.S. Computer Science Departments Ranked 25-36

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	56	$96,700	$111,070	$136,350	$143,290	$138,468	$128,201	$189,105	$217,360
Full, in rank 8-15 years	47	$104,202	$115,161	$130,977	$139,801	$135,430	$124,419	$169,933	$211,334
Full, in rank 0-7 years	89	$95,600	$113,508	$126,300	$150,938	$147,150	$117,900	$209,785	$300,000
Full, yrs in rank not given	16	*	$118,000	*	$133,150	$145,849	*	$225,000	*
Full Professor	208	$95,600			$144,944				$300,000
Assoc, in rank 8 years +	28	$70,516	$90,205	$104,158	$99,225	$95,972	$91,633	$111,918	$163,900
Assoc, in rank 0-7 years	87	$85,960	$94,812	$106,000	$106,011	$103,827	$94,561	$117,983	$143,172
Assoc yrs in rank not given	6	$95,200	*	*	$113,133	$115,650	*	*	$125,200
Assoc Professor: total	121	$70,516			$104,794				$125,200
Assistant Professor	100	$70,000	$86,240	$102,278	$91,699	$90,248	$85,947	$98,070	$105,000
Non-Tenure-Track									
Teaching Faculty	49	$43,260	$59,862	$88,300	$75,663	$71,763	$60,000	$101,687	$158,628
Research Faculty	56	$31,750	$65,500	$106,000	$84,493	$79,962	$66,100	$119,593	$238,154
Postdoctorates	28	$30,195	$41,906	$54,000	$46,642	$46,700	$30,195	$53,148	$81,600

* Values which are too revealing of individual department information, or which provide the distribution of fewer than 10 individuals, are not shown.

Table 31. Nine-month Salaries, 112 Responses of 147 U.S. Computer Science Departments Ranked Higher than 36 or Unranked

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	259	$77,750	$117,617	$188,000	$132,137	$130,520	$86,285	$151,596	$252,995
Full, in rank 8-15 years	261	$88,156	$118,492	$198,462	$130,448	$128,823	$92,847	$146,080	$222,000
Full, in rank 0-7 years	319	$83,343	$113,404	$210,000	$124,347	$122,528	$86,015	$141,239	$294,156
Full, yrs in rank not given	71	$90,900	$119,125	$229,257	$136,294	$132,483	$133,929	$163,796	$229,257
Full Professor: total	910	$72,983			$129,246				$266,667
Assoc, in rank 8 years +	256	$51,150	$88,320	$124,000	$95,354	$95,403	$60,618	$103,753	$198,187
Assoc, in rank 0-7 years	440	$71,753	$92,873	$124,000	$98,829	$98,185	$82,917	$108,228	$164,226
Assoc yrs in rank not given	133	$69,124	$85,081	$102,400	$97,556	$97,803	$94,950	$111,253	$139,740
Assoc Professor: total	829	$51,150			$97,552				$198,187
Assistant Professor	622	$56,962	$83,131	$118,000	$87,216	$87,007	$72,625	$92,526	$138,000
Non-Tenure-Track									
Teaching Faculty	359	$30,627	$56,314	$107,000	$63,441	$62,206	$35,929	$74,833	$155,600
Research Faculty	131	$24,780	$66,218	$138,000	$80,497	$79,106	$49,500	$99,873	$185,832
Postdoctorates	113	$23,435	$42,287	$75,000	$45,872	$45,967	$30,000	$53,389	$150,000

Table 32. Nine-month Salaries, 12 Responses of 32 U.S. Computer Engineering Departments

