COMPUTING RESEARCH NEWS

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March 1995 *Vol. 7/No. 2*

Clinton proposes modest increase for HPCC

By Juan Antonio Osuna
CRA Staff

With Clinton and the new Congress scrambling for ways to cut federal discretionary spending, the High-Performance Computing and Communications (HPCC) program received an unexpectedly modest increase in the president's fiscal 1996 budget.

Released February 6, the Clinton budget proposed a 6% increase for HPCC, which would bring the program to $1.14 billion, up from $1.08 billion in 1995.

Given the tight fiscal environment, HPCC fared better than many other federal science programs. The entire federal budget provides a 3.5% increase for all basic research, just enough to keep up with inflation. But applied research increased 0.8%, disappointing some Republican leaders who favored substantial cuts. Rep. Robert S. Walker (R-PA), chair of the House Science Committee, said, "I regret the strong emphasis [Clinton] places on applied science subsidies."

Table 1. NSF Budget (in millions of dollars)

	1994 Actual	1995 Planned	1996 Request
Research & Related Activities:			
Biological Sciences	288	301	324
Computer & Info. Sci. & Engineering	240	258	276
Engineering	297	320	344
Geosciences	404	419	451
Mathematical & Physical Sciences	618	645	698
Social, Behavioral & Economic Sci.	98	114	123
US Polar Research Programs	158	159	172
Other	65	65	65
Subtotal, Res./Rel. Activities*	**2,168**	**2,280**	**2,454**
Education & Human Resources	569	606	599
Academic Research Infrastructure	105	118	100
Major Research Equipment	17	126	70
Salaries and Expenses	118	124	127
NSF Headquarters Relocation	5	5.2	5
Office of Inspector General	4	4	5
Total NSF Budget	**2,987**	**3,264**	**3,360**

*Subtotal includes miscellaneous programs.

Overall, academic R&D increased by only 1.1%. (The administration's original budget document erroneously listed a 7% increase.)

The 6% HPCC increase translated into similar increases for the National Science Foundation's Computer and Information Science and Engineering (CISE) Directorate and the Advanced Research Projects Agency's Computer Systems and Communications Technology program.

NSF received an overall increase of 3%, with its research and related activities component receiving a more substantial 7.6%. At a press conference, NSF Director Neal Lane referred to the increase as a "good news in tight times."

Under research and related activities, all the directorates received similar increases ranging from 6.7% to 8.5%. Unlike previous years, in which CISE fared better than most directorates, CISE received the smallest increase—6.7%. Its budget increased from $258 million to $276 million.

At the conference, Lane said the slightly different increases among the directorates primarily were a result of constraints imposed by cross-agency initiatives such as HPCC.

HPCC funds within NSF only increased 5.6%. As HPCC represents the bulk of the CISE budget, the HPCC increase was strongly related to the CISE increase. (HPCC does not receive funds in addition to those allocated to various federal agencies; it is simply a way of putting one label on funds spread throughout the government.)

Paul Young, who heads CISE, said the difference in directorate increases "were simply too small to place any [policy] meaning on them."

CISE plans to keep the number of people awarded grants constant but increase the size of these grants

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NRC: Is scope of HPCC too broad?

By Juan Antonio Osuna
CRA Staff

In recent years, computing researchers have surfed the wave of public enthusiasm for information technology, allowing their activities to be subsumed under the politically popular High-Performance Computing and Communications Initiative (HPCCI). But what happens when this wave hits the shore and the program loses its political momentum? Will Congress and the executive branch continue to see computing research as a vital social concern?

The last question was suggested by a report released in February by the National Research Council, titled *Evolving the High-Performance Computing and Communications Initiative to Support the Nation's Information Infrastructure*.

"Today the HPCCI supports nearly all [computing] research, an arrangement that is both misleading and dangerous: misleading because much important computing research addresses areas other than high performance, and dangerous because reduced funding for the HPCCI could cripple all of computing research," the report said.

Produced by NRC's Computer Science and Telecommunications Board, the report issued broad and detailed recommendations for guiding the future of HPCC. On a broad level, it warned against putting all computing research efforts under one label and recommended greater political diversification.

"The 'war on cancer' did not support all of biomedical research, and neither should the HPCCI or any future initiative on the nation's information infrastructure subsume all of computing research," the report said.

This recommendation takes on special significance in the current climate of political uncertainty. Last year, Republicans placed the HPCC program on their list of possible budget cuts, which indicated a $1.2 billion reduction in HPCC over five years. Yet House Speaker Newt Gingrich has voiced overall enthusiasm for a government role in information technology. It is too early to predict how HPCC will fare under the new Congress.

The report's most prominent message to Congress may be that computing research has become essential to social and economic development and will only become more so.

"Computing research continues to be dramatically undersupported compared to its importance to society and its contributions to the economy," said CRA Board member Ed Lazowska, who served on the committee that prepared the report.

The report enumerated many technologies that were developed under government funds and then moved quickly into the commercial world. The most publicized example may be the National Center for Supercomputing Applications (NCSA) Mosaic Web browser.

Since Mosaic's inception, the number of Web servers has increased 100-fold, and more than 1 million copies of the Mosaic software have been downloaded. The NCSA-developed software has spawned massive development in the commercial world, which now offers 20 licensed versions of Mosaic and has created more than 20 million licensed copies. The software has become so popular that Microsoft Corp. plans to package Mosaic with its Windows 95 operating system.

While much of the report touted the benefits of computing research and made a case for increased—or at least sustained—funding, it also

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Opinions

Trying not to doubt Thomas

By Fred W. Weingarten
CRA Staff

House Speaker Newt Gingrich recently unveiled Thomas, the new congressional Internet access point to congressional information (http://thomas.loc.gov). The plan is for Thomas to provide access to the full text of bills and the *Congressional Record*, and eventually provide a much broader collection of information and services intended to bring citizens closer to the government.

However, Congress is not on the cutting edge—many other organizations have already developed a Web page. And much of what currently is on Thomas consists of Gopher services started by the previous Congress (but never expanded into anything useful).

The White House has had a Web page for several months (http://www.whitehouse.gov), as have, with strong encouragement from the president, most agencies. As with Thomas, most of these pages are incomplete.

Ironically, the newly discovered (by politicians) Internet grew out of federally funded R&D programs—mainly under the High-Performance Computing and Communications program—that appear to be at great risk this year from cuts by Congress.

Thomas as an example

Nevertheless, even in its current developmental state, Thomas shows how easily electronic access to legislative information can be made available. Useful as it is and will be, however, the page also illustrates the enormous gulf that exists between government as a provider and citizens as users of information. Few people have the motivation or expertise to read full-text bills or time to peruse the *Congressional Record*. (The daily information output of Congress includes all deliberations on the floor of both houses, countless hearings, legislative and investigative committee reports and the studies and reports of all congressional agencies.)

Many difficult technological problems and deep political issues revolve around a simple question: "To what extent should (and can) government try to bridge that gulf?" Even for those who favor openness and access, the answer is not as easy as it seems. There are several issues that will be tough to resolve.

1) Cost has to be a barrier. It is not inexpensive to put huge amounts of information online, but it is becoming more feasible. After all, most data, even that destined for eventual printing, exists somewhere in electronic form. But many questions need to be answered first: How can data be formatted so it is easy to use? How easily can data be made searchable? Can a front-end interface be designed and maintained that can be understood and used by the average citizen? How should the scale problem be dealt with? (Anyone in the world may drop in to browse. Traffic growth rates on the Internet continue to be phenomenal, to the occasional discomfort and expense of providers of popular resources.)

Putting information online is not at the top of the priority list of most agencies, however much they give lip service to it. The duty to do so generally is not in their basic charter but is more often inferred as part of their broader public responsibility. Expensive services will be the first to go when budgets get tight. In Congress, for example, committee and administrative budgets and staffs have been severely cut. When the glamour wears off, will maintaining Thomas continue be a high priority for committee and individual office staff? And will all those promised ancillary services find their way onto the net?

2) Can government officials possibly understand the needs of the user communities they will be

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Objectivity and policy making

By Fred W. Weingarten
CRA Staff

The other day I engaged in an electronic debate over the proper placement of an article in *CRN*. Should it be carried as news or as commentary? At one point, the author used the word "objective" to describe the piece. "There is no such thing as 'objective' writing on public policy" was my almost immediate response.

Although the debate with the author was settled (probably to no one's satisfaction), I continued to puzzle over my response for several days.

Was I right? If so, was it a cynical comment on politics or on policy makers these days?

I do not believe that objectivity exists in any meaningful way in political discourse. And in the rare case it might exist, it is counterproductive to claim it. We can strive to be fair, nonpartisan and balanced. But we claim objectivity at peril. That conclusion is not based on some cynical view by voters on how decisions are made in this town. The reasons strike at a basic problem in translating science and technology to the policy arena.

As scientists, we are trained to deal with objectivity and pure facts—measurements on instruments, points of light on photographic film, theorems derived through rigorous logic from axioms. We build explanatory models to fit those facts and then, perversely, proceed to try to discredit them by finding new facts that do not fit. The results of these efforts are formally disseminated within the community according to equally rigorous channels subject to peer review and checks by reproducing experiments.

(Sociologists and historians of science have pointed out that even this supposedly objective process is fraught with fad and subjective choice—technology embodies the values of its creators. But let's stay focused on the ideal of the process, which is what researchers and engineers are trained to believe they do.)

Policy making develops from efforts to resolve conflicts of all kinds: conflicts among different self-interests, public interests, values, ideologies and ways of viewing the world. The debate is obviously improved by reference to facts. But here's the kicker: Facts usually assume value content when they become inserted into politics.

Any author or editor necessarily selects, filters and orders information, with some value system guiding that selection. Even a magazine's inside page, with its seemingly random list of facts, can carry a subtle (or sometimes powerful) message.

Writing that affects policy debate must be done in language that communicates to a nonscientific audience. These people are not privy to the inside processes of scientific communication, to the little signals authors leave to indicate to their peers the certainty of a statement, measurement or conclusion. Authors must resort to more common English. A policy analyst I worked with used to say that in common English, "synonyms are not synonyms." What he meant was that every word is a landmine of intended and unintended connotation. The longer a policy debate wore on, the more encrusted the words became with historical meanings and values.

I once knew a congressional staff analyst who worked on privacy for many years. She developed writer's block on the subject. Because she had been so close to the issue for so long, every word choice became fraught with implications she did not want to convey. Crafting a single sentence became a tortuous, daylong enterprise. Despite her valuable experience and expertise, she finally had to leave the subject field.

Facts seem much less reliable now, at least to the outside world, and particularly in politics or the courts. You testified about a proven link between smoking and lung

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Expanding the Pipeline

Opening doors to exciting CS&E careers

BY Dian Rae Lopez

Frequently young women in college drop out of the sciences when they choose their undergraduate majors [KLe95]. Women turn away from science for many reasons, often because of negative messages received from the media, their peers, their parents and teachers who unconsciously treat young men and women differently in the classroom. The results of such messages have been documented. Young women show a lack of self-confidence and self esteem at the junior high level [Ore94, AAUW92] and the undergraduate level (see [KLe95] for a list of references).

Careers booklet

The Computing Research Association Committee on the Status of Women in Computing Research (CRAW) has developed a careers booklet to encourage young women at the high school and undergraduate level to consider careers in computer science and engineering (CS&E).

This booklet contains biographies and pictures of women working in a wide range of CS&E careers. The women are depicted not only as scientists, but also as people who have families, friends, hobbies and other outside interests. In other words, they form a diverse enough group to possibly cause a young woman to think, "This could be me someday."

Women included in the booklet represent a variety of occupations, ethnic backgrounds, achievement levels and geographic locations. Included in the booklet are an astronaut, a chip designer, undergraduate and graduate students in computer science, an entrepreneur, educators, scientists working in visualization and graphical animation, software engineers and women working with operating systems, telecommunications and the government.

By showing young women the many career paths available to them in computer science and engineering, the booklet provides role models to aid them in thinking about future career decisions.

Available soon

The booklets are expected to be available at the 1995 Association for Computing Machinery Computing Week meetings in Nashville, February 25-March 4. The National Science Foundation helped fund an initial printing of 15,000 copies of the booklet. CRAW is seeking additional funding to make the booklet available to as many high school and undergraduate students as possible. Anyone willing to help sponsor such an effort should contact Dian Lopez at lopezdr@cda.mrs.umn.edu or Kimberly Peaks of CRA at tel. 202-234-2111.

