CRA National Study of IT Worker Shortage

By Louise Arnhim

It was nearly two centuries ago that Thomas Jefferson asked Meriwether Lewis and William Clark to chart an overland route to the Pacific Ocean. The famed “expedition” was based on Jefferson’s assumption that such a route could be charted and his shrewd calculation that a mercurial standing position would be greatly improved if it could.

With that same adventurous spirit, a Presidential Advisory Committee envisions expeditions and similar ventures into unchartered domains of information technology (IT). Their findings are outlined in the “Interim Report to the President: New Federal Research Initiatives: Creating an Effective Management Structure” (http://www.hpcc.gov). The report’s authors are the twenty-five members of the President’s Information Technology Advisor Committee (PITAC).

The report’s purpose is “to influence FY 2000 funding levels for federal R&D, its thrusts and the number of recruiters, by far, come from foreign workers. The largest numbers of H-1B workers, by far, come from India and China. The committee urges the U.S. government to increase the cap on foreign workers and to change the visa program to allow for more IT workers to enter the United States. It is clear that this reason is not the primary reason for the increase. This issue, for example, has pitted members of the IEEE Computer Society against the increase. CRA has been concerned about the misconceptions that have been expressed by some of the participants in this H-1B debate and repeated in the national press. One particularly common misunderstanding was that the worker deficit could be overcome if only the universities would produce the requisite number of computer science and engineering graduates. It is clear that this reasoning is faulty on at least two grounds. First, the ITA A and Department of Commerce reports give a broad definition of IT workers, which includes virtually anyone who works in an IT organization; but degree recipients in computer science and engineering are not typically the people who hold many of these jobs, such as help desk support or web designer. Second, these organizations have warned that this country is not investing enough in computer science and engineering research to maintain U.S. world leadership in information technology.”

Overall, the Committee calls for $1 billion for IT over the next five years. But aside from funding levels for a few select proposals, the report abstains from naming specific budget figures (the Committee does, however, endorse the President’s FY ’99 budget for IT R&D, as well as the 21st Century Research Fund). A Committee member has pointed out that the final report (expected early next year) will supply such numbers.

However, increasing dollar amounts is not PITAC’s only concern. The interim report also calls for fundamental changes in the modes and management of federal R&D. For example, much of the report talks about federal R&D machinery in need of realignment — from the current emphasis on applied research to a renewed appreciation for basic research; from sponsoring short-term single-investigator studies to investing in long-term, multiple investigator studies; and from the current concentration on hardware to an intensive effort to develop software.

To maintain this balance across the wide spectrum of federal agencies engaged in IT-related R&D, PITAC says a single agency is needed to keep watch. “The only current feasible candidate” for this role, PITAC concludes, is the NSF. Accordingly, new IT funding would then be divided almost equally between NSF and other agencies. Within NSF itself, more than half of new funding would be put towards the modes cited above (the remainder would be allocated to “traditional programs within CISE — expanded to appropriate scope for larger size and longer duration”). PITAC also recommends more IT representation on the National Science Board.

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CRA National Study of IT Worker Shortage

Many of CRA’s members are reporting anecdotal data that suggests there is a significant shortage of information technology workers in the United States. A academic department are experiencing tremendous increases in the number of recruiters on campus to hire their graduates, as well as increases in graduate students and faculty members being attracted away to industrial jobs. And yet our industrial members are reporting their difficulties in filling positions. To investigate this growing concern and suggest national solutions, CRA is undertaking a study of the alleged shortage of Information Technology (IT) workers in the United States. The National Science Foundation (NSF) is funding the effort.

The national policy debate over the IT worker shortage has an interesting history. Over the past two years, a trade association, Information Technology Association of America (ITA), produced two reports arguing that there is a serious shortage of information workers in the United States. The first study is Help Wanted: The IT Workforce Gap A Report of the ITA, Feb. 1997. Stuart Anderson, ITA. The second study is Help Wanted 1998: A Call for Collaborative Action for the New Millennium, Feb. 1998. ITA A and the Virginia Polytechnic Institute and State University (Virginia Tech). Concern that the United States might have a deficit of hundreds of thousands of IT workers, coupled with an apparent worsening of the problem, captured the attention of the U.S. Department of Commerce. It too released its own report with findings similar to the first ITA A report. The Commerce report was widely criticized by the U.S. General Accounting Office (GAO), which faulted the statistical methods used in gathering the data put forward by ITA A. The Commerce Department, and questioned the basic shortage reported by both.

Proposed legislation in the U.S. Congress proposes the cap on the number of H-1B visas is given out each year has attracted national policy attention to the worker shortage issue. H-1B visas are a kind of temporary visa used by a number of high-tech companies, among others, to employ foreign workers. The largest numbers of H-1B workers, by far, come from India. The ITA A and most of the computer industry have lined up in favor of increasing the cap, while the labor unions and others have lobbied against the increase. This issue, for example, has pitted members of the IEEE Computer Society, many of whom work in industry and can see the signs of the shortage, against the IEEE U.S. Advisory Board (the lobbying arm for the IEEE in Washington), which is trying to protect jobs for U.S. electrical engineers.

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Expanding the Pipeline

Committee on the Status of Women in Computing Research

By Joan Francioni

We have all heard about the relatively low percentage of women and minorities in computer science and engineering (CS&E) at all stages of the educational pipeline. A star as CRA is concerned, this is and has been an undesirable situation.

In 1991, CRA took direct action to try to overcome this by establishing the Committee on the Status of Women in Computing Research (CRA-W). This committee was charged with taking positive action to directly increase the number of women participating in computer science and engineering research and education at all levels. In addition to this mission, the committee also works to increase the degree of success and professional experience and to provide a forum for addressing problems that often fail disproportionally upon women's domain. It is hoped that the committee activities will have a positive impact on other underrepresented groups in CS&E. Moreover, there is a commitment to improving the working environment for computer scientists and engineers of both genders.

In this article, we present an overview of CRA-W’s activities. A no one interested in participating in any of the activities should contact the lead member of the project.

Further details about the projects can be found on the committee’s webpage: http://www.cra.org/activites/craw/. Activities for High School and Undergraduate Students

A “Women in Computer Science” careers book has been designed to motivate young women at the undergraduate and high school levels to consider a career in the field of computer science. The book contains biographies of eighteen successful women who have chosen interesting and rewarding computer-related careers. The biographies represent a variety of occupations, ethnic backgrounds, achievement levels, and geographic locations. They also include family and/or outside activities of the women, in addition to employment responsibili-
ties and interests. The book is available on the CRA-W website and students will hopefully be encouraged to pursue careers in the field of computer science.

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In the printing, funded by NSF, 15,000 booklets were distributed. A CM supported the printing of 35,000 additional copies, allowing the book to be distributed to each high school in the United States.

Activities Targeted to Undergraduate Students

The Distributed Mentor Project was one of the committee’s first large projects. The project matches female undergraduate students with female faculty mentors. Since 1991, the project has been increased by 20 to 28 students each summer to participate in this program with mentors all across the country. In addition to arranging the mentor-student matches, the committee works with the LEAD (Learning Evaluation, Adaptation, and Dissemination) Center at the University of Wisconsin, Madison to develop follow-up and ensure that the project has broad impact.

