COMPUTING RESEARCH NEWS

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Wing and Lickel Recognized for Service

The CRA Board of Directors has selected **Jeannette M. Wing,** President's Professor of Computer Science and Head, Computer Science Department, Carnegie Mellon University, to receive its 2011 Distinguished Service Award. The award will be presented to Professor Wing at the ACM Awards Banquet in San Jose on June 4.

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.

Professor Wing was nominated for the award for her national and international thought leadership with respect to Computational Thinking, and for her extraordinary performance as NSF Assistant Director for CISE from 2007-10. Articulating the notion of Computational Thinking has been influential in identifying how computing research is indeed far different from computing per se. That is, the way key problems—in biology and other sciences, for example—are considered now is in terms of core computational notions such as abstraction, exponentials, and more.

Wing's leadership at NSF came at a crucial time both scientifically and politically. She has been deeply involved in a set of major NSF programs including Cyber-Enabled Discovery and Innovation, Expeditions in Computing, Trustworthy Computing, Data-Intensive Computing, and more. These have helped push research in numerous new directions, and they have been essential in further establishing computing research as a cornerstone of NSF's full research portfolio and as a critical dimension of America's innovation economy. In the words of Peter Lee, Managing Director of Microsoft Research Redmond, "[Simply,] Jeannette's service work has touched, in a tangible and positive way, virtually every working academic computer science researcher."

The CRA Board of Directors has selected **Charles Lickel,** Retired Executive Vice President, Global Research Software Strategy, Thomas J. Watson Research Center, to receive the 2011 A. Nico Habermann Award. The award is given for outstanding contributions aimed at increasing the numbers and/or successes of underrepresented groups in the computing research community.

Lickel's accomplishments have had an impact at the national, local, and individual levels for underrepresented groups, and particularly for researchers in the GLBT (gay, lesbian, bisexual, and transgendered) computing community. Within IBM Research, he developed a series of leadership conferences for the GLBT employees. These conferences led to his appointment by the UCLA Anderson School of Business to create a leadership institute in which employees of companies, such as Microsoft and Pepsi, worked with top professors and business leaders to learn to become effective leaders. His leadership and efforts to develop GLBT leaders and act as their role model resulted in his being honored as one of the Gay Financial Network 25 in 2001.

Outside IBM, in addition to his work at the UCLA Anderson School of Business, Lickel also has had an impact on computer science programs within academia—such as Arizona State University, New Jersey Institute of Technology, SUNY Albany, and Pace University—through his work on their advisory councils. In 2009, he was awarded the Harvey Milk Alumni Award from SUNY Albany for his outstanding contributions. He has had a significant impact on the universities, their programs, and the students at these universities. In addition to working for the GLBT community, Lickel also has been committed to other underrepresented groups in computing and is highly regarded for his leadership within other organizations.

Dr. Lickel's award will be presented at CRA's biennial Conference at Snowbird in July 2012. ∎

Inside CRN

New CS Science Policy Workshop Seeks Nominations

As part of its mission to develop a next generation of leaders in the computing research community, CRA's Computing Community Consortium (CCC) announces the **CCC Leadership in Science Policy Institute (LiSPI),** intended to educate a small cadre of computing researchers on how science policy in the U.S. is formulated and how our government works. We seek nominations for participants.

LiSPI will be centered around a one-day workshop to be held on **Monday, November 7, 2011** in Washington, DC.

LiSPI will feature presentations and discussions with science policy experts, current and former Hill staff, and relevant agency and Administration personnel about the mechanics of the legislative process, interacting with agencies, advisory committees, and the federal case for computing. (A list of sessions and speakers is available at: http://cra.org/ccc/spi)

LiSPI participants are expected to:

- complete a short lesson describing the basic structure and function of government (a sort of "Civics 101" assignment) prior to attending the workshop, so that time spent at the workshop can focus on more advanced content;
- attend the November 7 workshop, which includes breakfast and lunch as well as a reception with the speakers and invited guests at the conclusion of the day; and
- complete a small-group assignment afterwards that puts to use the workshop content on a CCC-inspired problem—perhaps writing an argument in favor of a particular initiative for an agency audience, or drafting sample testimony on a CCC topic.

LiSPI is not intended for individuals who wish to undertake research on science policy, become science policy fellows, or take permanent positions in Washington, DC. Rather, we are trying to reach work-a-day academics who appreciate that our field must be engaged in helping government.

The CCC will provide funds for hotel accommodations for two nights (before and after the workshop), meals, as well as airfare and other travel expenses in connection with attending the November 7 workshop.

Eligibility and Nomination Process

LiSPI participants are expected to be tenured academics from Computer Science and Information Science departments who are adept at communicating. They must be nominated by their chair or department head and must have demonstrated an interest in science policy, especially as it relates to computer science (and closely allied fields).

Specifically, the nomination process will be as follows:

- A chair or department head may propose a LiSPI candidate by visiting http://www.cra.org/ccc/spi_nomination.php and providing the name and institution of the nominee, along with a letter of recommendation.
- The candidate will then be contacted by the CCC and asked to submit a CV, a short essay detailing their interests in science policy, and an indication of whether they would require financial aid to attend.

All nominations and material from nominees must be received by **May 15, 2011.**

Selection Process

The LiSPI selection committee will evaluate each nomination based on record of accomplishment, proven ability to communicate, and promise. Selections will be announced by **June 15, 2011.** Funding is available for approximately 15 participants in this initial LiSPI offering.

Please discuss this opportunity with your colleagues, identify those you believe would be interested in participating, and submit nominations at: recommendation. [http://www.cra.org/ccc/spi_nomination.php]!

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A CIFellow's Perspective: "Becoming a Better Researcher"

By Susan P. Wyche

During his presentation at the CIFellows Research Meeting & Career Mentoring Workshop in December[1], Microsoft's Peter Lee shared his motivations for creating the program. Beyond giving recent PhDs an opportunity to remain in academia during a time when obtaining an academic job is more difficult than usual, he saw the program as a way to "create a cadre of highly independent computing researchers."

I am currently a first-year CIFellow in Virginia Tech's Computer Science Department, and I describe how this program is helping me to achieve what Peter intended—to be an "independent computing researcher."[2]

I conduct research in Human-Computer Interaction (HCI), a subfield in computer science that broadly focuses on studying, planning and designing interactions between people and computers. My current research addresses two frequently cited problems in HCI: 1) how to integrate design thinking into computer science, and 2) how to identify and break out of the Western values embedded in technology design.

To address these problems I am first conducting human-centered research examining how technology supports communication, economic exchange and connectedness between African immigrants in the U.S. and their families, friends and co-workers living in sub-Saharan Africa. Based on this research, and in collaboration with design and computer science students, I then will build technology interventions grounded in my empirical findings.

Virginia Tech is an ideal place to carry out this project because there is an established HCI program in the university's computer science department, a strong industrial design program, faculty whose interests mesh with mine, and a campus environment that values and supports interdisciplinary collaboration. The CIFellows Project gives me freedom to take advantage of what Virginia Tech has to offer, carry out my own research, and engage in other activities that will make me more competitive when the time comes to seek permanent employment.

For example, I have always felt comfortable pursuing my own research—but I am fortunate that this fellowship also provides formal experience in a less-well-charted territory for me: teaching. This semester I am co-teaching a short course on "Introduction to Human Computer Interaction" in Virginia Tech's College of Architecture and Urban Studies. I've enjoyed introducing students, who may not typically see connections between their disciplines and topics in computer science, to the field of HCI. In the fall, I will co-teach a new course focused on developing technology for users in developing countries. The course will bring together students from various disciplines who are interested in designing computational devices and applications for people in sub-Saharan Africa and India. Virginia Tech's Office of International, Research, Education and Development awarded me a grant to support the development of this new course. These experiences are exposing me to challenges that accompany creating courses that span multiple disciplines at a large university. Further, and more importantly, I have a newfound appreciation for the time and skill required to effectively teach undergraduates.

What I most value about the CIFellows Project is the freedom and set of resources the fellowship affords me. I have been able to explore a new research area that is largely separate from my dissertation work, a move that might have been risky if I were in a tenure-track position. Indeed, the freedom that accompanies the fellowship makes change in research directions possible. I have time to become acquainted with a new body of literature, and to write and think about a new set of problems I want to solve. Further, I've been able to familiarize myself with what developing a NSF proposal entails. I used my CIFellows proposal as a starting point for creating a larger grant proposal. Being able to control how I spend my time is a key luxury of being a CIFellow and is something that differentiates my postdoc from more traditional positions.

The generous financial resources that accompany the fellowship also make changing research topics possible. I've used these resources to compensate study participants, travel, purchase materials to develop prototypes, and fund an upcoming six-week deployment study in Kenya. In contrast to a more conventional postdoc I am not beholden to an advisor and I have taken advantage of this to work independently. In turn, this has given me the confidence necessary to continue to develop my own research agenda.

In addition to teaching and pursuing new research directions, I have time to engage in other activities that will help me reach my long-term goal of becoming an assistant professor at a research university. These activities include mentoring students, giving talks, serving on committees, and figuring out how to balance the various demands on my time. I feel incredibly fortunate to have two years, with no tenure clock ticking, to begin figuring these things out.

Like anyone transitioning from being a graduate student to something else, there are challenges. For example, I am working in a new institution with new ways and old histories that I don't understand. I am figuring out how to collaborate with individuals with different working styles than my own. I miss living in a major metropolitan area and wonder if I could stay in a small college town for a longer period of time. Again, these are challenges many people face after completing a PhD and transitioning to a new position. At the end of the day, being a CIFellow means I don't have to devote time and energy worrying about things I cannot control; instead it allows me to entirely focus on what I can control; that is, becoming a better researcher. ∎

Susan P. Wyche *received her Ph.D. in Human-Centered Computing from the Georgia Institute of Technology in 2010 under the direction of Dr. Rebecca E. Grinter. She is now a CIFellow at Virginia Tech where she works with Prof. Steve Harrison. Susan is part of the 2010 cohort of CIFellows.*

Notes:

[1] http://www.cra.org/resources/crn-online-view/cifellows_descend_on_washington/.

[2] For more details about the CIFellows Project, visit http://cifellows.org/.

Discipline-Specific Mentoring Workshops

Call for Proposals due June 15, 2011

CRA-W and CDC are jointly soliciting proposals for discipline-specific mentoring workshops within computing sub-fields. The goal of these workshops is to increase the participation of members of underrepresented groups within a specific research area by providing career-mentoring advice and discipline-specific overviews of past accomplishments and future research directions.

www.cra-w.org/discipline

CRA Election Results

CRA recently elected five new members to its **Board of Directors.** They will begin three-year terms on July 1, 2011.

Mary Czerwinski is the Research Area Manager, Visualization and Interaction for Business and Entertainment (VIBE) at Microsoft Research. In 2009, she was honored by ACM with its Distinguished Scientist Award, SIGCHI Lifetime Service Award, and SIGCHI CHI Academy Award. She has participated in CRA-W events and served as an invited lecturer, presenter, and panelist at the Grace Hopper Conference. Her research interests include: group awareness, communication and collaboration, personal information management, multitasking and task switching, information visualization, spatial cognition, and ubiquitous computing. Dr. Czerwinski received a Ph.D. in Cognitive Psychology from Indiana University, Bloomington, and brings a unique perspective to the board.

Susan B. Davidson is the Weiss Professor and Chair of the Department of Computer and Information Science at the University of Pennsylvania. An ACM Fellow since 2001, she received the ACM Service Award for performance as General Chair (PDIS 1994 and SIGMOD 2009). Davidson was a Member of the NRC's Committee on Engaging the Computer Science Research Community in Health Care Informatics (2007-09). She is Founder and Chair of Advancing Women in Engineering (2007-present) and was Co-Founder and Co-Director of the Center for Bioinformatics (1997-2003). Her research interests lie in the areas of databases and bioinformatics. Her goal as a CRA Board member is to strengthen the interdisciplinary impact and diversity of computer science. Professor Davidson received a Ph.D. in Computer Science from Princeton University.

Brent T. Hailpern is the Director of Programming Models and Tools at the IBM Thomas J. Watson Research Center. He is an ACM Fellow (2001) and an IEEE Fellow (1995). He received SIGPLAN's Distinguished Service Award 1998 and IBM's Outstanding Innovation Award in 1996. Hailpern has served as Chair, SIGPLAN (1993-95); Chair, ACMOOPSLA Conference 1999 and OOPSLA Steering Committee (1999-2002); Co-Chair, ACM History of Programming Languages Conference (HOPL-III, 2007); Secretary, ACM (1997-98); and Associate Editor, *ACM TOPLAAS* (2001-07). His research interests include programming languages and software engineering, object-oriented systems, concurrent systems, program verification, and governance of software development. Dr. Hailpern earned a PhD in Computer Science from Stanford University.

Jeannette M. Wing is Professor of Computer Science and Head of the CS Department at Carnegie Mellon University. From 2007 to 2010 she was Assistant Director, Computer and Information Science and Engineering, at the National Science Foundation; and Co-Chair, Networking and Information Technology Research and Development (NITRD). Professor Wing is a Fellow of the American Academy of Arts and Sciences (2010); Fellow of the American Association for the Advancement of Science (2007); Fellow of the Association for Computing Machinery (ACM, 1998); and Fellow of the Institute of Electrical and Electronic Engineers (IEEE, 2003). Her research interests include: trustworthy computing, privacy, security, software specification and verification, distributed and concurrent systems, programming languages, programming methodology, and software engineering. Professor Wing received a PhD in Computer Science from MIT.

Ellen W. Zegura, Professor and Founding Chair of the CS Department at Georgia Tech, is an IEEE Fellow (2010). Her research interests include: computer networking, Internet and mobile wireless; and humanitarian computing. She was a Member of the Interim Computing Community Consortium (CCC) that provided guidance to the GENI Planning Committee (2006), and Co-chair and then Chair of the Network Science and Engineering (NetSE) Research Council under the auspices of the CCC (2007-09). Zegura served as a Member of the NSF CISE Advisory Board (2005-09). Academic leadership positions included Interim Dean and Associate Dean during creation of the Threads undergraduate curriculum. She has served on CRA-W's DMP selection and matching committee. Professor Zegura received a DSc in Computer Science from the Washington University in St. Louis.

Four current board members, **James Kurose** (University of Massachusetts at Amherst), **David Notkin** (University of Washington), **Valerie Taylor** (Texas A&M University), and **J Strother Moore** (University of Texas at Austin) **were re-elected** to three-year terms effective July 1, 2011.

The terms of five members will end June 30, 2011. **Rich DeMillo** (Georgia Tech) served two terms and was active in the formation of CRA-E, chairing the committee in 2010-11. Two industry/lab members, **Phil Bernstein** (Microsoft) and **Dick Waters** (MERL), both of whom were term-limited, played significant roles during their tenure: Phil in his stellar service as CRA Treasurer from 2003-11 and Co-Chair of Snowbird 2002; and Dick in his ongoing role as Chair of the Outstanding Undergraduate Researcher Awards committee, appointed member of the Executive Committee 2005-07, and Co-Chair of Snowbird 2004. **Ran Libeskind-Hadas** (Harvey Mudd) focused on research experiences for undergraduates during his one-year appointed term on the board. **Sebastian Thrun** (Stanford) also will complete a one-year appointment as a board member. We acknowledge with thanks the contributions of all to CRA.

In officer elections this year, the board re-elected three of the current slate of officers for additional two-year terms (2011-13): **Chair, Eric Grimson** (MIT); **Vice Chair, Laura Haas** (IBM Almaden); and **Secretary, Martha Pollack** (University of Michigan). The board also elected **Ronald Brachman** (Yahoo!) as CRA's new Treasurer for a two-year term effective July 1. ▮

CRA-W and CDC Launch New "Data Buddies" Project to Measure Student Outcomes

The Computing Research Association Committee on the Status of Women (CRA-W) and the Coalition to Diversify Computing (CDC) are partnering to launch a new national "Data Buddies" project. The project is supported by the National Science Foundation (NSF) through a Broadening Participation in Computing (BPC) grant and will be conducted by the CRA.

The project will survey students from more than 40 randomly selected departments across the nation, including Bachelor's, Master's, and Ph.D. degree-granting programs. The goal is to develop baseline data on the percentage of undergraduates that go on to graduate school, the job search experiences of students who complete the Ph.D., and the career mentoring that students received.

