COMPUTING RESEARCH NEWS

The News Journal of the Computing Research Association

September 1995 *Vol. 7/No. 4*

Weingarten steps down as executive director

Fred "Rick" W. Weingarten, CRA's executive director for the past five years, has taken on a new role with the association. He will be devoting his full attention to government affairs and policy issues. As of September 1, he is working part time for CRA and part time in a senior policy advisory position with another non-profit association.

CRA expects to complete its search for a new executive director early this fall.

CRA has reached a major milestone in effectiveness and recognition and now has an opportunity to move forward to the next level of broadened activity.

Since CRA renamed and reorganized itself in 1990, a major goal has been to become one of the primary institutions on policy issues related to computing research. For several years this meant knocking on doors and explaining who we were and why we might have something valuable to contribute. Anonymity is no longer an issue for CRA, and today we are consulted routinely.

Our membership has grown to 140 computer science and engineering departments, 20 industrial laboratories and four affiliated professional societies. Not only did we expand our membership, we also expanded services to our members.

However, the person who beat the halls of Congress also ran CRA's headquarters. The CRA Board was thrilled with Rick's performance in his dual role, but he convinced us that it was in the best interests of our field to split the job," said CRA Board chair David A. Patterson. "Since Rick's first love is policy issues, we followed his advice and will seek a new executive director while he spends his time with policymakers."

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Flawed report on Ph.D. production creates stir

By Peter A. Freeman

An article in the July 4 *New York Times*—"Supply exceeds demand for Ph.D.s in many science fields"—alarmed a number of people in the computing research community because of its strongly worded assertion that "there is a 1-in-4 chance of [a newly minted Ph.D.] being disappointed [in finding a job in their specialty], according to a recent survey."

The article cited computer science as being the worst field: " 'The surplus of doctoral computer science degrees currently awarded over the number of those who get desirable jobs in their field is 50.3%,' Dr. [William A.] Massy [author of the study] said." Charles A. Goldman of RAND was co-author of the study.

My review of the study, given below, points out, among other things, that the study was merely a simulation, not a survey as reported by the *Times*, thus making the reported conclusions speculative at best.

The CRA Board appointed a group to review the study more thoroughly. Jeff Ullman of Stanford University and Bob Ritchie of Hewlett-Packard Co. volunteered to meet with the senior author of the study. Just before the scheduled meeting, Massy discovered a major flaw in the input data for computer science.

When corrected, Massy's model predicts a CS overproduction of less than 4% rather than the 50% originally reported—one of the lowest of all disciplines, as opposed to one of the highest. At *CRN* press time, Massy intended to reissue his report. Various other follow-up actions were under consideration.

In spite of the flaws in the study, however, two points in it are worth serious attention. First, it presents a model that shows how increasing research funding to employ additional Ph.D.s can actually lead to an even more serious problem of oversupply in the future. Second, it implicitly questions whether or not we are providing students in Ph.D programs with training and education appropriate to their likely employment.

Summary of study: This report describes a simulation of the supply and demand for science and engineering doctorates, and asserts there is a credible case for significant structural underemployment when the supply-and-demand system achieves a steady state. The report

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News Analysis

OTA victim of politics, budget cuts

By Fred W. Weingarten
CRA Staff

Who needs technology assessment? Apparently not Congress—it closed down its Office of Technology Assessment (OTA) after only 20 years of existence (see story on page 5). Others, myself included, are not so sure. I believe the nation will sorely miss an important experiment in incorporating a better understanding of technology into government policy making.

It isn't considered good form these days to speak well of a government agency or to suggest that the government can do something right. Nevertheless, I have always had great affection and respect for OTA; I spent nearly 10 years there, many of them as manager of the Communication and Information Technologies Program.

The budgetary attacks on OTA began shortly after the Republicans gained control of Congress. In January a Senate task force suggested, in a list of ways to cut the legislative budget, that OTA be eliminated. This summer, the House Appropriations Committee, in its legislative appropriations bill, provided zero funding for the agency. On the floor of the House, after some confusing parliamentary manipulation, an amendment to save OTA was barely passed.

The strategy for saving the agency was odd and hardly consoling to supporters. The bill buried OTA administratively in the Congressional Research Service and funded its operations by offsetting cuts in Library of Congress services and in public information activities of the Government Printing Office. This strategy meant Senate opposition to OTA would come from anti-OTA and budget-cutting forces and, indirectly, from certain sectors of the public-interest community concerned with preserving public access to government information.

Floor actions in the Senate designed to save OTA failed. Opposition stemmed from the Appropriations Committee, especially from the legislative subcommittee chaired by freshman senator Connie Mack (R-FL), who had led hostile hearings in the spring.

The question many might ask is: Why would Congress close down a small agency dedicated to helping senators and representatives do their jobs better? The most obvious reasons don't seem plausible.

One might eliminate an agency that was ineffective or incompetent. That didn't seem to be the case with OTA. Like any organization, OTA had its occasional failures and slipups, but they were rare. It had a solid track record of high-quality, influential reports.

Another excuse might be that the reasons for having OTA were no longer valid. That explanation is even less believable, unless technology has, unnoticed by most of us, become less important to our society and to policy issues.

I suspect OTA was brought down by a combination of three factors:

1) The inherent vulnerability of its mission. Bipartisan analysis that serves no special interests at the expense of others makes no political friends and creates a lot of enemies over time. Some Republicans also suspected OTA was a Democratic institution in its heart of hearts, a suspicion that was hardened when its director, John Gibbons, and several members of the analytical staff took jobs with the Clinton administration.

2) The political need in Congress for a blood sacrifice. Members of Congress, who have been trying to eliminate executive branch agencies, felt pressure to show they could do the same to themselves.

3) A changed political climate that places less value on policy analysis. According to press reports,

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Expanding the Pipeline

Mentor project passes muster

By Joseph O'Rourke

The Computing Research Association's Distributed Mentor Project has passed a milestone. After initial funding for two years, the National Science Foundation recently agreed to renew its funding for three additional years. Proposed by the CRA Committee on the Status of Women in Computing Research (CRAW) in 1993, the project was funded by NSF Computer and Information Sciences and Engineering (CISE) Directorate for two years, with a total of $286,000[1]

This generous support permitted CRAW in 1994 and 1995 to support 53 female undergraduate computer science and engineering (CS&E) students so they could spend a summer doing research under the direction of a female university professor. CRAW submitted a renewal proposal to NSF, and was recently recommended funding of $530,000 to continue the project for three more years[2].