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	32	$91,254	$113,816	$155,700	$127,521	$125,093	$107,679	$149,740	$221,202
Full, in rank 8-15 years	34	$90,900	$123,852	$179,600	$138,874	$134,856	$133,493	$160,923	$200,188
Full, in rank 0-7 years	29	$90,624	$109,346	$135,240	$124,266	$123,282	$101,200	$144,829	$210,000
Full, yrs in rank not given	13	$96,080	$116,089	$129,787	$131,381	$126,613	$129,787	$158,989	$199,426
Full Professor: total	108	$90,624			$130,686				$221,202
Assoc, in rank 8 years +	28	$55,500	$88,649	$113,600	$97,059	$95,294	$75,144	$105,522	$162,000
Assoc, in rank 0-7 years	53	$78,611	$90,286	$98,227	$95,734	$94,590	$87,004	$103,501	$118,850
Assoc yrs in rank not given	11	$87,150	$94,770	$112,525	$95,911	$95,862	$88,760	$97,020	$116,490
Assoc Professor: total	92	$55,500			$96,158				$162,000
Assistant Professor	51	$76,160	$82,203	$89,979	$85,432	$84,835	$76,376	$89,812	$97,783
Non-Tenure-Track									
Teaching Faculty	18	$35,250	$59,363	$78,018	$64,023	$62,225	$32,250	$71,061	$136,471
Research Faculty	15	$28,700	$49,309	$81,000	$76,920	$77,811	$57,660	$103,832	$154,500
Postdoctorates	32	$27,038	$51,774	$78,000	$52,264	$52,040	$41,250	$60,347	$80,000

2007-2008 Taulbee Survey

Table 33. Twelve-month Salaries, 20 Responses of 30 Canadian Computer Science Departments (Canadian Dollars)

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	90	$111,000	$133,362	$185,655	$149,386	$150,270	$118,835	$165,149	$241,971
Full, in rank 8-15 years	79	$107,369	$128,096	$165,054	$142,738	$141,682	$115,294	$155,244	$197,764
Full, in rank 0-7 years	97	$83,902	$116,387	$155,519	$132,102	$130,308	$105,551	$153,154	$219,683
Full, yrs in rank not given	34	$105,156	$113,941	$119,800	$136,572	$128,403	$168,958	$180,425	$190,310
Full Professor: total	300	$83,902			$140,595				$241,971
Assoc, in rank 8 years +	79	45,524	$101,888	$138,695	$114,212	$115,852	$105,173	$124,193	$160,194
Assoc, in rank 0-7 years	180	$81,630	$101,540	$143,490	$109,676	$110,161	$95,851	$121,372	$161,633
Assoc yrs in rank not given	24	$78,292	$96,691	$123,216	$107,585	$106,806	$106,357	$142,575	$119,768
Assoc Professor: total	283	$45,524			$110,765				$160,194
Assistant Professor	115	$68,218	$88,291	$110,000	$94,389	$94,157	$71,576	$101,877	$142,648
Non-Tenure-Track									
Teaching Faculty	73	$44,437	$68,550	$89,884	$82,026	$80,427	$57,703	$99,904	$177,784
Research Faculty	131	$37,684	$44,895	$55,000	$59,639	$59,288	$50,004	$75,867	$92,598
Postdoctorates	74	$24,000	$37,000	$60,000	$49,091	$46,406	$44,000	$50,376	$59,844

Table 34. Nine-month Salaries, 7 Responses of 19 U.S. Information Departments

Faculty Rank Tenured & Tenure-Track	Number of Faculty	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full, in rank 16 years +	8	*	*	*	$130,980	*	*	*	*
Full, in rank 8-15 years	14	$107,892	*	*	$145,165	$139,453	*	*	$219,960
Full, in rank 0-7 years	21	$93,200	$112,349	$125,166	$130,768	$126,001	$121,050	$157,753	$238,004
Full, yrs in rank not given	0								
Full Professor: total	43	$93,200			$135,495				$177,073
Assoc, in rank 8 years +	22	$63,268	$82,439	$99,402	$101,067	$102,380	$94,729	$116,318	$167,563
Assoc, in rank 0-7 years	49	$76,660	$92,125	$104,249	$104,956	$104,755	$96,408	$119,880	$155,222
Assoc yrs in rank not given	0								
Assoc Professor: total	71	$63,268			$103,751				$167,563
Assistant Professor	42	$70,899	$80,621	$88,500	$89,263	$85,588	$91,587	$105,296	$147,600
Non-Tenure-Track									
Teaching Faculty	61	$38,520	$60,783	$90,558	$78,450	$77,524	$77,700	$108,076	$207,281
Research Faculty	11	$50,000	$61,474	$70,796	$73,233	$71,707	$57,825	$87,698	$115,355
Postdoctorates	4	*	*	*	*	*	*	*	*

* Values which are too revealing of individual department information, or which provide the distribution of fewer than 10 individuals, are not shown.