Volunteers needed

One of the best ways to encourage young women to consider a career in computer science and engineering is to have them talk to other women who are working in such careers. Such mentoring is difficult because of the lack of sufficient role models needed to reach large numbers of these students.

In the CRA 1992-93 Faculty Survey less than 10% of computer science faculty and less than 5% of computer engineering faculty were women [CRA94]. Nevertheless, to enhance the impact of the careers booklet, CRAW is looking for women in computer science and engineering at colleges, universities and industries to distribute the booklets to students in their geographical area.

By giving a presentation to students about career possibilities and by dispelling some commonly held myths and stereotypes, these volunteers will be active role models, reinforcing the biographies shown in the booklet. Maria Klawe (klawe@cs.ubc.ca) has developed a list of topics as guidelines for volunteers to use in their presentations.

The booklets can be given to both female and male students because students of both sexes can develop an awareness of the many careers available and that women are a part of these fields.

People behind the booklet

Many disciplines have created careers booklets to encourage young women to consider career opportunities in their field. Thus it was natural for CRAW at its first meeting to consider the creation of a careers booklet as a high priority.

At the 1993 Federated Computing Research Conference, I heard of CRAW's interest in doing such a project and I volunteered to form a committee and begin working on the development of such a booklet for careers in computer science and engineering.

By September 1993 the committee had formed, was holding regular meetings via E-mail and was making many important decisions concerning the scope and format of the booklet.

Booklet committee members are: Sandra Johnson Baylor, IBM T.J. Watson Research Labs; Faith Fich, University of Toronto; Maria Klawe, University of British Columbia at Vancouver; Dian Rae Lopez (chair), University of Minnesota at Morris; Fanya Montalvo, Massachusetts Institute of Technology; and Marianne Winslette, University of Illinois at Urbana-Champaign.

All committee members have put forth tremendous effort in planning the booklet and in obtaining biographies and photographs of the featured women. The project has been a group effort of many people who worked diligently and continue working today to further its success.

The booklet is funded through CRAW, and my committee has worked closely with CRA and the CRAW members, all of whom have given us valuable advice and encouragement.

Ann Redelfs, of the San Diego Supercomputer Center, deserves special recognition for working with the booklet's designer, Karin Scholz, to organize the material into an attractive and professional booklet.

The booklet may be made available on the World Wide Web and also at an ftp site in the future.

References

[Ore94] Orenstein, P., *Schoolgirls: Young Women, Self-Esteem and the Confidence Gap*, Doubleday, 1994.

[AAUW92] Report by the American Association of University Women, "Shortchanging Girls, Shortchanging America," 1992.

[KLe95] Klawe, M. and Leveson, N., "Women in Computing—Where Are We Now?," *Communications of the ACM* 38(1), 29-35, January 1995.

[CRA94] CRA. "1992-93 CRA Faculty Salary Survey," *Computing Research News*, 6(1): 11-15, January 1994.

Dian Rae Lopez is a member of CRAW and leader of the careers booklet project. She currently is a visiting researcher in computer science at Academia Sinica in Taipei, Taiwan, on leave from the University of Minnesota at Morris campus where she is an assistant professor of computer science. Dian also is president of Info Link Inc., a company that provides Internet access and support services to schools, businesses and individuals in west-central Minnesota. E-mail: lopezdr@cda.mrs.umn.edu

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expected to serve? It is not that the officials are uninformed, but because the communities they are expected to serve are very diverse. Yet, as government providers, they must serve them all.

One advantage of commercial and non-profit, private-sector providers is that they serve particular groups—environmentalists, researchers, teachers, bankers or children. Each group has different interests and skills, and each will use the information in different ways. Is it feasible to think that Thomas, or any government system committed to serving everyone, could successfully bridge that gulf, even if the technical and financial resources were available?

3) A related issue that partly cuts along ideological lines is to what degree the government should be in the information marketplace in the first place, competing with private sector information providers. The information industry is growing rapidly and becoming increasingly important to the economy and trade. One would not want government to unnecessarily impede that industry's growth without a compelling public purpose.

The right to know

However, government does have the responsibility to inform its citizens. Except when there are concerns about privacy or national security, people have the right to information collected by their government. That premise is spelled out in the Freedom of Information Act, which was passed when paper was still the dominant medium of information storage. Even private sector information providers want open access to the government's raw data because they repackage it for resale. But they get nervous when government agencies "add value" and too aggressively start bridging the gap between user and provider.

4) A question that cuts to the basic relationship between government and the people is the degree to

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Association News

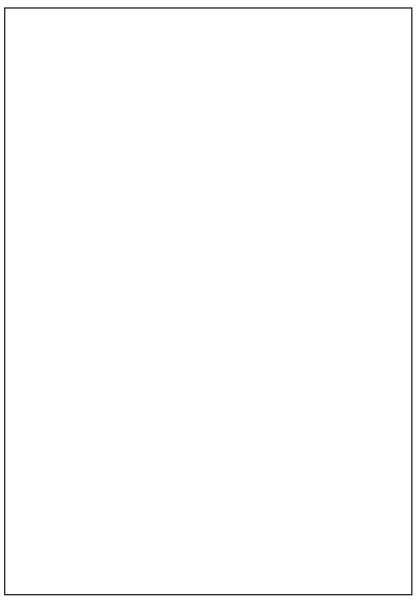
CRA awards presented to Katz and Lawler

The Computing Research Association recently announced the recipients of the 1995 CRA Distinguished Service Award and the CRA Nico Habermann Award.

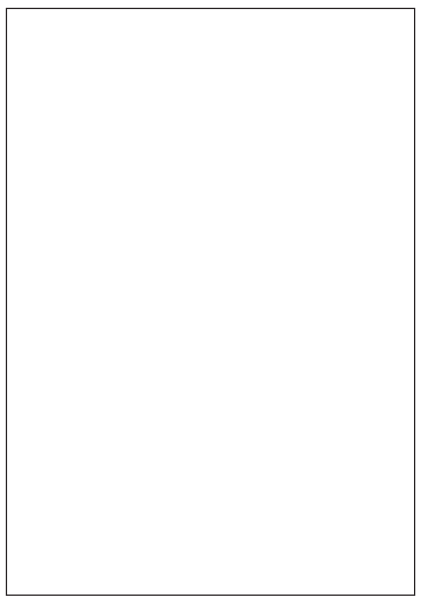
Randy Katz was selected as the winner of the 1995 CRA Distinguished Service Award. He was honored for the outstanding contributions he made to promote the National Information Infrastructure and the High-Performance Computing and Communications (HPCC) program during his tenure with the Advanced Research Projects Agency.

Katz was program manager and deputy director in ARPA's Computing Systems Technology Office from January 1993 to December 1994. He participated in Vice President Gore's National Performance Review and the Defense Department's Technology Reinvestment Project. As co-chair of the White House Information Technology Task Force, he was responsible for putting the White House on the Internet and establishing the president@whitehouse.gov E-mail address.

He played a major role in developing ARPA's HPCC Implementation Plan, co-chaired the HPCC Information Infrastructure Technology and Applications Working Group and edited the IITA report that defined the research activities and opportunities in the HPCC arena. He was a key player in the effort to develop a comprehensive strategic plan for the National Science and Technology Council's Committee on Information and Communications (CIC) and was instrumental in crafting major portions of the plan.



Randy Katz



Eugene Lawler

Katz is professor of computer science at the University of California at Berkeley, where he also serves as chair of the MICRO (Microelectronics and Computing Research Opportunities) Program Executive Committee for the State of California.

The 1995 CRA Nico Habermann Award will be presented to the family of the late Eugene Lawler for the outstanding contributions he made to promote the entry of female, minority, disadvantaged and disabled students into graduate research programs in computer science at the University of California at Berkeley.

As professor of computer science at Berkeley, Lawler played a major role in the establishment and operation of Berkeley's Computer Science Re-entry Program. This program, which was established in the 1980s and was one of the first of its kind, made it possible for under-represented students trained in other fields to prepare themselves for graduate studies in computer science. Lawler was the first faculty chair for the Re-entry Program and served for four years in that capacity.

Lawler promoted admissions of women and ethnic minorities into the graduate program and made recruiting trips to the Southwest on behalf of Chicano recruitment. His advocacy efforts on behalf of women, minorities and disabled students extended beyond Berkeley to the National Science Foundation and the American Association for the Advancement of Science. He was videotaped for the AAAS Access to Engineering Project, which was designed to encourage disabled students to aim for engineering careers. He worked with the Berkeley Disabled Students Center to try to obtain reading aids for blind students.

But his efforts went beyond admissions, to mentoring and advising. He carefully followed his students to make sure they found a research adviser and received financial support. He gave generously of his time, counseling students with patience, good sense and wisdom.

A comprehensive list of awards that members of the computing research community may be eligible for can be accessed through the World Wide Web at http://cra.org/awards.

Ad #1
Morgan Kaufmann

Association News

For Your Information

Visit CRA's home page

By Phillip Louis
CRA Staff

As you may have noticed, the January issue carried only salary information from universities that responded to the 1994 CRA Taulbee Survey questionnaire. In this issue we bring you complete CRA Taulbee results. Thank you for your continued support in submitting data. Because we redesigned the questionnaire and were more meticulous about checking data to ensure its accuracy, we were able to provide you with higher quality and more precise results. It has been a major undertaking for us all—and CRA greatly appreciates the efforts of its Taulbee Committee, the community for your responses and patience with all the telephone calls asking for more information, and to the CRA staff

Dues renewals

In mid-April we again will solicit your support in our 1995-96 annual dues renewal. This year look for a streamlined package containing CRA's current information, activities and our new invoicing system designed to make the renewal process easier. Your support is greatly appreciated. We encourage you to take full advantage of the benefits and services we offer to our members.

The Computing Research Association has much more to offer than CRA Forsythe List labels and a news journal. We are excited about the new year and new activities, especially our work to develop electronic services.

Electronic services

Our electronic services are continuing to expand. We have evolved from having an electronic version of the CRA Forsythe List and jobs posting to having a World Wide Web home page (http://cra.org). Here are highlights of what is available on our home page:

• CRA Board of Directors: A list of elected and appointed board members.

• CRA Database of CS/CE Departments: This searchable database includes contact information and Web links to CS and CE departments. The CRA List of CS/CE Departments is a list of contact information and Web links to departments in our database.

• Membership information: This will include an online version of our annual dues package.

• Statistical Trends in Computer Science: View tables and graphs of CS statistics, or download spreadsheet files.

• Job Announcements: This includes announcements for positions at research-oriented universities and other organizations.

• CRA Taulbee Survey: The annual survey of Ph.D. production and faculty salaries in CS/CE departments (PDF format, draft copy). The full 1994 survey will be available soon.

• Computing Researcher's Guide to Congress: Everything a researcher needs to know about Congress—maybe not everything, but a pretty good start.

• CRA Bulletin: An electronic news bulletin on federal policy affecting the computing research community

• CRA Committee on the Status of Women in Research: Learn more about this spearheading committee that has a full agenda and acts on it. Find out more about the new Minorities in Computer Science Committee, which you will be hearing more about this year

Finally, a reminder to check your mailing label and let me know if it needs to be updated or corrected. If your address does not include a street address or a PO box, please send the information to me at the address below

If you would like to contribute an item to this column or suggest an online service we should offer, contact Phillip Louis, Computing Research Association, 1875 Connecticut Ave. NW, Suite 718, Washington, DC 20009. Tel. 202-234-2111; fax: 202-667-1066; E-mail: info@cra.org

Dean joins CRA Board

Thomas L. Dean, professor of computer science at Brown University, has been appointed by the American Association for Artificial Intelligence (AAAI) as their CRA Board representative. Dean is replacing Mark Hayes, professor and visiting scholar at the Beckman Institute.

Dean earned a Ph.D. in computer science from Yale University. His research interests are automated planning and scheduling, robotics and machine learning

Dean received the National Science Foundation Presidential Young Investigator Award in 1989, was elected to the Executive Council of AAAI in 1993 and elected as a Fellow of AAAI in 1994.

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after all, created the Internet as it is today. But the chair of the House Science Committee is Robert Walker (R-PA), a self-styled "technobuff" and, reputedly, a member of Gingrich's inner circle.

Unfortunately, a glowering behind these happy assessments of political support for research is the ugly reality that, regardless of the popularity of science, the fiscal cupboard is bare.