The results will serve two purposes: 1) provide comparison data for evaluation of BPC efforts, and 2) inform the computing community about student experiences by identifying what helps and hinders them on the path to research careers. The project is directed by Joanne Cohoon (University of Virginia) and Betsy Bizot (CRA), with participation from PIs Manuel Perez-Quinones, Carla Brodley, and Kathleen Fisher.

The Data Buddies project team will survey graduating Bachelor's, Master's, and Ph.D. students from participating departments this spring. In the fall, all students and faculty from participating Data Buddy departments will be surveyed. Funding permitting, the program will continue for five years.

For more information on the data buddies project, please visit: http://www.cra.org/databuddies or contact Betsy Bizot (bizot@cra.org).

Undergraduate Researcher Award Presented

Credit: Ellie Young, USENIX

Patrick Wendell, a senior in computer science at Princeton, received CRA's Outstanding Undergraduate Researcher award at the NSDI '11 in Boston on March 30. Presenting the award is the symposium program co-chair, David G. Andersen, Carnegie Mellon University.

CCC Calling for Challenges and Visions Sessions

Computing Community Consortium

By Erwin P. Gianchandani and Hank Korth

As part of its mission to identify major new research opportunities in the field, the Computing Community Consortium (CCC) has sponsored three "Challenges and Visions Sessions" at computing research conferences in the past year, seeking to give time and attention to "wacky ideas" that may not otherwise make it through a conference's normal reviewing process. To incentivize submissions to these sessions, the CCC has offered travel awards to the top three papers/presentations, as judged by program committees or participants, and has publicized the winners through the CCC Blog.

Thus far, these sessions—run on an experimental basis to assess their value to the conferences as well as the broader research community—have been quite successful in elevating promising visions and generating vigorous discussions. Consequently, in the past month, the CCC has announced a call for additional Challenges and Visions Sessions (see shaded box).

For more information—including guidelines for conference program committees, recommendations for selecting winners, and logistics for issuing CCC-sponsored travel awards to the winners, as well as a sample Call for Papers for a Challenges and Vision Session—visit http://cra.org/ccc/vct.php.

We encourage you to apply! Requests need only include a brief description of the conference and a proposed list of program committee members for the track, and they may be directed to erwin@cra.org.

In the meantime, check out the three sessions below that have already been held, and be sure to contact the CCC if you would like to run a session at an upcoming conference or workshop you are organizing.

- **"Fun Ideas and Thoughts"** session at PLDI 2010: http://www.cccblog.org/2010/07/26/pldis-fun-ideas-thoughts-stimulating-new-research-visions/
- **"Research Vision"** session at OSDI 2010: http://www.cccblog.org/2010/10/07/research-visions-at-osdi-10/
- **"Outrageous Ideas and Visions"** (OIV) track at CIDR 2011: http://www.cccblog.org/2011/01/18/outrageous-ideas-at-cidr-seeking-to-stimulate-innovative-research-directions/ ∎

The Computing Community Consortium (CCC) is sponsoring an initiative to bring special "Challenges and Visions" tracks to leading computer science research conferences. The goal of this initiative is to help conferences reach out beyond the usual research papers that present completed work and to seek out papers that present ideas and visions that can stimulate the research community to pursue new directions.

Conferences may request CCC sponsorship of such tracks along with a CCC grant that provides for prize money for the top 3 papers (first prize $1000, second prize $750, and third prize $500, to be awarded as travel grants).

Papers in a "Challenges and Visions" track should be open-ended, possibly "outrageous" or "wacky", and present new problems, new application domains, or new methodologies that are likely to stimulate significant new research. The CCC is seeking papers (roughly 4 pages in length) so that the ideas can be referenced after the conference is over.

After the conference, the CCC will post links to the track papers on its Challenges and Visions web page (see http://cra.org/ccc/vctlist.php) and help disseminate these ideas broadly in the computer science research community.

Requests for CCC sponsorship should include information on the conference and a proposed list of program committee members for the track.

Dr. Erwin Gianchandani *(erwin@cra.org) is the Director of the Computing Community Consortium (CCC) and the Computing Innovation Fellows Project.*
Dr. Hank Korth *is a member of the CCC Council and Wieseman Professor in the Department of Computer Science and Engineering at Lehigh University.*

Credit: Matthew Modoono

Gulustan Dogan, a student at the City University of New York, discusses her poster at CRA-W's Grad Cohort Workshop in Boston.

Credit: Matthew Modoono

Mary Fernández, AT&T Research, CRA board member, and workshop speaker discusses her talk at Grad Cohort with a student.

Credit: Matthew Modoono

Some key people in the Grad Cohort Workshop—(l to r) **Carla Romero,** CRA Director of Programs; **Kathleen Fisher,** CRA-W co-chair and workshop speaker, Tufts University; and the workshop co-chairs **Lori Pollock,** University of Delaware, and **Lori Clarke,** UMass at Amherst.

Credit: Matthew Modoono

Members of the "Information Retrieval" discussion table at lunch at Grad Cohort.

Teaching the Parallel Future: Finding Promise in a Sea of Cores

By Daniel Ernst, EAPF

The recent National Academies report, *"The Future of Computing Performance: Game Over or Next Level?"* lays out several broad landscape changes computing researchers must address to sustain growth in system performance. Indeed, we hear about little else in the parade of articles, op-eds, and conference sessions these days. Opinions vary from "We solved this 30 years ago" to "It will all blow over" to "The sky is falling." For the computing community at large, this is clearly a significant challenge.

For computer science educators, it's even less clear how to find a way to convey the breadth and depth of this transformation to students at a time when there is enormous churn in the software and hardware solutions being proposed, adopted, and discarded. Indeed, as the NAS report emphasizes, it is critical to the field that students gain skills in reasoning about parallelism and data locality, even as undergraduates. By the time they graduate, current students will already be faced with platforms, even those in the embedded space, that build almost exclusively upon multi- and many-core architectures.

As least as far back as the mid-90s, during the peak of big-iron supercomputing and the beginning of the cluster era, groups of educators contemplated how to convert the undergraduate CS curriculum to include parallel approaches. However, looking at the working papers produced by the Forum on Parallel Computing Curricula in 1997, for example, you see that many of the issues they discuss are the same ones that still vex us today. How deeply do we integrate parallelism into the CS curriculum? Do we use separate courses or integrate material into existing course structures? Do we fundamentally change the structure and presentation of all material to reflect a parallel perspective? How do we prepare the general faculty to teach this material?

Despite all the effort put forth at that time and since, it is not surprising that we still don't have broad community agreement on approaches or definitive guidance from a curriculum standards group on whether and how to incorporate parallelism in the CS curriculum. Since the mid-90s, the tremendous explosion of computing applications, particularly those feeding off the growth of the Internet, meant that any spare space in the curriculum was devoted to client-server architectures, Java RMI, or web application programming. These pushed parallelism, not completely unjustly, to the sidelines.

The existing aggregation of curricula, teaching experience, programming languages, and legacy code has a significant amount of momentum that will not easily be displaced by new models. However, computing has seen and weathered many large changes before. As recently as the late 90's, educators were still working through the best methods of dealing with object-oriented abstractions that were developed in the 70's and 80's. None of our programming sea-changes have happened overnight. Similarly, in the transition to parallel programming models, there remains a lot of groundwork to be done— convincing faculty, finding the best teaching methods, and developing tools and abstractions that make the concepts more accessible to students. However, unlike these past changes, our field is already several years behind a fast-moving hardware curve that is driving the change.

It is in shortening this curricular transition that our research infrastructure can play a critical role. By an investment in expediting the transfer of newly developed architectures, tools, and programming models into the classroom, computer science students will gain a more mature perspective on parallel computing—one that otherwise will likely be informed only by the messy infrastructure of the past.

In particular, these efforts need to reach down to levels that are accessible by our students at the earliest stages of their training so we don't have to un-train them from rigid sequential thinking. The good news is that our students are always excited about trying new things, and they have no preconceived biases or fears surrounding the difficulty of parallel programming. In fact, we often overlook the fact that new students come to us with significant aptitude for reasoning about parallelism and concurrent systems.

At SIGCSE 2010, Kim Bruce reported on more than a decade's worth of experiences introducing concurrent event-driven designs in introductory programming courses. His conclusion was that students naturally think in very non-sequential terms, and that the carefully scaffolded exposure of first-year students to these topics isn't overreaching. Future scaffolding could come in the form of tools, libraries, or simple deterministic abstractions, which also serve to make this material more accessible to current faculty who may want to teach parallel topics, but lack the necessary background.

New frameworks in this space are starting to appear. The MapReduce model, for example, has been adapted for use in pilot courses as early as CS1 across a range of universities. With properly constructed tools, such as St. Olaf's WebMapReduce, students can gain direct, practiced exposure to "thinking in parallel" without the need for dealing with the details of the underlying system stack.

Researchers also stand to gain directly from partnerships with educators on at least two fronts. First, those working on simple and powerful programming interfaces to parallel systems could gain a lot of usability and performance data from observing how novice programmers use their infrastructure, as well as evaluating the programs they create for performance and correctness. Second, as industrial marketing has demonstrated many times, getting college students to use a tool is an excellent way to develop future demand—something that is necessary for reaching the critical mass of users needed to gain widespread adoption.

Among the groups supporting this interaction is the *Educational Alliance for a Parallel Future* (EAPF - http://www.eapf.org), a collection of individuals from academia, industry, and government research who are concerned with how we as a community navigate this transition to a more parallel future for the CS curriculum. Our efforts in this space span a range of approaches, from raising awareness among educators to providing infrastructure for teaching to encouraging the development of course materials. Most relevant to researchers may be our efforts in finding high-impact ways to "scale out" novel materials and practices that have been shown to be effective. If you are interested in working on this issue, we encourage you to get in touch with those of us involved with EAPF, or with one of the other groups engaging in the various facets of this issue.

As our field tackles these significant research challenges, we encourage everyone to keep in mind the impact these changes are having on our curriculum. ∎

Daniel Ernst *is an Assistant Professor of Computer Science at the University of Wisconsin-Eau Claire (ernstdj@uwec.edu), and a founding member of the Educational Alliance for a Parallel Future (EAPF).*

Credit: Matthew Modoono

CRA board member and CRA-W co-chair, **Carla Brodley,** Tufts University, engages a student in conversation at Grad Cohort.

CRA-W Twenty-Year Celebration at FCRC

CRA-W will celebrate its twentieth anniversary at FCRC on ***Sunday, June 5 at 7pm,*** following the Turing Award Lecture. The goals of the celebration are to recognize the successes of CRA-W and its programs, thank the many sponsors and friends for their support, and acknowledge the contributions of CRA-W participants. This is also a chance to meet the many women who have participated in CRA-W programs throughout the twenty years and to hear about their achievements. The celebration will include a reception, a talk by one of the early members, and a history of CRA-W. Please visit the CRA-Web page (www.cra-w.org) to register for the celebration. We hope you will join us!

2009-2010 Taulbee Survey

Undergraduate CS Degree Production Rises; Doctoral Production Steady

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 40th annual CRA Taulbee Survey.

Information is gathered during the fall. Responses received by January 5, 2011 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 (2009-10). Data for new students in all categories refer to the current academic year (2010-11). Projected student production and information on faculty salaries and demographics also refer to the current academic year. Faculty salaries are those effective January 1, 2011.

For this report, we surveyed a total of 265 Ph.D.-granting departments. Of the departments surveyed, 195 returned their survey forms, for a response rate of 74 percent. This is higher than last year's 71 percent. There is a lower response rate from the I departments (68 percent—but their participation in the survey continues to increase since they were first included two years ago) and Canadian departments (62 percent), and a typical low response rate (40 percent) from CE programs. We had a good response rate from U.S. CS departments (150 of 184, or 82 percent).[3]

Departments that responded to the survey were sent preliminary results about faculty salaries in December 2010; these results included additional distributional information not contained in this report. The CRA Board views this as a benefit of participating in the survey.

While we continue to report U.S. CS departments with the (now very dated) 1995 NRC rankings, we are reviewing alternative stratification of these departments based on other factors. We are hopeful that an update to this report can be issued later in the year reflecting a new stratification methodology, and that future reports will reflect the new methodology.

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

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

Total Ph.D. production in computing programs (Table 1) held steady in 2009-10, with 1,772 degrees granted compared with 1,747 last year with fewer departments reporting. Computer science degree production also was flat (1,481 vs. 1,473 last year). This follows a drop in production last year. As was pointed out last year, the economic conditions that resulted in

Table 1. PhD Production by Type of Department and Rank

Department, Rank	PhDs Produced	Avg. per Dept.	PhDs Next Year	Avg. per Dept.	Passed Qualifier	Avg. per Dept.	Passed Thesis Ex. (# Depts)		Avg. per Dept.
US CS 1-12	311	28.3	288	26.2	231	21.0	198	(8)	24.8
US CS 13-24	215	17.9	241	20.1	264	22.0	198	(10)	19.8
US CS 25-36	169	14.1	205	17.1	205	17.1	121	(10)	12.1
US CS Other	806	7.0	962	8.4	974	8.5	622	(95)	6.5
US CS Total	**1,501**	**10.0**	**1,696**	**11.3**	**1,674**	**11.2**	**1,139**	**(123)**	**9.3**
US CE	61	5.5	87	7.9	110	10.0	57	(8)	7.1
US Information	71	5.5	70	5.4	55	4.2	49	(9)	5.4
Canadian	139	7.7	202	11.2	188	10.4	251	(17)	14.8
Total	**1,772**	**9.2**	**2,055**	**10.7**	**2,027**	**10.6**	**1,496**	**(157)**	**9.5**

Table 2. Gender of PhD Recipients by Type of Degree

	CS		CE		I		Total	
Male	1,169	81.2%	148	84.6%	67	59.8%	1,384	80.1%
Female	271	18.8%	27	15.4%	45	40.2%	343	19.9%
Total known Gender	**1,440**		**175**		**112**		**1,727**	
Unknown	41		2		2		45	
Total	**1,481**		**177**		**114**		**1,772**	

Figure 1. Number of Respondents to the Taulbee Survey

Year	US CS Depts.	US CE Depts.	Canadian	US 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	151/181 (83%)	12/32 (38%)	20/30 (67%)	9/19 (47%)	192/264 (73%)
2009	147/184 (80%)	13/31 (42%)	16/30 (53%)	12/20 (60%)	188/265 (71%)
2010	150/184 (82%)	12/30 (40%)	18/29 (62%)	15/22 (68%)	195/265 (74%)

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Table 3. Ethnicity of PhD Recipients by Type of Degree								
	CS		CE		I		Total	
Nonresident Alien	613	45.8%	108	63.2%	33	30.0%	754	46.5%
American Indian or Alaska Native	3	0.2%	0	0.0%	1	0.9%	4	0.2%
Asian	169	12.6%	23	13.5%	15	13.6%	207	12.8%
Black or African-American	17	1.3%	2	1.2%	2	1.8%	21	1.3%
Native Hawaiian or Pacific Islander	7	0.5%	0	0.0%	0	0.0%	7	0.4%
White	503	37.6%	35	20.5%	56	50.9%	594	36.7%
Multiracial, not Hispanic	5	0.4%	0	0.0%	0	0.0%	5	0.3%
Resident Hispanic, any race	22	1.6%	3	1.8%	3	2.7%	28	1.7%
Total have Ethnicity Data for	**1,339**		**171**		**110**		**1,620**	92.1%
Resident, race/ethnicity unknown	26		6		3		35	
Residency unknown	116		0		1		117	
Total	**1,481**		**177**		**114**		**1,772**	