The goal of the Distributed Mentor Project has been to involve the students in research at a university with a female mentor, hoping to inspire them to continue on to graduate school in CS&E. It is too early to tell if the program has been successful in convincing students to attend graduate school, but it has attracted many student applicants and generated considerable enthusiasm among those funded.

Table 1. Mentor Project Applicants

	1994	1995	Total
Students:			
Applications received	76	78	154
Funded	25 (33%)	28 (36%)	53 (36%)
Declined offer	5	3	8
Not selected	46 (61%)	47 (60%)	93 (60%)
Mentors:*			
Applications received	33	29	62
Selected	22 (67%)	23 (76%)	45 (73%)
Not selected	11	6	17

*Note: Some mentors supervised two students

Table 2. Women in CS&E in 1994

	Number	Percent
Degrees granted to women:		
Bachelor's	1,474	18%
Master's	991	19%
Ph.D.	157	16%
Female professors:		
Assistant	137	18%
Associate	102	9%
Full	59	5%

The funds in the first two years of the grant permitted us to support about 25 students per summer (about $5,000 per student). Both years we received more than 75 student applications. Perhaps the most difficult aspect of my role was to turn down nearly 50 eager young women each year. About 30 female university professors volunteered each year to mentor one or more students, and we were able to match about threequarters of them with

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[1]NSF program director: Caroline Wardle. Principle investigator: Joseph O'Rourke, Smith College

[2]NSF program director: Caroline Wardle. Principle investigator: Anne Condon, University of Wisconsin at Madison.

Help for minorities in CS field

Below is an edited version of the executive summary of the Final Report of the Workshop on Increasing Participation of Minorities in the Computing Disciplines. The workshop was held May 4-7 at the Airlie Center in Virginia. The workshop chair was Bryant York of Northeastern University

The primary motivation for this workshop was the 1991-92 CRA Taulbee Survey, published in the March 1993 issue of *Computing Research News*. It indicated that less than 1% of the Ph.D.s in computer science that year were earned by African Americans and less than 2% were earned by Hispanics. African Americans and Hispanics make up about 21% of the US population, according to 1990 Census data. No CS Ph.D.s were reported as earned by Native Americans. The low production of minority CS Ph.D.s is just one indication of a lack of participation of minorities within the computing and information science disciplines. Other data indicate similarly low participation throughout all levels.

As a result, we decided to design a workshop that would examine the root causes and make some recommendations that might improve the situation. The workshop was planned in October 1994 and held in May 1995. Our original goal was to consider issues relating to the participation of African Americans, Hispanics and Native Americans. However, because the number of Native Americans enrolled in CS programs is so small, their academic experience is significantly different from that of other minorities. We acceded to the suggestion that we focus the workshop on issues relating only to African Americans and Hispanics. Although the initial goal of the workshop was to identify those issues that are specific to minority students and institutions and to propose remedies, the real strength of the workshop is that we were able to formulate our conclusions and recommendations in generic terms. Minority students and institutions are part of the fabric of diversity in US society

The most significant conclusions to come out of the workshop were the following:

• A variety of types of mentoring is essential to the success of students at all levels. The base of mentors must be expanded. Same gender and same ethnicity are not required. Scalability of mentoring is a problem.

• The reward structure of academic institutions must be revised to reflect the importance of teaching and mentoring

• The nation needs explicit metrics for evaluating teaching and mentoring

• Despite the current glut of Ph.D.s in computer science, some minority institutions should develop Ph.D. programs in computer science.

• The computer science community needs to acknowledge the continuum of need from basic computer/information literacy to Ph.D.-level research.

• All academic institutions—minority and majority—need to clearly articulate their missions. Different missions have different infrastructure requirements.

• The notion of replication of successful federal programs needs to be more carefully analyzed.

• Better coordination among professional organizations, community organizations, industrial organizations and educational institutions with respect to the overall development of children is possible through effective use of the Internet.

• New K-12 curriculum in information management that is integrated with traditional mathematics and science is required.

Our conclusions, for the most part, apply to all students and all institutions. If acted upon through specific projects, we feel that all students would benefit and that minority participation would gradually rise to proportionate levels. T

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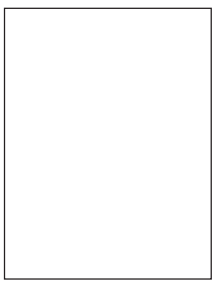
Association News

New board members elected



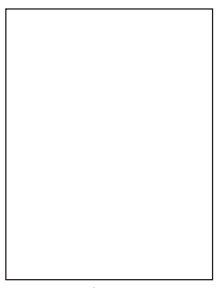
Alfred V. Aho

Chair of the Department of Computer Science, Columbia University

Aho has a doctorate in electrical engineering and computer science from Princeton University.

Aho's research interests are information management systems, software production and pattern matching algorithms. He was named doctor of mathematics, honoris causa, University of Waterloo; IEEE Fellow; doctor of philosophy, honoris causa, University of Helsinki; Fellow of the American Association for the Advancement of Science; and Fellow of AT&T Bell Laboratories.

Aho attended CRA Formative Meetings. He was director of the Computer Science Research Center, AT&T Bell Labs, 1987-91; general manager of the Information Sciences and Technologies and Research Laboratory, Bellcore, 1991-95; and chair of NSF's Computer and Information Science and Engineering Directorate Advisory Committee, 1992-94.



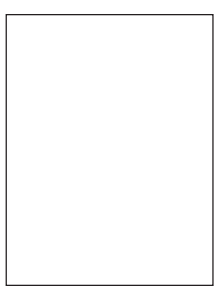
Sandra Johnson Baylor

Research staff member in Parallel Systems Analysis, IBM T.J. Watson Research Center

Baylor earned a doctorate in electrical engineering from Rice University.

Baylor's research interests are parallel I/O, parallel file systems, memory systems, computer architecture, performance evaluation and parallel processors.

Baylor received IBM's first Patent Application Invention Achievement Award. She is a member of CRA's Committee on the Status of Women in Computing Research. Her work on this committee includes writing a graduate school information kit for women in computer science and engineering (available later this year).



Irene Greif

Director of Workgroup Technologies, Lotus Development Corp.