The Collaborative Research Experience for Women in Undergraduate Computer Science and Engineering (CREW) program is a new program. It is designed to provide research experiences for groups of two to three undergraduate women, who will each work together at the students’ home institutions. By increasing the opportunity to do research and by decreasing the isolation that may be experienced in doing independent research, women scientists and engineers will hopefully be encouraged to pursue similar work in graduate school. The students each receive a stipend of $1,000 and up to $500 per project may be used to obtain special equipment, travel, or supporting materials. At the end of the project, students will be required to submit a one-page summary of their work. These summaries will be posted on the CRA-W website and students will be encouraged to submit papers and present their work to other appropriate journals and conferences.

Activities for Ph.D. Graduate Students and Faculty

Since 1993, CRA-W has sponsored a series of workshops on Academic Careers for Women in Computer Science. Knowing that women are almost always a minority in their own departments (and frequently the only female in the department), the CRA-W workshops were designed to bring new faculty members to their new departments and provide them with a model not only for research, but also with a model of a successful female academic.

Support for these workshops also targeted Ph.D. graduate students in order to give them information for deciding whether to go into industry or academics upon graduation. Within the forum of the workshops, a group of established professionals provides practical information, advice, and support to their younger colleagues. Each of the workshops is associated with a major professional meeting, providing many attendees with the opportunity to interact with faculty and other women in their research areas. In an effort to serve as a resource for women who are not attending the workshops, the sessions have been transcribed and developed into summaries (see the CRA-W website). In addition, a more complete publication is currently being prepared.

Activities for Undergraduate and Graduate Students

The experience of attending a research conference has been found to be very motivating for young students. In addition to the excitement of the conference itself, the opportunity to interact with faculty (particularly female faculty who can act as role models) is important in the decision of women to pursue a research career.

The Conference Experiences for Women Project increases the number of female students who can have the opportunity by providing funding for undergraduate and graduate student attendance at research conferences. The Education, Outreach, and Training group of the Partnership for a Advanced Computational Infrastructure (EOT-PA CI) of the N S E F funded this project.

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Industrial and Faculty Salaries Compared in Two CRA Surveys

Data from two CRA surveys, the Salary Survey of Computer Science Researchers in Industry Laboratories, and the Taubee Survey, have been compiled in a graph that compares industrial and faculty starting salaries. Figure 1 plots the mean minimum, mean, and maximum summer salaries from the two surveys, both conducted in late fall 1997. The results indicate that, roughly speaking, the mean 12-month industrial salary is about 143 percent of the mean 9-month university salary.

CRA's Industry Committee, recognizing the need for a survey that explicitly addressed the issue of salaries paid to computer science researchers employed in industrial computer science laboratories, proposed that the industrial salary survey be initiated. In November 1997, CRA conducted the first survey with nine companies, representing 285 individuals, participating. CRA staff analyzed the results and, because of the proprietary nature of the information, the summary data were distributed in January 1998 only to the companies that participated in the survey.

The survey asked for minimum, average, and maximum starting salaries for computer science Ph.D.s in computer science research positions at the experience levels of 1 to 5, 6 to 10, 11 to 15, and 16 to 20 years over a 12-month period. The experience level is plotted in Figure 1 at the points 3, 8, 13, and 18 years. (The 12-month salaries include the estimated value of bonuses and stock plans as determined by each respondent.)

The industrial data were compared to the data reported from the annual CRA Taubee Survey. This survey covers the enrollment, production, and employment of Ph.D.'s in CS & CE, and salary and demographic data for faculty in CS & CE in North America. Preliminary salary data for faculty are published in Computing Research News in January, and the full results of the survey appear in the M Arch edition. These data are used not only by academic institutions, but also by federal agencies, the media, and the computing industry as well. Last year, 135 departments responded to the Taubee Survey.

The data used from the Taubee survey assigns experience levels of 3, 9, and 22 years to assistant, associate, and full professors, respectively. (Experience level 0 was not available in the Taubee Survey, which is why they needed to be assigned.) Figure 1 shows the 9-month salaries for the top 12 institutions (with the exception of the starting salary at the experience level point of 0, which were taken over from the Taubee Survey).

The 1998 CRNA Survey is currently under way; responses are due on November 13. The second CRA survey of industrial lab salaries will begin in early November, with results available in January 1999 to companies that participate.

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Policy News

Policy 01: Science Policy and the Communities

By Fred W. Weingarten

Introduction
My current role with CRA as Director of Public Policy is drawing to an end. This is a good opportunity to look back over eight years of representing computing research in this town, and assess the course of two or three articles in general where the field now stands in the science policy debate. In doing so, I’m not going to spend a lot of time in the past. Opportunity always lies in the other direction, toward the future, and I think that the computing research community will be faced with enormous opportunities over the next few years. In these articles, I’m going to briefly summarize past efforts.

In this piece, I’m going to describe briefly the nature and structure of the science policy debate; in January I’ll discuss the decision-making process and how to influence it. In a final piece in March, I’ll explore what the computing research community, itself, should consider doing, especially in light of recent developments, particularly the opportunities presented by the Interim Report of the President’s Information Technology Advisory Committee (PITAC) (see “PITAC’s Interim Report: Expeditions of an IT Kind,” page 1). Much is when the two-year political cycle starts; it’s also when the computing research community should start any campaign to improve the state of affairs of computing research funding and avoid the recommendation of the report.

Computing Research at the Table
At the Snowbird ski resort in Utah in the summer of 1988, computer science and computer engineering department chairs decided at their biennial meeting to reconstitute what was then known as the Computing Policy Committee (CPC) as a formal organization. The organization was to be called the Computing Research Association (CRA) and its offices would be located in Washington, D.C. The choice of a Washington address was deliberate. The principal purpose of this organizational change, as some explained later, was to give computing research “a seat at the table.” The Snowbird group felt that, for too long, decisions regarding the nature and evolution of their field were being made by people who were, at best, ignorant of its particular needs or, at worst, hostile to its interests.

Coming into existence only in the early 1960s, the fields of computer science and computer engineering are relatively junior to the traditional fields of research in the natural sciences, whose origins date back several centuries or even millennia. At the political priority levels of the preceding decades, computing researchers had seen federal research policy and funding priorities set predominantly by the needs of those from these older fields, most of whom were much too old to have been exposed to computing or computer science in their graduate training or research. It is commonly said that the heavy representation of physicists in post-war science policy circles was a reward for the important contributions they made during the war. My guess is that their willingness to engage in politics came about because they realized, first, that the well-being of basic research in physics and astronomy at least in part directly linked with federal government support— if for no other reason, because of the rapidly escalating price for experimental facilities. Second, some of these scientists, confronting the awful (and awesome) results of their work, felt that an enormous sense of social and political responsibility had been laid on their shoulders.

But now, computing and digital communications technologies that had their origins in that same war and that grew in the post-war environment, are assuming major social and economic significance. At that 1988 Snowbird meeting, attendees declared that computing research had come of age, and it was time for the field to assert a voice in the policy debate. CRA in its current form was created to carry out that mission.