Table 35. Nine-month Salaries for New PhDs, Responding U.S. CS, CE, and I Departments

Faculty Rank	Number of New Ph.D.s	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Tenure-Track	99	$67,266	$84,951	$106,076	$86,059	$86,319	$67,266	$87,387	$165,958
Non-Tenure-Track									
Teaching Faculty	20	$33,915	*	*	$63,597	$63,831	*	*	$80,000
Research Faculty	31	$33,480	*	*	$68,927	$68,421	*	*	$106,000
Postdoctorates	92	$30,000	*	*	$48,959	$49,411	*	*	$94,836

* Values which are too revealing of individual department information, or which provide the distribution of fewer than 10 individuals, are not shown.

Table 35a. Twelve-month Salaries for New PhDs, Responding Canadian Departments

Faculty Rank	Number of New Ph.D.s	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept. Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Tenure-Track	3	*	*	*	$82,156	*	*	*	*
Non-Tenure-Track									
Teaching Faculty	1	*	*	*	*	*	*	*	*
Research Faculty	5	*	*	*	$68,500	*	*	*	*
Postdoctorates	15	$30,000	$41,950	$60,000	$49,227	$49,800	$45,000	$55,800	$72,000

* Values which are too revealing of individual department information, or which provide the distribution of fewer than 10 individuals, are not shown.

2007-2008 Taulbee Survey

rank is computed by summing the individual means reported at each rank and dividing by the number of departments reporting at that rank. Thus, it is not a true average of all the salaries.

Overall U.S. CS average salaries (Table 27) increased between 1.6% and 4.5%, depending on tenure-track rank, and 1.4% for non-tenure-track teaching faculty. Faculty at higher rank received larger average increases than did faculty at lower rank. The increases are lower than those experienced in the past few years for all faculty ranks except full professor.

Canadian salaries (Table 33) rose 2.3% to 4.1% among tenure-track ranks, with the largest increase at the associate professor rank and the smaller at the assistant professor rank. Non-tenure-track teaching faculty salaries for Canadian departments rose 4.4%. Except at the full professor rank, Canadian increases were larger than those observed for U.S. CS programs at the same faculty rank.

Average salaries for new Ph.D.s (those who received their Ph.D. last year and then joined departments as tenure-track faculty) increased 1.2% from those reported in last year's survey (Table 34). This is a smaller increase than was observed in each of the past two years for new Ph.D.s. and, as has been the case for the past few years, is somewhat smaller than the average increases for continuing faculty. There were too few new Ph.D. salaries in Canadian departments to make meaningful comparisons.

Concluding Observations

It is encouraging to see a three-year increase in new undergraduate CS students and the increased total undergraduate enrollment. With the continued peak production of new CS Ph.D.s, the rise in the number of academic faculty positions available among the CRA departments also was welcome. However, economic conditions have changed considerably since last year. How this will affect new Ph.D. hiring in both industry and academia remains to be seen. With the exception of diversity, our discipline entered these changed economic conditions from a position of strength. This should help us cope with the times much better than most.

Rankings

For tables that group computer science departments by rank, the rankings are based on information collected in the 1995 assessment of research and doctorate programs in the United States conducted by the National Research Council (NRC) [see http://www.cra.org/statistics/nrcstudy2/home.html]. New NRC rankings are anticipated later in 2009, and future Taulbee reports may be modified as a result.

The top twelve schools in this ranking are: Stanford, Massachusetts Institute of Technology, University of California (Berkeley), Carnegie Mellon, Cornell, Princeton, University of Texas (Austin), University of Illinois (Urbana-Champaign), University of Washington, University of Wisconsin (Madison), Harvard, and California Institute of Technology. All schools in this ranking participated in the survey this year.