Greif has a doctorate in computer science from the Massachusetts Institute of Technology.

Greif's research interests include computer-supported cooperative work (CSCW), distributed systems, information visualization and interpersonal communication.

She is a Fellow of the AAAS, holds a patent for Rendezvous Manager, presented the opening keynote speech for Hypertext '93 and the opening keynote speech for OOPSLA '94, and was an invited speaker at the Grace Hopper Celebration of Women in Computing.

Greif is a founding member of the Board of Directors of the Commonwealth Exchange (regional networking pilot under the auspices of the Massachusetts Telecommunications Council), 1994-present; a member of the National Research Council (NRC) NII 2000 Committee, 1995-96; and a member of the NRC Task Force on Telecommuting, 1993-94 (report published in 1994). She founded the CSCW research field.

Patterson re-elected as chair of the CRA Board

Three new directors have been elected to serve on the Computing Research Association Board. Five directors were re-elected.

CRA's Board also re-elected David Patterson of the University of California at Berkeley as chair and Michael Garey of AT&T Bell Laboratories as treasurer. Mary Jane Irwin of Pennsylvania State University was elected vice chair, and Nancy G. Leveson of the University of Washington is the new secretary. Retiring as board officers are Maria Klawe of the University of British Columbia and Gregory R. Andrews of the University of Arizona. Both are still members of the board.

CRA's newly elected board members are Alfred V. Aho of Columbia University, Sandra Johnson Baylor of the IBM T.J. Watson Research Center and Irene Greif of Lotus Development Corp.

The directors who were re-elected are Andrews, Gary Bill Gear of the NEC Research Institute Inc., John Guttag of the Massachusetts Institute of Technology and Edward Lazowska of the University of Washington.

John R. White of the Xerox Palo Alto Research Center is the new representative to the board appointed by the Association for Computing Machinery, a CRA-affiliated professional society. White replaces Dorothy Denning of Georgetown University. (Biographical information and a photograph of White were unavailable at press time.)

CRA appreciates the time and effort contributed by its retiring board members: Dennis Dick Lampman of Hewlett-Packard Co., Mark Weiser of the Xerox Palo Alto Research Center and David Wise of Indiana University.

CRA's bylaws state that elections will be held each spring to fill seats left open by expiring terms of office or by resignations. Each CRA member organization is allowed one vote for each open seat on the board. A board member's three-year term begins July 1.

The CRA Election Committee, chaired this year by Rick Adrion of the University of Massachusetts, puts together a slate of candidates from nominations made by members of the computing research community.

In preparing the slate, the committee seeks reputable computer researchers and research administrators who are willing to devote time and energy to CRA. The committee looks for a varied slate in terms of research field, organization type, gender, ethnic background and geography.

For Your Information

Taulbee Survey in the mail

By Phillip Louis
CRA Staff

Welcome back to another year with CRA. Once again it is time to start work on the CRA Taulbee Survey.

This year's survey will be mailed to department chairs September 8, and we are counting on your cooperation in returning the survey before the deadline. There are only minor changes this year, which should make completing it a little easier than last year. Next year we hope to expand to an electronic format, which is only possible with your continued support of CRA.

We would like to thank the departments, laboratories and affiliated professional societies that have renewed their membership with CRA or have recently joined. Because we are a dues-supported organization, your membership allows us to provide many services, including *Computing Research News*, electronic information services, workshops and other programs. We appreciate your support. If you would like membership information, forward your request to info@cra.org.

Grace Hopper Celebration of Women in Computing videotapes are now available. See order form on page 9.

The CRA Conference at Snowbird will be here before you know it. If you would like information on the conference when it becomes available, fill out the form on Page 11 and return it to CRA.

Finally, more than 4,000 *CRN* subscribers in the United States still need to renew their subscriptions. You should have recently received a renewal notice in the mail. Please do not disregard this notice or your subscription will end after this issue of *CRN*. We must hear from you by September 25.

Send suggestions or comments about this column to 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.

Attention CRA Members

Mailing labels of our membership and the CRA Party List are available free to CRA members. The labels are available electronically or on 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.

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Association News

CRA mission statement

The Computing Research Association (CRA) seeks to strengthen research and advanced education in computing and allied fields. It does this by working to influence policy that impacts computing research, encouraging the development of human resources and contributing to the cohesiveness of the professional community. The collection and dissemination of information about the importance and state of computing and computing research play important roles in achieving all of these objectives.

CRA counts among its members more than 160 North American organizations active in computing research: academic departments of computer science and computer engineering, government and industrial laboratories, and affiliated professional societies (AAAI, ACM, IEEE Computer Society and SIAM). CRA works with these organizations to represent the computing research community and to effect change that benefits both computing research and society at large.

CRA was formed in 1972 as the Computer Science Board, which provided a forum for the chairs of Ph.D.-granting computer science departments to discuss issues and share information. In 1986, CSB, in recognition of its increasing concern for R&D in the computing fields, including computer engineering and computational science, incorporated as the Computing Research Board. In 1990, CRB was given its present name, and a permanently staffed office was opened in Washington, DC.

Though computing is an integral part of modern life, it is still in its infancy. The benefits that computing brings to our society can be traced directly to basic research and advanced development carried out in academic, government and industrial laboratories by men and women with advanced educations in computing and related fields. Research, advanced development and related educational issues fall under the broad definition of computing research that CRA uses in framing its mission and planning its activities. These activities will help to ensure a firm foundation for the advances in computing that will be essential to meet the challenges of the 21st century

Computing research environment

The benefits that computing brings to our society are the result of a long-standing and highly effective partnership among academia, government and industry. Today the nature of that partnership is in flux.

Government funding for research in science and engineering is decreasing and changing in character. Industrial research is increasingly focused on the near term and is under severe funding pressure. These shifts in emphasis already have led to decreased support for long-term research or research that has benefits that are difficult to predict, despite the fact that history clearly demonstrates the vital role of such efforts.

The environment for computing research in particular has been dramatically affected by the enormous economic and social impacts of information technology. Tremendous advances and opportunities lead to tremendous pressures for immediate results. The "goose that laid the golden egg"—basic research, advanced development and the education of those who carry it out—must evolve but must not be sacrificed.

CRA strives to be both the advocate and the conscience of the computing research community. An organization of organizations, CRA maintains a more narrow focus than its members: promoting the health of the computing research enterprise.