Table 4. Employment of New PhD Recipients By Specialty

	Artificial Intelligence	Computer-Supported Cooperative Work	Databases /Information Retrieval	Graphics/Visualization	Hardware/Architecture	Human-Computer Interaction	High-Performance Computing	Informatics: Biomedical/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 PhD-Granting Depts.																						
Tenure-track	15	0	7	8	5	7	2	3	6	5	6	6	9	4	3	0	2	7	8	21	124	8.2%
Researcher	12	0	4	1	1	1	3	4	1	0	2	1	5	1	3	2	1	2	1	6	51	3.4%
Postdoc	39	4	9	15	3	10	4	34	10	3	6	19	8	13	14	4	4	14	33	48	294	19.5%
Teaching Faculty	5	2	3	4	1	1	0	1	0	0	0	0	2	2	0	1	1	5	2	7	37	2.5%
North American, Other Academic																						
Other CS/CE/I Dept.	1	0	0	3	0	0	0	3	2	1	2	9	1	2	2	1	1	3	0	5	36	2.4%
Non-CS/CE/I Dept.																						
North American, Non-Academic																						
Industry	76	6	57	35	47	17	5	14	27	5	15	61	22	28	27	15	7	72	30	106	672	44.7%
Government	6	0	2	1	2	4	5	5	2	1	1	2	3	0	4	5	2	5	2	12	64	4.3%
Self-Employed	2	1	0	2	1	0	0	0	3	1	0	3	1	0	2	0	0	2	1	0	19	1.3%
Unemployed	0	0	1	2	0	0	2	0	0	0	0	1	0	1	0	0	3	1	2	3	16	1.1%
Other	3	0	1	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	1	4	13	0.9%
Total Inside North America																						
	159	13	84	71	61	41	21	65	51	16	32	102	52	51	55	28	21	111	80	212	1,326	88.2%
Outside North America																						
Tenure-Track in PhD Granting	3	0	2	1	3	0	1	0	4	0	2	12	2	1	3	0	0	2	9	6	51	3.4%
Researcher in PhD	1	0	0	1	0	0	0	0	1	0	0	1	0	1	0	1	0	0	1	1	8	0.5%
Postdoc in PhD	2	3	3	3	1	0	0	2	1	0	0	3	0	2	3	1	0	3	9	5	41	2.7%
Teaching in PhD	2	0	2	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	2	9	0.6%
Other Academic	0	0	0	0	0	0	0	0	2	1	0	6	1	0	0	0	0	1	0	0	11	0.7%
Industry	4	2	0	5	3	2	0	0	2	0	2	10	2	2	1	1	1	1	1	3	42	2.8%
Government	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	2	0	0	3	10	0.7%
Other	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	6	0.4%
Total Outside NA	12	5	8	10	8	3	3	3	10	1	4	37	5	6	8	3	3	8	20	21	178	11.8%
Total with Employment Data, Inside North America plus Outside North America																						
	171	18	92	81	69	44	24	68	61	17	36	139	57	57	63	31	24	119	100	233	1,504	
Employment Type & Location Unknown																						
	10	1	7	6	9	5	5	7	9	3	0	11	2	8	2	2	4	7	10	160	268	
Total																						
	181	**19**	**99**	**87**	**78**	**49**	**29**	**75**	**70**	**20**	**36**	**150**	**59**	**65**	**65**	**33**	**28**	**126**	**110**	**393**	**1,772**	

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Table 5. New PhD Students in Fall 2010 by Department Type and Rank

	CS				CE				I				Total	
Department, Rank	New Admit	MS to PhD	Total	Avg. per Dept.	New Admit	MS to PhD	Total	Avg. per Dept.	New Admit	MS to PhD	Total	Avg. per Dept.	Total	Avg. per Dept.
US CS 1-12	360	29	389	32.7	0	0	0	0.0	0	0	0	0.0	389	35.4
US CS 13-24	267	27	294	22.3	8	0	8	0.7	0	0	0	0.0	302	25.2
US CS 25-36	301	29	330	25.1	1	0	1	0.1	32	1	33	2.8	364	30.3
US CS Other	1,186	179	1,365	10.3	90	6	96	0.8	43	1	44	0.4	1,505	13.1
US CS Total	**2,114**	**264**	**2,378**	**14.1**	**99**	**6**	**105**	**0.7**	**75**	**2**	**77**	**0.5**	**2,560**	**17.1**
US CE	0	0	0	0.0	88	6	94	8.5	4	0	4	0.4	98	8.9
US Information	0	0	0	0.0	0	0	0	0.0	90	14	104	5.8	104	5.8
Canadian	162	21	183	12.5	17	0	17	1.3	0	0	0	0.0	200	15.4
Total	**2,276**	**285**	**2,561**	**11.9**	**204**	**12**	**216**	**1.1**	**169**	**16**	**185**	**1.0**	**2,962**	**15.4**

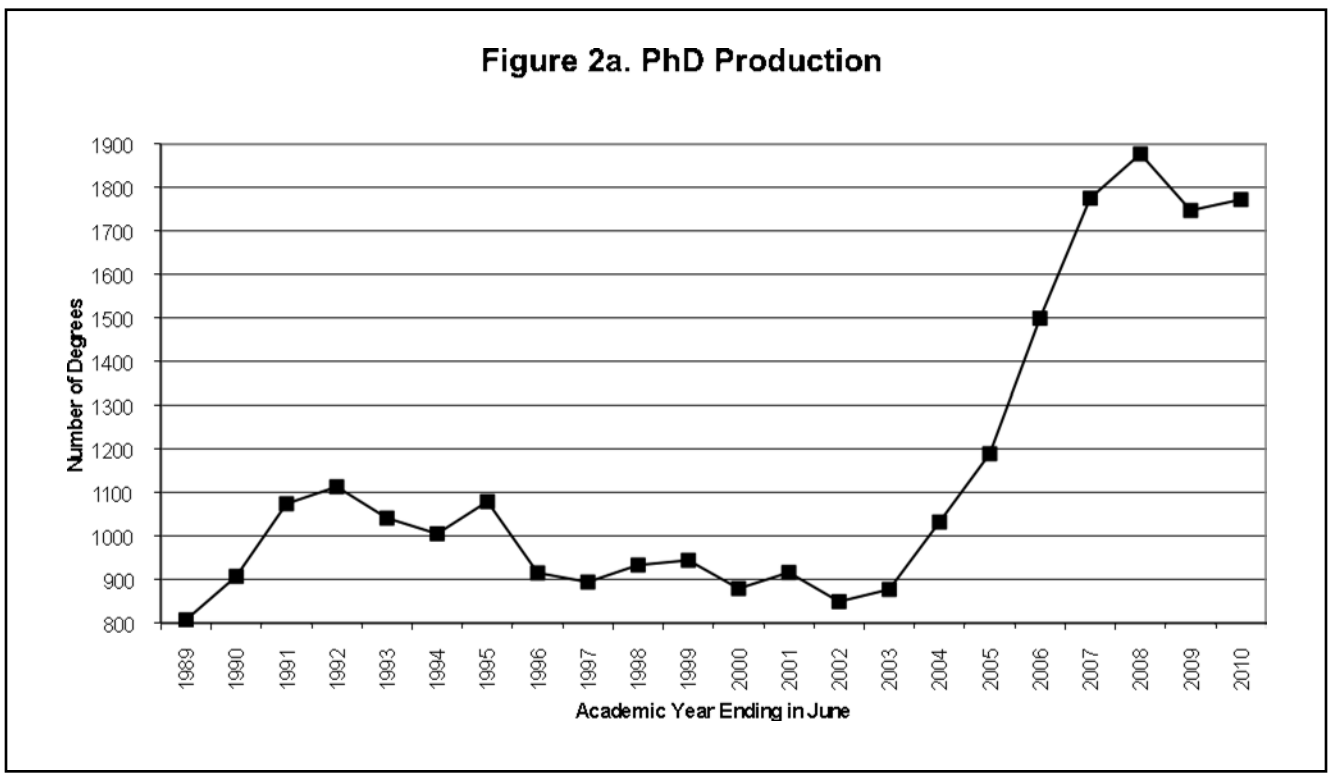
Averages per department are computed for all reporting departments

Table 5a. New PhD Students from Outside North America

Department, Rank	CS	CE	I	Total New Outside	Total New	% Outside North America
US CS 1-12	187	0	0	187	389	48.1%
US CS 13-24	144	3	0	147	302	48.7%
US CS 25-36	192	1	20	213	364	58.5%
US CS Other	790	83	15	888	1,505	59.0%
Total US CS	**1,313**	**87**	**35**	**1,435**	**2,560**	**56.1%**
US CE	0	69	7	76	98	77.6%
US Information	0	0	33	33	104	31.7%
Canadian	135	4	0	139	200	69.5%
Total	**1,448**	**160**	**75**	**1,683**	**2,962**	**56.8%**
Total New	2,561	216	185	2,962		
% Outside	56.5%	74.1%	40.5%	56.8%		

Table 6. PhD Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE		I		Total	
US CS 1-12	2,117	16.7%	0	0.0%	0	0.0%	2,117	14.1%
US CS 13-24	1,537	12.1%	21	1.5%	0	0.0%	1,558	10.4%
US CS 25-36	1,398	11.0%	21	1.5%	118	11.9%	1,537	10.2%
US CS Other	6,294	49.7%	715	51.9%	261	26.3%	7,270	48.3%
Total US CS	**11,346**	**89.6%**	**757**	**54.9%**	**379**	**38.1%**	**12,482**	**83.0%**
US CE	0	0.0%	532	38.6%	30	3.0%	562	3.7%
US Information	0	0.0%	0	0.0%	585	58.9%	585	3.9%
Canadian	1,320	10.4%	89	6.5%	0	0.0%	1,409	9.4%
Total	**12,666**		**1,378**		**994**		**15,038**	



some students delaying graduation two years ago and instead graduating last year may have halted what might otherwise have been another year of declining production last year.

The 2009-10 production of 1,772 is well below the 2,009 predicted in last year's survey. The "optimism ratio," defined as the actual number divided by the predicted number, was 0.88, better than last year's 0.83. Departments notoriously over-predict the number of Ph.D. graduates. The prediction for 2010-11 graduates is 2,055, similar to what they predicted last year.

The number of new students passing thesis candidacy exams in U.S. CS departments (most, but not all, departments have such exams) was flat after accounting for the additional departments reporting. The overall number of students passing the qualifier also was flat in these departments.

For the second year in a row, the number of new Ph.D. students overall (Table 5) is about the same as last year (2,962 this year vs 2,995 last year). However, with the increased number of departments reporting this year, this total actually represents a slight decline. The number of new students in computer engineering programs also declined. This year, there was a decline in the proportion of new doctoral students from outside North America (Table 5a), from 59.1% last year to 56.8% this year. However, this still is greater than the 54% from outside North America two years ago. Total enrollment in computer science doctoral programs (Table 6) is comparable to that of last year, after accounting for the increased number of departments reporting this year.

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.

Figure 4 shows the employment trend of new Ph.D.s in academia and industry, those taking employment outside of North America, and those

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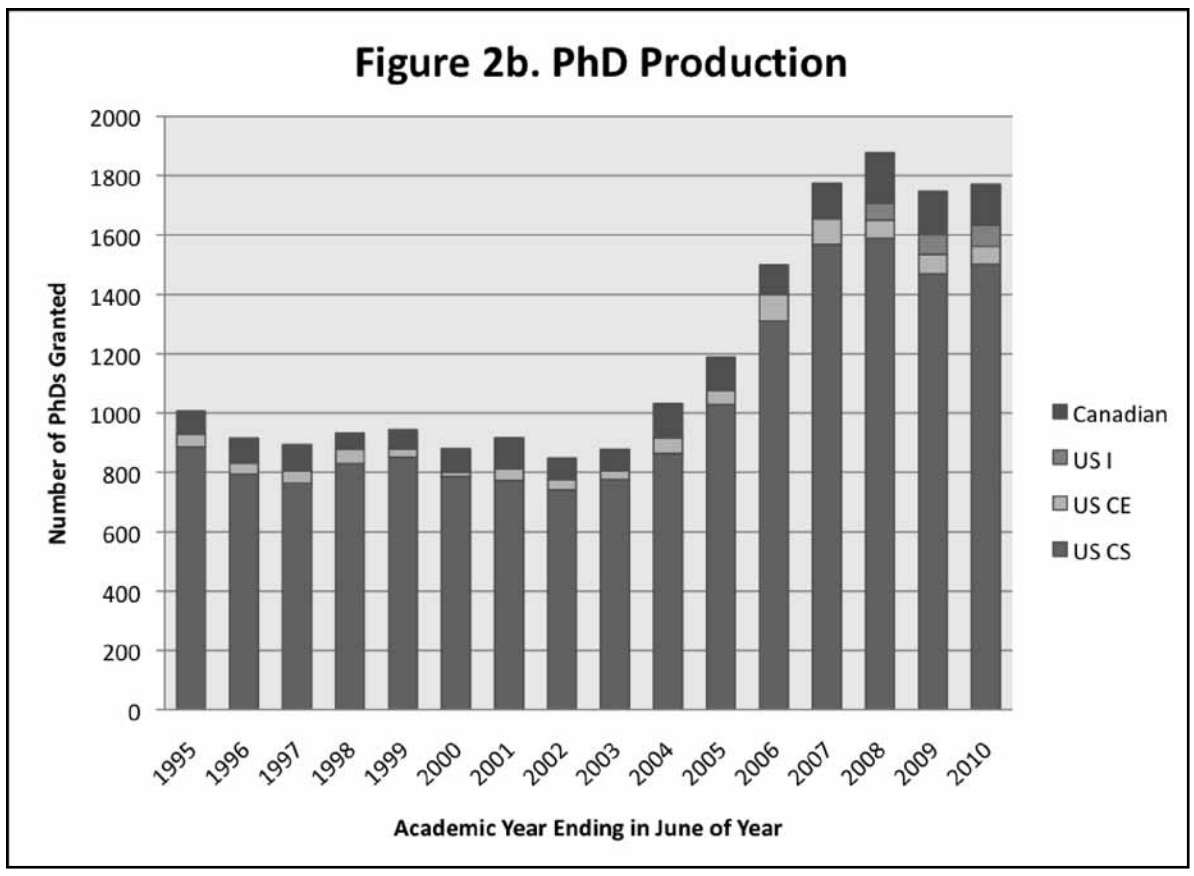
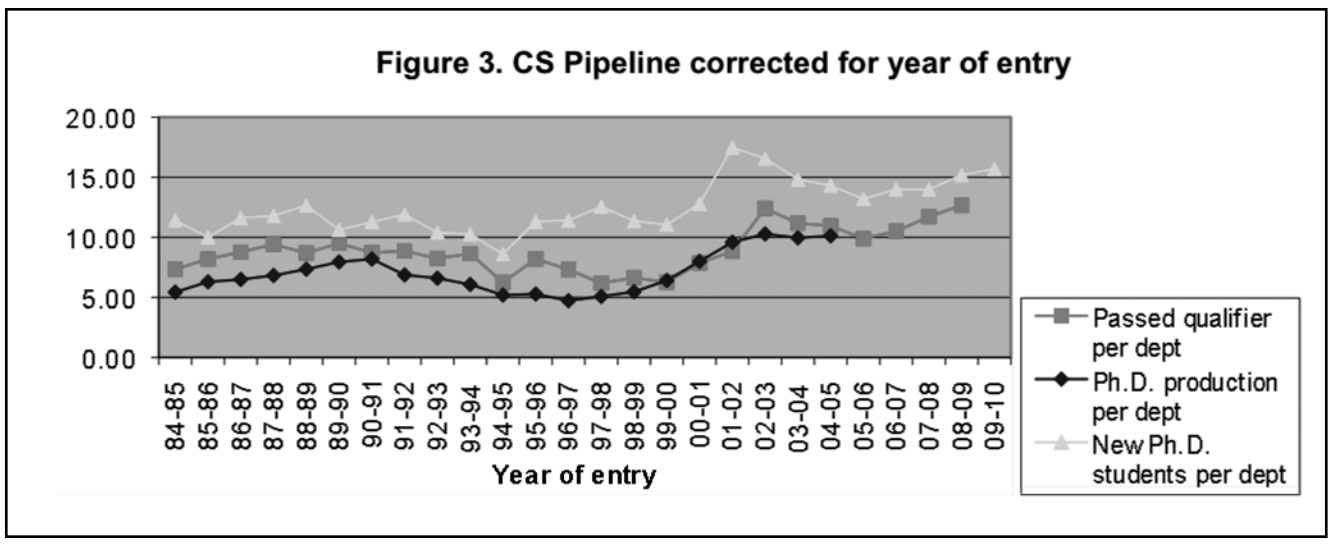
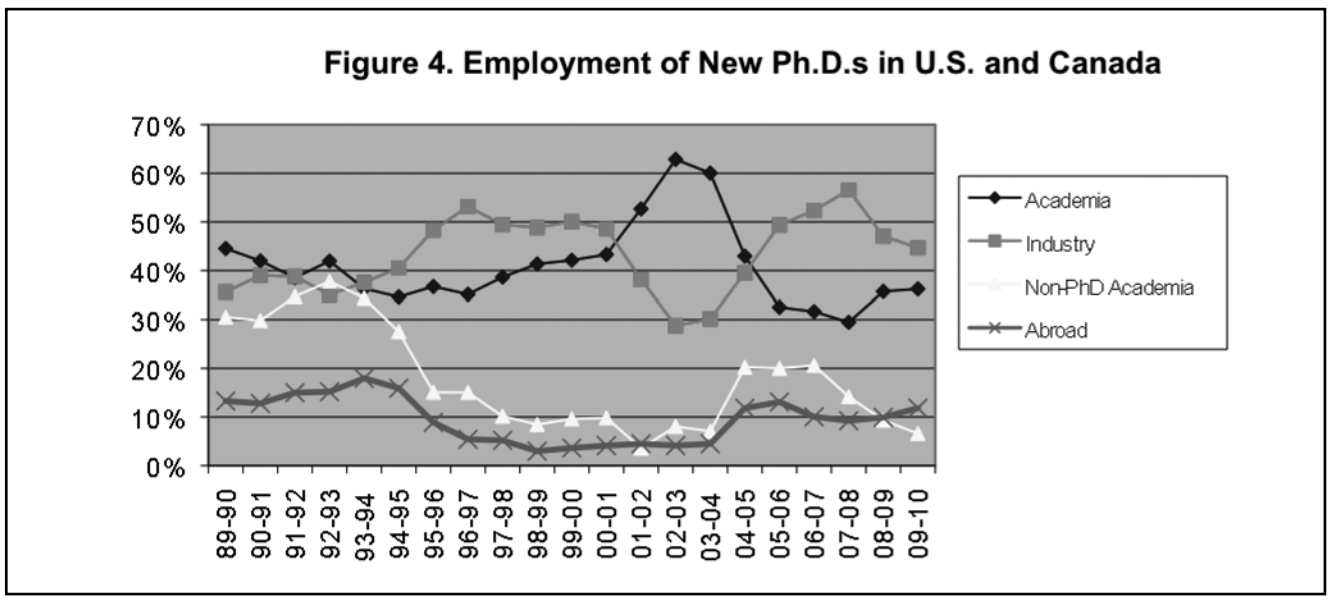
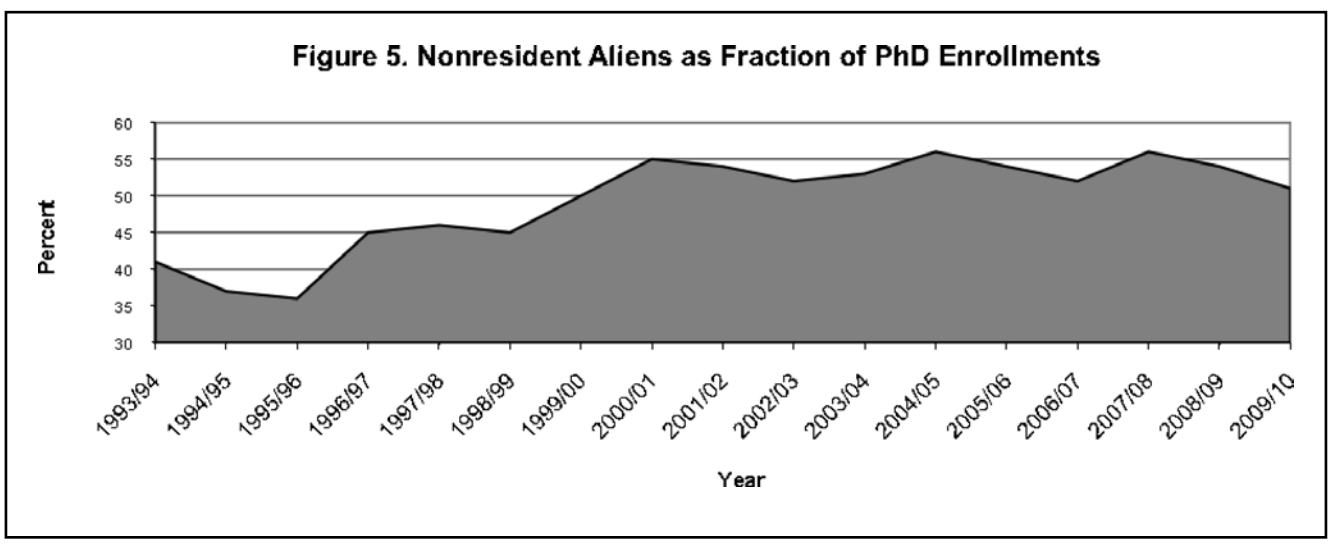
going to academia who took positions in departments other than Ph.D.-granting CS/CE departments. Table 4 shows a more detailed breakdown of the employment data for new Ph.D.s. There continues to be a decline in the fraction of new Ph.D.s who take positions in industry (44.7% in 2009-10 vs. 47.1% in 2008-09 and 56.6% in 2007-08). A similar fraction of graduates took academic jobs in 2009-10 as did so in 2008-09. However, once again many more graduates went into academic positions as post-doctoral employees in 2009-10, while the fraction taking tenure-track positions dropped from 10.4% in 2008-09 to 8.2% in 2009-10.