CS departments ranked 13-24 are: Brown, Yale, University of California (Los Angeles), University of Maryland (College Park), New York University, University of Massachusetts (Amherst), Rice, University of Southern California, University of Michigan, University of California (San Diego), Columbia, and University of Pennsylvania.[4] All schools in this ranking participated in the survey this year.

CS departments ranked 25-36 are: University of Chicago, Purdue, Rutgers, Duke, University of North Carolina (Chapel Hill), University of Rochester, State University of New York (Stony Brook), Georgia Institute of Technology, University of Arizona, University of California (Irvine), University of Virginia, and Indiana. All schools in this ranking participated in the survey this year.

CS departments that are ranked above 36 or that are unranked that responded to the survey include: *Arizona State University, Auburn, Binghamton University SUNY, Boston University, Case Western Reserve, City University of New York Graduate Center, College of William and Mary, Colorado School of Mines, Colorado State, Dartmouth, DePaul, Drexel, Florida Institute of Technology, Florida International, Florida State, George Mason, Georgia State, Illinois Institute of Technology, Iowa State, Johns Hopkins, Kansas State, Kent State, Lehigh, Louisiana State, Michigan State, Michigan Technological, Mississippi State, Montana State, Naval Postgraduate School, New Jersey Institute of Technology, New Mexico State, New Mexico Technology, North Carolina State, North Dakota State, Northeastern, Northwestern, Oakland, Ohio State, Oklahoma State, Old Dominion, Oregon State, Pace, Pennsylvania State, Polytechnic, Portland State, Rensselaer Polytechnic, Rochester Institute of Technology, Stevens Institute of Technology, Syracuse, Texas A&M, Texas Tech, Toyota Technological Institute (Chicago), Tufts, Vanderbilt, Virginia Tech, Washington State, Washington (St. Louis), Wayne State, Worcester Polytechnic, and Wright State.*

University of: *Alabama (Birmingham, Huntsville, and Tuscaloosa), Albany SUNY, Arkansas (Fayetteville and Little Rock), Buffalo, California (at Davis, Riverside, Santa Barbara, and Santa Cruz), Central Florida, Cincinnati, Colorado (Boulder), Connecticut, Delaware, Florida, Georgia, Houston, Idaho, Illinois (Chicago), Iowa, Kansas, Kentucky, Louisiana (Lafayette), Louisville, Maine, Maryland (Baltimore Co.), Massachusetts (at Boston and Lowell), Minnesota, Mississippi, Missouri (at Columbia and Kansas City), Nebraska (Lincoln and Omaha), Nevada (Las Vegas and Reno), New Hampshire, New Mexico, North Carolina (Charlotte), North Texas, Notre Dame, Oklahoma, Oregon, Pittsburgh, South Carolina, South Florida, Tennessee (Knoxville), Texas (at Dallas, El Paso, and San Antonio), Tulsa, Utah, and Wyoming.*

Computer Engineering departments participating in the survey this year include: *Boston University, Clemson, Florida Institute of Technology, Iowa State, Northeastern, Princeton, Purdue, Rensselaer Polytechnic, Santa Clara, Virginia Tech; and the* ***Universities of:*** *California (Santa Cruz), Houston, New Mexico, and Southern California.*

Canadian departments participating in the survey include: *Concordia, Dalhousie, McGill, Memorial, Queen's, Simon Fraser, and York.* ***Universities of:*** *Alberta, British Columbia, Calgary, Manitoba, Montreal, New Brunswick, Ottawa, Regina, Saskatchewan, Toronto, Victoria, Waterloo, and Western Ontario.*

Information departments participating in the survey include: *Drexel University, Syracuse, and* ***Universities of:*** *California (Berkeley), Illinois, Maryland (Baltimore County), Michigan, Pittsburgh, and Washington. I-programs at Indiana University and University of California (Irvine) also submitted information combined with their CS programs.*

Acknowledgments

Betsy Bizot once again provided valuable assistance with the data collection, tabulation, and analysis for this survey. Thanks also to Debra Richardson and Bobby Schnabel for their assistance in modifying the survey for use with the I-schools, and to Susanne Hambrusch and Jean Smith for offering constructive comments to an earlier version of the report.