Having Something to Say
A high priority has to do so! It’s not a thing to have a seat at the table. One simply buys a chair and hires someone to sit on it. That wasn’t the case. It is quite difficult to get authorization for something useful to say and to influence the debate. While I have rarely been accused of lacking something to say, and I did the best I could, it hasn’t been the field’s job to develop a coherent message that everyone could agree on. Looking back, I see a similar pattern to that shortly after I arrived at CRA, the field erupted in a fight over the R & C report, Computing the Future, a broader AAG for Computer Science and Engineering, 1992.

The specifics of that fight are not important, but it illustrated the difficulty computing research faced in getting its story told and, more importantly, in getting it commonly agreed upon within the community.

We are being asked with great urgency by people in the political community to participate in policy making. It is no longer necessary for us to convince political leaders that computing research is important to the nation; that is broadly accepted as a proposition in all the right places. But in politics, good will does not translate automatically into good policy, or even tangible support. Now, we have to answer a broad range of questions from policy makers and politicians. So the bottom line is: What should we do about it? And, of course, if computing researchers don’t provide a convincing answer, others are standing by, ready to do so for us.

A naveling that question is not easy. Science policy is a complex set of issues, and a fifty-year history of debate and many established precedents—customary ways of thinking—and the present system. It is not easy to say something new, even if we have a sense that the present system is not serving computing research as well as it might and that something new needs to be said.

So, the computing research community has two tasks to prepare itself to assert an effective voice on science policy: develop its message, and organize to deliver it. The organization I will leave for the next few articles in this series. Here, I want to concentrate on the structure of policy itself.

The Bottom Line of Science Policy
It is often said (even by me) that the bottom line of science policy is the dollar sign, since the principal focus is on government funding of research. But, in fact, the underlying structure of science policy is much more complex. Federal funds come by way of intricate, political decision-making—a careful dance among science agencies, the administration, the Congress, and the research community that is all too often understood as a process of deciding whether to spend federal money on R & D, even for fundamental research, comes with strings attached.

Some of those strings:
Purpose: Why we have a surplus or deficit in the federal budget. Many more hands are out there than there are funds available. If appropriations have to be justified and tied, in some way, to a public purpose, then philanthropy is not a particularly useful use of federal funds. Thankfully, on use of federal funds. Thankfully, this is the framework and that often takes place below the threshold of attention for the affected communities. But, the choices do have consequences, sometimes enormous. A gain, since decisions on process will be made one way or the other, shouldn’t the computing community be part of the debate?

Proscriptions (Strings): Finally, we need to keep in mind that political decisions are not always rational (those of you in shock may close your eyes while reading this paragraph). Even straightforward funding of basic research can often come attached with odd and often intrusive little strings. Funds will be earmarked for various purposes or restrictions will be placed on the expenditures or on use of federal funds. Thankfully, much of this stuff goes away, but a lot of time is spent on it each year by the Washington science policy community, and sometimes it just doesn’t go away.

So, science policy has these two interlocking and mutually dependent aspects:
- A general policy, which is to keep the federal science programs well-funded.
- A corollary of the corollary but critically important considerations raised above (each of which raises a far more complicated and richer set of questions than I have time to address here).

Next month, I’ll discuss the political environment in which these policy decisions are made. Who are the players and what games do they play?
Policy News

CRA Appoints New Director Of Government Affairs

CRA has recently made a major new commitment to its government affairs program, appointing its first full-time Director of Government Affairs while retaining the services of Fred W. "Rick" Weinberger, our former Executive Director and Director of Public Policy, as a consultant. We believe these changes will enable CRA to be even more effective in the coming years as we work on policy issues related to computing research funding, underrepresented groups in the profession, and other policy issues of concern to the computing research community.

We are pleased to announce the appointment of Lisa L. Thompson as CRA’s new Director of Government Affairs. Lisa received a Bachelor’s degree in Physical Sciences from the University of Southern California and studied science policy at George Washington University. She worked briefly for the Council of Scientific Society Presidents on policy issues before joining the Joint Policy Board for Mathematics. There, for the past eight years, she has handled government-affairs programs, focusing on both research and educational issues for the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics (an affiliate society of CRA).

Lisa is thoroughly familiar with the legislative process and players in the science and technology area, and she knows how to communicate effectively with lawmakers and their staffs. She has developed a highly regarded electronic bulletin to apprise researchers in the field of activities in Washington. She has also compiled useful information kits for mathematicians that provide them basic taking points on mathematics policy to use with lawmakers and offers practical advice on topics such as writing a congressman. Lisa has also been an active member in the Coalition for National Science Funding (CNSF), which works to obtain funding for all areas of science, and she is well known in the Washington science policy community.

Lisa’s appointment is as follows: “I have known and worked with Lisa for many years on science policy issues that affected both CRA and the mathematics community. I know that the CRA community will find her to be an incredibly talented and knowledgeable representative for computing research. She will do a great job.”

Rick will continue to serve the community by spending about a week a month as a consultant on policy issues to CRA. Rick joined CRA in 1990, serving as the first full-time Executive Director and simultaneously holding the position of Director of Public Policy. He did an extraordinary job at establishing CRA as an important presence in the science policy community in Washington and has been an excellent proponent for computing research. He built up CRA membership, as well as a staff and programs to serve them. With the growth of the organization, it became time in 1995 to separate the senior administrative post from the government affairs directorship. Rick stayed on at CRA part-time, serving as the Director of Public Policy, while holding a similar part-time position at the Library of Congress (LAC). For three satisfying years in these dual half-time positions, Rick decided it was time for him to throw himself full-time into new efforts. He has accepted a one-year position to recreate LAC’s information technology (LAC’s information technology). In this role, he will set new policies and priorities for this organization and hire a permanent director. A former assistant to Lisa, managing a president, Rick plans to move on to another policy or educational position. It is CRA’s good fortune to be able to draw on the knowledge and ability of both Lisa and Rick. CRA is looking forward to continuing its tradition of serving the computing research community with this partnership.

Domain Names Transferred to Department of Commerce

Over the past two years, CRN has been reporting the story behind domain name registration. Network Solutions Inc. began registering domain names under the authority of the National Science Foundation (NSF) in 1993. There has been nearly 2 million domain names registered in top-level domains.com, .edu, .gov, .net, and .org with Network Solutions over this five-year time frame.

NSF has now relieved the cooperative agreement to the Department of Commerce. Commerce will now administer the registration of domain names in an effort to move the practice away from a government-centered arrangement and toward a more private-sector one. It has been reported by the Council of Scientific Society Presidents that, “after an extensive public comment process, the Department of Commerce issued a Statement of Policy on privatizing and the future administration of the Internet domain name system (DNS). The policy statement describes a process whereby the Council on Internet Commerce, including development of future policies for domain name registration. (see: http://www.ntia.doc.gov/dnshome/ domainnamed 5_89.htm.) CRN had also reported in November 1997 that more than $60 million in fees had been accumulated through the former agreement for the registration of domain names. Network Solutions had been required to put 30% of registration fees collected into an interest-bearing account designated as an intellectual infrastructure fund. This money had been slated for use by NSF for the Next Generation Internet project. However, disagreement over the legitimacy of the collection of such fees and problems with the appropriation of its use had frozen access to the funds.