The unemployment rate for new Ph.D.s remains approximately 1%. The proportion of Ph.D. graduates who were reported taking positions outside of North America, among those whose employment is known, jumped to 11.8% in 2009-10 from 9.9% in 2008-09 and 9.2% in 2007-08. This is a trend that bears watching.









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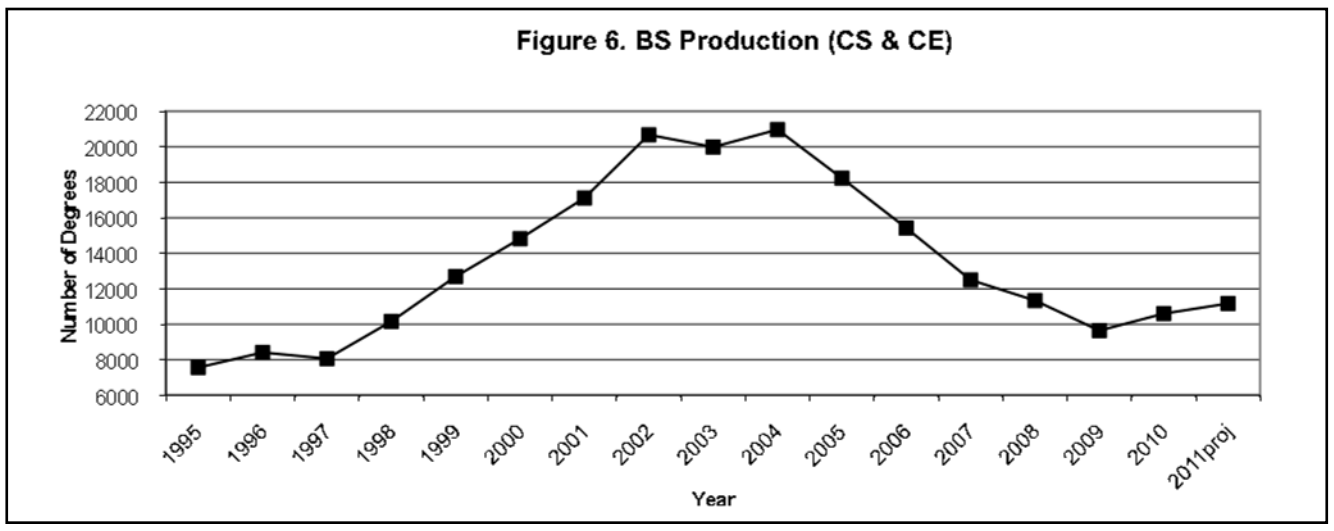

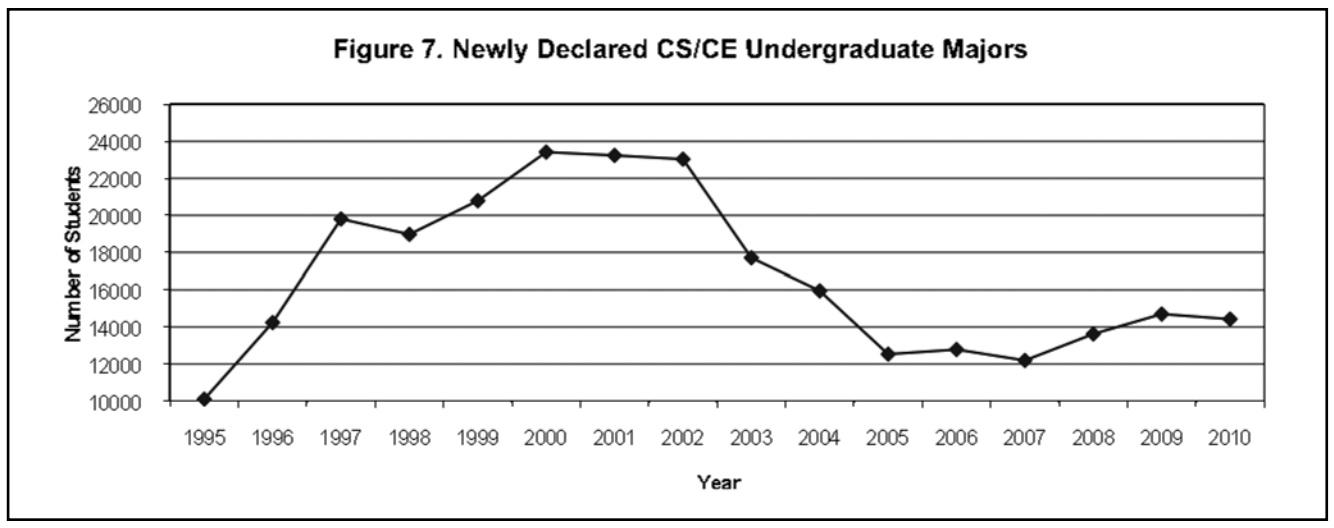

Table 7. PhD Program Total Enrollment by Gender

	CS		CE		I		Total	
Male	10,290	81.2%	1,141	82.8%	589	59.3%	12,020	79.9%
Female	2,300	18.2%	237	17.2%	404	40.6%	2,941	19.6%
Total have Gender Data for	**12,590**		**1,378**		**993**		**14,961**	
Unknown	76		0		1		77	
Total	**12,666**		**1,378**		**994**		**15,038**	

Table 8. PhD Program Total Enrollment by Ethnicity

	CS		CE		I		Total	
Nonresident Alien	6,395	50.5%	866	62.8%	403	40.5%	7,664	51.0%
American Indian or Alaska Native	18	0.1%	1	0.1%	5	0.5%	24	0.2%
Asian	926	7.3%	97	7.0%	88	8.9%	1,111	7.4%
Black or African-American	245	1.9%	23	1.7%	37	3.7%	305	2.0%
Native Hawaiian or Pacific Islander	35	0.3%	1	0.1%	6	0.6%	42	0.3%
White	3,745	29.6%	263	19.1%	368	37.0%	4,376	29.1%
Multiracial, not Hispanic	13	0.1%	1	0.1%	4	0.4%	18	0.1%
Resident Hispanic, any race	171	1.4%	19	1.4%	19	1.9%	209	1.4%
Total have Ethnicity Data for	**11,548**		**1,271**		**930**		**13,749**	
Resident, race/ ethnicity unknown	474		90		59		623	
Residency unknown	644		17		5		666	
Total	**12,666**		**1,378**		**994**		**15,038**	

Table 9a. Gender of Bachelor's Recipients

	CS		CE		I		Total	
Male	7,622	86.2%	1427	89.6%	1625	85.5%	10,674	86.6%
Female	1,216	13.8%	166	10.4%	275	14.5%	1,657	13.4%
Total have Gender Data for	**8,838**		**1,593**		**1,900**		**12,331**	
Unknown	170		0		0		170	
Total	**9,008**		**1,593**		**1,900**		**12,501**	

Table 4 also indicates the areas of specialty of new CS/CE Ph.D.s.

More doctoral graduates specialized in artificial intelligence, informatics: biomedical/other science, operating systems, scientific computing and social computing in 2009-10 than did so in 2008-09, while a smaller proportion specialized in databases/information retrieval (second year in a row), human-computer interaction, and high-performance computing. There have been few long-term trends in these specialization data over the years, so these year-to-year differences should not be construed as necessarily indicative of any shift in emphasis.

A smaller fraction of this year's computer science graduates were women (18.8% vs. 20.8% last year) while a larger fraction of this year's I school graduates were women (40.2% vs. 36.1% last year). A larger fraction of this year's graduates were White (36.7% vs. 33.3% last year). This change was largest at I schools, where there was a 15% larger fraction of Whites and a 10% smaller fraction of Non-resident Aliens, but this may reflect differences in the specific departments reporting this year.

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

This section reports data about enrollment and degree production for Master's and Bachelor's programs in the doctoral-granting departments. Although the absolute number of degrees and students enrolled reported herein only reflect departments that offer the doctoral degree, the trends observed in the master's and bachelor's data from these departments tend to strongly reflect trends in the larger population of programs that offer such degrees.

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Master's degree production in CS was flat in 2009-10 with 6,851 graduates (Tables 9b-11b). Production declined in CE departments and increased in I departments, the reverse of what was experienced last year. However, these changes may reflect nothing more than changes in the programs reporting.

There were very small changes in 2009-10 in the proportion of female graduates among master's recipients. There has been little change in the gender balance among CS master's recipients for many years. A higher fraction of the I department master's recipients were Non-resident Aliens in 2009-10. In CE departments, the reverse held, with a corresponding increase in the fraction of master's graduates who were White. CS programs showed little change in ethnicity characteristics, if Non-resident Aliens and (resident) Asians are combined. We suspect that some departments incorrectly classify some Non-resident Aliens as resident Asians.

There is an increase in the number of new master's students in CS programs this year, to 5,881 from 5,440 last year (Table 13). Changes in new enrollment among CE and I programs appear consistent with changes in the number of departments in these categories that reported.

Overall bachelor's degree production in 2010 rose nearly 11 percent from that in 2009 (Tables 9a-11a). Bachelor's degree production in U.S. CS departments was up more than 9 percent. The increases in new students observed during each of the previous two years have resulted in increased degree production, a welcome turnaround from the past several years of declining bachelor's degree production.

The number of new students in U.S. CS programs continues to increase (Table 14). The number of new CS majors among U.S. computer science departments is about the same as last year, but there was a huge (50 percent) increase in the number of new pre-majors (students who are pursuing a curriculum for the major in computer science but as yet have not declared their official major). It should be noted that a relatively small number of programs have the pre-major status, and not all of them report data every year. For programs who reported non-zero numbers of pre-majors last year and this year, the increase was 22 percent. Total enrollment among majors and pre-majors in U.S. CS departments increased 10 percent (Table 16), although about one-third of these departments still report decreases in total enrollment. This is the third straight year of increases in total enrollment, and indicates that the post-dot-com decline in undergraduate computing program enrollments is over.