In keeping with this focus, there are many important activities in which CRA chooses not to engage. Among these are the publication of research journals, the staging of individual research conferences, curriculum development, accreditation, standards development, and the advocacy of social and economic policy

CRA works to influence policy that impacts computing research, collects and disseminates information, encourages the development of human resources and contributes to the cohesiveness of the professional community

Mission	Strategies	Examples of Current Activities
Policy: Develop a deeper understanding of policy issues and their impact and work for informed policies involving computing research and computing technology in general.	◆ Influence policy related to computing research by improving public and policymaker understanding of the nature and role of such research. ◆ Increase the computing community's awareness of and participation in policy issues.	CRA, through its executive director and Government Affairs Committee, provides an informed and coherent voice for the computing research community to policy makers. Efforts include extensive consulting with policy makers, congressional testimony and seminars, preparing background material on specific issues and on the general role of computing research, and encouraging and facilitating involvement in policy issues by the broad computing research community
Information: Collect and disseminate to the research and policymaking communities information about the importance and state of computing research and related policy	◆ Develop additional policy-relevant information. ◆ Bring this information to the attention of the public, policy makers and the computing research community	*Computing Research News*, the flagship publication on matters of broad interest to the computing research community, is sent five times per year to more than 5,000 researchers and policy makers in academia, industry and government. Through electronic distribution (e-mail and World Wide Web) an even wider audience is reached. CRA maintains the Forsythe database of graduate programs in computing and conducts the annual Elbee Survey of graduate education and employment trends.
Human Resources: Ensure that society's need for a continuous supply of talented and well-educated computing researchers and advanced practitioners is met.	◆ Assist with leadership development within the computing research community ◆ Promote needed changes in advanced education. ◆ Encourage full participation by members of underrepresented groups.	CRA fosters excellence in education through programs such as the Effective Teaching Workshop and Outstanding Educator videotapes. CRA's Committee on the Status of Women in Computing Research sponsors the Grace Hopper Celebration of Women in Computing, the Distributed Mentor Project, the Women in Computing database and a careers handbook. CRA's Outstanding Undergraduate Award recognizes and encourages top students.
Community: Promote a cohesive and effective sense of community among those involved in computing research.	◆ Promote cooperation among various elements of the computing research community ◆ Strengthen CRA as the focal point of this community	The biennial CRA Conference at Snowbird for graduate department chairs and industrial lab directors was CRA's first activity, and it continues to be a great success. CRA was instrumental in establishing the Federated Computing Research Conference, which brings together researchers from all the computing disciplines every three years. CRA also is helping increase coordination among professional organizations through the Leadership Summit for computing society heads.

Policy News

News Analysis

Call for a Department of Science not new

By Fred W. Weingarten
CRA Staff

One of the unusual characteristics of research funding by the US government, when compared with that of other countries, is its fragmented nature. Research programs exist in literally dozens of agencies. The structure of support that has evolved since World War II has mission agencies concentrating their funding in particular areas and styles of research tailored to their individual needs. These programs often support long-term research in university laboratories. But at some level it needs to be tied to the agencies' needs.

Complementing the focused support of the mission agencies is the National Science Foundation. A major goal of NSF is the broad support of fundamental research efforts.

This structure seems to have worked well, and the pattern has been supported by most people in the science establishment. However, it has not pleased everyone. There have always been critics who think the structure of government science is chaotic and nearly unmanageable. Hence, over the years, some science policy experts and politicians periodically have suggested creating a larger, cabinet-level Department of Science.

This proposal nearly always surfaces every time a new administration comes into office. Looking for ways to reorganize government is a favorite way for new presidents to show that they have come to town to change things. The particular structure of the new department differs, but most proposals would combine NSF with NASA and several other civilian research agencies. (Most proposals leave defense research programs and the National Institutes of Health, the two largest sources of government research funding, out of the new department.) In the past, these proposals have quickly sunk without a trace.

With this history, it should not be surprising that another proposal is being circulated, this time by Rep. Bob Walker (R-PA), who is chair of the House Committee on Science. What is surprising are the tremors that went through the science establishment and agency officials when Walker raised the idea. With all the emphasis on change and the eagerness of the Republican Congress to reexamine the fundamentals of government, some observers think it more likely that such a proposal could pass. Another possibility is that, with all the new voices being heard in the science policy arena, the leadership has no effective filter with which to separate the serious proposals from the perfunctory.

The boundary conditions for the debate have changed.

• Growth of cross-agency programs. In the late 1980s, the Bush administration began to develop interagency research programs coordinated through the Office of Science and Technology Policy. The High-Performance Computing and Communications Initiative was an early example of such a program, and it is still the largest one. The Clinton administration created an even more elaborate coordination structure and, in its reinventing government report, referred to creating "Virtual Science Agencies."

• Tight budgets. Research budgets have stopped growing and may be on the verge of dropping precipitously if the long-term budget proposals in Congress come to pass. In such an environment, there is much greater pressure to prioritize and to avoid duplication.

• Orphan R&D programs and facilities. In addition to cutting research budgets, the congressional budget resolutions, particularly the House's, propose the elimination of whole departments. Some of those departments, in particular the departments of Commerce and Energy, encompass some large research facilities and science offices. DOE has its national laboratories. Commerce has organizations such as the National Institute of Standards and Technology and the National Oceanic and Atmospheric Adminis

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OTA from Page 1

House Speaker Newt Gingrich recently quoted in a speech Mao Tse-Tung's dictum that politics is war without blood. According to that view, important political choices are shaped not by reason or by careful analysis of options, but by the clash of ideology and raw self-interest. So who needs a think tank?

OTA was formed on a rationalist view of policy making: that careful analysis of issues, trends and policies could improve the quality of legislative debate. Its genius was to transform a detached, academic style of policy analysis into a form that could be woven into the real-life, combative and emotional political process Gingrich referred to.

In a sense, OTA had invented a discipline. The agency was formed when concern about the unintended and unexpected impacts of technology was high, and the government, particularly Congress, seemed to be confronted with increasingly complex issues involving technology. A new field of study, called technology assessment, had begun to spring up in US and European universities and think tanks. In Europe, it took a more negative rhetorical tone, antagonistic to technology. In the United States, it developed with a more pragmatic, analytical field, identifying threats and looking at opportunities and how to capture them. The National Science Foundation established a small program of research support in technology assessment that focused on building methodology for long-term assessment. This program was eliminated several years ago but should be revived.