A class action lawsuit against the collection of these fees had been filed, but in late August of this year a District of Columbia Circuit Court dismissed the lawsuit and lifted the preliminary injunction on the use of these funds by NSF. However, the debate over the funds did not end. Senate Majority Leader Trent Lott (R-Mississippi) sought to attach a provision to the Internet Tax Freedom Act, S. 442, that would repeal the provision in the FY ’98 emergency supplemental appropriations law that directed the $60 million in question to NSF.

If, however, Senator Lott were unsuccessful in adding such language to the Internet Tax Freedom Act, at a press time, Congress was preparing its final legislation of the session — a catchall spending bill for FY ’99. Lott’s language could still be included in this bill.

As you are informed in coming issues of the status of the use of these funds.

Internet Tax Freedom Act

Both the House and the Senate have passed S. 442, the Internet Tax Freedom Act. This bill creates a three-year moratorium on the collection of taxes by local and state agents from electronic commerce conducted on the Internet. At the time the CRN goes to press, it is uncertain whether that signature is soon to follow. In a statement from the Office of the Press Secretary released on October 8, 1998 the President announced his resolve to sign this bill into law.

STATEMENT BY THE PRESIDENT

“I am pleased that the Senate has joined the House in passing the Internet Tax Freedom Act. This bill will create a short-term moratorium on new and discriminatory taxes that would slow down the growth of the Internet, and launch a search for long-term solutions to the tax issues raised by electronic commerce. As I said earlier this year in my speech on Information Highway, we must not allow 30,000 state and local tax jurisdictions to stifle the Internet, nor can we allow the erosion of the revenue that state and local governments need to fight crime and invest in education.

I look forward to signing this legislation into law so that America can continue to lead the world in the Information Age.”

CRA Seeks Applications for Executive Fellowship Program

CRA is seeking applications for its Executive Fellowship Program, which was created to recognize those who have been working in the scientific community for many years on science policy issues and who have the talent and ability of both Lisa and Rick. CRA is looking forward to continuing its tradition of serving the computing research community with this partnership.

Complete details about the fellowship program and application information can be found on the CRA website: http://www.cra.org/Policy/execfell.html

DEADLINE: January 15, 1999

Electronic applications are preferred, and may be sent to the address below:

CRA Fellowship Program, 1310 L Street, NW, Suite 501, Washington, DC 20005-4632; or Fax: 202-667-1066.

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Profiles Survey

1997-1998 CRA Departmental Profiles Survey

By Mirek Truszczynski and Stephen Seidman

In spring 1998, the Computing Research Association conducted a survey of U.S. and Canadian Ph.D. granting departments of computer science and engineering to collect data on budget, staff support, space, faculty teaching loads, and graduate student support. The survey asked for data for the most recent annual period for which the data were available. In most cases this meant the period from July 1, 1996 to June 30, 1997. The results of the survey were reported in a workshop at the 1998 CRA Conference at Snowbird.

The survey was sent to 186 Ph.D. granting programs in computer science and engineering. The response rate for the survey to allow us to report the aggregate results of the survey, was sufficiently high for the small, only sporadically exceeding 10%. We believe that these response rates are important, averaging over many responses decreases their effect and yields meaningful aggregate data. Second, since this was the first survey of its kind in many years, there is no temporal data to substantiate any conjectures about longitudinal trends.

Support staff

Table 1 presents the average ratio of the number of secretaries, computer support staff, and research programmers to the number of full-time equivalent (FTE) faculty for all categories of programs. The results show that for the categories of secretarial support staff and research programmers, this ratio is higher for the U.S. programs than for the Canadian ones. The ratio is higher for the Canadian programs for computer support staff. Further, privately funded institutions have generally higher levels of staff support per FTE than institutions supported by public funds. Finally, the ratio of staff support is generally higher in top ranked departments.

Budget

Table 2 presents the average ratio of annual department expenditures for the most recent complete fiscal year (in thousands of U.S. dollars) to the number of FTE faculty. (Please note that all Canadian dollars were converted to U.S. dollars for comparison and analysis.) Total expenditures include the regular departmental budget expenditures (salaries, including TA stipends, equipment purchases, and maintenance, and operating expenses), expenditures of funds from external grants and contracts and from discretionary accounts, and expenditures of overhead funds returned to the department. Total expenditures do not include the value of equipment donations. There are no significant differences between the three groups of top-ranked U.S. programs. However, the average expenditure per FTE in a U.S. program ranked 37 or higher is about 40% lower than the same average for programs ranked 1-36. There is also a striking difference between U.S. and Canadian programs, with the average expenditure per FTE in Canadian programs being more than 50% lower than in the United States.

Table 3 summarizes the findings on the rate of external funding per faculty member. Unlike other results of the survey, there is a significant difference here between private and public institutions.

The rate of external funding is also higher in the U.S. than in Canada. It is also higher for top-ranked departments than for departments ranked 37 and higher.

The survey also asked about the structure of the budget. These data are summarized in Table 4. The data show that external funding plays a smaller role in the budgets of the Canadian programs compared with the U.S. Similarly, the portion of the budget that comes from external funds in the U.S. departments ranked 1-36 and up is lower than in the programs ranked 1-36.

Table 5 presents the average ratio of departmental expenditures for instructional and research laboratories to the number of FTE faculty (in thousands of U.S. dollars). These expenditures include maintenance, and expenditures of funds from external grants and contracts and from discretionary accounts, and expenditures of overhead funds returned to the department.

Survey Continued on Page 7
nance costs, equipment purchases, and personnel costs. The value of donated equipment is not included. It is noteworthy that the ratio for instructional laboratories is higher in Canada than in the U.S., but that the ratio for research laboratories is lower in Canada. Further, the per-FTE level of support for research laboratories in the U.S. departments ranked 1–36 is two to four times higher than for the remaining U.S. programs.

The survey also gathered data on the structure of expenditures for instructional and research laboratories. These data are presented in Tables 6 and 7. As might be expected, staff and equipment purchases predominated.

Equipment donations to instructional and research laboratories provide substantial support to many computer science programs. Thirty-four U.S. computer science programs reported donations of instructional equipment. The same number of U.S. computer science programs reported research equipment donations. The first quarter, median, and the third quartile of the estimated value of these donations are shown in Table 8. Five Canadian programs (out of 8 responding to the survey) reported donations of instructional equipment, with an estimated value ranging from $5,000 to $255,000. Three Canadian programs (out of 8 responding to the survey) reported donations of research equipment, with an estimated value ranging from $5,000 to $255,000. These data are presented in Table 8. As might be expected, staff and equipment purchases predominated.

Table 7: Research Lab Expenditure Structure

<table>
<thead>
<tr>
<th></th>
<th>Private</th>
<th>Public</th>
<th>US CS Ranked</th>
<th>US CS Ranked</th>
<th>US CS Ranked</th>
<th>US CS Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>11%</td>
<td>10%</td>
<td>26%</td>
<td>13%</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>Equipment</td>
<td>57</td>
<td>57</td>
<td>22</td>
<td>62</td>
<td>61</td>
<td>58</td>
</tr>
<tr>
<td>Staff</td>
<td>32</td>
<td>33</td>
<td>52</td>
<td>25</td>
<td>33</td>
<td>32</td>
</tr>
</tbody>
</table>
Survey from Page 7

...
In his opening statement Lazowska noted that a common PITAC theme was essentially, "It's the software, stupid." Picking up on that paraphrase of the famous campaign slogan, Rep. Vernon Ehlers (R-Michigan) asked witnesses to explain the complexity of the software in use and how they anticipated closing the software gap.