In Canada, the number of new CS majors increased for the third straight year, by nearly 4 percent, but the total number of CS majors declined by nearly 8 percent. Bachelor's degree production in Canada increased by more than 15 percent. These trends

Table 9b. Gender of Master's Recipients

	CS		CE		I		Total	
Male	5,381	79.0%	594	77.6%	945	49.1%	6,920	72.8%
Female	1,434	21.0%	171	22.4%	981	50.9%	2,586	27.2%
Total have Gender Data for	**6,815**		**765**		**1,926**		**9,506**	
Unknown	36		0		0		36	
Total	**6,851**		**765**		**1,926**		**9,542**	

Table 10a. Ethnicity of Bachelor's Recipients

	CS		CE		I		Total	
Nonresident Alien	584	8.4%	99	7.1%	73	4.8%	756	7.6%
American Indian or Alaska Native	27	0.4%	6	0.4%	13	0.9%	46	0.5%
Asian	1,034	14.8%	250	17.9%	173	11.4%	1,457	14.7%
Black or African-American	236	3.4%	57	4.1%	120	7.9%	413	4.2%
Native Hawaiian or Pacific Islander	20	0.3%	3	0.2%	3	0.2%	26	0.3%
White	4,650	66.5%	901	64.6%	1,024	67.2%	6,575	66.4%
Multiracial, not Hispanic	65	0.9%	13	0.9%	1	0.1%	79	0.8%
Resident Hispanic, any race	373	5.3%	65	4.7%	116	7.6%	554	5.6%
Total have Ethnicity Data for	**6,989**		**1,394**		**1,523**		**9,906**	
Resident, race/ ethnicity unknown	455		96		119		670	
Residency unknown	1,564		103		258		1,925	
Total	**9,008**		**1,593**		**1,900**		**12,501**	

Table 10b. Ethnicity of Master's Recipients

	CS		CE		I		Total	
Nonresident Alien	3,585	59.0%	381	57.0%	380	23.1%	4,346	51.8%
American Indian or Alaska Native	9	0.1%	1	0.1%	13	0.8%	23	0.3%
Asian	646	10.6%	88	13.2%	167	10.2%	901	10.7%
Black or African-American	78	1.3%	10	1.5%	75	4.6%	163	1.9%
Native Hawaiian or Pacific Islander	14	0.2%	1	0.1%	4	0.2%	19	0.2%
White	1,620	26.7%	164	24.6%	927	56.4%	2,711	32.3%
Multiracial, not Hispanic	15	0.2%	0	0.0%	10	0.6%	25	0.3%
Resident Hispanic, any race	110	1.8%	23	3.4%	68	4.1%	201	2.4%
Total have Ethnicity Data for	**6,077**		**668**		**1,644**		**8,389**	
Resident, race/ ethnicity unknown	267		89		184		540	
Residency unknown	507		8		98		613	
Total	**6,851**		**765**		**1,926**		**9,542**	

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

Department, Rank	CS		CE		I		Total	
US CS 1-12	1,154	12.8%	183	11.5%	0	0.0%	1,337	10.7%
US CS 13-24	760	8.4%	164	10.3%	0	0.0%	924	7.4%
US CS 25-36	886	9.8%	26	1.6%	167	8.8%	1,079	8.6%
US CS Other	5,036	55.9%	832	52.2%	696	36.6%	6,564	52.5%
Total US CS	**7,836**	**87.0%**	**1,205**	**75.6%**	**863**	**45.4%**	**9,904**	**79.2%**
US CE	0	0.0%	286	18.0%	13	0.7%	299	2.4%
US Information	0	0.0%	0	0.0%	1001	52.7%	1,001	8.0%
Canadian	1,172	13.0%	102	6.4%	23	1.2%	1,297	10.4%
Total	**9,008**		**1,593**		**1,900**		**12,501**	

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are significantly influenced by the specific departments reporting.

Because of the newness of the I-school data and the increasing number of I-schools reporting, it is not appropriate to try to discern any enrollment patterns at this time. Computer engineering enrollment data appear comparable to those from last year in aggregate, for the second year in a row, although there are more pre-majors this year.

The fraction of women among bachelor's graduates increased this year in all three areas (CS, CE and I), though only 13.8 percent of bachelor's graduates in CS, 10.4 percent in CE, and 14.5 percent in I, were women. Ethnicity patterns were similar to last year, though this year there are somewhat fewer Whites and more Non-resident Alien graduates in both CS and I programs.

Faculty Demographics *(Tables 17-23)*

Table 17 shows the current and anticipated sizes for tenure-track, teaching and research faculty, and postdocs. While analyzing this year's faculty demographic data, we discovered that previous years' counts were reported incorrectly for certain of these classes. While tenure-track and total counts were accurate, the teaching, research, and postdoc numbers typically were transposed. This problem appears to have begun with the 2006-07 report, which provided actual counts for the 2007-08 academic year. So that our readers may have the correct trend data for their own information and use, we are including this year a special table, Table 17a, that shows the corrected actual figures for each academic year, beginning 2005-06.

Tenure-track faculty size rebounded this year from last year's losses. The 6.7% increase this year returns the

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

Department, Rank	CS		CE		I		Total	
US CS 1-12	761	11.1%	58	7.6%	0	0.0%	819	8.6%
US CS 13-24	1,061	15.5%	1	0.1%	0	0.0%	1,062	11.1%
US CS 25-36	655	9.6%	6	0.8%	81	4.2%	742	7.8%
US CS Other	3,830	55.9%	410	53.6%	544	28.2%	4,784	50.1%
Total US CS	**6,307**	**92.1%**	**475**	**62.1%**	**625**	**32.5%**	**7,407**	**77.6%**
US CE	0	0.0%	204	26.7%	14	0.7%	218	2.3%
US Information	0	0.0%	0	0.0%	1287	66.8%	1,287	13.5%
Canadian	544	7.9%	86	11.2%	0	0.0%	630	6.6%
Total	**6,851**		**765**		**1,926**		**9,542**	

Table 12a. Bachelor's Degree Candidates for 2010-2011 by Department Type and Rank

Department, Rank	CS		CE		I		Total	
US CS 1-12	1,188	12.6%	270	15.5%	0	0.0%	1,458	11.1%
US CS 13-24	924	9.8%	182	10.4%	0	0.0%	1,106	8.4%
US CS 25-36	680	7.2%	28	1.6%	240	12.3%	948	7.2%
US CS Other	5,001	53.1%	934	53.5%	776	39.7%	6,711	51.1%
Total US CS	**7,793**	**82.7%**	**1,414**	**80.9%**	**1,016**	**51.9%**	**10,223**	**77.9%**
US CE	0	0.0%	277	15.9%	0	0.0%	277	2.1%
US Information	0	0.0%	0	0.0%	910	46.5%	910	6.9%
Canadian	1,630	17.3%	56	3.2%	30	1.5%	1,716	13.1%
Total	**9,423**		**1,747**		**1,956**		**13,126**	

Table 12b. Master's Degree Candidates for 2010-2011 by Department Type and Rank

Department, Rank	CS		CE		I		Total	
US CS 1-12	794	12.5%	70	11.9%	0	0.0%	864	10.2%
US CS 13-24	921	14.5%	1	0.2%	0	0.0%	922	10.9%
US CS 25-36	663	10.4%	2	0.3%	92	6.0%	757	8.9%
US CS Other	3,544	55.7%	339	57.8%	477	31.0%	4,360	51.4%
Total US CS	**5,922**	**93.1%**	**412**	**70.3%**	**569**	**37.0%**	**6,903**	**81.4%**
US CE	0	0.0%	171	29.2%	12	0.8%	183	2.2%
US Information	0	0.0%	0	0.0%	936	60.9%	936	11.0%
Canadian	439	6.9%	3	0.5%	20	1.3%	462	5.4%
Total	**6,361**		**586**		**1,537**		**8,484**	

Table 13. New Master's Students in Fall 2010 by Department Type and Rank

	CS		CE		I		Total		Outside N America	
Department, Rank	Total	Avg. per Dept.	Total	Avg. per Dept.	Total	Avg. per Dept.	Total	Avg. per Dept.	Total	%
US CS 1-12	662	60.2	63	5.7	0	0.0	725	65.9	371	51.2%
US CS 13-24	1,014	84.5	6	0.5	0	0.0	1,020	85.0	727	71.3%
US CS 25-36	514	42.8	0	0.0	71	5.9	585	48.8	357	61.0%
US CS Other	3,182	27.7	362	3.1	335	2.9	3,879	33.7	2,127	54.8%
US CS Total	**5,372**	**35.8**	**431**	**2.9**	**406**	**2.7**	**6,209**	**41.4**	**3,582**	**57.7%**
US CE	0	0.0	164	14.9	2	0.2	166	15.1	114	68.7%
US Information	0	0.0	0	0.0	1,207	92.8	1,207	92.8	194	16.1%
Canadian	509	28.3	21	1.2	39	2.2	569	31.6	284	49.9%
Total	**5,881**	**30.6**	**616**	**3.2**	**1,654**	**8.6**	**8,151**	**42.5**	**4,174**	**51.2%**

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Table 14. New Undergraduate Students in Fall 2010 by Department Type and Rank

Department, Rank	CS Pre-Major	CS Major	CS Avg. Major per Dept.	CE Pre-Major	CE Major	CE Avg. Major per Dept.	I Pre-Major	I Major	I Avg. Major per Dept.	Total Major	Total Avg. Major per Dept.
US CS 1-12	368	1,072	107.2	0	358	119.3	0	0		1,430	143
US CS 13-24	109	965	80.4	0	346	57.7	0	0		1,311	109.3
US CS 25-36	321	795	88.3	0	32	32.0	15	246		1,073	107.3
US CS Other	2,550	6,585	72.4	618	1,474	46.1	20	683	34.2	8,742	96.1
Total US CS	**3,348**	**9,417**	**77.2**	**618**	**2,210**	**52.6**	**35**	**929**	**46.5**	**12,556**	**102.1**
US CE	0	0	0.0	93	432	48.0	0	38		470	47
US Information	0	0	0.0	0	0	0.0	0	512	64.0	512	64.0
Canadian	226	2,292	134.8	0	75	37.5	0	0		2,367	139.2
Total	**3,574**	**11,709**		**711**	**2,717**		**35**	**1,479**		**15,905**	

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

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

Department, Rank	CS		CE		I		Total	
US CS 1-12	1,298	8.1%	81	4.9%	0	0.0%	1,379	6.1%
US CS 13-24	1,870	11.6%	4	0.2%	0	0.0%	1,874	8.3%
US CS 25-36	1,123	7.0%	3	0.2%	320	6.8%	1,446	6.4%
US CS Other	10,444	64.8%	903	55.1%	1,526	32.4%	12,873	57.3%
Total US CS	**14,735**	**91.5%**	**991**	**60.5%**	**1,846**	**39.2%**	**17,572**	**78.3%**
US CE	0	0.0%	562	34.3%	44	0.9%	606	2.7%
US Information	0	0.0%	0	0.0%	2,734	58.1%	2,734	12.2%
Canadian	1,374	8.5%	85	5.2%	85	1.8%	1,544	6.9%
Total	**16,109**		**1,638**		**4,709**		**22,456**	

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 Pre-Major	CS Major	CS Avg. Major per Dept.	CE Pre-Major	CE Major	CE Avg. Major per Dept.	I Pre-Major	I Major	I Avg. Major per Dept.	Total Major	Total Avg. Major per Dept.
US CS 1-12	957	4,476	406.9	0	740	185.0	0	0		5,216	474.2
US CS 13-24	139	3,574	297.8	0	793	132.2	0	1	1.0	4,368	364.0
US CS 25-36	595	3,493	291.1	0	104	104.0	179	789	263.0	4,386	365.5
US CS Other	4,770	23,849	227.1	1,087	4,694	126.9	133	3,705	161.1	32,248	307.1
Total US CS	**6,461**	**35,392**	**252.8**	**1,087**	**6,331**	**131.9**	**312**	**4,495**	**166.5**	**46,218**	**330.1**
US CE	0	0	0.0	76	1,350	150.0	0	111	111.0	1,461	162.3
US Information	0	0	0.0	0	0	0.0	873	2,863	357.9	2,863	357.9
Canadian	160	8,028	446.0	0	214	107.0	0	0	0.0	8,242	457.9
Total	**6,621**	**43,420**		**1,163**	**7,895**		**1,185**	**7,469**		**58,784**	

Table 17. Actual and Anticipated Faculty Size by Position

	Actual	Projected			
	2010-2011	2011-2012	2012-2013	Expected Two-Year Growth	
Tenure-Track	4,758	4,904	5,018	260	5.5%
Teaching Faculty	665	678	694	29	4.4%
Research Faculty	455	532	583	128	28.1%
Postdoc	675	742	807	132	19.6%
Other/Not Listed	114	118	131	17	14.9%
Total	**6,667**	**6,974**	**7,233**	**566**	**8.5%**

Table 17a. Faculty Size by Position: 2006-2010

	2006	2007	2008	2009	2010
Tenure-Track	4,403	4,390	4,776	4,458	4,758
Teaching Faculty	635	633	589	625	665
Research Faculty	411	400	456	491	455
Postdoc	316	353	423	512	675
Other/Not Listed	94	131	162	226	114

* Uses Taulbee data collected in the fall of each year, covering faculty size for the academic year that was beginning.

tenure-track level to that of two years ago. However, at U.S. CS departments the increase was only 3.3%, and some of this is due to an increased number of departments reporting this year. The use of postdocs continued to grow at an astonishing rate of 31.8% this year. The postdoc numbers have more than doubled in a four-year period. Teaching faculty numbers rose 6.4% while research faculty numbers dropped 7.3%.

The overall totals reflect a 5.6% increase. However, among U.S. CS departments the overall increase was a modest 1.3%. Large increases in CE, I, and Canadian totals were present this year (20.7%, 33.1% and 20.9%, respectively), but the specific departments reporting in those sectors makes these data subject to larger swings from year to year.

Table 18b shows the continued effects of the economy on faculty hiring this past year. There were only 211 tenure-track vacancies reported in 2009-10, a 17% decrease from 2008-09 and nearly a 60% decrease from 2007-08. Of these, 29.9% were reported unfilled, better than the 35.4% in 2008-09. The fraction of women hired into tenure-track positions (Table 19) rose again in 2009-10, to 26.5% from 23.1% in 2008-09 and 21.9% in 2007-08. With only 19.9% of new Ph.D.s being women, this year's tenure-track faculty hiring would appear to continue the trend toward increased gender diversity. The fraction of women among new postdocs also rose, from 15.3% to 19.5%. This year there was an increased percentage of new faculty members who are White and those who are Resident Hispanic, while there was a decrease in the percentage who are Non-resident Aliens (Table 20).

There was a slight increase in the overall fraction of women at the assistant and full professor ranks (Table 21). The largest increase again was at the assistant professor level, where the fraction of women rose to 25.8% from 24.3% last year and 21.7% two years ago. There also are more Whites and fewer Asians and Non-resident Aliens among current assistant professors this year compared with last year (Table 22).

For next year, reporting departments forecast a 3% growth in tenure-track faculty. Last year's forecast was for a 2% growth. U.S. CS departments also forecast a 3% growth for next year, and their actual growth this year was very close to the estimates they made last year.

There was a 9% increase in the overall number of faculty losses this year, due to an increased number of retirements (73 vs 53 last year). As the baby-boomer retirement years commence, it will be interesting to see if this is the beginning of a trend toward higher retirement rates or simply a one-time spike (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 U.S. CS data indicate that the higher the ranking, the more external funding is received by the department (both in total and per capita).

This year mean total expenditures rose among U.S. CS departments by over 8%, with increases in all strata except those departments ranked 25-36. Median total expenditures also rose

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

	Actual	Projected			
	2009-2010	2010-2011	2011-2012	Expected Two-Year Growth	
US CS 1-12	808	829	846	38	4.7%
US CS 13-24	680	717	741	61	9.0%
US CS 25-36	629	664	690	61	9.7%
US CS Other	3,054	3,203	3,347	293	9.6%
US CS Total	**5,171**	**5,413**	**5,624**	**453**	**8.8%**
US CE	268	291	306	38	14.2%
US Information	366	385	402	36	9.8%
Canadian	861	886	901	40	4.6%
Total	**6,666**	**6,975**	**7,233**	**567**	**8.5%**

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

	Actual		Projected					
	2009-2010		2010-2011		2011-2012		Expect 2-Yr Growth	
US CS 1-12	Total	Average	Total	Average	Total	Average	#	%
TenureTrack	494	44.9	507	46.1	514	46.7	20	4.0%
Teaching	69	6.3	67	6.1	67	6.1	-2	-2.9%
Research	64	5.8	66	6.0	68	6.2	4	6.3%
Postdoc	142	12.9	150	13.6	158	14.4	16	11.3%
Other	38	3.5	38	3.5	38	3.5	0	0.0%
US CS 13-24								
TenureTrack	399	33.3	420	35.0	432	36.0	33	8.3%
Teaching	42	3.5	44	3.7	45	3.8	3	7.1%
Research	107	8.9	120	10.0	123	10.3	16	15.0%
Postdoc	132	11.0	134	11.2	142	11.8	10	7.6%
Other	0	0.0	0	0.0	0	0.0	0	
US CS 25-36								
TenureTrack	425	35.4	442	36.8	455	37.9	30	7.1%
Teaching	64	5.3	68	5.7	72	6.0	8	12.5%
Research	50	4.2	57	4.8	61	5.1	11	22.0%
Postdoc	56	4.7	62	5.2	68	5.7	12	21.4%
Other	34	2.8	34	2.8	34	2.8	0	0.0%
US CS Other								
TenureTrack	2,358	20.5	2,421	21.1	2,483	21.6	125	5.3%
Teaching	322	2.8	330	2.9	341	3.0	19	5.9%
Research	157	1.4	195	1.7	225	2.0	68	43.3%
Postdoc	190	1.7	228	2.0	258	2.2	68	35.8%
Other	26	0.2	28	0.2	39	0.3	13	50.0%

in each U.S. CS stratum except for departments ranked 25-36. Significant increases in both mean and median expenditures were observed for CE and I departments. For Canadian departments, there was a significantly increased mean but a decreased median, clearly reflecting the particular departments that reported this year versus last year.