The biggest impact of the revolution on research funding will likely be due to an issue that has nothing to do with science—the race to cut taxes and the deficit, which will tighten the screws even further. Given the inherent limitations on the ability of government to control expenditures, research inevitably stands exposed as an inviting target.

Key issues

We most likely will begin to get answers to two key questions later this spring through congressional action.

1) How will overall R&D funding levels survive the budget cutting pressures?

2) Will a Republican Congress redraw the line on the continuum between fundamental research and industrially focused programs such as ATP?

The answers cannot be predicted yet, but they are likely to be mixed. That is, each question will be addressed in a different congressional arena. The debate and outcomes could differ markedly for different agencies.

For instance, decisions about overall R&D funding largely will come from debates in the House and Senate budget and appropriations committees. Will Gingrich or Walker have any influence over those decisions (or will they even choose to expend precious political capital by exerting influence)?

Traditionally, these committees jealously guard their prerogatives and are extremely independent. Some reports already have two major House committees—Budget and Appropriations—struggling over turf, an old fight that seems immune to a change in party control.

Decisions about research agency priorities will be more diffused throughout Congress, influenced by authorization, appropriations and even budget committees. The decisions also will be more diverse, differing agency by agency. Because agency missions differ, agencies face different budgetary and political pressures, and different oversight committees have different views.

Some examples:

• NSF may feel pressure to move back from strategic to fundamental research. However, that shift, if it occurs, may be more rhetorical than real, because the word "strategic" did not necessarily mean "applied." Rather, it meant that some proportion of funding would be prioritized and directed to areas according to presumed social benefits.

As the first hearings of Walker's House Science Committee showed, most members of Congress, regardless of party, still expect social and economic benefits. For Republicans, too, federal support for research is not an exercise in philanthropy. Walker's comments have been ambiguous, asserting on the one hand the need for NSF to concentrate on basic science, yet on the other hand extolling the need to realize the social and economic benefits of research.

• As the Warner/McCain letter and last year's appropriations battle show, DOD faces pressures to back away from support of long-term academic research. At the same time, shorter-term, industry-related programs such as ATP are headed for the chopping block. Weapons development and force modernization are the new hot buttons. (Some Republicans are even talking about resurrecting the Strategic Defense Initiative.) But, if basic and industrial research programs are eliminated, where will all this new weapons technology come from?

• The Energy Department, when not fighting for its very existence, will face yet another debate about the future and direction of its national laboratories. An important new study recommended that the labs focus more on basic research and less on industry-related research.

Most depressing is that all these struggles are nothing more than holding actions, trying to delay or slow the steady erosion of federal support for research. The pressures driving the erosion are not confined to one party or another and are not due to any single event.

George E. Brown Jr., former chair and now ranking minority member of the House Science Committee, after reviewing the administration's fiscal 1996 budget, summed it up as follows:

"The outlook for science and technology programs remains grim, as tight budget caps, deficit reduction and the proposed $56 billion middle-class tax cut will continue to squeeze funding for worthwhile science programs. I am very concerned about the direction of the president's budget, but I am afraid that the situation will only get worse after the new Congress gets through with it."

Attention CRA Members

Mailing labels of our membership and the CRA Forsythe List are available free to CRA members. The labels are available in electronic form or on Cheshire or laser labels. The labels are $25 per set for non-members. Contact Phillip Louis at tel. 202-234-2111; fax: 202-667-1066; or E-mail: info@cra.org

1994 CRA Taulbee Survey

CRA Taulbee Survey: Ph.D.s holding steady

Results of the 1994 CRA Taulbee Survey on the Production and Employment of Ph.D.s and Faculty in Computer Science and Computer Engineering

By Gregory R. Andrews
Chair, CRA Surveys Committee

For 24 years the Computing Research Association and its predecessor—the Computer Science Board—have been charting the growth of Ph.D. production and employment of computer scientists and computer engineers in North America.

The accompanying tables present the results of this year's CRA Taulbee Survey† of Ph.D.-granting departments of computer science (CS) and computer engineering (CE)—and combinations thereof—in the United States and Canada. Each September, the survey is mailed to all organizations included on the CRA Forsythe List* of departments that offer a Ph.D. in computer science or computer engineering. The tables include all responses received by the end of January.

Information on degree production and enrollment applies to the last academic year (1993-94). Information on faculty applies to the current fiscal year (1994-95). Faculty salaries reflect those in effect as of Jan. 1, 1995.

The response rate—especially from computer science departments—once again was quite high. This greatly enhances the utility of the data. However, one should keep in mind that the results are from Ph.D.-granting departments only. There are hundreds more departments that award only bachelor's or master's degrees.

The survey was revised and expanded this year. I will describe the changes and rationale for them. The remainder of the article comments briefly on the most important results and trends.

Additions and changes

This year's survey questionnaire appeared to be much longer than in the past (10 pages versus four), much to the dismay of some department chairs. Part of the increased length was due merely to using a more graphical layout and including general instructions. We did seek some additional information.

The 1994 CRA Conference at Snowbird pointed out the need for more detailed information on Ph.D. production and demand—such as subfields in which dissertations are done—and the need for a more complete view of the "pipeline" of bachelor's and master's students. This year's information is interesting in its own right; it should prove especially useful in years to come, because it will give us more detailed information on trends.

The other additions to the survey grew out of our desire to have data that is comparable in scope, detail and reporting periods to that used by federal agencies in the United States and Canada. Consequently, we clarified the reporting periods, added enrollment information and changed categories for ethnic origin and residence status.

Many questions were reworded to make them more consistent and precise. Finally, questions about students were expanded to distinguish between students in computer science and computer engineering degree programs, and to distinguish between full-time and part-time students.

Perhaps as a result of the increased length and complexity of the survey, the response rate was down slightly from last year (from 94% to 92% of CS departments).

Results and trends

To a first approximation, academic computing has reached a steady state, at least within Ph.D.-granting departments. The number of Ph.D.s awarded has leveled out, and the number of Ph.D.-granting departments was up only slightly after dramatic growth in the 1980s. Enrollment in Ph.D. programs was fairly stable. Anecdotal evidence indicates that enrollment also was fairly stable in undergraduate and master's programs, after a dramatic fall in undergraduate enrollment in the late 1980s. Faculty sizes in individual departments also were virtually unchanged. Moreover, departments no longer expect the number of faculty positions to grow much over the next five years, despite previous predictions of growth of 10-20% over five years. (Such predictions always have been overly optimistic; this year's numbers are probably much more realistic.)

The number of Ph.D.s reported this year (1,005 for both computer science and computer engineering) appears to be down somewhat from the past three years. However, ever since CE programs have been included in the surveys, it has been difficult to get a high rate of response from departments offering CE degrees. And those departments sometimes have had difficulty separating out CE from EE degrees. (The response rate from CS also is down slightly this year.) Still, we believe this year's figures on Ph.D. production are accurate, and that those from the previous few years were slightly higher than they should have been. Hence, Ph.D. production has for all practical purposes been steady during the 1990s.

Table 5 presents the employment status of last year's Ph.D. recipients and includes new information on degree areas (specialties). Not surprisingly, there are significant differences between the numbers of Ph.D.s in various specialties, and the specialty and employer mix. Despite horror stories and student fears, it appears that most of last year's graduates found jobs. However, the data could be somewhat misleading because some students might have deferred graduation. Postdoctorates were not listed as a separate category. The list of specialties may need to be refined. (It looks like "other" was a good category to be

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†*The title of the survey honors the late Orrin Taulbee of the University of Pittsburgh, who conducted these surveys for the Computer Science Board from 1970 until 1984.*

**The CRA Forsythe List is a list of departments in the United States and Canada that grant a Ph.D. in computing—computer science (CS) and computer engineering (CE). It is maintained by the Computing Research Association. This is the eighth year computer engineering departments have been included.*

DEGREE PRODUCTION IN ACADEMIC YEAR 1993-94

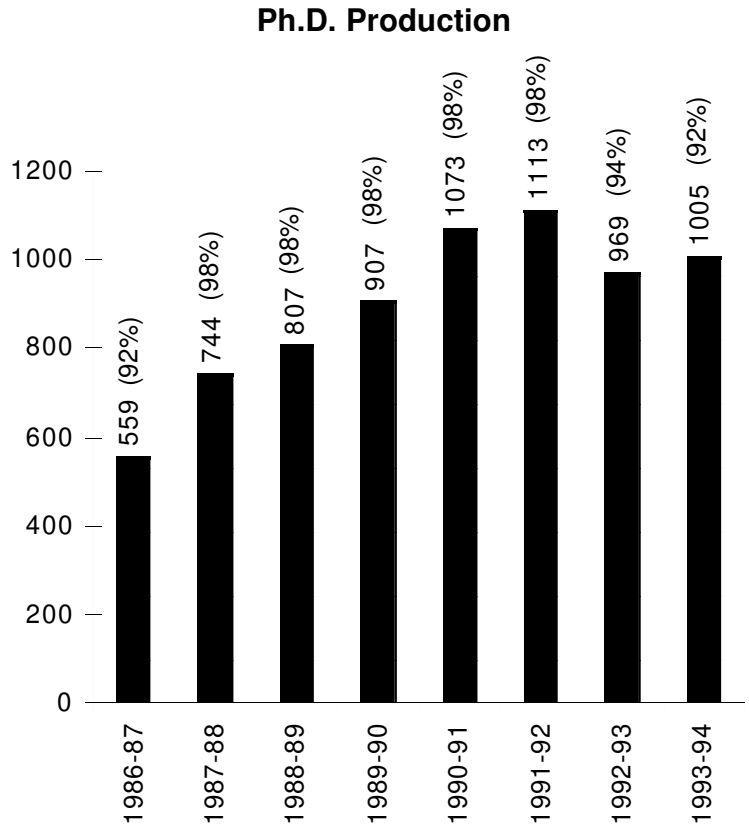

Figure 1 (above) shows a steady growth in the number of departments awarding CS and CE degrees. **Figure 2** (right) shows a slight decline or plateau in the total Ph.D. production of CS and CE degrees. However, these historical indications may be slightly inaccurate for two reasons. First, the survey response rate has dropped, raising the possibility of more unreported degrees. (The response rate is shown in parentheses for each year.) Second, a few electrical engineering degrees may have been included in past statistics. During the last two years, more rigorous attempts were made to remove them.

1994 CRA Taulbee Survey

Table 1. Ph.D. Production by Ranking

	Ph.D.s Produced	Average per Dept.	Ph.D.s Next Year	Average per Dept.	Passed Qualifier	Average per Dept.
CS Ranked 1-12	203	16.9	204	17.0	174	19.3
CS Ranked 13-24	124	10.3	152	12.7	152	13.8
CS Ranked 25-36	114	9.5	138	11.5	131	13.1
CS Other	492	5.4	607	6.7	581	6.8
CE	72	7.2	65	6.5	100	9.1
CS&CE	**1005**	**7.3**	**1166**	**7.9**	**1138**	**9.3**

Table 2. Gender and Ethnicity of Ph.D. Recipients

	CS			CE			CS & CE		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Nonresident Alien	239	30	269	51	3	54	300	33	333
African American	10	3	13	1	0	1	11	3	14
Native American	0	0	0	0	0	0	0	0	0
Asian	100	21	121	23	2	25	130	24	154
Hispanic	6	0	6	2	0	2	9	0	9
White	311	66	377	24	5	29	352	72	424
Other	23	3	26	0	0	0	24	4	28
Did Not Indicate	30	3	33	13	0	13	44	4	48
Total	**719**	**126**	**845**	**114**	**10**	**124**	**870**	**140**	**1010**

Table 3. Gender of Ph.D. Recipients by Percentage

	CS		CE		CS & CE	
Male	723	(83%)	97	(94%)	848	(84%)
Female	149	(17%)	6	(6%)	157	(16%)
Total	**872**		**103**		**1005**	

Table 4. Gender of Bachelor's and Master's Recipients

	Bachelor's		Master's	
Male	6742	(82%)	4188	(81%)
Female	1474	(18%)	991	(19%)
Total	**8216**		**5179**	