Other concerns raised included NSF as the lead agency for coordinating related R&D, teacher training in IT, and the Department of Energy's Accelerated Strategic Computing Initiative (ASCI) program.

A third issue of C RN goes to press, C IT is expected to hold another meeting to discuss the subpanel's findings. PITAC's final report is expected next February. Thus, by the time any budget figures were decided on for Congress, the 2000 Presidential Election will be ramping up.

C RN will continue to follow developments and report further on PITAC in future issues.

PITAC from Page 8

 lebih

research in:
- innovative computing technologies and architectures;
- software for improving high-end computing performance.

Furthermore, the Committee encourages the attainment of petascale/teraflop-level performance more as a technology driver, not "as a goal unto itself."

Socio-Economic and Workforce Issues
Here, the Committee advocates greater research on the socio-economic impacts of technology adoption. In the Committee's judgment, research regarding the former has been merely speculative and more empirical data are needed.

With regard to workforce issues, two recommendations are particularly noteworthy for the computing research community. First, in an effort to increase IT literacy and access at all education levels, PITAC suggests expanding government/university industry partnerships. On such a strategic extension, it notes, could be the Experimental Program to Stimulate Competitive Research (EPSCoR).

The second recommendation arises from the Committee's conclusion that the current shortage of computer science Ph.D.s and faculty (and consequently, a substantial IT labor force) is due not only to salary considerations, but "the perception that there is a disconnect between the place where the most exciting work is being done." It proposes that increased funds for long-term research would attract and retain computer science graduate students.

Virtual Center Expeditions

Invoking the spirit of Lewis and Clark, the legend of H.G. Wells, and the imagination of D.H. Gelernter, PITAC invites researchers to "live in the technological future." By establishing "virtual center expeditions" of the federal government would give researchers a mandate to explore the unknown. A Kennedy observes, "we have a long history of ideas (such as the World Wide Web) that weren't predicted."

With the United States needs, says, are the types of "wide-ranging explorations of the future that characterize Xerox PARC and CIT Project Mac."

As proposed by PITAC, each center could (through competitive bidding) receive as much as $400 million annually for ten years. The focus of such expeditions could be infrastructure-based (examples include distributed databases, teleimmersion) or discipline-based (bioinformatics, multi-scale engineering).

Enabling Technology Centers
To advance the use of next generation IT in various applications (healthcare, transportation, government services, environment), PITAC proposes Enabling Technology Centers (ETC). These centers could be at both universities and federal research institutions. As a matter of fact, many as fifteen centers might operate at once, with each receiving as much as $10 million annually for ten years. Each ETC could enter into a five-year cooperative agreement, with a formal review in the third year for renewed funding. A small model, PITAC suggests NSF's Science and Technology Centers.

What's Up Ahead
Since the report's release, subpanels of PITAC members and non-members have been meeting to review comments on the interim report. Additionally, says Kennedy, Committee members have been interacting with the Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB) "so things are moving alive."

On Capitol Hill, the House Subcommittee on Basic Research held hearings on the report in early October. Subcommittee reaction to the report was generally favorable. In fact, several members testified to prepare witnesses (among them, CRA Board Chairman Edward Lazowska) for the inevitable budget questions they would face in testifying before Congress next year.

Rep. Eddie Bernice Johnson (D-Texas) asked whether PITAC's CIT panel could be met if new funds were forthcoming. In other words, could existing R&D funds be reallocated and applied to long-term investments? Neil Lane (in his first appearance before the Subcommittee as Director of OSTP) replied that "while there's always an opportunity for reallocation," without additional revenue "it would be hard to make much progress in response to the recommendations of the Committee."

PITAC's final report is expected next February. Thus, by the time any budget figures were decided on for Congress, the 2000 Presidential Election will be ramping up. C RN will continue to follow developments and report further on PITAC in future issues.
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Arizona State University

Computer Science and Engineering Department

We invite applications from outstanding candidates for an assistant professor position. Applicants must have a Ph.D. in computer science, computer engineering, or a closely related field. The appointment will be at the assistant professor level. An alternate position for an associate professor level appointment is available. The salary is competitive. The position is for the 1998-1999 academic year. Outstanding candidates are encouraged to apply. The closing date for receipt of applications is January 1, 1999. Applications will be accepted until the position is filled. Further information may be obtained by contacting Dr. Robert L. Miller, Department of Computer Science and Engineering, Arizona State University, Tempe, Arizona 85287-6006. Applications are invited from qualified candidates regardless of race, color, national origin, sex, age, or disability.

Brown University

Department of Computer Science

A position is available for a postdoctoral associate in the area of computer security. The successful applicant must have received the Ph.D. in computer security or a closely related field. The appointment is for a period of two years. Starting date is negotiable. The principal investigator, Prof. Shafi Goldwasser, will examine the candidate’s commitment to research in computer security and related areas. She will consider candidates with a Ph.D. in computer science or a closely related field. Brown University is an Affirmative Action/Equal Opportunity employer.

Brooklyn College of The City University of New York (CUNY)
Department of Computer Science (CIS)

We are seeking a tenure-track professor position at the Assistant or Associate Professor level. We are an urban liberal arts college and offer B.A. degrees in computer science and computing. Our computer science program has an annual enrollment of approximately 1000 undergraduate majors, over 150 full-time graduate students, and 100 Ph.D. students. Several major research projects are currently underway. Exemplary faculty and students publish in ACM, IEEE, and Elsevier publications and are heavily used in undergraduate and for computer science courses.

Brown University

Department of Computer Science

A position is available for a postdoctoral associate in the area of computer security. The successful applicant must have received the Ph.D. in computer science or a closely related field. Brown University is an Affirmative Action/Equal Opportunity employer.

Case Western Reserve University

Department of Computer Science

The Department of Computer Science at Case Western Reserve University invites applications for multiple tenure-track positions beginning September 1998. We welcome applications from outstanding candidates in all areas of computer science. The deadlines for receipt of applications are December 1, 1998 for tenure-track faculty positions open at all ranks (Assistant, Associate, and Full Professor). Applications will be accepted until the positions are filled. Further information may be obtained by contacting Dr. Susan H. Corson, Chair, Department of Computer Science, Case Western Reserve University, Cleveland, OH 44106-7071. Applications should include a cover letter, research statement, and a list of publications, and the names and addresses of at least three references.

Dartmouth College

Department of Computer Science

Computing and Information Science Faculty

The Department of Computer Science at Dartmouth College invites applications for tenure-track positions in computer science at the level of Assistant Professor. Dartmouth welcomes women and minorities. Candidates with a Ph.D. in computer science, and significant experience in research and teaching, are encouraged to apply. Candidates must be able to provide evidence of excellence in teaching and research, and should indicate which of the following areas interest them: artificial intelligence and computer systems, computer networking, computer security, computer architecture, computational complexity, databases, distributed systems, software engineering, and theoretical computer science. Applications will be reviewed as they are received. Successful candidates will be expected to obtain tenure. Applications should include a letter of application, a curriculum vitae, a statement of research and teaching interests, and the names and addresses of three references.