Per-capita expenditure results based on the first capitation method generally reflect the total expenditure results, although an anomalous value in I departments last year caused the mean per faculty member to drop this year while the mean total expenditures increased. Results using the second capitation method mirror those using the first method, except that median expenditures dropped for U.S. CS departments ranked 1-12 and mean expenditures were flat for this stratum, and mean expenditures dropped for departments ranked 13-24.

Table 25 shows the number of graduate students supported as full-time students as of fall 2010, further categorized as teaching assistants (TAs), research assistants (RAs), fellows, or computer systems supporters, and also shows the split between those on institutional vs. external funds. The number of TAs in CS departments increased more than 12% this year. Support for RAs and fellows shifted considerably this year in some strata. In departments ranked 1-12, there were many fewer reported RAs in total this year compared with last year, and more of the RAs were on institutional funds. While there were more externally supported fellows this year in departments ranked 1-12, there were fewer total fellows. In departments ranked 13-24, there were many more RAs this year in both externally supported and institutionally supported categories, but fewer fellows in each of these two categories. Departments ranked 25-36 also had more RAs and fewer fellows in both categories, while departments ranked greater than 36 had more externally supported and fewer institutionally supported RAs and fellows this year.

Median stipends for TAs and RAs rose this year, except in U.S. CS departments ranked greater than 36, where they were flat (Table 26). U.S. Information departments also showed very small changes, though there are many fewer departments reporting in this category. Entries in this table show the net amount (as of fall 2010) of an academic-year stipend for a first-year doctoral student (not including tuition or fees). Canadian stipends are shown in Canadian dollars.

Faculty Salaries *(Tables 27-35)*

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, 2011. For U.S.

Table 18b. Vacant Positions 2009-2010 by Position and Department Rank and Type

	Vacant Positions 2009-2010			
	Tried to fill	Filled	Unfilled	% Unfilled
US CS 1-12				
TenureTrack	15	12	6	40.0%
Research	4	4	0	0.0%
Postdoc	20	20	0	0.0%
Teaching	49	48	1	2.0%
US CS 13-24				
TenureTrack	18	15	4	22.2%
Research	2	2	0	0.0%
Postdoc	15	15	0	0.0%
Teaching	46	45	1	2.2%
US CS 25-36				
TenureTrack	22	12	6	27.3%
Research	14	12	2	14.3%
Postdoc	27	20	7	25.9%
Teaching	21	19	2	9.5%
US CS Other				
TenureTrack	117	80	34	29.1%
Research	38	36	2	5.3%
Postdoc	55	51	3	5.5%
Teaching	62	59	5	8.1%
US CS Total				
TenureTrack	172	119	50	29.1%
Research	58	54	4	6.9%
Postdoc	117	106	10	8.5%
Teaching	178	171	9	5.1%
US CE				
TenureTrack	7	4	2	28.6%
Research	22	22	0	0.0%
Postdoc	15	15	0	0.0%
Teaching	11	10	3	27.3%
US Information				
TenureTrack	17	13	4	23.5%
Research	2	2	0	0.0%
Postdoc	15	13	2	13.3%
Teaching	17	17	0	0.0%
Canadian				
TenureTrack	15	8	7	46.7%
Research	4	4	2	50.0%
Postdoc	7	5	2	28.6%
Teaching	24	24	10	41.7%
Total				
TenureTrack	211	144	63	29.9%
Research	86	82	6	7.0%
Postdoc	154	139	14	9.1%
Teaching	230	222	22	9.6%

Table 19. Gender of Newly Hired Faculty

	Tenure-track		Researcher		Postdoc		Teaching Faculty		Total	
Male	182	73.1%	58	79.5%	152	77.9%	45	68.2%	437	75.0%
Female	66	26.5%	15	20.5%	38	19.5%	21	31.8%	140	24.0%
Unknown	1		0		5		0		6	
Total	**249**		**73**		**195**		**66**		**583**	

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Table 20. Ethnicity of Newly Hired Faculty

	Tenure-Track		Researcher		Postdoc		Teaching Faculty		Total
Nonresident Alien	30	16.7%	26	36.6%	61	32.3%	5	8.2%	122
American Indian or Alaska Native	1	0.6%	1	1.4%	2	1.1%	0	0.0%	4
Asian	36	20.0%	4	5.6%	39	20.6%	12	19.7%	91
Black or African-American	5	2.8%	1	1.4%	4	2.1%	2	3.3%	12
Native Hawaiian or Pacific Islander	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0
White	88	48.9%	34	47.9%	74	39.2%	40	65.6%	236
Multiracial, not Hispanic	2	1.1%	0	0.0%	0	0.0%	0	0.0%	2
Resident Hispanic, any race	8	4.4%	1	1.4%	2	1.1%	1	1.6%	12
Resident, race/ethnicity unknown	10	5.6%	4	5.6%	7	3.7%	1	1.6%	22
Total have Residency Data for	**180**		**71**		**189**		**61**		**501**
Residency Unknown	69		2		6		5		82
Total	**249**		**73**		**195**		**66**		**583**

Table 21. Gender of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Male	1,927	87.4%	1,409	84.1%	660	74.2%	519	72.2%	396	81.0%	572	84.2%	5,483	82.4%
Female	277	12.6%	266	15.9%	230	25.8%	200	27.8%	93	19.0%	107	15.8%	1,173	17.6%
Total gender known	**2,204**		**1,675**		**890**		**719**		**489**		**679**		**6,656**	
Gender unknown	0		2		2		2		3		2		11	
Total	**2,204**		**1,677**		**892**		**721**		**492**		**681**		**6,667**	

Table 22. Ethnicity of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Nonresident Alien	5	0.3%	37	2.5%	116	14.2%	12	1.8%	67	14.8%	188	32.3%	**425**	7.2%
American Indian or Alaska Native	2	0.1%	3	0.2%	1	0.1%	1	0.2%	3	0.7%	2	0.3%	**12**	0.2%
Asian	428	21.7%	386	26.4%	240	29.3%	61	9.4%	86	19.0%	132	22.7%	**1,333**	22.4%
Black or African-American	11	0.6%	17	1.2%	24	2.9%	17	2.6%	2	0.4%	6	1.0%	**77**	1.3%
Native Hawaiian or Pacific Islander	10	0.5%	6	0.4%	0	0.0%	1	0.2%	1	0.2%	4	0.7%	**22**	0.4%
White	1,476	74.7%	974	66.6%	412	50.3%	543	83.3%	278	61.4%	240	41.2%	**3,923**	66.0%
Multiracial, not Hispanic	12	0.6%	3	0.2%	3	0.4%	2	0.3%	5	1.1%	1	0.2%	**26**	0.4%
Resident Hispanic, any race	32	1.6%	36	2.5%	23	2.8%	15	2.3%	11	2.4%	9	1.5%	**126**	2.1%
Total have Residency Data for	**1,976**		**1,462**		**819**		**652**		**453**		**582**		**5,944**	
Resident, race/ethnicity unknown	65		73		34		20		15		53		**260**	
Residency Unknown	163		142		39		49		24		46		**463**	
Total	**2,204**		**1,677**		**892**		**721**		**492**		**681**		**6,667**	

Table 23. Faculty Losses

	Total
Died	11
Retired	73
Took Academic Position Elsewhere	46
Took Nonacademic Position	27
Remained, but Changed to Part-Time	12
Other	30
Unknown	9
Total	**208**

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

	Total Expenditure			
Department, Rank	**Minimum**	**Mean**	**Median**	**Maximum**
US CS 1-12	$3,898,400	$24,237,101	$16,925,276	$81,308,897
US CS 13-24	$4,497,242	$11,159,539	$11,551,077	$20,286,667
US CS 25-36	$758,708	$6,900,565	$5,570,869	$23,500,983
US CS Other	$3,858	$3,719,261	$2,306,925	$55,389,000
US CE	$146,047	$5,453,512	$4,476,107	$13,178,370
US Info	$221,605	$3,508,394	$3,042,284	$10,758,084
Canadian	$103,281	$6,166,551	$2,202,252	$48,545,725

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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
US CS 1-12	$203,939	$457,435	$389,078	$948,276	$97,217	$340,712	$256,383	$948,276
US CS 13-24	$174,947	$327,100	$325,015	$522,073	$123,313	$217,967	$235,015	$322,011
US CS 25-36	$47,419	$193,016	$173,251	$337,836	$37,935	$150,711	$146,620	$246,529
US CS Other	$168	$161,058	$122,172	$2,130,346	$138	$135,364	$107,937	$1,318,786
US CE	$18,256	$365,936	$251,310	$878,558	$18,256	$269,127	$212,084	$732,132
US Info	$16,415	$259,061	$139,447	$1,054,714	$16,415	$174,923	$113,699	$614,972
Canadian	$3,130	$161,630	$88,465	$1,055,342	$3,130	$116,734	$75,012	$693,510

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

Department, Rank	Number on Institutional Funds										Number on External Funds									
	Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other		Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other	
US CS 1-12	662	29.6%	389	17.4%	142	6.4%	13	0.6%	9	0.4%	0	0.0%	788	35.3%	217	9.7%	0	0.0%	15	0.7%
US CS 13-24	341	18.9%	310	17.2%	96	5.3%	0	0.0%	0	0.0%	24	1.3%	940	52.2%	70	3.9%	0	0.0%	20	1.1%
US CS 25-36	336	24.1%	127	9.1%	51	3.7%	3	0.2%	0	0.0%	28	2.0%	781	56.1%	66	4.7%	0	0.0%	1	0.1%
US CS Other	1,725	32.5%	492	9.3%	197	3.7%	64	1.2%	96	1.8%	24	0.5%	2,536	47.7%	172	3.2%	1	0.0%	8	0.2%
US CS Total	**3,064**	**28.5%**	**1,318**	**12.3%**	**486**	**4.5%**	**80**	**0.7%**	**105**	**1.0%**	**76**	**0.7%**	**5,045**	**47.0%**	**525**	**4.9%**	**1**	**0.0%**	**44**	**0.4%**
US CE	103	22.1%	27	5.8%	47	10.1%	5	1.1%	0	0.0%	0	0.0%	265	56.9%	8	1.7%	0	0.0%	11	2.4%
US Information	86	20.7%	78	18.8%	35	8.4%	13	3.1%	10	2.4%	0	0.0%	174	41.9%	18	4.3%	0	0.0%	1	0.2%
Canadian	467	32.5%	240	16.7%	202	14.1%	0	0.0%	115	8.0%	1	0.1%	259	18.0%	135	9.4%	0	0.0%	17	1.2%
Total	**3,720**	**28.5%**	**1,663**	**12.7%**	**770**	**5.9%**	**98**	**0.8%**	**230**	**1.8%**	**77**	**0.6%**	**5,743**	**44.0%**	**686**	**5.3%**	**1**	**0.0%**	**73**	**0.6%**

Table 26-1. Fall 2010 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Teaching Assistantships				Research Assistantships			
	Minimum	Mean	Median	Maximum	Minimum	Mean	Median	Maximum
US CS 1-12	11,400	19,448	19,845	30,000	17,475	21,924	21,700	30,000
US CS 13-24	3,697	19,590	20,050	29,000	4,205	21,129	21,780	29,000
US CS 25-36	7,573	17,542	17,308	24,312	8,000	17,643	17,308	24,312
US CS Other	800	15,023	15,000	33,820	500	16,294	16,200	33,820
US CE	8,800	15,228	16,600	19,250	8,800	17,328	17,426	28,200
US Information	8,955	16,556	16,600	25,000	11,190	19,427	18,450	38,000
Canadian	3,000	10,891	11,200	25,000	6,000	17,450	18,000	30,000

Table 26-2. Fall 2010 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Full-Support Fellows				Assistantships for Computer Systems Support			
	Minimum	Mean	Median	Maximum	Minimum	Mean	Median	Maximum
US CS 1-12	19,600	24,021	23,700	30,000	*	*	*	*
US CS 13-24	17,270	25,956	26,995	36,000	*	*	*	*
US CS 25-36	11,250	21,306	20,250	30,000	7,573	16,295	17,000	24,312
US CS Other	8,395	21,913	19,150	75,000	1,433	13,022	14,925	25,550
US CE	18,000	23,450	23,750	28,200	*	*	*	*
US Information	15,000	22,819	19,250	51,000	12,670	15,848	16,135	18,450
Canadian	14,684	19,716	20,000	23,645	*	*	*	*

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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 2010. This year, 85% of those reporting salary data provided salaries at the individual level.

We also report salary data based on time in rank, for meaningful comparison of individual or departmental faculty salaries with national averages. We report associate professor salaries for time in rank of 7 years or less, and of more than 7 years. For full professors, we report time in rank of 7 years or less, 8 to 15 years, and more than 15 years.

The minimum and maximum of the reported salary minima (and maxima) are self-explanatory. The 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 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 0.3% and 0.7%, depending on tenure-track rank, and 0.2% for non-tenure-track teaching faculty. Even more strikingly than last year, the U.S. CS data reflect the low or nonexistent salary increases offered at many institutions due to economic realities, coupled with the effects of retirements and resignations of persons with relatively high salaries in their rank and the hirings and promotions of persons new to their rank.

Canadian salaries (Table 33) rose 1.9% to 3.1% among tenure-track ranks, with the largest increase at the associate professor rank and the smallest at the assistant professor rank. Non-tenure-track teaching faculty salaries for Canadian departments rose 10.6%. While these increases are much better than the U.S. CS increases, they are lower than the corresponding Canadian increases last year. Because of the sample sizes, Canadian values are affected more strongly than are U.S. values by the particular set of schools that responded to this year's survey compared to those who responded last year.