OTA, however, was not an independent think tank or academic policy research center. Its survival depended on providing a service to its congressional clients, and it took a while for the office to find its footing. In searching for an identity during its first few years, it went through three stages, the first two being dismal failures.

At first, OTA was run somewhat like a partisan and politicized congressional committee, under the leadership of an ex-member of Congress. OTA then adopted the guise of a blue-sky, long-range research agency. It took less than a year to learn that Congress had little interest in long-term, theoretical speculation about the future. Sentiment for closing OTA began to grow.

Then OTA found its niche—conducting fairly long-term analyses of the impacts of short-term decisions. The agency forged a pragmatic compromise between the rigor and depth of academic policy research and the needs of its political clients for quick, readily understandable answers. It invented a new analytical style, one that made numerous contributions to the public-policy debate.

OTA's studies were conducted in the public spotlight. Through advisory panels, workshops, contractor reports and reviews, OTA was able to tap the most knowledgeable people in the country on any topic it studied. Project staff made a particular effort to identify representatives of key stakeholders and bring them into the study at an early stage.

The nation will miss OTA. Looking just at information technology, how can one ignore that we are in the middle of a huge, complex technological change that is confronting politicians with a myriad of difficult issues? The same situation exists in biotechnology, materials, energy and a host of other technologies.

Gingrich—and Mao—may be right in their belief that "politics is war." But successful generals always want to understand the terrain on which they are waging the battle. Congress has just closed down a pretty effective map maker.

End imminent for OTA

Legislation to end the congressional Office of Technology Assessment is in the final stages of becoming law.

House and Senate conferees met in late July and agreed to eliminate OTA as part of the legislative branch appropriations bill, HR 1854. However, Congress delayed a final vote on the bill until after the session resumes September 6.

OTA has a $22 million budget, only a fraction of the $2.4 billion under the legislative appropriations bill. The agency's mission is to provide Congress and the public with objective analyses of technology issues, including information policy.

There had been attempts in the House to save OTA by providing $15 million to incorporate it into the Library of Congress' Congressional Research Service. However, the Senate voted for complete termination, and it got its way during conference.

Now that the conference committee has reported the bill, it must be approved by the House and Senate. Although members of the House may be reluctant to eliminate OTA, they are unlikely to hold up the bill, which covers the entire legislative branch.

Although OTA is scheduled to close October 1, many of its 143 full-time workers and 100 contractors already have left to take more stable positions.

Presidential veto remains unlikely because the president most likely will not get involved in the affairs of Congress.

NAS set to release ratings study of Ph.D. programs

The research community has been anxiously awaiting a new ratings study of Ph.D. programs by the National Academy of Sciences. Although the study has been postponed several times throughout the year, an NAS spokesperson said NAS is "fairly certain" the report will be released in September. The tentative release date is September 12.

The forthcoming document, *Report on Research-Doctorate Programs in the United States*, is expected to be an authoritative source of qualitative information on Ph.D. programs unparalleled by ratings published in the popular press. It will include a wealth of data on faculty, scholarly publications, financial standings and research facilities.

The last study was conducted in 1982.

Because of the intense interest expressed by our members, CRA will send out an electronic news bulletin as soon as the report is released. If you have not done so already, you may subscribe to the *CRA Bulletin* by sending the following command in the body of an e-mail message addressed to listproc@cra.org: subscribe cra_b firstname lastname.

Policy News

Telecom reform on verge of becoming law

BY Juan Antonio Osuna
CRA Staff

After months of crawling through committee hearings and markups, separate bills finally passed the House and Senate over the summer that would completely redefine the telecommunications industry and the nation's information infrastructure.

With the August 4 passage of HR 1555 in the House (305-117), the local Bell operating companies were gleeful at the prospect of entering long-distance and electronic-publishing markets.

Although the Senate bill, S 652, contains more rigorous restrictions designed to thwart Bell monopolies and prevent premature entry into the long-distance market, similar restrictions were relaxed in HR 1555.

Differences between these bills will be resolved in a conference committee that will meet after Congress reconvenes September 7.

The legislation not only deregulates local telephone companies but also cable, media and long-distance companies.

Deregulation of the local telephone and cable companies, however, dismayed many consumer advocacy groups. Ralph Nader, head of the Taxpayer Assets Project, called the bill "a major blow to consumers" and warned against telephone companies enjoying greater monopoly status by buying up smaller cable companies.

The legislation not only deregulates local telephone companies but also cable, media and long-distance companies.

Many conservative members of Congress see deregulation of telephone and cable companies as a surefire formula for spurring competition and the development of new technologies. However, others see these technology developments happening a long way into the future and fear that consumers will end up paying dearly to subsidize this technological growth.

"The hoopla many of us heard as recently as a few months ago about a video world with over 500 channels being offered to millions of consumers by the end of the year is pure fantasy," said Rep. Edward Markey (D-MA). "The high-tech hype has confronted engineering reality. The phone companies are still figuring out how to make the technology work."

Without real competition from telephone companies, "many cable operators will use their newfound freedom to charge exorbitant rates," Markey said.

Also, media groups will be allowed to join forces in greater numbers and merge with cable companies to forge vast media conglomerates, Nader warned. The bill eliminates restrictions on the number of broadcast television stations owned by a single entity and raises the national "audience cap" from 25% to 35%, indicating the proportion of the national audience that any single media entity can reach.

A provision of HR 1555 drawing substantial press coverage was a provision mandating a new rating system for television programming and a device called the "V-chip," which would be built into most televisions to allow parents to block programs with a certain rating.

On the Senate side, the Telecommunications Competition and Deregulation Act passed June 15 (81-18) after a flood of amendments were considered and adopted on the floor.

Among those adopted was an amendment to "provide to elementary schools, secondary schools and libraries universal services for educational purposes at rates less than the amounts charged for similar services to other parties."

However, the bill excludes for-profit schools with an endowment of more than $50 million.

The American Library Association was relieved to get the amendment included, although it would have preferred earlier language, which defined rates more precisely based on the incremental cost of providing the service.

Also adopted in the Senate bill was an amendment proposed by Sen. John Kerry (D-MA) prohibiting redlining in rural or low-income areas.

Among Internet and online users, the most controversial provision, added to both bills, was an amendment to censor "indecent" communications on computer networks.