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Professional Opportunities

Institutional Opportunities

**Simulations of Telecommunications Systems, and in Computational Support for Molecular Biology and Sets, DNA Computing, Mathematical and positions will be in a special year and focus on areas statistical mechanics, and telecommunications. geometry, discrete optimization, graph theory, and analysis of algorithms, combinatorics, complexity, and DIMACS, the Center for Discrete Mathematics and DIMACS Center Research at DIMACS focuses on such areas as Computer Science and Engineering, Florida Atlantic University, 777 W. Ocean Drive, Boca Raton, Florida 33431. Electronic mail communication to: poster@regr.cs.rutgers.edu. Duke University Theoretical Computer Science, invites applications for The Computer Science Department of Harvey Mudd College is an Equal Opportunity/Affirmative Action institution. Florida Atlantic University is an Equal Employment, Telecommunications, Artificial Intelligence, Robotics, and Chemistry, and is ranked among the top computer science and biology, computer science, and computer systems development. Familiarity with external memory computation. The department has a faculty of seventeen and a rich history in teaching and research and makes significant contributions to the academic community in the form of teaching and research programs. The Computer Science Department of Harvey Mudd College is an Equal Employment Opportunity/Affirmative Action institution.

**Georgia Institute of Technology College of Computing**

Georgie Tech's College of Computing invites applications for tenured-track faculty positions. We are particularly interested in candidates from groups underrepresented in the academy. Applications received by December 15, 1998 will be given special consideration. The College has a rich history and is situated in a 220-acre campus with an enrollment of 2,200 students. Small sister of the Department of Mathematics and Computer Science at California Institute of Technology, the Computer Science department focuses on areas of theoretical computer science and discrete math and is invited to apply. At least two references are requested along with the application. The department has a faculty of seventeen and a rich history in teaching and research and makes significant contributions to the academic community in the form of teaching and research programs. The College has strengths in a broad range of areas and is ranked among the top computer science programs in the nation. One of the College's missions is to train exceptional computer scientists. Our philosophy is that prospective joint appointments are welcome. Preference will be given to candidates whose applications were received by January 15, 1999. We prefer electronic applications (consult http://www.cs.gatech.edu/ application-center/faculty-application-information.html), but we also accept applications via mail. Please e-mail us at a url pointing to your application materials, including a vita and the names of at least three references. E-mail: racquet@gatech.edu. Manuscript application should be sent to: Dr. John Kadzior Chair, Faculty Search Committee College of Informatics Georgia Institute of Technology Atlanta, GA 30332-5200 T 404-894-1834 Fax: 404-894-3966 Georgia Tech is an Affirmative Action/Equal Opportunity Employer and an equal opportunity/affirmative action employer. Women and minority candidates are encouraged to apply.

Georgia Tech's College of Computing encourages diversity and encourages qualified women and members of minority groups to apply. Women and minority candidates are encouraged to apply.

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Department of Computing and Software
Faculty of Engineering
FACULTY POSITIONS IN COMPUTING AND SOFTWARE

McMaster University is recognized as the most innovative University in Canada. The Faculty of Engineering at McMaster has a new department, Computing and Software, that offers a new program in Software Engineering and an established program in Computer Science. The Department is in a period of rapid growth and advancement, and is aggressively positioning itself to be at the forefront of state-of-the-art research and education.

We have the following opportunities:

**Assistant and Associate Professor**

- The Department of Computer Science seeks to hire one or two outstanding candidates in the broad area of electronic commerce to begin in September 2000. The successful candidate will have a Ph.D. in computer science or a related field, and an extensive research record.

**Assistant Professor**

- The Department of Computer Science is currently recruiting in the area of software engineering to begin in September 2000. The successful candidate will have a Ph.D. in computer science or a related field, and an extensive research and teaching record.

**Professor in the area of Network Security**

- The Department of Computer Science and Engineering is seeking to hire a candidate in the area of network security to begin in September 2000. The successful candidate will have a Ph.D. in computer science or a related field, and an extensive research and teaching record.

Applications are invited from all ranks. Applications are now being accepted and will continue until all positions are filled. Further information and a complete list of positions is available on the Computing and Software Faculty web site (http://www.csc.mcmaster.ca). All materials must be submitted by January 31, 2000. McMaster University is committed to employment equity and welcomes applications from women, members of visible minorities, aboriginal peoples, people with disabilities, and people of any sexual orientation. McMaster University is a smoke-free campus.

**Salary and Benefits**

- Salary will be commensurate with qualifications and experience. McMaster University provides a comprehensive benefits package including insurance, tuition fee assistance, defined benefit pension plan, and paid sick and leave days.

**Application Guidelines**

- Applications should be submitted online at http://www.csc.mcmaster.ca. Inquiries may be directed to the Chair, Department of Computer Science and Engineering, McMaster University, Hamilton, Ontario, Canada, L8S 4L7.

- Electronic submission of the application is encouraged. A complete application should include the following:
  - A cover letter
  - A curriculum vitae
  - A statement of research and teaching interests
  - A list of publications
  - Three letters of reference from appropriate mentors

**Inquiries**

- Further details may be obtained by contacting the Chair, Department of Computer Science and Engineering, McMaster University, Hamilton, Ontario, Canada, L8S 4L7. Telephone: 905-525-9140, Ext. 5380. Fax: 905-525-9152. Email: cscdept@mcmaster.ca.
Professional Opportunities

Professional Opportunities Ads Available on Web

Not all departments and organizations choose to run their Professional Opportunities ads in CRN—their ads are only distributed electronically to the Computing Research Association's Web site and jobs@cs.org. If you would like to subscribe to jobs@cs.org so you can read the announcements before they are published in CRN (or see the ones that don't appear in CRN), send the following mail message to listproc@cs.org subscribe jobsname lastname.

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November 1998

COMPUTING RESEARCH NEWS
University of California, Irvine
Department of Information and Computer Science (ICS)
Open Faculty Positions in Information and Computer Science
The Department of Information and Computer Science at the University of California, Irvine invites applications for tenure-track or tenured faculty positions in the following areas of research emphasis:

A. Software and hardware engineering: require candidates with expertise in methodologies, design, and tools for the development of computer systems and software.
B. Computer networks and parallel processing: require candidates with expertise in computer networks, distributed systems, and high performance computing.
C. Computer-supported cooperative work: require candidates with expertise in developing, information systems, and human-computer interactions.
D. Cloud computing: require candidates with expertise in system architecture, design, validation and testing of cloud infrastructure, computer software, and tools for software development.

Applications will be considered for a full professor in software engineering and assistant professor positions. Exceptional candidates from all ranks will be considered. In all cases, we look for candidates who will make the University of California a related field, and strong research evidence as evidenced by scholarly publications. For professor positions, candidates will also demonstrate a proven track record in original research and creative activities. The College of Computing and Digital Arts is organized around major research programs and the focus is on innovative programs that contribute to a diverse group of students and faculty. The College encourages diversity in the classroom, research, and creative activities. The successful candidate(s) will be expected to interact and collaborate with faculty from both the Department of Computer Science and other departments.