Average salaries for new Ph.D.s (those who received their Ph.D. last year and then joined departments as tenure-track faculty) in U.S. departments decreased 1.7% from those reported in last year's survey (Table 35). In each of the previous

Table 26-3. Fall 2010 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Other Assistantships			
	Minimum	Mean	Median	Maximum
US CS 1-12	22,473	24,241	23,250	27,000
US CS 13-24	*	*	*	*
US CS 25-36	*	*	*	*
US CS Other	1,577	14,100	12,000	30,000
US CE	*	*	*	*
US Information	*	*	*	*
Canadian	*	*	*	*

Table 27. Nine-month Salaries, 150 Responses of 184 US CS Computer Science Departments

Faculty Rank Tenured & Tenure-Track	# 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 +	527	$84,681	$120,059	$186,200	$143,533	$140,876	$94,749	$174,278	$298,327
Full, in rank 8-15 years	535	$86,279	$123,121	$215,079	$140,267	$138,010	$90,331	$163,126	$244,200
Full, in rank 0-7 years	556	$83,376	$115,317	$219,734	$129,198	$126,873	$83,376	$150,436	$313,660
Full, yrs in rank not given	90	$92,716	$117,594	$147,993	$142,606	$141,065	$110,390	$176,979	$327,043
Full Professor: total	1,708	$83,376			$137,795				$327,043
Assoc, in rank 8 years +	314	$51,150	$92,419	$126,600	$99,816	$99,968	$60,618	$107,942	$213,187
Assoc, in rank 0-7 years	834	$72,079	$97,011	$145,135	$104,128	$103,096	$84,840	$112,831	$187,418
Assoc, yrs in rank not given	86	$74,387	$93,334	$110,840	$100,600	$100,482	$78,623	$107,807	$135,305
Assoc Professor: total	1,234	$51,150			$102,785				$213,187
Assistant Professor	704	$61,538	$86,079	$105,700	$89,754	$89,558	$75,000	$94,053	$125,360
Non-Tenure-Track									
Teaching Faculty	483	$26,000	$61,507	$120,451	$69,540	$68,791	$36,000	$81,712	$180,500
Research Faculty	368	$24,115	$68,360	$114,444	$81,308	$81,140	$24,115	$103,218	$280,089
Postdoctorates	474	$20,000	$41,174	$75,000	$49,646	$49,173	$28,500	$60,193	$112,588

Table 28. Nine-month Salaries, 11 Responses of 12 US Computer Science Departments Ranked 1-12

Faculty Rank Tenured & Tenure-Track	# 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 +	109	$104,922	$127,152	$186,200	$169,048	$167,638	$168,652	$231,731	$298,327
Full, in rank 8-15 years	91	$103,548	$129,299	$179,061	$152,521	$148,510	$124,704	$193,547	$227,300
Full, in rank 0-7 years	82	$97,025	$119,422	$154,200	$138,851	$134,878	$134,655	$177,319	$250,500
Full, yrs in rank not given	4	*	*	*	$165,603	*	*	*	*
Full Professor: total	286	$97,025			$155,083				$298,327
Assoc, in rank 8 years +	10	$83,420	$99,446	$118,856	$104,386	$103,225	$83,420	$110,983	$144,100
Assoc, in rank 0-7 years	111	$85,685	$103,144	$127,400	$115,212	$114,986	$115,490	$131,627	$160,000
Assoc, yrs in rank not given	1	*	*	*	*	*	*	*	*
Assoc Professor: total	122	$83,420			$114,317				$144,100
Assistant Professor	82	$76,014	$90,308	$105,700	$96,194	$96,121	$94,698	$101,051	$115,000
Non-Tenure-Track									
Teaching Faculty	54	$50,273	$72,059	$116,000	$86,335	$84,700	$71,236	$105,109	$127,100
Research Faculty	49	$68,096	$81,291	$98,160	$108,606	$106,604	$98,505	$147,078	$232,300
Postdoctorates	135	$20,000	$40,228	$60,000	$56,917	$57,108	$56,250	$69,531	$80,000

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two years, salaries for new Ph.D.s. increased between 1.0% and 1.5%. There are about 70% as many new Ph.D. salaries reported this year compared with last year. Again this year, there were too few new Ph.D. salaries in Canadian departments to make meaningful comparisons.

Concluding Observations

Despite difficult economic times, academic computing programs seem to have held their own in 2009-10. Undergraduate enrollments increased, and graduate enrollments held steady. Though a smaller fraction of doctoral graduates took tenure-track positions available at North American Ph.D.-granting departments and positions in industry, post-doctoral positions utilizing the graduates' doctoral computing expertise were available to them. It will be interesting to see the impact on the future faculty job market of this increased number of persons with post-doctoral research experience. It also will be interesting to see if the use of post-doctoral research positions continues near its present level once economic conditions improve.

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://archive.cra.org/statistics/nrcstudy2/home.html].

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 with the exception of the California Institute of Technology.*

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, Boston University, Brandeis, 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, George Washington, 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 Mexico Institute of Mining and Technology, New Mexico State, North Carolina State, North Dakota State, Northeastern, Northwestern, Oakland, Ohio, Ohio State, Old Dominion, Oregon State, Pace, Pennsylvania State, Polytechnic, Portland State, Rensselaer Polytechnic, Rochester Institute of Technology, Southern Illinois University (Carbondale), 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, Western Michigan, Worcester Polytechnic,* and *Wright State.*

University of: *Alabama (Birmingham, Huntsville, and Tuscaloosa), Albany, Arkansas (Fayetteville), Buffalo, California (at Davis, Riverside, Santa Barbara, and Santa Cruz), Central Florida, Cincinnati, Colorado (Boulder and Colorado Springs), Connecticut, Delaware, Florida, Georgia, Idaho, Illinois*

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

Faculty Rank Tenured & Tenure-Track	# 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 +	71	$98,400	$128,098	$149,523	$167,582	$163,892	$178,000	$212,407	$270,583
Full, in rank 8-15 years	84	$98,400	$125,972	$164,024	$156,261	$153,921	$162,400	$191,782	$244,200
Full, in rank 0-7 years	63	$102,600	$123,976	$140,300	$147,954	$146,409	$144,450	$182,284	$245,000
Full, yrs in rank not given	14	*	*	*	$169,476	*	*	*	*
Full Professor	232	$98,400			$158,267				$270,583
Assoc, in rank 8 years +	17	$74,473	$104,415	$126,600	$110,715	$111,175	$89,000	$116,575	$142,244
Assoc, in rank 0-7 years	75	$95,600	$106,798	$137,700	$112,775	$110,288	$101,968	$122,602	$150,728
Assoc, yrs in rank not given	5	*	*	*	*	*	*	*	*
Assoc Professor: total	97	$74,473			$112,394				$150,728
Assistant Professor	64	$86,250	$92,478	$96,900	$95,752	$95,272	$94,000	$100,241	$110,625
Non-Tenure-Track									
Teaching Faculty	37	$49,920	$75,291	$102,250	$86,505	$84,857	$49,920	$104,132	$164,404
Research Faculty	102	$27,000	$83,995	$114,444	$104,967	$102,476	$51,587	$138,125	$280,089
Postdoctorates	109	$22,500	$42,973	$55,000	$54,815	$53,611	$56,700	$70,866	$85,500

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

Faculty Rank Tenured & Tenure-Track	# 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 +	64	$98,534	$117,249	$135,587	$146,131	$138,410	$124,419	$192,080	$233,209
Full, in rank 8-15 years	69	$104,000	$120,299	$141,282	$146,833	$143,218	$119,838	$186,222	$236,325
Full, in rank 0-7 years	93	$96,500	$114,282	$128,757	$139,402	$132,964	$107,000	$190,878	$313,660
Full, yrs in rank not given	0	*	*	*	*	*	*	*	*
Full Professor	226	$96,500			$143,576				$313,660
Assoc, in rank 8 years +	29	$72,484	$92,746	$125,463	$96,762	$96,729	$89,100	$105,018	$125,200
Assoc, in rank 0-7 years	88	$85,527	$99,546	$115,350	$107,172	$106,129	$97,000	$116,442	$144,887
Assoc, yrs in rank not given	0	*	*	*	*	*	*	*	*
Assoc Professor: total	117	$72,484			$104,592				$125,200
Assistant Professor	85	$77,822	$88,045	$96,350	$92,609	$92,305	$86,600	$97,633	$120,000
Non-Tenure-Track									
Teaching Faculty	57	$43,260	$60,736	$90,508	$78,127	$75,475	$62,475	$103,289	$158,628
Research Faculty	74	$33,996	$66,514	$106,000	$81,110	$80,271	$50,000	$102,754	$175,000
Postdoctorates	60	$31,099	$40,784	$60,000	$49,814	$50,142	$42,000	$60,492	$75,000

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

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(Chicago), Iowa, Kansas, Kentucky, Louisiana (Lafayette), Maine, Maryland (Baltimore Co.), Massachusetts (at Boston and Lowell), Minnesota, Mississippi, Missouri (at Columbia), Nebraska (Lincoln), Nevada (Las Vegas and Reno), New Hampshire, New Mexico, North Carolina (Charlotte), North Texas, Notre Dame, Oklahoma, Oregon, Pittsburgh, South Carolina, South Florida, Southern Mississippi, Tennessee (Knoxville), Texas (at Arlington, Dallas, El Paso, and San Antonio), Tulsa, Utah, and *Wyoming.*

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

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

Information departments participating in the survey include: *Cornell, Drexel, Indiana, Penn State, and Syracuse Universities, and the Universities of: California (Berkeley, Irvine, Los Angeles, and Santa Cruz), Illinois (Urbana-Champaign), Maryland (College Park and Baltimore County), Michigan, Pittsburgh, Texas (Austin),* and *Washington.*

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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 Deans group members, and participants in the iSchools Caucus (www.ischools.org) that 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 rate.

[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.

Table 31. Nine-month Salaries, 115 Responses of 148 US Computer Science Departments Ranked Higher than 36 or Unranked

Faculty Rank Tenured & Tenure-Track	# 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 +	283	$84,681	$118,563	$174,849	$136,959	$134,899	$94,749	$160,158	$247,431
Full, in rank 8-15 years	291	$88,279	$122,339	$215,079	$136,176	$134,286	$90,331	$153,551	$242,100
Full, in rank 0-7 years	318	$83,376	$113,849	$219,734	$124,378	$122,680	$83,376	$138,394	$271,887
Full, yrs in rank not given	72	$92,716	$112,940	$133,482	$136,534	$133,841	$110,390	$174,162	$327,043
Full Professor: total	964	$83,376			$132,541				$327,043
Assoc, in rank 8 years +	258	$51,150	$90,775	$125,340	$98,814	$99,048	$60,618	$107,233	$213,187
Assoc, in rank 0-7 years	560	$72,079	$94,980	$145,135	$101,714	$100,887	$84,840	$109,479	$187,418
Assoc, yrs in rank not given	80	$74,387	$90,528	$110,840	$98,142	$98,335	$78,623	$105,448	$128,789
Assoc Professor: total	898	$51,150			$100,563				$213,187
Assistant Professor	473	$61,538	$84,694	$101,290	$88,052	$87,888	$75,000	$92,204	$125,360
Non-Tenure-Track									
Teaching Faculty	335	$26,000	$59,331	$120,451	$65,343	$64,962	$36,000	$74,755	$180,500
Research Faculty	143	$24,115	$63,214	$113,922	$71,799	$72,427	$24,115	$88,776	$172,000
Postdoctorates	170	$20,250	$41,012	$75,000	$47,261	$46,611	$28,500	$56,205	$112,588

Table 32. Nine-month Salaries, 12 Responses of 31 US 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 +	30	$99,308	$125,664	$182,400	$139,825	$135,168	$99,308	$166,423	$248,035
Full, in rank 8-15 years	28	$90,900	$109,940	$135,323	$130,212	$125,372	$133,493	$160,588	$215,832
Full, in rank 0-7 years	23	$89,109	$108,666	$129,600	$115,395	$110,920	$101,200	$123,581	$165,600
Full, yrs in rank not given	10	$127,496	*	*	$169,171	$166,544	*	*	$240,402
Full Professor: total	91	$89,109			$133,917				$248,035
Assoc, in rank 8 years +	25	$57,800	$86,632	$102,600	$95,837	$96,410	$85,037	$101,434	$123,300
Assoc, in rank 0-7 years	40	$85,959	$94,386	$109,200	$98,454	$97,571	$87,004	$104,064	$126,200
Assoc, yrs in rank not given	10	$87,150	$97,093	$113,601	$99,135	$103,789	$93,177	$115,002	$157,100
Assoc Professor: total	75	$57,800			$97,672				$123,300
Assistant Professor	38	$79,761	$88,825	$83,776	$87,143	$87,529	$82,479	$90,296	$101,900
Non-Tenure-Track									
Teaching Faculty	19	$50,929	$86,504	$67,147	$75,186	$73,389	$51,953	$86,819	$142,612
Research Faculty	20	$30,720	$52,544	$81,000	$71,019	$68,463	$48,372	$95,855	$157,000
Postdoctorates	23	$20,004	$42,488	$75,000	$50,661	$50,505	$39,231	$57,756	$75,000

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Table 33. Twelve-month Salaries, 18 Responses of 30 Canadian Computer Science Departments (Canadian Dollars)

Faculty Rank Tenured & Tenure-Track	# 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 +	80	$123,993	$147,349	$188,220	$158,034	$157,025	$124,130	$169,613	$238,920
Full, in rank 8-15 years	88	$117,184	$136,005	$153,651	$149,656	$148,627	$134,148	$166,761	$209,539
Full, in rank 0-7 years	135	$104,907	$124,518	$151,067	$142,797	$140,717	$112,541	$168,014	$249,418
Full, yrs in rank not given	2	*	*	*	*	*	*	*	*
Full Professor: total	305	$104,907			$148,812				$249,418
Assoc, in rank 8 years +	65	$90,182	$115,959	$136,060	$122,447	$121,772	$105,928	$130,686	$168,507
Assoc, in rank 0-7 years	209	$91,322	$106,432	$134,385	$119,188	$119,379	$94,428	$130,843	$164,863
Assoc, yrs in rank not given	0	*	*	*	*	*	*	*	*
Assoc Professor: total	274	$45,524			$119,961				$160,194
Assistant Professor	71	$73,826	$130,655	$93,264	$101,467	$101,628	$88,896	$109,739	$147,471
Non-Tenure-Track									
Teaching Faculty	68	$48,543	$74,889	$99,590	$91,291	$90,670	$80,396	$106,947	$149,469
Research Faculty	14	$41,084	$46,634	$52,183	$69,280	$68,838	$87,125	$89,215	$91,305
Postdoctorates	74	$20,000	$33,229	$45,000	$45,661	$47,490	$50,000	$56,000	$62,000

Table 34. Nine-month Salaries, 16 Responses of 22 US 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 +	15	$81,000	$128,968	$250,000	$141,987	$144,362	$107,600	$152,632	$250,000
Full, in rank 8-15 years	27	$86,449	$116,993	$165,363	$133,547	$133,830	$86,449	$152,388	$238,200
Full, in rank 0-7 years	44	$45,984	$113,769	$146,700	$133,535	$131,443	$120,000	$163,504	$235,000
Full, yrs in rank not given	0	*	*	*	*	*	*	*	*
Full Professor: total	86	$45,984			$135,013				$235,000
Assoc, in rank 8 years +	41	$66,655	$85,120	$101,754	$103,782	$98,823	$73,200	$135,181	$252,117
Assoc, in rank 0-7 years	67	$70,700	$90,849	$103,914	$100,250	$99,886	$86,103	$109,686	$138,477
Assoc, yrs in rank not given	0	*	*	*	*	*	*	*	*
Assoc Professor: total	108	$66,655			$101,591				$252,117
Assistant Professor	96	$62,071	$77,821	$95,004	$84,413	$83,812	$76,000	$94,451	$151,100
Non-Tenure-Track									
Teaching Faculty	77	$33,000	$56,459	$70,000	$78,039	$71,405	$77,700	$107,359	$148,103
Research Faculty	37	$33,672	$75,435	$143,900	$85,603	$83,005	$48,460	$103,169	$143,900
Postdoctorates	14	$27,500	$45,790	$75,000	$51,214	$51,234	$45,000	$55,445	$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 35. Nine-month Salaries for New PhDs, Responding US CS, CE, and I Departments

Faculty Rank	Number of New PhDs	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Tenure-Track	70	$62,071	$85,511	$95,004	$85,817	$85,937	$70,000	$86,245	$97,524
Non-Tenure-Track									
Teaching Faculty	11	$50,000	$61,270	$82,000	$61,270	$61,270	$50,000	$61,270	$82,000
Research Faculty	26	$25,000	$60,258	$95,000	$60,539	$65,854	$25,000	$68,294	$95,000
Postdoctorates	130	$20,004	$47,523	$87,805	$51,710	$51,067	$20,004	$56,939	$87,805

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

Faculty Rank	Number of New PhDs	Reported Salary Minimum			Average of Dept. Mean Salaries	Average of Dept Median Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Tenure-Track	5	*	*	*	$85,564	*	*	*	*
Non-Tenure-Track									
Teaching Faculty	2	*	*	*	*	*	*	*	*
Research Faculty	0	*	*	*	*	*	*	*	*
Postdoctorates	14	$40,000	$46,250	$50,000	$50,758	$51,875	$50,000	$55,250	$61,000

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

Professional Opportunities

Georgia Southern University
Department of Computer Sciences
Assistant Professor

Tenure-track position in Computer Sciences at the Assistant Professor level to begin August 1, 2011. For the full text advertisement, including all qualifications, application instructions, and information about the department and faculty, see http://cit.georgiasouthern.edu/cs/.