Table 5. Employment of Ph.D. Recipients by Specialty

Ph.D.s Employed Domestically in:	Artifical Inteligence/ Robotics	Hardware Systems/ Architecture	Numerical Analysis/ Scientific Computing	Software Systems	Theory	Other	Total
Ph.D. CS/CE Dept.	42	32	9	36	21	34	187
Non-Ph.D. CS/CE Dept.	12	8	7	25	13	7	73
Non-CS/CE Dept.	2	5	1	2	5	10	25
Industry	60	51	12	85	11	52	295
Government	8	2	2	7	2	5	34
Self-Employed	5	3	0	3	1	1	14
Other Categories:							
Employed Abroad	32	11	6	28	17	39	141
Unemployed	2	0	0	8	3	3	16
Unknown	11	4	6	15	5	30	220
Total	**174**	**116**	**43**	**209**	**78**	**181**	*

Table 6. Ethnicity of Ph.D. Recipients by Percentage

	CS		CE		CS & CE	
Nonresident Alien	269	(33%)	54	(49%)	333	(35%)
African American	13	(2%)	1	(1%)	14	(1%)
Native American	0	(0%)	0	(0%)	0	(0%)
Asian	121	(15%)	25	(23%)	154	(16%)
Hispanic	6	(1%)	2	(2%)	9	(1%)
White	377	(46%)	29	(26%)	424	(44%)
Other	26	(3%)	0	(0%)	28	(3%)
Subtotal	**812**	**(100%)**	**111**	**(100%)**	**962**	**(100%)**
Did not indicate	33		13		48	
Total	**845**		**124**		**1010**	

Table 7. Ethnicity of Bachelor's and Master's Recipients

	Bachelor's		Master's	
Nonresident Alien	483	(10%)	1557	(37%)
African American	172	(3%)	82	(2%)
Native American	9	(0%)	1	(0%)
Asian	810	(16%)	755	(18%)
Hispanic	164	(3%)	64	(2%)
White	3198	(65%)	1702	(40%)
Other	99	(2%)	75	(2%)
Subtotal	**4935**	**(100%)**	**4236**	**(100%)**
Did Not Indicate	3476		953	
Total	**8411**		**5189**	

Table 8. Degrees Awarded to People with Disabilities

	Bachelor's	Master's	Ph.D.
CS	25	9	3
CE	1	3	0
CS&CE	26	14	3

Asian/Nonresident Inaccuracies

In accordance with guidelines set forth by the Education Department, this year's survey attempts to separate nonresident aliens from the ethnic breakdown. Although the survey had asked departments not to classify nonresidents under any ethnic category, many departments did not follow these instructions, especially when classifying Asians and Pacific Islanders.

A close look at the raw data reveals many departments with more than 50 Asian graduate students but no nonresident aliens reported. We find this data suspect. When calling back a few of these departments, we found that an error was usually made and that most of their Asian Ph.D.s and graduate students were nonresidents.

Hence, the number of Asian Ph.D.s and graduate students who permanently reside in North America is likely to be substantially less than the statistics indicate, while the number of nonresidents is likely to be correspondingly greater.

The reasons behind this approach are political and practical.

Issues of minority representation usually are framed within the political and legal context of North America, where certain ethnic categories tend to be less represented than others. While the ethnicity of foreign students may be of some interest, it is not as critical simply because most foreign students return to their home countries where they are a part of a majority ethnic group and where the issues of representation are dissimilar to those of North America.

The practical reason for distinguishing nonresidents is that it allows us to compare our data with data kept by the Education Department, which may prove useful in determining historical trends.

Footnotes

All ethnicity tables: "Native American" includes Alaskan natives; "Asian" includes people originating from the Pacific Islands, China, Japan, Korea, the Philippine Islands, Samoa, India and Vietnam; "white" includes people originating from Europe, North Africa and the Middle East.

All tables with rankings: Statistics sometimes are given according to departmental rank. Schools are ranked only if they offer a CS degree. Those that only offer CE degrees are not ranked and statistics are given on a separate line, apart from the rankings. In Table 1, the "Ph.D.s Produced" column shows the number of CS and CE degrees produced throughout the rankings. While CE degrees are mixed into all rank categories, there are no CS degrees in the CE category.

**Totals do not match:* The reader may find that totals from certain tables do not equal each other, even though theoretically, they should. These discrepancies stem from inconsistencies in the way departments answered different questions. We tried to minimize this by calling departments that provided inconsistent answers. The horizontal and vertical totals in Table 5 do not equal each other because many departments could not tell us the specialty area of the Ph.D.s.

Nonresident faculty: A small percentage of faculty were nonresident aliens when they were hired to work in fiscal 1994-95. In many cases, these new employees were gaining residency based on their new employment prospects.

All faculty tables: The survey makes no distinction between faculty specializing in CS versus CE programs. Although we tried to minimize inclusion of any faculty in electrical engineering, there may be a few who slipped through.

1994 CRA Taulbee Survey

STUDENT ENROLLMENT IN ACADEMIC YEAR 1993-94

Table 9. Gender of Enrolled Ph.D. Students

	CS				CE				CS & CE			
	Full Time		Part Time		Full Time		Part Time		Full Time		Part Time	
Male	5429	(84%)	1119	(83%)	545	(89%)	111	(94%)	6211	(84%)	1271	(84%)
Female	1046	(16%)	232	(17%)	70	(11%)	7	(6%)	1151	(16%)	246	(16%)
Total	**6475**		**1351**		**615**		**118**		**7362**		**1517**	

Table 10. Ethnicity of Enrolled Ph.D. Students

	CS				CE				CS & CE			
	Full Time		Part Time		Full Time		Part Time		Full Time		Part Time	
Nonresident Alien	2319	(41%)	237	(21%)	170	(41%)	21	(40%)	2589	(41%)	262	(21%)
African American	92	(2%)	28	(2%)	2	(0%)	2	(4%)	98	(2%)	31	(2%)
Native American	27	(0%)	2	(0%)	0	(0%)	1	(2%)	27	(0%)	3	(0%)
Asian	621	(11%)	193	(17%)	137	(33%)	11	(21%)	780	(12%)	210	(17%)
Hispanic	68	(1%)	17	(1%)	6	(1%)	1	(2%)	76	(1%)	20	(2%)
White	2445	(43%)	659	(58%)	98	(24%)	17	(32%)	2667	(42%)	732	(58%)
Other	110	(2%)	3	(0%)	2	(0%)	0	(0%)	132	(2%)	13	(1%)
Subtotal	**5682**	**(100%)**	**1139**	**(100%)**	**415**	**(100%)**	**53**	**(100%)**	**6369**	**(100%)**	**1271**	**(100%)**
Did Not Indicate	779		188		198		59		1005		249	
Total	**6461**		**1327**		**613**		**112**		**7374**		**1520**	

Table 11. New Students in Fall 1994

	Bachelor's		Master's		Ph.D.	
	Full Time	Dept. Avg.	Full Time	Dept. Avg.	Full Time	Dept. Avg.
CS Ranked 1-12	1191	99.3	515	42.9	247	20.6
CS Ranked 13-24	653	54.4	159	13.3	167	13.9
CS Ranked 25-36	307	25.6	111	9.3	128	10.7
CS Other	6890	59.9	1825	15.9	761	6.6
CE	641	40.1	272	17.0	99	6.2
CS&CE	**9682**	**58.0**	**2882**	**17.3**	**1402**	**8.4**

FACULTY GROWTH IN FISCAL 1994-95

Table 12. Anticipated Faculty Growth

	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	Five-Year Increase	
CS Ranked 1-12	341.0	344.0	350.0	354.0	354.0	354.0	13.0	(4%)
CS Ranked 13-24	301.5	309.5	315.5	319.5	324.5	328.5	27.0	(9%)
CS Ranked 25-36	261.8	267.8	268.8	270.8	272.8	273.8	12.0	(5%)
CS Other	3165.1	3250.1	3319.1	3368.1	3407.1	3445.1	280.0	(9%)
CE	269.0	274.0	276.0	277.0	281.0	282.0	13.0	(5%)
CS&CE	**4338.4**	**4445.4**	**4529.4**	**4589.4**	**4639.4**	**4683.4**	**345.0**	**(8%)**

Table 13. Gender of Professors

	Assistant		Associate		Full	
Male	614	(82%)	982	(91%)	1157	(95%)
Female	137	(18%)	102	(9%)	59	(5%)
Total	**751**		**1084**		**1216**	

Table 14. Ethnicity of Professors

	Assistant		Associate		Full	
Nonresident Alien	29	(4%)	9	(1%)	9	(1%)
African American	15	(2%)	4	(0%)	3	(0%)
Native American	1	(0%)	6	(1%)	2	(0%)
Asian	151	(21%)	198	(20%)	124	(11%)
Hispanic	15	(2%)	10	(1%)	13	(1%)
White	478	(67%)	754	(75%)	964	(85%)
Other	23	(3%)	25	(2%)	19	(2%)
Subtotal	**712**	**(100%)**	**1006**	**(100%)**	**1134**	**(100%)**
Did Not Indicate	40		79		81	
Total	**752**		**1085**		**1215**	

Table 15. Faculty Losses

	With Ph.D.	Without Ph.D.	Total
Died	7	1	8
Retired	43	3	47
Visitors Returing to Employer	46	3	49
Teaching Elsewhere	64	2	66
Left for Non-Academic Position	38	2	40
Returned to Graduate School	1	4	5
Remained, Changed to Part Time	7	1	8
Other	22	4	26
Unknown	3	0	3
Total	**231**	**20**	**252**

Table 16. Gender of Newly Hired Faculty

	Tenured	Tenure-Track	Other
Male	20 (83%)	93 (77%)	110 (80%)
Female	4 (17%)	28 (23%)	28 (20%)
Total	**24**	**121**	**138**

Table 17. Ethnicity of Newly Hired Faculty

	Tenured		Tenure-Track		Other	
Nonresident Alien	1	(5%)	14	(12%)	8	(6%)
African American	0	(0%)	1	(1%)	1	(1%)
Native American	0	(0%)	0	(0%)	0	(0%)
Asian	3	(16%)	22	(19%)	37	(29%)
Hispanic	0	(0%)	2	(2%)	3	(2%)
White	15	(79%)	76	(66%)	75	(59%)
Other	0	(0%)	1	(1%)	3	(2%)
Subtotal	**19**	**(100%)**	**116**	**(100%)**	**127**	**(100%)**
Did not indicate	3		6		17	
Total	**22**		**122**		**144**	

Survey text from Page 6

in last year).

The percentage of female Ph.D. recipients in computer science continued to increase (from 12% in 1992, to 14% in 1993, and 17% in 1994). Moreover, 23% of the new hires for tenure-track faculty positions were women, so they were hired into such positions in a higher proportion than their presence in last year's graduating class.

However, there is no clear trend in the numbers of female professors at various ranks: the number of assistant professors was up slightly (133 to 137), and the number of associate professors is up significantly (87 to 102), but the number of female full professors decreased (66 to 59). (This year's information combines CS and CE faculty, so it is possible some EE faculty erroneously

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1994 CRA Taulbee Survey

FACULTY SALARIES IN FISCAL 1994-95

Table 18. Nine-Month Salaries, 115 Responses of 136 US CS Departments

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	560 of 567	$30,200	$49,587	$61,600	$52,374	$43,300	$55,394	$70,800
Associate	782 of 787	$36,641	$54,794	$71,400	$60,481	$50,500	$67,300	$93,200
Full	876 of 899	$38,940	$66,341	$103,000	$81,606	$54,998	$101,531	$181,500

Table 19. Nine-Month Salaries, 11 Responses of 11 US CS Departments Ranked 1-12

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	76 of 77	$48,855	$52,616	$60,000	$54,593	$54,200	$58,286	$70,800
Associate	92 of 92	$49,100	$57,750	$63,500	$62,988	$60,156	$70,551	$82,100
Full	142 of 145	$38,940	$65,652	$75,050	$86,431	$84,320	$110,097	$126,400

Table 20. Nine-Month Salaries, 11 Responses of 12 US CS Departments Ranked 13-24

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	52 of 56	$50,000	$52,548	$59,900	$54,971	$53,040	$57,511	$61,200
Associate	93 of 93	$53,183	$59,876	$69,200	$66,242	$63,266	$73,301	$91,982
Full	132 of 133	$58,904	$72,122	$95,500	$91,959	$105,054	$120,411	$142,000

Table 21. Nine-Month Salaries, 10 Responses of 12 US CS Departments Ranked 25-36

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	37 of 37	$35,000	$51,263	$61,600	$54,911	$56,250	$59,534	$70,800
Associate	48 of 48	$56,000	$61,880	$71,400	$66,373	$61,800	$73,332	$86,300
Full	60 of 62	$60,500	$71,508	$86,100	$93,933	$82,246	$124,735	$181,500