Applications should be sent to:

Chair, Department of Information and Computer Science
University of California, Irvine
900 Social Science Plaza C, Irvine, CA 92697-5100

The University of California is an Equal Opportunity/Affirmative Action Employer.

University of California, Los Angeles
Department of Electrical Engineering and Computer Science
Several faculty searches have been approved.

The University of California at Berkeley invites applications for tenure-track positions in electrical engineering and computer science beginning Fall Semester 1999.

A. Computer Engineering
B. Computer Science
C. Electrical Engineering

We are also considering the possibility of additional faculty positions in Computer Science. We seek excellent candidates with a strong commitment to teaching and research. The Department has a strong commitment to diversity and we encourage applications from candidates who would bring additional diversity to the faculty.

A. Computer Engineering
The Department of Electrical Engineering and Computer Science at the University of California, Los Angeles invites applications for tenure-track Assistant Professor positions. Exceptional candidates from all ranks will be considered. In all cases, we look for candidates who will make the University of California a related field, and strong research evidence as evidenced by scholarly publications. For professor positions, candidates will also demonstrate a proven track record in original research and creative activities. The College of Computing and Digital Arts is organized around major research programs and the focus is on innovative programs that contribute to a diverse group of students and faculty. The College encourages diversity in the classroom, research, and creative activities. The successful candidate(s) will be expected to interact and collaborate with faculty from both the Department of Computer Science and other departments.

Applications should be sent to:

Chair, Computer Science
University of California, Los Angeles
405 Hilgard Avenue, Los Angeles, CA 90095-1594.

University of California, Riverside
Faculty Positions in Computer Science
The Department of Computer Science at the University of California, Riverside invites applications for tenure-track or tenured faculty positions in the following areas of research emphasis:

A. Computer Networks and Communication Systems
B. Software Engineering
C. Computer Architecture
D. Computer Systems Engineering
E. Computer Human Interaction
F. Information Retrieval

Applications will be considered for a full professor in software engineering and assistant professor positions. Exceptional candidates from all ranks will be considered. In all cases, we look for candidates who will make the University of California a related field, and strong research evidence as evidenced by scholarly publications. For professor positions, candidates will also demonstrate a proven track record in original research and creative activities. The College of Computing and Digital Arts is organized around major research programs and the focus is on innovative programs that contribute to a diverse group of students and faculty. The College encourages diversity in the classroom, research, and creative activities. The successful candidate(s) will be expected to interact and collaborate with faculty from both the Department of Computer Science and other departments.

Applications should be sent to:

Dean of College of Letters and Sciences
University of California, Riverside
900 E. UC Path, Riverside, CA 92521-0136

The University of California, Riverside is an Equal Opportunity/Affirmative Action Employer.

University of California, Santa Cruz
Computer Science Department
The University of California, Santa Cruz (UCSC) invites applications for several tenure-track Assistant Professor positions in computer science.

The successful candidate(s) will be expected to interact and collaborate with faculty from both the Department of Computer Science and other departments.

Applications should be sent to:

Chair, Computer Science Department
University of California, Santa Cruz
115 Softball Court
Santa Cruz, CA 95064-1150

The University of California, Santa Cruz is an Equal Opportunity/Affirmative Action Employer.

University of Colorado, Boulder
Computer and Information Science Department
The University of Colorado, Boulder invites applications for tenure-track positions in computer science.

The University of Colorado, Boulder is one of the strongest academic colleges at the University, its College of Engineering and Applied Science, starting in the 1999-2000 academic year. The University is located in a state-of-the-art building in Boulder, and current and prospective employees must be committed to excellence in teaching and research. The successful candidate(s) will be expected to interact and collaborate with faculty from both the Department of Computer Science and other departments.

Applications should be sent to:

Chair, Computer Science Department
University of Colorado, Boulder
Box 384, Boulder, CO 80309-0384

The University of Colorado at Boulder is an Equal Opportunity/Affirmative Action Employer.

University of Florida
College of Engineering
Computer and Information Science and Engineering Department
BellSouth Emmy Scholar’s Chair in Computer Communication and Networking
The College of Engineering at the University of Florida invites nominations and applications for an endowed, chair professorship in the field of computer communication and networking. We are interested in finding an exceptional faculty member who will interact with faculty from both the Department of Information and Computer Science and Engineering (ICSE) and the Department of Electrical and Computer Engineering (ECE). The College is a member of the American Association for the Advancement of Science (AAAS) and the 14th ranked public university in the United States. The College of Engineering at the University of Florida was ranked 13th among A.U.V. public universities with engineering programs in 1997.

The BellSouth Emmy Chair in Computer Communication and Networking is endowed by the BellSouth Foundation to support research and teaching in areas of computer science, computer engineering, media, and human-computer interactions.

Applications are solicited from candidates who will be an active researcher and teacher of great distinction whose work has been recognized by national and international levels. The Chair is endowed by the BellSouth Foundation to support research and teaching in areas of computer science, computer engineering, media, and human-computer interactions.

Applications should be sent to:

Dr. Gerhard X. Ritter, Chair
Department of Computer and Information Science and Engineering
Attn: BelSouth Chair Search Committee
University of Florida
P.O. Box 112320
Gainesville, FL 32611-6200

The application deadline is March 31, 1999.

The University of Florida is an AA/EO Employer and women and minorities are encouraged to apply.

University of Idaho
Department of Computer Science
The University of Idaho Department of Computer Science invites applications for a tenure-track position at the Assistant Professor level to begin August 16, 1999. Applicants must have completed a Ph.D. degree in a computer-related area before the starting date. Applicants in all areas of computer science will be considered. Evidence of ongoing and potential for future research, a commitment to teaching, and willingness to participate fully in the department's graduate and undergraduate programs is essential.

Outstanding applicants should send a letter of interest and a CV to the address of at least three references.

Dr. A. Timo Hämäläinen
Chair, Computer Science Search Committee
Department of Computer Science
University of Idaho
Box 879290
Tuscaloosa, AL 35487-0290

The University of Idaho is an equal opportunity/affirmative action employer and women and minorities are encouraged to apply.

University of Washington
Department of Computer Science
The University of Washington Department of Computer Science invites applications for a tenure-track position in computer science beginning Fall 1999. Applicants must have completed a Ph.D. degree in computer science or a related field before the starting date. Applicants in all areas of computer science will be considered. Evidence of ongoing and potential for future research, a commitment to teaching, and willingness to participate fully in the department's graduate and undergraduate programs is essential.

Outstanding applicants should send a letter of interest and a CV to the address of at least three references.

Dr. John M. Ruml
Chair, Computer Science Search Committee
Department of Computer Science
University of Washington
Box 352350
Seattle, WA 98195-2350

The University of Washington is an equal opportunity/affirmative action employer.

University of Wisconsin-Madison
Department of Computer Sciences
The Department of Computer Sciences at the University of Wisconsin-Madison invites applications for a tenure-track position in computer science.