Georgia is an Open Records state. Georgia Southern University is an AA/EO institution. Individuals who need reasonable accommodations under the ADA in order to participate in the search process should contact the Associate Provost.

Institute for Defense Analyses
Center for Communications Research, La Jolla, CA
Research Staff Member (Computer Scientist)

The Center for Communications Research (CCR) in La Jolla, California, is seeking a PhD-level computer scientist with a strong mathematical background to address problems in network security, cryptography, and high-performance computing.

CCR's researchers work on difficult scientific problems vital to the nation's security, often engaging multidisciplinary teams with backgrounds across a broad range of computing, mathematical, and statistical sciences. The collaborative atmosphere and fascinating problems provide for a vibrant research culture and a rich sense of intellectual inquiry.

Candidates should have experience communicating with researchers in different areas, as well as a strong programming background and expertise in at least one of the following areas: algorithms, network systems, architecture, software engineering, and high-performance computing.

IDA/CCR offers a competitive salary, an excellent benefits package, and a superior professional working environment. US citizenship and a high-level security clearance are required for employment; CCR will sponsor the clearance for those selected. The Institute for Defense Analyses is proud to be an Equal Opportunity Employer.

Please send inquiries or applications to: rsmjobs@ccrwest.org

Missouri University of Science and Technology
Computer Science Department
Assistant Professor

The Computer Science Department at the Missouri University of Science and Technology is seeking outstanding applicants for a tenure-track faculty position. Missouri S&T is the primary science and engineering campus for the University of Missouri system.

Detailed information is available at: http://hraadi.mst.edu/hr/employment/compsci.html

NEC Laboratories America
Research Staff Members – Computing Systems Architecture

NEC Laboratories America, a premier research facility of NEC Corporation, has multiple openings in the Computing Systems Architecture Department located in Princeton, NJ. The department's mission is to innovate, design, evaluate and deliver parallel systems for high-performance, energy-efficient enterprise computing. We invite applications from exceptional candidates (senior-level or junior-level) for research staff (RSM) and associate research staff (ARSM) positions.

Candidates for the RSM position must have a PhD in CS, CE, or EE, strong research record and excellent credentials in the international research community. Applicants must be able to propose and execute innovative research projects, including prototyping effort that leads to demonstration in an industry environment. Applicants must demonstrate competency in one or more parallel computing research areas like heterogeneous cluster architectures, parallel programming models and runtimes, and key technologies to accelerate performance and lower power consumption of enterprise applications on heterogeneous clusters. Candidates for the ARSM position must have at least a MS in CS, CE, or EE, with a strong motivation and skill set to prototype/transfer innovative research results into industry practice. Expertise in one or more of the above parallel computing areas is desirable. Strong interest and aptitude for research is necessary.

For consideration, please access our career center at http://www.nec-labs.com and submit your resume/CV and research statement.

EOE/AA/MFDV

Oregon State University
Postdoctoral Positions in Machine Learning and Computational *Sustainability*

We seek two postdocs to join our Machine Learning group. One postdoc will work on ML problems that arise in ecological science and ecosystem management. These include (a) methods for fitting large semi-parametric latent variable graphical models to understand the species distribution, migration, and invasion and (b) methods for solving very large spatiotemporal MDPs for ecosystem management. The second postdoc will work on anomaly detection problems that arise in data cleaning, computer vision, and activity recognition. Start dates: 4/11-1/12.

Applicants must expected to complete a Ph.D. in computer science or related areas before starting the position. Interested candidates should send a CV, statement of research accomplishments and career goals, and the names and email addresses of three references to Tom Dietterich (tgd@cs.orst.edu). Initial closing date for applications is March 21, 2011, but additional applications will be accepted until the positions are filled.

The Machine Learning group at Oregon State conducts research on all aspects of machine learning and consists of Tom Dietterich, Alan Fern, Xiaoli Fern, Prasad Tadepalli, Sinisa Todorovic, Kagan Tumer, and Weng-Keen Wong.

OSU is an affirmative action/equal opportunity employer.

Palo Alto Research Center (PARC)
Research Scientist Machine Learning and Data Mining

Palo Alto Research Center (PARC) is working on anomaly detection from social and information network data. The candidate is desired to be familiar with state-of-the-art machine learning and data mining technologies, including graph mining, graph structure analysis, statistical relational learning, anomaly detection, large scale statistical inference, and related fields. Experience with information network or social network analytics is a plus. Experience with large scale data analytics platforms such as Hadoop is a plus. Both recent Ph.D. graduates and well-established scientists are encouraged to apply.

Apply at: www.parc.com/job/175

Saarland University, Germany
Computer Science Department; Center for IT Security, Privacy and Accountability
Assistant Professor/Juniorprofessur W1

Saarland University, Germany, is seeking to establish within the department of mathematics and computer science several tenure-track faculty positions (assistant professor / Juniorprofessur, W1) offered for a three-year term, with a possible extension of another three years, dependable on a teaching evaluation and an external evaluation of the research activities. Every position will receive additional complementary funding by the IT-security center CISPA, to cover research personnel and other costs. We maintain an open, international and diverse work environment and seek applications from outstanding researchers regardless of national origin or citizenship.

We explicitly solicit applications from female candidates as part of the department's general effort to strengthen the role of female researchers in computer science.

The positions are part of the recently established IT-security center "CISPA–Center for IT-Security, Privacy, and Accountability". CISPA was established as part of the German initiative to create three distinguished centers of outstanding research in IT-security. CISPA covers the whole range of research problems in IT-security, privacy, and accountability, from fundamental research questions to the development of new technologies and prototypic systems for practical application. CISPA moreover seeks to shorten the path from research to practical applications through a network of collaborations including the German research Center for Artificial Intelligence (DFKI).

Applications are invited for positions in all areas related to IT-security, privacy, and accountability. These areas include, but are not limited to:

design and formal verification of security protocols, programs, and architectures;

cryptography;

network and operating systems security;

web security;

privacy enhancing technologies in a broad sense, privacy in data acquisition, processing, and publishing;

reliability, accountability and trust;

security and privacy in decentralized systems;

as well cross-cutting disciplines such as usability and social aspects in this research field.

A doctoral degree in computer science or related areas and an outstanding research record are required. Successful candidates are expected to build a team and pursue a highly visible research agenda, both independently and in collaboration with other groups. Moreover, active participation in teaching is required. The working and teaching language is English.

Saarland University is the home of one of the highest-ranked CS departments in Germany. In the department's immediate proximity are the Max Planck Institute for Informatics, the Max Planck Institute for Software Systems, the German Center for Artificial Intelligence (DFKI), the Excellence Cluster for Multimodal Computing and Interaction (MMCI), the Saarbruecken Graduate School of Computer Science, as well as the Intel Visual Computing Institute (IVCI). The close interactions and collaborations between these institutes, and their joint interest in IT-security research, enables CISPA to address research problems in IT-security in a comprehensive manner, from fundamental research questions to the development of prototypic systems for practical application.

Saarland University and CISPA are located in Saarbruecken, in the tri-border area of Germany, France and Luxembourg.

Professional Opportunities

Saarbruecken and the surrounding area offer a high standard of living, beautiful surroundings and easy access to major metropolitan areas in the center of Europe, as well as a stimulating, competitive and collaborative work environment.

Saarland University is an equal opportunity employer. In accordance with its policy of increasing the proportion of women in this type of employment, the University actively encourages applications from women. For candidates with equal qualification, preference will be given to people with physical disabilities.

The review of applications will begin on April 14, 2011 and applicants are encouraged to submit applications by that date. Candidates should submit their application (curriculum vitae, photograph, list of publications, short research plan, copies of degree certificates, copies of the three most important publications, list of five references) to:

Universität des Saarlandes
Prof. Dr. Michael Backes
Campus, E 1 1
D-66123 Saarbrücken, Germany

Please, also send your application as a single PDF file to balthasar@cs.uni-saarland.de

University of New Hampshire
Department of Computer Science
Lecturer Position

UNH invites applications for a full-time non-tenure track Lecturer position to begin August 22, 2011. Demonstrated interest in undergraduate teaching is essential. The candidate should be able to teach a variety of undergraduate computer science and information technology courses. We anticipate this position evolving to encompass many key facets of the undergraduate program, such as advising, curriculum development, or supervision of capstone experiences. A Ph.D. in computer science or a closely related discipline is required by the time of appointment. This is a benefits-eligible position. After a probationary year, the position will be under a renewable three-year contract.

The Department offers B.S., M.S., and Ph.D. degrees and currently has 17 faculty, 175 undergraduate majors, and 75 graduate students. UNH is a land-, sea-, and space-grant institution and serves as the flagship public research institution of New Hampshire. It is located in the vibrant seacoast area of the state, with easy access to the White Mountains and to Boston. The University actively promotes a dynamic learning environment in which qualified individuals of differing perspectives, life experiences, and cultural backgrounds pursue academic goals with mutual respect and shared inquiry.

Submit a cover letter, brief statement of teaching experience and interests, complete CV, and contact information for three individuals who will submit recommendation letters at academicjobsonline.org/ajo/cs

Evaluation of applications will commence March 23, 2011. Applications will be reviewed as they are received, until the position is filled. For more information about UNH and the Department see: http://www.cs.unh.edu/search.htm

UNH is an Equal Opportunity, Equal Access, and Affirmative Action institution and is a recent recipient of a National Science Foundation ADVANCE award to promote hiring and advancement of women in science and engineering. The University seeks excellence through diversity among its administrators, faculty, staff and students. The university prohibits discrimination on the basis of race, color, religion, sex, age, national origin, sexual orientation, gender identity or expression, disability, veteran status, or marital status. Application by members of all underrepresented groups is encouraged.

United States-Israel Educational Foundation
Fulbright Israel Post-Doctoral Fellowships for American Researchers in All Academic Disciplines

The United States-Israel Educational Foundation (USIEF), the Fulbright commission for Israel, offers 8 fellowships to American post-doctoral researchers in support of work to be carried out at Israeli universities during the course of the 2012/2013-2013/2014 academic years.

The US Post-Doctoral Fellowship Program is open to candidates in all academic disciplines.

Program grants total $40,000, $20,000 per academic year.

Program fellows must be accepted as post-doctoral researchers by Israeli host institutions, which agree to provide them with a standard post-doctoral grant, which they will receive in addition to their Fulbright Fellowship. Thus, the total financial support received by Program Fellows is likely to be in the range of at least $35,000-$40,000 per year.

Applications for 2012/2013-2013/2014 Fulbright Post-Doctoral Fellowships must be submitted to the Council for International Exchange of Scholars by August 1, 2011.

Further details on the program and on application procedures may be found at:

http://www.fulbright.org.il/index.php?id=1317;

http://catalog.cies.org/viewAward.aspx?n=2416;

http://www.cies.org/us_scholars/us_awards/Application.htm

Potential candidates should contact Ms. Judy Stavsky, Deputy Director, USIEF (jstavsky@fulbright.org.il; +972-3-517-2392) for guidance and assistance.

West Virginia University Institute of Technology
Computer Science Department
Assistant Professors (2 positions)

West Virginia University Institute of Technology (WVU Tech), a regional four-year campus and division of West Virginia University, located in Montgomery, WV, invites applications for Assistant Professors (2 positions) in Computer Science within the Computer Science Department in the Leonard C. Nelson College of Engineering and Sciences. Positions are 9-mo, full-time, tenure-track, and benefits eligible.

Qualifications: A Ph.D. in Computer Science

Responsibilities: Teaching Computer Science courses for baccalaureate program in Computer Science and other majors and pursuing scholarly activities.

Read the position announcement at http://compsci.wvutech.edu/jobs for more information and application procedure.

WVU Tech is an EEO/AA Employer.

University of Maryland, Baltimore County
Computer Science Lecturer

The Department of Computer Science and Electrical Engineering of the University of Maryland, Baltimore County (UMBC) invites applications for a non-tenure track Lecturer position to begin August 23, 2011. Candidates should be able to teach a variety of undergraduate computer science courses. A demonstrated ability to teach such courses and a strong interest in teaching undergraduates are essential. Applicants must have received an M.S. or Ph.D. in computer science, computer engineering, electrical engineering, or a related discipline before being appointed.

The Department offers B.S., M.S., and Ph.D. degrees and currently has 39 full time teaching faculty, 15 research faculty, 886 undergraduate majors, 310 graduate students, and over $6.4M per year in sponsored research expenditures. UMBC is located near the BWI Airport, and is close to many federal agencies and industry research laboratories. Submit a cover letter, brief statement of teaching experience and interests, and complete CV to search@cs.umbc.edu by March 15, 2011. Applicants should arrange for three letters of reference to be sent to the same address. Applications will be reviewed as they are received and will continue until the position is filled. For additional information about UMBC and the Department see http://www.cs.umbc.edu/.

UMBC is an affirmative action/equal opportunity employer and is a recent recipient of a National Science Foundation ADVANCE award to promote hiring and advancement of women in science and engineering. We welcome applications from women, minorities, and individuals with disabilities.

Professional Opportunities

Qatar Foundation seeks

Computer Scientists

Qatar Computing Research Institute, part of Qatar Foundation for Education, Science and Community Development is inviting applicants for research positions at the level of scientist, senior scientist, and principle scientist. The roles' responsibilities and minimum requirements are described below. Outstanding candidates in all areas of computer science will be considered with a focus on the following research areas:

- **Arabic Language Technologies, including NLP, IR, MT**
- **Internet Computing, including Cloud Computing and Social Networking**
- **Data Analytics, including Data Mining and Machine Learning**
- **Advanced Computer Hardware Design**
- **High Performance Computing**
- **Bioinformatics**

Candidates with multidisciplinary research interests are highly encouraged to apply.

1. Principal Scientist:

The Principal Scientist is a senior departmental leader within QCRI who is responsible for leading and conducting scientific research work of strategic importance to Qatar. The Principal Scientist will have the primary responsibility in defining the methodology for conducting research and for evaluating research results in order to ensure the highest standards of practice and research quality, aligning research activities with QCRI's mission and vision. The candidate must be a mature scientist with both theoretical and applied skills. A PhD in computer science from a top-tier institution and a strong record of major accomplishments and publications are required.

2. Senior Scientist/Scientist/Visiting Scientist:

Senior scientists, scientists, and visiting scientists are expected to contribute towards the research efforts of QCRI and to develop research expertise tackling the research challenges in the areas mentioned above. The scientist will work as part of a research team, collaborating with peer researchers and software engineers to develop solutions, necessary prototypes, and intellectual property in the form of disclosures and patent applications. A PhD in computer science from a top-tier institution and a strong record of major accomplishments and publications are required.

3. Senior Software Engineer/Software Engineer:

Senior Software Engineers and Software Engineers will lead and be actively involved with researchers in the analysis, design, development, and implementation of in-house-developed application systems. They will establish technical objectives, design and execute work-plans, and manage software development projects as appropriate. Minimum requirements are a Bachelor's degree in Computer Science, Computer Engineering, or a related field and a minimum of 6 years (senior software engineer) or 3 years (software engineer) of progressive and directly related experience.

The compensation will include attractive tax-free salary and additional benefits such as furnished accommodation, annual paid leave, medical insurance, etc. If interested and fulfill the criteria, kindly email your resume including the position applied for in the subject to **careers@qcri.org**. The closing date to receive applications is June 15, 2011. Please note that only qualified applicants will be notified.

The State of Qatar is an Arab state in Southwest Asia, occupying the small Qatar Peninsula on the eastern coast of the larger Arabian Peninsula. More than 100 nationalities live and work in harmony in the country of 1.5 million people.

Qatar Foundation is a private, chartered, nonprofit organization, founded in 1995 by His Highness Sheikh Hamad Bin Khalifa Al-Thani, Emir of Qatar. Guided by the principle that a nation's greatest resource is the potential of its people, Qatar Foundation aims to develop that potential through a network of centers devoted to progressive education, research and community welfare.

Qatar Computing Research Institute conducts world-class, applied computing research, creating knowledge and supporting innovation in select areas of computing science that will have long-term relevance and lasting value for Qatar. QCRI will use its expertise to implement Qatar's national computing research strategy, and will employ a unique, collaborative, and interdisciplinary approach with exceptional research and support staff equipped with outstanding tools and facilities shared between QCRI and other Qatari institutes.

For more information, please visit **www.qcri.org**