Table 22. Nine-Month Salaries, 83 Responses of 101 US CS Departments Ranked Higher than 36

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	395 of 397	$30,200	$48,674	$56,400	$51,502	$43,300	$54,405	$68,178
Associate	549 of 554	$36,641	$53,090	$65,800	$58,719	$50,500	$65,535	$93,200
Full	542 of 559	$43,500	$65,188	$103,000	$78,254	$54,998	$96,012	$145,000

Table 23. Nine-Month Salaries, 10 Responses of 16 US CE Departments

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	55 of 56	$44,637	$49,705	$56,450	$50,819	$44,637	$52,951	$61,720
Associate	60 of 62	$46,573	$55,156	$62,000	$59,756	$53,829	$63,821	$75,500
Full	76 of 78	$53,418	$65,187	$82,500	$77,295	$65,422	$96,819	$136,700

Table 24. 12-Month Salaries, 12 Responses of 15 Canadian CS Departments (Canadian Dollars)

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	67 of 70	$31,639	$49,424	$61,336	$55,514	$52,333	$62,899	$80,961
Associate	154 of 155	$40,815	$59,221	$76,086	$68,884	$66,367	$81,323	$124,987
Full	143 of 145	$52,748	$72,312	$86,388	$87,956	$84,165	$109,672	$159,539

Table 25. Nine-Month Salaries, 125 Responses of 152 US CS and CE Departments

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Faculty Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
Assistant	615 of 623	$30,200	$49,598	$61,600	$52,241	$43,300	$55,161	$70,800
Associate	842 of 849	$36,641	$54,828	$71,400	$60,419	$50,500	$66,971	$93,200
Full	952 of 977	$38,940	$66,249	$103,000	$81,269	$54,998	$101,120	$181,500

Table 26. Salaries of Newly Appointed Faculty, 68 Responding CS & CE Departments

	# Reporting	Reported Salary Minimums				Reported Salary Maximums		
Dept. Rank	Salary Data	Min.	Mean	Max.	Avg. of all Salaries	Min.	Mean	Max.
US: CS 1-12	7 of 7	$49,000	$51,914	$55,500	$52,271	$49,000	$52,629	$55,500
CS 13-24	12 of 12	$50,000	$52,443	$55,000	$53,395	$53,000	$54,709	$58,700
CS 25-36	6 of 6	$53,004	$56,976	$65,900	$56,976	$53,004	$56,976	$65,900
CS Other	62 of 64	$34,000	$47,646	$56,000	$48,742	$34,000	$50,106	$76,000
CE	9 of 9	$40,000	$46,900	$50,500	$47,356	$40,000	$47,715	$52,690
CS&CE	**96 of 98**	**$34,000**	**$49,134**	**$65,900**	**$50,010**	**$34,000**	**$51,086**	**$76,000**
Canadian: CS&CE	14 of 14	$27,500	$47,182	$55,000	$49,915	$45,521	$53,724	$58,000

Survey text from previous page

have been included.)

The percentage of degrees awarded to women last year was almost the same for bachelor's (18%), master's (19%) and Ph.D. degrees (17%).

Tables 18-26 report on faculty salaries. Most readers probably have already studied these tables in detail and made their own interpretations. For these tables, each department was asked for the minimum, mean and maximum salary for each category of professor. Because tables show the minimums and maximums of the minimums and maximums reported by each department, these figures reflect salaries of individual professors. Also shown are the means of the minimums and maximums reported by each department. Finally the average of all salaries is the average of the means reported by each department. If a department gave only a partial answer for a category of professor, it was discounted. All Canadian salaries are in Canadian dollars.

Rankings

For Tables 1, 12 and 18-26, which group computer science departments by the rank of 1-12, 13-24 and 25-36, we based our ranking on information from a

Continued on Page 16

Fiscal 1996 Federal Budget

Table 2. CISE Program Funding (in millions of dollars)

	1994 Actual	1995 Planned	1996 Request
Computer & Computation Research:			
Theory of Computing	9.4	9.8	10.3
Numeric, Symbolic & Geom. Comp.	7.3	7.5	8.0
Computer Systems	4.3	4.4	4.6
System Software	13.2	13.4	14.3
Software Engineering	4.9	5.3	5.6
Subtotal	**39.1**	**40.3**	**42.9**
Info., Robotics & Intelligent Systems:			
Knowledge & Database Systems	12.7	14.0	15.1
Robotics & Machine Intelligence	6.5	7.1	7.4
Interactive Systems	4.8	5.6	6.3
Info. Tech. & Organizations	5.6	5.6	6.3
Subtotal	**29.6**	**32.3**	**35.1**
Microelectronic Info. Processing Sys.:			
Design, Tool & Test	4.4	4.8	5.2
Microelectronic Systems Architecture	4.1	4.5	4.8
Circuits & Signal Processing	4.4	4.8	5.1
Experimental Systems	7.7	8.3	9.0
Sys. Prototyping & Fabrication	3.0	3.4	4.0
Subtotal	**23.5**	**25.8**	**28.1**
Advanced Scientific Computing:			
Centers	69.7	73.5	77.5
New Technologies	4.8	5.8	6.6
Subtotal	**74.6**	**79.2**	**84.1**
Net. & Comm. Res. & Infrastructure:			
NSFnet	39.1	45.2	46.2
Networking & Communications Res.	10.8	11.2	13.3
Subtotal	**49.9**	**56.5**	**59.6**
Cross-Disciplinary Activities:			
CISE Institutional Infrastructure	19.6	20.7	22.2
CISE Instrumentation	3.2	3.6	3.6
Subtotal	**22.8**	**24.2**	**25.8**
Total CISE Funding	**239.5**	**258.3**	**275.6**

Table 3. Number of People Involved in CISE Actvities

	1994 Est.	1995 Est.	1996 Est.
Senior Researchers	1,558	1,597	1,597
Other Professionals	1,906	1,955	1,955
Postdoctorates	141	142	142
Graduate Students	1,791	1,840	1,840
Undergraduate Students	368	372	372
Total Number of People	**5,764**	**5,906**	**5,906**

Table 4. NII Funding (in millions of dollars)

	1994 Actual	1995 Planned	1996 Request
Natl. Telecommunications Info. Admin.	26	64	100
HPCC:			
Defense	338	384	403
Health & Human Services	57	68	78
Energy	115	113	114
NASA	111	131	131
National Science Foundation	267	297	314
Commerce	29	32	50
Environmental Protection Agency	8	15	12
Veterans Affairs	---	24	24
Education	2	16	17
Subtotal for HPCC Funding	**926**	**1,080**	**1,142**

Table 5. R&D Funding by Agency (in billions of dollars)

	1993 Actual	1995 Planned	1996 Request
Defense	38.9	36.3	35.2
Health and Human Services	10.5	11.7	12.1
NASA	8.9	9.5	9.5
Energy	6.9	6.6	7.1
National Science Foundation	2.0	2.5	2.5
Agriculture	1.5	1.6	1.5
Commerce	0.8	1.3	1.4
Transportation	0.6	0.7	0.8
Interior	0.7	0.7	0.7
Environmental Protection Agency	0.5	0.6	0.7
Other	1.3	1.4	1.4
Total R&D Funding	**72.5**	**72.7**	**72.9**

Select programs in the 1996 budget

Advanced Research Projects Agency

ARPA's proposed budget represents a decrease from 1995. The fiscal 1996 budget of $2.64 billion is almost $100 million less than the 1995 budget of $2.7 billion. However, the Computing Systems and Communications Technology program is slated for a 3.9% increase, from $389 million in 1995 to $404 million in 1996. This program focuses on software engineering technologies and intelligent systems and contains most of the HPCC funds allocated to the Defense Department.

The overall Defense portion of HPCC will increase 5%, from $384 million in 1995 to $403 million in 1996. Some of this money traditionally has gone to the National Security Agency

National Institute of Standards and Technology

Despite Republican proposals to eliminate the Advanced Technology Program, the Clinton administration proposed to increase funding in 1996 to $431 million—14% over 1995. ATP provides cost-shared funding to individual companies and industry-led joint ventures for the development of high-risk but potentially high-payoff technologies.

Also, the 1996 budget for Computer Systems would increase 25% to $48 million, which is $9 million over the 1995 budget. This program focuses on developing standards and conformance tests for computers and telecommunications systems and on security and interoperability

Finally, funding for Applied Mathematics and Scientific Computing would rise from $7.3 million in 1995 to $11 million in 1996—a 50% increase. This program provides expertise in mathematical modeling, statistics, numerical analysis, scientific computing and, as part of the HPCC program, collaborates with other laboratories.

Budget from Page 1

enough to cover inflation. The CISE Directorate provides 56% of all federal support to computer scientists at academic institutions. According to CISE estimates, the number of people receiving grants will remain at 5,906, whereas the median grant size will rise from $58,000 in 1995 to $61,000 in 1996.

"Given the relatively modest percentage increases in our research budgets, we expect the average size of grants to go up modestly, partly to match inflation," Young said. "If that holds, it will allow little increase in the number of awardees."

While most components within CISE will sustain growth similar to the overall directorate, a few areas stand out. For instance, funding to support the NSFnet architecture and user connections will increase only 2.2%, whereas basic research in networking and communications will increase 18.7%. The networking and communications research area will increase from $11.24 million to $13.34 million—the largest increase of any subcomponent within CISE

Young said differences in emphasis among the CISE subcomponents reflect input from various sources, including a meeting at the Airlie Conference Center and the *R&D for the NII: Technical Challenges* and *Realizing the Information Infrastructure* reports. The stagnant funding for NSFnet is due to the increasing privatization of network infrastructure, he said. "As that program winds down, you'll see more emphasis on experimental networks" and basic research.

"In general, we have continued the trend toward increased emphasis on research for information infrastructure," Young said. "NSF funds a major portion of all of the nation's basic research in networking and communications. These are clearly going to play a continuing major role, as today's networks are transformed to support the information infrastructure technologies in the 21st century

Policy from Page 2

cancer? I will find a statistician to show your data is inconclusive. You claim to have found a greenhouse effect? I will find a physicist to say you found nothing of the sort. You want to teach evolution in high school science? I will find a Ph.D biologist who will testify that evolution is a discredited theory.

No wonder politicians are skeptical of experts armed with facts. That skepticism has been fed not just by charlatans, but by too many cases of researchers overstating the significance or the certainty of their findings, either to prove a political point or to gain personal advantage.

In Congress, in the courts, in regulatory processes and certainly in the press, all views and facts tend to get leveled. A few years ago, when the Midwest experienced serious flooding a major news network invited a senior government meteorologist to explain what was happening. The network set the interview up as a debate and invited a prominent apocalyptic prophet, who argued that the cause of the floods was not meteorological but the result of God's wrath.

The network probably was satisfied that it had not only enlightened, but provided a balanced view. But in fact, they had smoothed scientific knowledge onto the same horizontal plane as popular culture and superstition and missed an opportunity to teach the public something about climate and the science of weather prediction.

Faced with a policy environment based on values and processes so contrary to the ideals of the scientific method, it is not unre-

Continued on Page 12

Policy News

Need for supercomputer centers being reviewed

By Juan Antonio Osuna
CRA Staff

The National Science Foundation formed a task force in January to consider the future of the four NSF-funded supercomputer centers, whose funding is scheduled to end after fiscal 1997.

Last October, the National Science Board approved a continuation of funds through 1997, giving the task force two years to plan a strategy for fiscal 1998 and beyond. The task force committee will prepare an analysis with recommendations for the continuation, restructuring or phasing-out of the Cornell Theory Center, the National Center for Supercomputing Applications at University of Illinois at Urbana-Champaign, the Pittsburgh Supercomputing Center and the San Diego Supercomputer Center.

In the meantime, the centers received a modest increase in the president's 1996 budget proposal. The administration requested a 5.6% increase for the centers, from $70.9 million in 1995 to $74.9 million in 1996.

The task force is likely to consider some of the recommendations of the recently released National Research Council report on the High-Performance Computing and Communications program. Although the report broadly addressed the overall HPCC program, it also tackled issues involving the centers, suggesting the possibility of charging some users for access to computing cycles. The report also recommended focusing HPCC on computing and communications research areas and not classifying unrelated disciplinary activities at the centers under the HPCC umbrella.