Congress looking at new vehicles for censorship

BY Juan Antonio Osuna
CRA Staff

Censorship legislation was incorporated into a House telecommunications bill over the summer, which may win out over similar legislation in the Senate.

Shortly before the House adjourned August 4, an omnibus Manager's Amendment was incorporated into a landmark telecommunications bill by a vote of 256-149.

Among many additions was a provision making it illegal to "intentionally communicate by computer…to any person the communicator believes has not attained the age of 18 years any material that, in context, depicts or describes, in terms patently offensive as measured by contemporary community standards, sexual or excretory activities or organs."

Although apparently narrower than Sen. James Exon's (D-NE) Communications Decency Act that was added to the Senate bill, the provision still has caused concern among civil liberties groups.

"This provision would effectively reduce all online content to that which is suitable only for children," the American Civil Liberties Union said. Because a conference committee will hash out differences between the House and Senate bills when Congress reconvenes in September, either piece of legislation could prevail.

The Communications Decency Act, included in the Senate bill, would criminalize any online traffic, including private e-mail, judged either "obscene, lewd, lascivious, filthy or indecent."

While the ACLU opposes any such government-mandated censorship, it approved the "general approach" of yet another amendment added to the House bill that would encourage online services to censor their own traffic. This amendment was offered in the context of the May 1995 New York Supreme Court ruling in the case of *Stratton Oakmont.v Prodigy*.

The court ruled that Prodigy, unlike many other online services, was liable for defamatory language contained in one of its forums because it had historically exercised control over content in an effort to market itself as a "family service."

In essence, the court deemed Prodigy a publisher of information rather than a distributor because of its efforts to censor sexual content. By exercising editorial control, Prodigy had exposed itself to greater liability than other online services that acted purely as distributors and paid no attention to content.

To remedy this apparently unfair situation, Reps. Christopher C. Cox (R-CA) and Ron Wyden (D-OR) added an amendment to the House telecommunications bill that protects online services against such liabilities.

The amendment states: "No provider or user of interactive computer services shall be held liable

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Science from Page 5

tration. Assuming there may not be a political desire to close those particular operations, they need to be housed somewhere.

• The growing importance of science and technology. It's an argument that may sound a bit self-serving, but, clearly, a strong science and technology base has become central to the economic and social well-being of the nation. Cabinet-level representation in the government would reflect that importance and move S&T to a more central point in government decision making.

In Walker's view, these reasons all point to the need for a Science Department, although, as he admits, the arguments for forming a new agency fly in the face of the strong desire in his own party to reduce government.

The historical arguments against a Science Department still seem strong, the strongest being the argument for diversity in research funding. Differences among agencies in perspectives, priorities and funding strategies can increase the opportunities for new ideas or even new fields to be developed.

Computing research is a good example. In the late 1960s, while NSF officials were trying to convince a conservative and traditional management that computer science was a potentially new and exciting field for research investments, the Advanced Research Projects Agency was pushing ahead aggressively and pouring large grants into a few research programs at Stanford University, Carnegie Mellon University, the Massachusetts Institute of Technology and other major universities. This was a strong stimulus to the growth of US computer science and engineering, in terms of creating a discipline and educating the first generation of computer researchers actually trained in that discipline.

Meanwhile, NSF continued to expand its programs of computing support in its traditional model of a single-investigator, competitive grant, which opened up support to the broader group of researchers not located at ARPA-funded centers. NSF and ARPA, with comparable funding levels in computing research, still operate in different but clearly complementary modes of support to the field.

DOE's national laboratories were a third major influence on computing research. They stimulated the development of supercomputer technology, particularly through the 1960s and 1970s. Needing substantial computing horsepower, mainly for their weapons design missions, the labs worked with several computer manufacturers to develop new architectures for high-speed computers and the software tools for using them. This work took place at the companies and at the labs.

Each agency supported the discipline in its own way, tailored to its own needs and style of operation. And it was probably to the advantage of the discipline.

The arguments are basic ones: Diversity versus efficiency. Top-down versus bottom-up management of the scientific enterprise. Is it best to have a science czar controlling all expenditures, setting priorities, determining the nature of support? Or are we better off with a diversified system, with diffused authority and loose coordination through the science

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Policy News

Bill restricts encryption

BY Juan Antonio Osuna
CRA Staff

Legislation introduced in June would restrict online distribution of any encryption software in a way accessible to foreign nationals or governments.

However, the bill specifically excludes encryption techniques that can be reversed by "a universal decoding device or program that was provided to the Department of Justice prior to the distribution."

These provisions are part of the Anti-Electronic Racketeering Act of 1995, a bill introduced by Sen. Charles E. Grassley (R-IA), which has not been received well in the online community.

Privacy advocates see the bill as almost a mandate for government key escrow, an idea that could plausibly gain acceptance in Congress and in the Clinton administration. However, other provisions of the bill have been ridiculed as absurdly worded.

For example, the bill tries to clamp down on computer crime by making it "unlawful for any person to damage electronically or digitally stored data."

"You evidently can't delete or edit files under the new regime," quipped Jim Gillogly in the electronic *Privacy Forum Digest* (Vol. 4, No. 16).

Another provision makes it "unlawful to use a computer or computer network to transfer unlicensed computer software."

"This means no more code fragments, shareware or freeware to be distributed on the Net," Gillogly said.

As for the encryption provisions, the bill prohibits the distribution of "computer software that encodes or encrypts electronic or digital communications to computer networks that the person distributing the software knows or reasonably should know is accessible to foreign nationals and foreign governments."

"As drafted, the legislation would appear to prohibit the distribution of any program that contains security features, including Netscape Navigator, various digital cash applications and even PKZIP," said David Banisar of the Electronic Privacy Information Center (EPIC).

Although Banisar and other experts worry about the imprecise nature of the language, many are also concerned about the bill's intentions, which seemingly take the Clipper chip proposal one step closer to making it a mandatory standard.

EPIC is ready to cite comments made by the Clinton administration, suggesting a more ambitious agenda than outlined in press releases.

For instance, FBI Director Louis Freeh said in congressional testimony in May "We're in favor of strong encryption, robust encryption. The country needs it; industry needs it. We just want to make sure we have a trap door and key under some judge's authority where we can get there if somebody is planning a crime."

The bill has been referred to the Senate Judiciary Committee.