Applications are encouraged from women, minority candidates, and individuals with disabilities. Applications are welcome from researchers in all areas of computer science.

Applications should be sent to:

Dr. Steven D. Goldstein
Chair, Computer Science Search Committee
Department of Computer Sciences
University of Wisconsin-Madison
475 North Sandell Street
Madison, WI 53706

The University of Wisconsin-Madison is an equal opportunity employer.

University of Wisconsin-Milwaukee
Department of Computer Science
The position is located on the Milwaukee campus of the University of Wisconsin-Milwaukee. The University of Wisconsin-Milwaukee has an ongoing commitment to excellence in teaching and research. The successful candidate(s) will be expected to interact and collaborate with faculty from both the Department of Computer Science and other departments.

Applications should be sent to:

Dr. Magdy A. Fouad
Chair, Computer Science Search Committee
Department of Computer Science
University of Wisconsin-Milwaukee
4140 N. Holton Street
Milwaukee, WI 53211-1805

The University of Wisconsin-Milwaukee is an equal opportunity employer and women and minorities are encouraged to apply.
Computing Professional Opportunities

University of Kentucky Department of Computer Science

The Department of Computer Science at the University of Kentucky invites applications for one or more anticipated tenure-track positions beginning August 15, 1999. Although appointment at any rank is possible, we especially encourage applications for assistant professor, although applications at all ranks will be considered. Candidates will be expected to have Ph.D. or equivalent degree and qualified candidates will be considered for associate professor and full professor positions. Applicants should have research interests that promise to advance the department's research agenda in, but not limited to, areas such as computer science, software engineering, computer engineering, or related areas.

Candidates should send a curriculum vitae and a statement of research and teaching interests to:

Diane Mier, Department of Computer Science, University of Kentucky, 110 Keeney Hall, Lexington, KY 40506-0027. E-mail: search@cs.uky.edu. WWW: http://www.cs.uky.edu

The University of Kentucky is an Equal Opportunity/Affirmative Action employer.

University of Mississippi Department of Computer and Information Science

The Department of Computer and Information Science invites applications for a position at the Assistant Professor level. Requirements: a Ph.D. in Computer Science, or related area, and the ability to teach undergraduate and graduate students, conduct research in major areas of computer science, and supervise M.S. and Ph.D. students. Research opportunities exist in areas including artificial intelligence, computer vision, supercomputing, and other areas of the department. The University of Mississippi is located in the beautiful city of Oxford, 12 miles from Oxmoor Square. Applications should be sent to:

Chair, Assistant Professor Search Committee
Department of Computer and Information Science
University of Mississippi
PO Box 1848
Oxford, MS 38601-1848
U.S.A.

The University of Mississippi is an Affirmative Action/Equal Opportunity employer.

University of Missouri-Rolla Department of Computer Science

The Department of Computer Science at the University of Missouri-Rolla (UMR) invites applications for an assistant/associate professor in Computer Science. Position begins Fall 1999. Position requires a Ph.D. or D.Sc. in Computer Science (or related field), ability to teach undergraduate and graduate students, and research interests that complement existing strengths of the department. Responsibilities include teaching undergraduate and graduate classes in computer science, advising undergraduate and graduate students, and engaging in a vigorous research program. One year postdoctoral experience is preferred. Send curriculum vitae and a statement of research and teaching interests to:

Professor R. Hankins
Chair, Computer Science Department
University of Missouri-Rolla
Rolla, MO 65409-1050

The University of Missouri-Rolla is an Equal Opportunity/Affirmative Action employer

University of Oregon Department of Computer Science

The Department of Computer Science at the University of Oregon invites applications for a tenure-track position at the assistant professor level. Applications should be sent to:

Chair, Computer Science Search Committee
University of Oregon Department of Computer Science
Bartlett Hall, University of Oregon, Eugene, OR 97403-1222
U.S.A.

The University of Oregon is an Equal Opportunity/Affirmative Action employer.

University of Pittsburgh Department of Computer Science

The Department of Computer Science at the University of Pittsburgh invites applications for tenure-track positions at the rank of Assistant Professor. Applications will be accepted until the position is filled, but consideration will be given to complete applications received by November 1, 1998. The University of Pittsburgh is situated in the heart of the North Hills of Pittsburgh, PA, 15 minutes from downtown Pittsburgh and 30 minutes from the beautiful Allegheny Mountains. The University offers a comprehensive research-oriented, public university with approximately 15,000 students in undergraduate, graduate and professional degree programs. The Department of Computer Science at the University of Pittsburgh was established in 1971. The faculty includes 30 members holding Ph.D. degrees. The Department has a highly competitive, high-ori...
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Professional Opportunities

of graduate student research (Ph.D. and M.S.), and positions at all levels of the career ladder, including faculty positions at the Assistant, Associate, and Full Professor levels.

University of Texas at Austin Computing Opportunities The Department of Computer Sciences at The University of Texas at Austin invites applications for tenure-track faculty positions at all levels, particularly at the Assistant Professor level. Applicants must hold a Ph.D. degree in computer science or a closely related field.

University of Virginia Department of Computer Science The University of Virginia is an Equal Opportunity, Affirmative Action employer. Women and minority candidates are especially encouraged to apply. University of Utah Department of Computer Science The University of Utah invites applications for tenure-track positions at the rank of Assistant or Associate Professor. Applicants must have a Ph.D. degree in computer science or a closely related field and should have a strong record of research, teaching, and service, which is essential. University of Washington Computer Science Department The University of Washington invites applications for a faculty position at the Assistant, Associate, or Full Professor level. Applicants must have a Ph.D. degree in computer science or a closely related field and should have a strong record of research, teaching, and service, which is essential.

Washington University in Saint Louis Department of Computer Science The University of Washington is an Equal Opportunity, Affirmative Action employer. Women and minority candidates are especially encouraged to apply. University of Kentucky Department of Computer Science The University of Kentucky is an Equal Opportunity, Affirmative Action employer. Women and minority candidates are especially encouraged to apply.

Wheaton College Department of Mathematics and Computer Science Recruitment Announcement for Mathematics and Computer Science The Department of Mathematics and Computer Science at Wheaton College (IL)-Department of Mathematics and Computer Science invites applications for a position at the Assistant Professor level. Applicants must have a Ph.D. degree in mathematics or computer science or a closely related field and should have a strong record of research, teaching, and service, which is essential.

York University Department of Computer Science The Department of Computer Science at York University is an Equal Opportunity, Affirmative Action employer. Women and minority candidates are especially encouraged to apply.

Vanderbilt University Department of Computer Science Chair of the Department of Computer Science Vanderbilt University invites applications and nominations for the Chair of the Department of Computer Science. The position will be available July 1, 1999. Vanderbilt University is an Equal Opportunity, Affirmative Action employer. Women and minority candidates are especially encouraged to apply.

Vanderbilt University Department of Computer Science Chair of the Department of Computer Science Vanderbilt University invites applications and nominations for the Chair of the Department of Computer Science. The position will be available July 1, 1999. Vanderbilt University is an Equal Opportunity, Affirmative Action employer. Women and minority candidates are especially encouraged to apply.