Although most experts do not doubt the history of technological breakthroughs at the centers, most see a need to adapt to a changing technological and political environment. For many users, desktop workstations provide sufficient power. Industry has come to accept and experiment more with parallel machines. Political pressures have mounted to bring the centers in line with a broader social agenda, and federal budgets are becoming more constrained.

Other items on the committee's agenda include:

• How best to meet future needs of science and engineering communities for high-end computational resources.

• The appropriate role of NSF in driving leading technologies such as parallel and distributed computation into scientific and engineering applications; and NSF's role in interacting with computer scientists and

Continued on Page 12

NRC from Page 1

offered a critical analysis of how the HPCC program can be improved and shaped.

For instance, the report echoed concerns expressed by a General Accounting Office report released in November that said software has lagged behind hardware development on parallel computers. Specifically, the NRC report said research should focus on developing better compilers and programming languages with improved portability across machines of different sizes.

NRC's report also warned against wasteful spending in areas best left to industry. "Avoid funding the transfer ['porting'] of existing commercial applications to new parallel computing machines unless there is a specific research need," the report said, explaining that such transfer does little to expand scientific knowledge because most of these applications were written for sequential or vector machines.

Government funding has done much to establish parallel hardware as a viable tool in the commercial world. Now that it is established, the report said, the HPCC program should refrain from funding "industrial stimulus" purchases of hardware and the development of commercial hardware by computer vendors.

In the area of networking, the report urged a greater focus on reliability and performance of large-scale networks offering distributed information systems and on network applications that, like Mosaic, increase network access.

Many of the report's recommendations concern the four National Science Foundation-managed supercomputing centers, which constitute the largest chunk of the entire HPCC program. Much of supercomputing money is inappropriately classified under HPCC, the report said. "Use of HPCCI funds is appropriate only when the research contributes significantly to the development of new high-performance computing and communications hardware or software," the report said.

The centers serve the routine needs of scientists in various disciplines by granting free access to computing cycles. To continue these services outside HPCC, NSF should consider "charging mechanisms" to users and additional non-HPCC funding sources within disciplinary directorates.

As for overall management of the program, the report recommended that Congress establish an advisory committee intended to provide broad-based, active input to HPCC. The government also should appoint a full-time coordinator to serve as the program spokesperson and advocate for HPCC.

To ensure that long-term research goals are not too dependent on the HPCC program, the report concluded that federal funding agencies should identify research areas that are long-term and independent of HPCC.

"This problem is particularly acute at NSF, where nearly all of the funding in the Computer and Information Science and Engineering Directorate is coded as HPCCI funding," the report said. "Given that NSF is not a mission agency, this approach seems shortsighted. Ongoing funding of important research areas in computer science will be critical to the nation's future, independent of the future of HPCCI."

Frank heads ARPA's CSTO

Howard Frank, a seasoned information industry executive, has been appointed to head the Advance Research Projects Agency's Computer Systems Technology Office.

A senior fellow at the Wharton School's SEI Center for Advanced Studies in Management, Frank has served as founder, chair and CEO of Network Management Inc., president and CEO of Contel Information Systems, president and founder of Network Analysis Corp., a consultant to the Executive Office of the President and an associate professor at the University of California at Berkeley.

He has served on six editorial boards, been a featured speaker at more than 100 business and professional meetings and has written more than 190 articles and chapters in books.

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Policy News

Online from Page 3

which it is proper for government to be the interpreter and filter of information it holds. Making information usable involves filtering and interpreting. As much as we love and deeply trust our government officials, do we really want to rely solely on them to interpret and filter information?

In January a minor flap occurred over the post of House historian. Whether the accusations made at the time about that person's political views were accurate or fair is not the point here. What is important is that for the first time, the personal views of a House historian were publicly debated.

Traditionally, the post has been unnoticed and unremarkable in its duties of primarily gathering, archiving and organizing House documents. But Gingrich said that he wanted the House historian to play a more active and publicly visible role in teaching people about Congress and "the history of the institution." When the job changed from that of archivist and cataloger to interpreter and communicator, the ideology of the person in the job became a politically sensitive issue.

Issues for the community

The issue of access to government information should heat up this year as the Internet continues to grow and as networking enthusiasts in the administration and Congress share their futurist visions. A number of government organizations will appear online. Congress will debate the role of the Government Printing Office (which some want to close down), possible amendments to the Freedom of Information Act, development of the new Government Information Locator Service and many other related policy issues. The debates will be relevant to the computing research community at many levels.

A great deal of research must be done and technology invented before these futuristic visions can be fully realized. This may be yet another time when the hype and the vision triggered by a splashy success such as Mosaic can result in a backlash after people's expectations hit the current limitations of technology

The National Science Foundation's major digital library grants made last year under the HPCC program will begin to work on an agenda. Some research needs to be done in the social and cognitive sciences. We know little about how people will access and use information in an electronic environment, or what role the intermediary institutions will play in moderating that access.

The government has a particular responsibility in providing the scholarly community with access to research and technical information. As the principal supporter of research, government is, in a sense, the principal creator of an enormous information bank. Some of the agencies are just now getting around to the idea that part of their responsibility to support research entails giving the research community access to the information. As broader rules and systems are established to mediate access to government information, will these rules and systems fit or work well in the case of science and technology information?

Many organizations, schools, universities, research labs, libraries and technical societies are important intermediaries in flow of information in society. What roles will they play in the future? Will services offered by government agencies obviate the need for or change the nature of services provided by other organizations? Will government science agencies sit more squarely in the middle of the basic flow of scientific information, particularly in some data-heavy disciplines? Should they?

To the research community, access and other such information policy questions are issues that are far afield from the more direct matters of research budgets and agency funding priorities. But the issues are becoming increasingly central to the National Information Infrastructure debate. Just as the physics community became drawn into the broader defense and nuclear policy debates following World War II, so too will the computing community inevitably be drawn into these broader information questions.

Draft telecom bill released

Sen. Larry Pressler (R-SD) released a draft bill in late January that would reform telecommunications law, removing regulations and opening markets to greater competition.

The "Telecommunications Competition and Deregulation Act of 1995" would be implemented in three one-year phases, ultimately dismantling Modified Final Judgment restrictions and freeing cable, utility, long-distance and local telephone companies to cross over into each other's markets.

The draft was criticized by the Regional Bell Operating Companies (RBOCs), who expressed dissatisfaction with the timing of the reform. The draft only allows local telephone companies into the long-distance market during the final phases.

"True competition will come only when all players are allowed into all markets at the same time and under the same terms and conditions," said Gary McBee, chair of the Alliance for Competitive Communications, an ad hoc RBOC coalition.

"It opens the local telephone market but denies the American public the right to choose to receive long-distance and cable services from their local phone company at the same time or allow consumers to do business with us in the same way," McBee said.

Pressler, chair of the Commerce, Science and Transportation Committee, said, "Because of their monopoly status, local telephone companies and the Bell Operating Companies have been prevented from competing in certain markets. It is time to eliminate these restrictions. Nonetheless, transition rules designed to open monopoly markets to competition must be in place before certain restrictions are lifted."

Last year, Sen. Ernest Hollings (D-SC) introduced similar legislation but withdrew it during a similar dispute with the Bell companies over timing issues.

ONR shifts program funds

The Office of Naval Research has suspended its Graduate Fellowship Program for students seeking Ph.D. in science and engineering. A glut in Ph.D. production prompted the agency to shift funds further down the pipeline to post-Ph.D. faculty.

"The country's got a lot more Ph.D.s than can be employed," said Debra T. Hughes, ONR deputy director of the Corporate Programs Division. "Obviously, we don't want to stop people from going into these fields," she said, adding that the shift in funds was merely a response to changing demographics, employment statistics and trends in degree production.

Hughes also said ONR will continue participating in other Defense programs that provide fellowships to graduate students.

The $5 million program offered three-year fellowships to students seeking Ph.D.s in one of 11 fields, including computer science. Each year, ONR would award fellowships to four CS students.

The funds are being moved to the Young Investigator Program, which accepts research proposals from tenure-track faculty, Hughes said. She added that the faculty program has seen a "marked" increase in the number of qualified proposals.

Students already awarded fellowships will continue under the program. However, no new students will be accepted for the fall of 1995.

"The decision was made after much deliberation," Hughes wrote in a letter to faculty. "We considered carefully the impact of responding to today's circumstances against long-term scientific goals. We will continue to observe economic and other trends and to evaluate our program balances in response to these trends and Navy needs."

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pected that members of the scientific community become frustrated and disillusioned.

Nor is it surprising that some members who do participate try to keep an antiseptic separation between their work and the debate by hiding behind the thin film of "objectivity."

Yet policy makers see that posture for what it too often is—a claim of intellectual and moral superiority and a sense that the writer is somehow descending to a lower plane of discourse.

Facts and analysis can add rationality to policy debates. As science and technology pervade ever more deeply the critical policy decisions, it is important that the scientific community participates. Above all, it is important that we set the following as goals: to be accurate, clear and nonpartisan.

We scientists must understand that when dealing with public policy we are working in an arena that does not view facts in the same way we do and that asks us, just as it asks a big-time lobbyist lawyer, where we are coming from. "No where" is not an acceptable or believable answer.

To understand this helps us to better appreciate the process we are trying to influence and tailor our work and participate more effectively. Who knows, it might even help us find the fun in democratic debate, a concept that seems to have totally disappeared from this town lately.

Task Force from Page 11

engineers, computational mathematicians, vendors of parallel systems and industrial users.

• The appropriate range of potential grantees and suppliers in such a program, and the potential for leverage of NSF program funds by partnering with other federal and state agencies, technology vendors, universities and industrial users.

• The potential needs of high-end computational users versus those of more information-intensive users.

• Expected budget realities for the first five years of any recommended program.

The members of the committee are:

Ed Hayes (committee chair), Ohio State University
Arden Bement Jr., Purdue University
John Hennessey, Stanford University
John Ingram, Schlumber Limited
Peter Kollman, University of California at San Francisco
Mary Vernon, University of Wisconsin at Madison
Andy White, Los Alamos Advanced Computing Laboratory
William A. Wulf, University of Virginia.

Policy News

News Analysis

Research funding and the new Congress

By Fred W. Weingarten
CRA Staff

Three months after the momentous congressional elections of last November, the computing research community is still trying to assess the implications of the political change for federal research funding. What will be the effect of a Republican Congress on research funding in general, particularly in the computing fields?

All these struggles are nothing more than holding actions, trying to delay or slow the steady erosion of federal support for research.

Pessimist's view

Pessimists found a lot to be concerned about. They noticed, for example, that when the now famous "Contract With America" was released, it was accompanied by a table listing several possible budget cuts.

The table proposed several cuts in R&D support. It recommended eliminating the Commerce Department's Advanced Technology Program (ATP) and the Defense Department's Technology Reinvestment Program (TRP), two cornerstones of the administration's Technology Policy.

It also proposed cutting $1.25 billion over five years from the High-Performance Computing and Communications (HPCC) program and a relatively small cut in the growth rate in funding for the National Science Foundation (NSF).

The table was not officially part of the contract. It was created on short notice by Republican budget committee staff members to serve as proof that sufficient cuts could be made to achieve the goals of the contract. (The exact phrase used in the header was "examples of possible offsets.")

Nonetheless, as the contract rose to post-election prominence, particularly in the House, so did attention to the accompanying numbers and concern that they would be a convenient starting place for budget cutters.

On December 5 another event occurred that raised more alarm. Senators John McCain (R-AZ) and John Warner (R-VA), members of the Senate Committee on Armed Services, sent a letter to the administration expressing concern about declining military preparedness. The senators suggested a reallocation of funds this year, including the elimination of ATP, TRP and $1.5 billion for medical and university research.

The letter, sent while memories of last year's attacks on defense research appropriations were still fresh in the minds of the university research community, created an ominous picture for the community. Academic computing research depends on DOD for about 50% of its support.

Furthermore, stories persist in the press that Sen. Strom Thurmond (R-SC) may step down as chair of the Armed Services Committee (although Republican leadership denies it). Warner is next in line to chair the committee. His views count. Some think that the letter was simply a tactic to get the attention of the administration and does not reflect his true priorities.

Optimist's view

Optimists, while not expecting meaningful increases in research funding, do not foresee an assault from the new Congress. Republicans, even the "government minimalists," always have supported research as a legitimate and important federal responsibility. And support for agencies such as NSF, ARPA and the National Institutes of Health has always been bipartisan.