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Endnotes

1. The title of the survey honors the late Orrin E. Taulbee of the University of Pittsburgh, who conducted these surveys for the Computer Science Board until 1984, with retrospective annual data going back to 1970.
2. Information (I) programs included here are Information Science, Information Systems, Information Technology, Informatics, and related disciplines with a strong computing component. In fall 2008, the first year these programs were surveyed as part of Taulbee, surveys were sent to CRA members, the CRA IT Deans group members, and participants in the iSchools Caucus (www.ischools.org) who met the criteria of granting Ph.D.s and being located in North America. Other I-programs that meet these criteria and would like to participate in the survey in future years are invited to contact survey@cra.org for inclusion.
3. The set of departments responding varies slightly from year to year, even when the total numbers are about the same; thus, we must approach any trend analysis with caution. We must be especially cautious in using the data about CE and I departments because of the low response rates.
4. Although the University of Pennsylvania and the University of Chicago were tied in the National Research Council rankings, CRA made the arbitrary decision to place Pennsylvania in the second tier of schools.
5. All tables with rankings: Statistics sometimes are given according to departmental rank. Schools are ranked only if they offer a CS degree and according to the quality of their CS program as determined by reputation. Those that only offer CE or I degrees are not ranked, and statistics are given on a separate line, apart from the rankings.
6. All ethnicity tables: Ethnic breakdowns are drawn from guidelines set forth by the U.S. Department of Education.
7. All faculty tables: The survey makes no distinction between faculty specializing in CS vs. CE programs. Every effort is made to minimize the inclusion of faculty in electrical engineering who are not computer engineers. ■

CRA-W Honors Irwin and Soffa

At the recent Grad Cohort meeting in San Mateo, Mary Jane Irwin and Mary Lou Soffa were honored for their role as founders/organizers of the program. CRA-W co-chair, Lori Pollock (left), made the presentations.

Professional Opportunities

CRN Advertising Policy

See http://www.cra.org/main/cra.jobshow.html

College of William and Mary
Computer Science Department
Postdoctoral Research Associate

The Computer Science Department is currently seeking a Postdoctoral Research Associate in "Performance Evaluation and Modeling" of computer systems, starting August, 2009.

Applicants should submit a CV, which should include their publication record and three (3) references with contact information, a brief description (1-2 pgs.) of their thesis work and related research interest, and two (2) of their best publications.

The College of William and Mary is an EEO/AA employer.

All applications should be forwarded to:
Evgenia Smirni, Professor
Computer Science Department
P O Box 8795
College of William and Mary
Williamsburg, VA 23185-8795
esmirni@cs.wm.edu

Henry M. Jackson Foundation
U.S. Army Medical Command's Bioinformatics Cell
Scientist Position

The Henry M. Jackson Foundation is looking for junior and senior scientists to join the U.S. Army Medical Command's Bioinformatics Cell (BIC) [www.BHSAI.org]. This opening is for a dynamic scientist with interest in working in an interdisciplinary environment with focus on the development and application of computational solutions to biomedical problems, involving signal processing of time series physiologic data, data mining, data driven and physiologic based models, and artificial intelligence. The candidate should have a Ph.D. in a related discipline and a strong publication record. The candidate is expected to simultaneously work in multiple projects, involving a diverse and interdisciplinary team of scientists across multiple laboratories. This position is located in Frederick, Maryland.

Please submit resume to:
Meri-lyn Ball
Executive Assistant
Biotechnology High Performance Computing Software Applications Institute (BHSAI)
Ft. Detrick, MD
Email: mball@bioanalysis.org
Phone: 301-619-8130
www.BHSAI.org

King Abdullah University of Science and Technology (KAUST)
Computer Science and Applied Mathematics
Faculty Openings

King Abdullah University of Science and Technology (KAUST) is being established in Saudi Arabia as an international graduate-level research university dedicated to inspiring a new age of scientific achievement that will benefit the region and the world. As an independent and merit-based institution and one of the best endowed universities in the world, KAUST intends to become a major new contributor to the global network of collaborative research. It will enable researchers from around the globe to work together to solve challenging scientific and technological problems. The admission of students, the appointment, promotion and retention of faculty and staff, and all the educational, administrative and other activities of the University shall be conducted on the basis of equality, without regard to race, color, religion or gender.