NSF funding bill passed

The House passed (228-193) a funding bill in July for the National Science Foundation. This year's budget of $3.26 billion would be reduced by 3% in fiscal 1996, to $3.16 billion.

These cuts are concentrated mainly in equipment and infrastructure. Some cuts come from the Research and Related Activities account, which would fall $26 million below this year's level and $200 million below the Clinton administration's request. All other NSF accounts would be funded as requested.

Major Research Equipment would be funded at $70 million, as requested, but $56 million below the 1995 level. Academic Research Infrastructure would be funded at $100 million, as requested, but $150 million below the 1995 level. Finally, the Education and Human Resources account would be funded at $599 million, as requested, but about $6 million below this year's level.

"The reduction recommended by the committee is taken without prejudice," House Committee Report 104-201 noted, "and is to be allocated by the foundation in accordance with internal procedures, subject to approval by the committee."

Despite rumors of drastic cuts to NSF, these cuts are much milder than those applied to many other agencies under the VA-HUD and Independent Agencies bill (HR 2099).

Overall, the Appropriations Subcommittee on VA-HUD and Independent Agencies had about 12% less for fiscal 1996 than it had for the current fiscal year.

NSF had one close call on the House floor, when Rep. John Ensign (R-NV) introduced an amendment to slice NSF and NASA budgets by another $186 million. However, the amendment was defeated by a vote of 296-121.

Committee considers NSF's authorization

BY Juan Antonio Osuna
CRA Staff

The House Science Committee marked up in June the National Science Foundation authorization bill for fiscal 1996 and 1997.

The agency's budget was capped at $3.13 billion for 1996 and $3.17 billion for 1997. Current year funding is $3.26 billion, while the Clinton administration is asking for $3.36 billion in 1996.

The budget for the Computer and Information Science and Engineering (CISE) Directorate was capped at $249 million for 1996, with a 2.7% growth rate assumed but unspecified for the following year.

These figures compare with the president's 1996 request of $276 million for CISE.

Although the full committee's budget figures did not deviate from the earlier recommendations of the House Science Subcommittee on Basic Research, Rep. Robert Walker (R-PA), chair of the Science Committee, introduced policy changes.

The bill now eliminates one of NSF's seven assistant directors, which most likely will be the assistant director for the Social, Behavioral and Economic Sciences Directorate. It recently has come under fire by Republicans who say it does not fit within NSF's mission.

Another of Walker's changes is a new requirement that the director of the Office of Science and Technology Policy prepare a plan to stabilize and reduce by 10% federal reimbursements to universities for indirect costs.

The bill also attempts to eliminate earmarks by prohibiting NSF awards to any person who has received federal funds in the last five years without being subject to "a competitive, merit based award process."

House and Senate tackle Defense appropriations

BY Juan Antonio Osuna
CRA Staff

Senate and House Appropriations Committees reported separate bills in late July for the Defense Department. Although funds for computing research appear intact in the House, the Senate committee recommended cuts.

In the House bill, HR 2126, the Computing Systems and Communications Technology (CSCT) program would be funded at $403 million in fiscal 1996—$1 million less than the Clinton administration's request. The Advanced Research Projects Agency manages the bulk of CSCT funds.

Although the House Appropriations Committee report (104-208) recommended no major changes to overall funding of the program, the committee did recommend a few shifts in emphasis:

- $11 million more for nuclear monitoring technologies to thwart terrorists.
- $10 million more for a software managers network.
- $8 million more for a Global Broadcast Service.
- $10 million less for seismic monitoring research.

The report said ARPA "should pursue cutting edge, high-risk/high-payoff research and advanced technologies." In the Senate bill, S 1087, the CSCT program would be funded at $373 million for fiscal 1996—$30 million less than the budget request. Changes would be distributed as follows:

- $13.3 million less for intelligent systems and software.
- $24.8 million less for high-performance computing and defense information enterprise.
- $5 million less for defense information warfare.
- $8 million more for an interoperative intelligent metacomputing test bed.
- $3.7 million more for the asset source for software engineering technology.

According to the Senate committee report (104-124), the $8 million for a metacomputing test bed would be "competitively awarded to a qualified Washington, DC, region-based institution of higher education with expertise and programs in computational science and informatics."

The Senate report recommended increasing the High-Performance Computing Modernization Program to $120 million—$30 million above the requested level. The extra funds would go to the supercomputing facility at the Ballistic Missile Defense Organization's Advanced Research Center.

Workshop from Page 2

expect a precipitous rise in minority participation resulting from an impulse intervention is folly. The bottom line is that mentoring is the key basic activity. It is a human-intensive activity; at this point, unfortunately, we do not know how to scale it well.

Based on these conclusions, a number of recommendations surfaced during the workshop. Some recommendations were very specific, and others were fairly general. Only a few recommendations were directed specifically at NSF. We attempted to phrase the general recommendations so as to allow flexibility in their implementation by agencies and organizations with specific missions.

- Redistribute research/education dollars to encourage academic institutions to evolve their reward structures to reflect an emphasis on quality teaching and mentoring.
- Publish, in hard copy and electronically, explicit assessment criteria and the evaluation process for all federally funded projects.
- Foster mentoring programs in majority institutions at graduate and undergraduate levels.
- Develop partnerships between minority and majority institutions with strong CS programs.
- Encourage industrial partnerships with minority institutions.
- Provide Internet access to minority institutions—both high schools and colleges. Currently the CISE NCRI Connections program and NASA MUSPIN are doing a good job at the college level. These

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Research News

Opinion

Peer review valuable; helps catch mistakes

BY Peter A. Freeman

My article, "Flawed report on Ph.D. production creates stir," describes a *New York Times* article on a recent study. Without getting into details of the study, I think this whole episode sadly illustrates two important points that too often are overlooked.

Point 1: *Peer review is extremely valuable.*

The study was released without any formal peer review as far as I can tell. It is simply an unbound report available from the authors. It contains typos, and some of the underlying data—obtained from the National Science Foundation—have some anomalies in it obvious to anyone who knows the reality of particular departments. So, the study has some grievous errors of the "garbage in, garbage out" variety resulting from an inadequate examination of the data used to drive the model. Whether other errors are still lurking, either in their assumptions or in the base data, is unknown.

Peer review is no more perfect than program testing. But its absence can be disastrous.