House Speaker Newt Gingrich and some of his colleagues seem particularly taken with technology, particularly information technology. Gingrich talks about the Internet and the new information society. He hangs around with and constantly cites futurists such as Alvin Toffler and George Gilder. Republicans have learned quite well, probably better than the Democrats, how to harness the power of modern communications and computer technology for political organization and action. (He has even suggested that the government should buy laptops for the poor.)

It remains to be seen whether this enthusiasm will translate into support for basic computing research or programs such as HPCC, which,

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Purdue University
Department of Computer Sciences

The Department of Computer Sciences has no regular faculty vacancies for academic year 1994-95 at this time. If vacancies occur, it is anticipated that one-year visitors will be hired. It appears likely that one to three such visitors might be hired. Definitive information is expected early in 1995. We expect to have several regular faculty positions to fill for 1996-97. It is likely that the fields given the highest priority for these positions will be computational science and engineering, computer systems and programming languages. However, candidates with outstanding credentials in other fields will be given serious consideration.

We have about 30 faculty members in operating systems, networks, programming languages, database systems, robotics, software engineering, solid modeling, supercomputing, theory and numerical analysis. The department affords great opportunities for people who want to get involved in exciting research. Each faculty member has access to the departmental computing facilities (many Sun file/compute servers, a 64-processor Ncube 2 and many workstations), to the computing center's Intel Paragon supercomputer and to national computer networks.

Visitor applicants should submit resume and names of references by March 1, 1995, to Chair, Personnel Committee, Department of Computer Sciences, Purdue University, West Lafayette, IN 47907.

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Columbia University
Department of Computer Science

The Department of Computer Science anticipates at least one tenure-track opening. We invite applications from exceptional candidates at all ranks and in all areas, but we are particularly interested in areas that complement current departmental research interests, especially software and systems.

Our department of 19 tenure-track faculty and two lecturers emphasizes research and attracts excellent Ph.D. students, virtually all of whom are fully supported. Departmental facilities include numerous Sun servers; Sun, HP, DEC, SGI and IBM workstations; an eight-processor HP 9000/735 cluster; plus state-of-the-art experimental equipment. The department is in the fourth year of an NSF CISE infrastructure grant. We are within an hour's drive of the research laboratories of AT&T, Bellcore, IBM, Matsushita, NEC, NYNEX, Philips, Siemens and other leading industrial companies.

Columbia University is one of the leading research universities in the United States, and New York City is one of the cultural, financial and communications capitals of the world. Columbia's enclosed campus of tree-lined walks is located in Morningside Heights on the Upper West Side. The department has its own building plus additional space and facilities in the new interdisciplinary Schapiro Center for Engineering and Physical Science Research. University subsidized housing and parking are available.

Candidates for assistant professor should exhibit exceptional research promise, while those seeking a more senior position should have an outstanding record of research achievement. Interest and ability in teaching undergraduates and graduates is necessary. Please submit a summary of research interests, curriculum vitae, E-mail address and the names of at least three references to Faculty Search Chair, Department of Computer Science, 450 Computer Science Building, Columbia University, New York, NY 10027. E-mail: recruiting@cs.columbia.edu.

Columbia University is an equal opportunity, affirmative action employer. We encourage applications from women and minorities.

University of Kentucky
Department of Computer Science

The Department of Computer Science at the University of Kentucky invites applications for anticipated tenure-track positions for fall 1995. Although appointment at assistant professor is preferred, exceptionally qualified candidates will be considered for appointment at associate or full professor. Candidates should have a Ph.D. in computer science or a related discipline. Review of credentials began Jan. 15, 1995, and the search process will continue until suitably qualified candidates are found.

We are especially interested in candidates with an expertise in database engineering, vision and computer graphics, and high-performance distributed computing. In high-performance distributed computing, experience with interdisciplinary projects is desirable.

The University of Kentucky is the major graduate degree-granting institution in Kentucky. The Department of Computer Science of the University of Kentucky is strongly committed to the goal of maintaining research and teaching excellence and high national visibility. The department offers Ph.D., M.S. and B.S. degrees. There are about 300 undergraduate and 75 graduate students currently enrolled.

Please send a curriculum vitae and the names of three references to Faculty Search Committee, c/o Diane Mize, Department of Computer Science, University of Kentucky, Lexington, KY 40506-0027. Fax: 606-323-1971; E-mail: diane@ms.uky.edu.

The University of Kentucky is an equal opportunity, affirmative action employer. It especially encourages applications from women and minorities.

University of Oregon
Department of Computer and Information Science

The Department of Computer and Information Science invites applications for at least one tenure-track faculty position. Candidates from all areas of computer science will be considered. However, we are particularly interested in the areas of programming languages, computational science and software systems. Candidates should have a Ph.D. in computer science and a strong commitment to both research and teaching. We offer an excellent research environment.

The department has major research strengths and funding in the areas of human/machine interfaces, parallel programming languages and environments, software engineering, computational science, distributed operating systems, electronic media, graphics, declarative languages and the theory of computation. The department is associated with the NSF-funded Software Engineering Research Center (SERC) and the Computational Intelligence Research Laboratory (CIRL). Instructional laboratories consist of Unix-based workstations and computer servers. Research facilities include special equipment for user-interface design, graphics and parallel processing. A new computational science laboratory will house multiple parallel computers with high-performance graphics hardware.

The University of Oregon is located in Eugene, a community rated among the most livable in the nation. Qualified candidates should send their curriculum vitae and the names of at least four references to Faculty Search Committee, Computer and Information Science, University of Oregon, Eugene, OR, 97403-1202. E-mail: facultysearch@cs.uoregon.edu. For full consideration, applications should be received by March 1, 1995, but we will continue to accept applications until the position is filled.

The University of Oregon is an equal opportunity, affirmative action institution committed to cultural diversity and compliance with the Americans with Disabilities Act.

University of Illinois, Chicago
Department of Electrical Engineering and Computer Science

The Department Electrical Engineering and Computer Science has openings for tenured and tenured-track faculty positions at all levels in the areas of computer science and computer engineering. Of particular interest are VLSI, operating systems, compilers and architectures.

All candidates are expected to have an outstanding research record and commitment to quality teaching. UIC is a Research-I university, one of 70 top-ranked universities nationwide. The EECS Department has 50 faculty members and 500 graduate students. The department receives more than $4 million per year in research funding (sources include NSF, ONR, ARPA and AFOSR). The department houses a substantial computing environment including 150 workstations, and over 25,000 square feet of research labs (much of the lab space is in a new Engineering Research Facility).

For fullest consideration, send a resume and the names of at least three references by March 31, 1995, to Dr. Robert V. Kenyon, Search Committee Chair, Department of EECS (M/C 154), University of Illinois at Chicago, 1120 Science and Engineering Offices, 851 S. Morgan St., Chicago, IL 60607-7053.

The University of Illinois at Chicago is an affirmative action, equal opportunity employer.

University of Washington
Department of Computer Science and Engineering

The Department of Computer Science and Engineering at the University of Washington seeks applications from outstanding teachers to collaborate with the current faculty in teaching the introductory course sequence and more advanced undergraduate courses. There is no deadline for applications, but candidates are encouraged to apply early. A lecturer appointment may be made during the 1994-95 academic year.

The department is committed to excellence in education. Candidates should have an exceptional record of classroom instruction and curricular innovation that can further enhance UW undergraduate offerings. The teaching load is five quarter-courses plus certain responsibilities for overall management of the introductory sequence. Though the lecturer rank is not a tenure-track position, the faculty seeks candidates interested in establishing a long-term professional relationship with Washington.

Qualified applicants should send a letter of application, a resume and the names of four references to Faculty Recruiting Committee, Department of Computer Science and Engineering, FR-35, University of Washington, Seattle, WA 98195.

The university is building a culturally diverse faculty and strongly encourages applications from female and minority candidates. UW is an affirmative action, equal opportunity employer.

Florida Atlantic University
Department of Computer Science and Engineering

The Department of Computer Science and Engineering seeks applications for tenure-track faculty positions at the assistant professor level. The positions require demonstrated teaching ability and research potential. A doctorate in computer science, computer engineering or a closely related field is required. More information about the department can be accessed through the World Wide Web at http://www.cse.fau.edu.

Applicants with expertise related to our new B.S. program in computer engineering are preferred. Salaries and fringe benefits are competitive. The appointments will begin in August 1995. To receive primary consideration, an application must be received by March 17, 1995, although the applications will be reviewed until suitable candidates are found.

Applicants should send a resume, including the names and telephone numbers of at least three professional references, and a cover letter specifying teaching and research interests to Faculty Search Committee, Department of Computer Science and Engineering, Florida Atlantic University, 777 West Glades Road, Boca Raton, FL 33431. Electronic mail communications should be addressed to searchcomm@cse.fau.edu.

Florida Atlantic University is an equal opportunity, affirmative action employer. Members of protected classes are encouraged to apply.

Tulane University
Department of Computer Science

The Department of Computer Science at Tulane University seeks a new tenure-track faculty member to complement our existing strengths in artificial intelligence and computer engineering. Successful candidates must have research interests at the interface between these areas. Such candidates must be able to direct both computer science and computer engineering students and be able to teach software and hardware courses. A doctorate (completed by Sept. 1, 1995) in computer engineering, computer science or a related field is required. We will consider both junior and senior faculty candidates. Salary and rank are commensurate with experience.

Tulane is an AAU university located in a historic residential area of New Orleans. The Department of Computer Science is in the School of Engineering and offers bachelor's degrees in computer science and computer engineering and master's and doctorates in computer science. Highly selective in our student recruiting, we have especially strong graduate and undergraduate students. The department has three labs dedicated to computer engineering instruction and research, and manages its own state-of-the-art network. The university's network provides additional resources such as supercomputing.

Tulane is situated in the heart of one of New Orleans' most historic areas. Stately antebellum homes, the New Orleans street car, Audubon Zoo, the Jazz Festival, the French Quarter, world-famous food and endless music and art options provide an active extracurricular life for faculty and students alike.

We are committed to providing opportunities to all qualified persons, and we urge all who are qualified to apply. Reply by March 20, 1995, to Johnette Hassell, Chair, Department of Computer Science, Tulane University, New Orleans, LA 70118. E-mail: hassell@cs.tulane.edu; Web site: http://www.cs.tulane.edu.

Professional Opportunities

University of California, Riverside

Department of Computer Science

The Department of Computer Science at the University of California at Riverside invites applications for a tenure-track position at open ranks. Appointment to start July 1, 1995. Applications by excellent candidates are sought in all areas of computer science, with particular emphasis for the following areas: artificial intelligence, graphics and computer systems (both hardware and software).

Applicants should hold a Ph.D. degree in computer science or a closely related field. Junior candidates are expected to demonstrate exceptional promise in research and teaching. Applicants at the senior level are expected to have a distinguished record in both areas. Responsibilities of the position include research, graduate and undergraduate teaching and departmental service. Salary level will be competitive and commensurate with the applicant's rank and qualifications.

UCR is a major research institution and member of the nine-campus University of California System, widely regarded as the most distinguished system of public higher education in the United States. Graduate degrees in computer science are offered at the M.S. and Ph.D. levels.

Applications received by F. 25, 1995, will receive full consideration. Applications received after this date will be considered if an appointment is not made from the initial application pool. A complete application shall consist of the curriculum vitae, list of publications and the names and addresses (including E-mail addresses) of four or more references. Applications should be sent to Professor Todor C. Przymusinski, Professor Faculty Search Committee, Department of Computer Science, University of California, Riverside, CA 92521-0304. Tel. 909-787-5639. E-Mail: hire@cs.ucr.edu.

The University of California at Riverside is an affirmative action, equal opportunity employer.

University of Alberta

Department of Computing Science

Applications are invited for a tenure-track position at the assistant professor level in the areas of communication networks, distributed and parallel systems or software engineering. Responsibilities include research as well as teaching at both the graduate and undergraduate levels.

The department consists of 31 academic and 27 support staff, and offers a graduate program with more than 100 M.Sc. and Ph.D. students. Current computer equipment consists of a network interconnecting a four-processor SGI 4D340S, a 64-processor Myrias SPS-2 parallel computer, four Sun file servers delivering 40 gigabytes of storage, more than 110 Sun, DEC and SGI workstations in research laboratories and offices, and several MIPS CPU servers. The department is well-connected via the campus FDDI network to the remainder of the campus and the Internet. Instructional facilities include six laboratories of Sun workstations and two of Macintoshes. There are several well-supported research laboratories in artificial intelligence, computer graphics, computer vision and robotics, database systems, networks and distributed operating systems, distributed and parallel systems, and software engineering.