KAUST is located on the Red Sea at Thuwal (80km north of Jeddah). Opening in September 2009, KAUST welcomes exceptional researchers, faculty and students from around the world. To be competitive, KAUST will offer very attractive base salaries and a wide range of benefits. Further information about KAUST can be found at: http://www.kaust.edu.sa/.

KAUST invites applications for faculty position at all ranks (Assistant, Associate, Full) in Applied Mathematics (with domain applications in the modeling of biological, physical, engineering, and financial systems) and Computer Science, including areas such as Computational Mathematics, High-Performance Scientific Computing, Operations Research, Optimization, Probability, Statistics, Computer Systems, Software Engineering, Algorithms and Computing Theory, Artificial Intelligence, Graphics, Databases, Human-Computer Interaction, Computer Vision and Perception, Robotics, and Bio-Informatics (this list is not exhaustive). KAUST is also interested in applicants doing research at the interface of Computer Science and Applied Mathematics with other science and engineering disciplines. High priority will be given to the overall originality and promise of the candidate's work rather than the candidate's sub-area of specialization within Applied Mathematics and Computer Science.

An earned Ph.D. in Applied Mathematics, Computer Science, Computational Mathematics, Computational Science and Engineering, Operations Research, Statistics, or a related field, evidence of the ability to pursue a program of research, and a strong commitment to graduate teaching are required. A successful candidate will be expected to teach courses at the graduate level and to build and lead a team of graduate students in Master's and Ph.D. research.

Applications should be submitted in a pdf format and include a curriculum vita, brief statements of research and teaching interests, and the names of at least 3 references for an Assistant Professor position, 6 references for an Associate Professor position, and 9 references for a Full Professor position. Candidates are requested to ask references to send their letters directly to the search committee. Applications and letters should be sent via electronic mail to kaust-search@cs.stanford.edu. The review of applications will begin immediately, and applicants are strongly encouraged to submit applications as soon as possible; however, applications will continue to be accepted until December 2009, or all 10 available positions have been filled.

In 2008 and 2009, as part of an Academic Excellence Alliance agreement between KAUST and Stanford University, the KAUST faculty search committee consisting of professors from the Computer Science Department and the Institute of Computational and Mathematical Engineering at Stanford University, will evaluate applicants for the faculty positions at KAUST. However, KAUST will be responsible for all hiring decisions, appointment offers, recruiting, and explanations of employment benefits. The recruited faculty will be employed by KAUST, not by Stanford. Faculty members in Applied Mathematics and Computer Science recruited by KAUST before September 2009 will be hosted at Stanford University as Visiting Fellows until KAUST opens in September 2009.

NICTA (National ICT Australia)
Statistical Machine Learning Group
Senior Researchers, Junior Researchers, Sabbatical Visitors

National ICT Australia (NICTA) is Australia's ICT Research Centre of Excellence. NICTA brings together world-class researchers and professional staff to enhance their skills and build a culture of entrepreneurship and achievement in use-inspired research. This will build Australia's ICT capacity into the future.

The Statistical Machine Learning Research Group, based in Canberra, is a team of researchers, software engineers and PhD students who pursue fundamental research in principled methods for data analysis and its applications to a variety of fields, including document and text analysis, computer vision and pattern recognition. We work at the intersection of theory, methods and applications. As such, our staff and students are encouraged to collaborate broadly and we are committed to using machine learning to address diverse areas.

We are looking for applicants at both senior levels (permanent positions) and junior levels (post-doctoral positions), as well as sabbatical visitors, who have a strong track record of basic research and research leadership in one or more of the following areas:

- Document Analysis
- Computer Vision
- Graphical Models
- Kernel Methods
- Learning Theory

The successful applicants will have an excellent publication record and experience with supervising students. Candidates with both a strong methodological background and experience in practical domains or commercialisation are a plus. A record of industry or government collaboration is also desirable.