The current salary minimum is $39,230 (Canadian), with the appointment level being commensurate with qualifications and experience. A Ph.D. or equivalent is the minimum qualification; new Ph.D.'s should include a copy of their transcripts. Applications will be accepted until March 1, 1995, or until the position is filled, with employment commencing July 1, 1995.

Please send applications, including curriculum vitae, the names of three references and up to three reprints or copies of important publications, to Dr. M. Tamer Ozsu, Acting Chair, Department of Computing Science, University of Alberta, Edmonton, Alberta, Canada T6G 2H1. Email: ozsu@cs.ualberta.ca.

In accordance with Canadian Immigration requirements, priority will be given to Canadian citizens and permanent residents. The University of Alberta is committed to the principle of equity in employment. The university encourages applications from aboriginal persons, disabled persons, members of visible minorities and women.

University of Florida

Department of Computer and Information Sciences

The Department of Computer and Information Sciences invites applications for tenured or tenure-track faculty positions at the assistant, associate and full professor ranks in all areas of computer science and engineering. Applicants must possess a doctoral degree in computer science or computer engineering or equivalent and show a strong record and commitment to teaching and research in these areas. The positions are available in the 1995-96 academic year.

Applicants should send their resumes and the names and addresses of at least four references to Professor Sartaj Sahni, Chair, Faculty Search and Screening Committee, Computer and Information Sciences Department, 301 CSE, University of Florida, PO Box 116120, Gainesville, FL 32611-6120. Tel. 904-392-1200; E-mail: sahni@cis.ufl.edu. The closing date is March 24, 1995.

The University of Florida is an equal opportunity, affirmative action employer. This faculty search will be conducted in compliance with "Florida's Government in the Sunshine Law."

Purdue University

School of Electrical Engineering

The Purdue University School of Electrical Engineering seeks outstanding candidates in computer engineering for research and teaching in the following areas: operating systems for parallel and/or distributed systems, languages and compilers, software engineering, computer architecture and artificial intelligence. Openings are for tenure-track faculty at all levels.

Applicants must possess a doctorate degree. Send a resume, including a statement of teaching and research interests, and a list of three references to Head, School of Electrical Engineering (CE), Purdue University, 1285 EE Building, West Lafayette, IN 47907-1285. Applications will be considered as they are received.

Purdue University is an equal opportunity, affirmative action employer.

University of Southwestern Louisiana

Center for Advanced Computer Studies

Nominations and applications are sought for the position of director of the Center for Advanced Computer Studies. The financial package includes a competitive salary, an administrative stipend and a discretionary fund. The candidate may also be considered for appointment to an endowed research professorship, depending on qualifications.

About the center: The center is primarily a research unit, with M.S. and Ph.D. degree programs in computer science and computer engineering. About 175 students are enrolled in the graduate programs, of which about 100 are pursuing a Ph.D. degree. The center currently has about 20 research faculty members. External grants and contracts of approximately $3.5 million support research in a variety of areas. The center has state-of-the-art instructional computing facilities and several research laboratories.

Lafayette has a population of 94,000 and is approximately 120 miles west of New Orleans.

Qualifications for the director: The candidate must have demonstrated abilities in administrative leadership in an academic setting. Candidates must have national visibility through accomplishments in research, contract and grant funding, professional activities, etc. The candidate must be able to enhance and promote collaboration with government agencies and industrial corporations.

The search will continue until the position is filled.

Send applications/nominations containing a statement of goals and vision, a detailed resume and names of five references to Dr. Vijay V. Raghavan, Chair, Search Committee for the Director, The Center for Advanced Computer Studies, University of Southwestern Louisiana, Lafayette, LA 70504-4330, tel. 318-482-6603.

The University of Southwestern Louisiana is an equal opportunity, affirmative action employer.

State University of New York, Stony Brook

Department of Computer Science

Applications are invited for faculty positions in computer science and information systems. We are particularly looking for people interested in distributed systems, computational logic, visual computing or in the technical aspects of information systems.

The Stony Brook Computer Science Department, consistently rated among the top 20 in North America, currently has 25 faculty members with a wide variety of research interests including computer architecture, databases, distributed systems, software engineering, logic programming, automated reasoning, computer graphics, visualization, user interfaces, image processing and artificial intelligence.

In June 1993, the department was awarded its third NSF Institutional Infrastructure grant to develop a computing environment consisting of a network of parallel workstations connected to a large parallel server.

Applicants should have a Ph.D. in computer science, information systems or a related discipline. Please submit a detailed curriculum vitae, together with the names of five references and reprints of recent publications, to Professor I.V. Ramakrishnan, Chair, Faculty Recruiting Committee, Department of Computer Science, SUNY at Stony Brook, Stony Brook, NY 11794-4400. Tel. 516-632-8451 or 632-8470. E-mail: ram@cs.sunysb.edu.

Please specify computer science or information systems on your application.

Applications from women and minorities are particularly sought. Stony Brook is an affirmative action, equal opportunity educator and employer.

GE Corporate Research and Development Center

Research Staff

GE has a variety of openings for information technologists in its Corporate Research and Development Center in the Albany/Schenectady area of New York.

GE is one of the world's largest and most successful companies, having leadership positions in business segments including electrical power generation, plastics, manufacturing capital services and others. GE's 94-year-old Corporate Research and Development Center (CRD) supports the advanced technology requirements of all of GE's businesses. The 1,000-plus staff of scientists and engineers is composed of representatives of most major disciplines. CRD currently is offering a variety of employment opportunities for Ph.D.'s in computer science, statistics, operations research, finance and business. GE CRD also is looking for MBAs with skills in marketing, business development and finances. Much of this growth arises from opportunities to impact GE's Capital Services business.

Technical specialties desired for the Ph.D. positions include the following:

Computer science

- artificial intelligence: neural networks, machine learning, data mining and case-based reasoning
- fuzzy logic-based control
- natural language text processing
- database and systems re-engineering
- graphics and visualization
- image processing and understanding
- industrial inspection
- real-time signal processing
- network-based information services
- object-oriented software

Statistics

- quality and product life improvement
- financial services
- engineering analysis

Operations Research

- manufacturing and service process optimization

Finance/Business

- economic asset pricing
- financial decision support models
- computer-based financial systems
- automatic auditing

For consideration, forward your resume to: Carl Trent, Manager, Professional Recruiting, Ref. ITL, GE Research and Development Center, Building K-1, Room D206, PO Box 8, Schenectady, NY 12301.

GE is an affirmative action, equal opportunity employer. Hiring is contingent upon eligibility to work in the United States.

Conference News

EFFECTIVE TEACHING IN CS&E ✦ JUNE 8-9 ✦ SNOWBIRD, UTAH

As part of its workshop series, the Computing Research Association is sponsoring Effective Teaching in Computer Science and Engineering. The workshop is intended for new faculty members teaching college and university courses in computer science and engineering. However, if space is available, experienced faculty are welcome to attend.

The purpose of the workshop is to help new faculty members teach more effectively. This highly interactive workshop includes theoretical material on educational objectives and learning styles, and practical tips on effective lecturing, course organization, creative problem solving and collaborative learning.

Attendees are asked to bring a syllabus and examination from one of their courses. Attendees will actively participate individually, in pairs and in small groups. Each person will receive a booklet of readings and a bibliography on effective college teaching. The workshop leaders are Michael C. Loui, professor of electrical and computer engineering, University of Illinois at Urbana-Champaign; and Michael B. Paulsen, associate professor of educational leadership, University of New Orleans.

For more information about the workshop, contact Kimberly A. Peaks of CRA at tel. 202-234-2111 or via E-mail at kpeaks@cra.org. Space is limited.

Preliminary Agenda

Thursday, June 8

Breakfast 7:30AM–8:30AM
Registration 8:30AM–8:45AM

Session 1 8:45AM–10:30AM
Learning Styles
This session will begin with a brief introduction to the workshop and a brainstorming exercise on the characteristics of good teaching, generated by the participants.

The Gregorc model of learning styles will be presented. Instructors should use a variety of styles so they can reach all students. For example, factual information should be presented verbally and visually because some students prefer words and others prefer pictures.

Activities: Participants will use the Gregorc style delineator to determine their own preferred learning styles. They will share their findings to show the diversity of learning styles among themselves.

Morning Break 10:30AM–10:45AM

Session 2 10:45AM–12:30PM
Effective Lecturing
Every aspect of a lecture should promote either motivation or cognition. Motivation strategies include gaining attention, showing relevance to students' interests, increasing students' confidence in their ability to learn and giving feedback on students' performance. Cognition strategies include rehearsal and repetition, elaboration and rephrasing, organization and metacognition in which students monitor their own progress.

Activities: Participants will observe a 20-minute model lecture and identify the motivation and cognition strategies that were used.

Luncheon 12:30PM–2:00PM

Session 3 2:00PM–3:45PM
Creative Problem Solving in Groups
Most computer science courses emphasize technical problem solving but rarely teach problem solving skills per se. Participants will learn how to make the process of solving problems explicit, using the IDEAL model. In addition, participants will learn how to foster students' creativity in devising solutions to problems and how to incorporate collaborative learning into the classroom.

Activities: Participants will be assigned to groups of three or four to balance their levels of experience and their backgrounds. All groups will consider the same pedagogical problem in computer science for part of the time and their own problems for the remainder. Answers to the common problem will be shared with the full group.

Dinner 6:00PM–7:30PM

Friday, June 9

Breakfast 7:30AM–8:30AM

Session 4 8:30AM–10:15AM
Course Organization and Instructional Objectives
Bloom's taxonomy of educational objectives will be presented. Participants will learn how to write instructional objectives for a particular assignment and for an entire course.

Activities: Participants will write six questions on the same concept at different levels of Bloom's taxonomy, analyze their examination according to the levels, and critique each other's syllabi.

Morning Break 10:15AM–10:30AM

Session 5 10:30AM–11:30AM
Advising Thesis Students (tentative)
(This session is still being formulated.) Because participants will come from Ph.D.-granting departments, they will be expected to supervise research projects by undergraduate and graduate students. This session will focus on techniques for individual instruction and on research ethics, including authorship questions and conflicts of interest.

Session 6 11:30AM–Noon
Evaluation for Improvement
Participants will learn how to use informal early feedback after the first or major assignment.

Evaluation of the workshop.

Luncheon Noon–1:30PM

Registration Information

The registration fees for the workshop are as follows:

	By April 28	After April 28
CRA members	$350	$400
Non-members	$450	$500

The conference hotel is the Cliff Lodge at Snowbird Ski & Summer Resort. All hotel accommodations must be arranged through the Computing Research Association. Snowbird Resort will not accept direct reservations.

The following room rates (effective June 5-11) include all conference meals:

Bedroom	$85/night
Deluxe Bedroom	$131/night
One bedroom suite	$216/night

Rate does not include current 9.63% state room tax.

Survey text from Page 6

1980 assessment of research doctorate programs in the United States done under the auspices of the National Research Council. We modified our ranking to include top Canadian universities.

Our top 12 schools are Stanford University, Massachusetts Institute of Technology, Carnegie Mellon University, University of California at Berkeley, Cornell University, University of Illinois at Urbana-Champaign, University of California at Los Angeles, University of Toronto, University of Washington, University of Texas at Austin, University of Wisconsin at Madison and the University of Southern California.

The departments ranked 13-24 are the University of Maryland, Princeton University, Brown University, University of Utah, New York University, University of Massachusetts at Amherst, the State University of New York at Stony Brook, University of North Carolina at Chapel Hill, University of Pennsylvania, Yale University, Pennsylvania State University and the Georgia Institute of Technology.

The departments ranked 25-36 are the University of California at San Diego, the California Institute of Technology, Columbia University, Ohio State University, Rice University, Duke University, Northwestern University, Syracuse University, Rutgers–the State University of New Jersey, University of California at Irvine, University of Minnesota and the University of Rochester.

Acknowledgments

The staff at CRA headquarters—notably Juan Osuna and Phillip Louis—were responsible for drafting the survey, collecting information and preparing the accompanying tables. Jeffrey Ullman of Stanford University, Duncan Lawrie of the University of Illinois at Urbana-Champaign, and John Savage of Brown University helped refine the survey. Mary Jane Irwin of the Pennsylvania State University provided the interpretation of female statistics noted in this article. Lawrie and Robert Schnabel of the University of Colorado provided useful feedback on this article.