The appointees will be eligible for an adjunct position at the College of Engineering and Computer Science, Australian National University. Consequently, appointees will have the opportunity to teach at the postgraduate level and supervise PhD students.

Applications:

For more information on the project, please visit http://sml.nicta.com.au. Please visit NICTA Careers to view the criteria essential to this role and apply online: (http://nicta.com.au/director/careers.cfm)

For further queries regarding the project, please contact:

Prof. Wray Buntine (wray.buntine@nicta.com.au), and
Dr. Tiberio Caetano (Tiberio.caetano@nicta.com.au)
Closing date: 31 May 2009

Simon Fraser University
School of Computing Science
Assistant Professor Position

The School of Computing Science at Simon Fraser University invites applications for a tenure-track position at the Assistant Professor level for its Surrey campus in the Metropolitan Vancouver area. A Ph.D. in Computing Science or equivalent is required, with a strong commitment to excellence in research and teaching. Preference will be given to candidates with expertise in the software aspects of Real Time and Embedded Systems; although, Candidates in the Software Engineering area may also be considered.

Simon Fraser University is consistently one of the top-ranked universities in Canada. The School of Computing Science currently has more than 200 Ph.D. and M.Sc. students, more than 900 undergraduate majors, and 57 faculty members, across two campuses. The new Surrey campus of SFU is located in an award-winning architectural complex in the centre of Surrey, while the main campus is situated 25 minutes away on Burnaby Mountain. Vancouver thrives as a scenic waterfront city located just minutes away from the mountains and a wide range of outdoor activities. Vancouver's cultural and intellectual pursuits, leisure opportunities, favorable climate, and clean and safe environment are consistently cited as quality of life factors that make it one of the most desirable places in the world to live and work.

All qualified candidates are encouraged to apply, however Canadian citizens and permanent residents will be given priority. Simon Fraser University is committed to employment equity and encourages applications from all qualified women and men, including visible minorities, aboriginal people, and persons with disabilities. Under the authority of the University Act, personal information that is required by the University for academic appointment competitions will be collected. For further details see:

www.sfu.ca/vpacademic/Faculty_Openings/Collection_Notice.html

Applications will be accepted and candidates will be interviewed until the position is filled. For additional information see www.cs.sfu.ca.

To apply, provide a curriculum vitae, evidence of research productivity, and the names and email addresses of three referees at:

www.cs.sfu.ca/JobOpp
Faculty Search (Surrey campus)
School of Computing Science
8888 University Drive
Simon Fraser University
Burnaby, British Columbia, Canada, V5A 1S6
faculty-search@cs.sfu.ca or 778.782.7572

University of Wisconsin-Milwaukee
Medical Informatics
Research Scientist and Postdoc

Natural language processing and machine learning experts are invited to apply for all areas of biomedical NLP research. PhD in Computer Science, Computation Linguistics, or equivalent. The positions may start in June 2009, or until they are filled. 1-3 years of support. Salary and benefits are competitive.

Send CV, two references, and two best publications to hongyu@uwm.edu.

TU WIEN

Announcement of an open position at the Faculty of Informatics, Vienna University of Technology, Austria

Full Professor (tenured)
in
Parallel Computing

The successful candidate will establish her/his own group conducting research and teaching in the area of parallel computing. Research and teaching experiences are expected to include several of the following topics:

- The design, analysis and implementation of efficient (including general purpose) parallel algorithms.
- The design and optimization of effective programming languages, models and methods for parallel programs.
- The design and analysis of parallel and high performance computing systems, such as SMP, cluster, and multi-core systems.
- The development of algorithms and environments for parallel-, cluster- and multi-core computing.
- Integration of parallel computing systems to modern infrastructures such as grids and clouds.
- Programming environments (including tools for semi- or automatic parallelization) for efficient development of parallel programs.

The applicant should have demonstrated her/his ability to apply the above methods in various areas of Computational Science and Engineering such as e-science and simulation.

A more detailed announcement and information on how to apply can be found at **http://www.informatik.tuwien.ac.at/PC.pdf**

Application deadline: **June 15, 2009.**