Point 2: *Publicity, even in reputable publications, may be totally misleading*

The *Times* article stated as fact—in its title—that "Supply Exceeds Demand for Ph.D.'s in Many Science Fields." In the discussion of computer science, specifically, the article stated, "The surplus of doctoral computer science degrees currently awarded over the number of those who get desirable jobs in their field is 50.3%." This statement strongly implies that the William F. Massy–Charles A. Goldman report is a survey of current graduates.

However, in its first sentence, the study notes: "This report describes a *simulation* [emphasis added] of the supply and demand for science and engineering doctorates." Will know that the correction to this misleading article, if ever published, will never have the impact the original article had.

There are important points concerning Ph.D. production that need to be discussed. A simulation—possibly even this one, when corrected—would be a useful tool to aid those discussions. Unfortunately, serious discussions now will be harder because some researchers have widely distributed work that was unreviewed and erroneous, and a reporter distorted what they said.

Flaw from Page 1

implies that this will happen some time in the future, but the time frame is not clearly laid out.

The model assumes that Ph.D.-granting departments admit students with almost no attention to the demand for completed doctorates. The report backs up this assumption with an extensive set of interviews with faculty throughout the country in all fields.

Another key assumption, based on data and simple reasoning, is that each faculty member in a research university, throughout all fields, produces an average of 10 doctorates during his or her career. This alone is enough in many situations to suggest a structural imbalance. This, in turn, leads to the simulation's conclusion that expanding research funding in the face of a surplus of Ph.D.'s in the long run, will cause an even greater oversupply, assuming that more than one of the 10 go into a faculty position in which they produce more Ph.D.s.

The simulation is a system of detailed models: faculty career transitions, completion rates and so on. The authors observe that the simulation "boils down to a large first-order Markov process." The report might lead one to believe that the overall simulation is carefully built because of the amount of detail presented. Yet the report apparently is only a technical report, unreviewed at this point; it is dated July 1995 and has numerous typos, suggesting its draft status.

When Ritchie and Ullman visited Massy at Stanford to explore details of the study, he told them he had just discovered that a critical number—total employed doctorates—was incorrect for computer science. As a result, computer science now shows an employment gap of only 3.6% instead of the reported 50.3%.

This number is one of the lowest of all fields and suggests that the estimate of 1,000 CS Ph.D.s/year needed, formulated 15 years ago, is in close agreement with the new Massy-Goldman estimate. Others have raised additional questions about detailed aspects and underlying assumptions of the model.

Some of Massy and Goldman's results are compared to National Science Foundation data, but otherwise the authors do not seem to have done a large amount of validation. Again, it may be buried in the details.

The report seems to indicate that the authors have carefully built the component models, such as faculty transitions, validated them and then put them together into an overall simulation to arrive at their conclusions. Based on our experience so far, however, any detailed conclusions should be looked at skeptically until a more thorough validation exists.

When a more detailed analysis is available, it will be linked into the CRA home page (http://cra.org).

Conclusion: Having a validated model of Ph.D. production, such as this study hoped to provide, would be of great value. Some of the qualitative conclusions, such as those stating that some fields may be producing too many Ph.D.s and that expanding research funding only makes it worse in the long run, are worthy of careful consideration. Likewise, the implicit conclusion that many Ph.D.s are not being

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efforts need to be expanded.

• Provide funding for equipping minority institutions with computing facilities that will support a strong CS curriculum.

• Develop new, more human-oriented and intellectually exciting high school computing curricula.

• Continue and expand, if possible, the Young Scholars, Research Assistantships for Minority High School Students and the Research Experiences for Undergraduates programs.

• Develop community-based networks, and train parents as mentors.

• Study a variety of institutions that have already begun to re-emphasize teaching and mentoring, such as the University of Wisconsin, the City University of New York and so on—with respect to the issue of replicability.

• Study the issue of scalability of different forms of mentoring.

• Provide $20 million per year in matching funds for institutions that attract corporate sponsorship for minority students.

The body of the report contains a complete description of the process of participant selection, the panel topics, summaries of the panel discussions, a list of specific project ideas and important but unaddressed questions.

Appendix A of this report contains a list of often-used acronyms. For full and complete detailed recommendations, the reader is referred to the Working Papers. The Working Papers are available as Northeastern University College of Computer Science Technical Reports, TR NU-CCS-95-08.

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[i.e., considered a publisher of information] on account of action voluntarily taken in good faith to restrict access to material that the provider or user considers to be obscene, lewd, lascivious, filthy, excessively violent, harassing or otherwise objectionable, whether or not such material is constitutionally protected." The ACLU said it supported the general approach of the amendment because "it prohibits FCC [Federal Communications Commission] regulation of content on the Internet and generally supports private-sector initiatives, not government censorship, in cyberspace."

However, the ACLU added, "there are several ambiguities and some real problems with the Cox/Wyden amendment. The two sponsors have committed to working with us on resolving the problems."

Conference News

Hopper conference tapes now available

As general chair of the 1994 Grace Hopper Celebration of Women in Computing, I want to personally urge you to purchase for your department this set of 15 conference videolectures by leading women in computer science.

Although the technical quality of the materials is extraordinarily high and appropriate for both male and female audiences, the tapes provide inspiration for women. I wish such tapes, presenting senior role models in the field, had been available when I was in graduate school.

I believe every computer science department, library and guidance center should have this collection readily available to recruit women and inspire them to stay in the computer science field.

—Anita Borg

Conference Information

The First Grace Hopper Celebration of Women in Computing was held in Washington, DC, June 9-11, 1994. Its purpose was to celebrate the continuing achievements and contributions of women in computing.

The conference featured 17 leading women in computer science, each offering videolectures of 15 presentations. Due to technical difficulties, we are unable to offer the presentations by Irene Greif of Lotus Development Corp. and Elaine Cohen of the University of Utah.

Conference sponsors: CRA, ACM, IEEE Computer Society, Office of Naval Research, National Science Foundation, Digital Equipment Corp., Microsoft Corp., Motorola Corp., Sun Microsystems Inc., Unisys Corp., AT&T, Intel Foundation, Lotus Development Corp., Silicon Graphics Inc., Hewlett-Packard Co., Leonard X. Bosack & Bette M. Kruger Charitable Foundation, Ascel Corp., AAAI, Autodesk Corp. and Amyris.

Videolecture Topics

Topic Category: Women in Computer Science (4 tapes, #1-4)

1) Women in Computer Science
Mildred Dresselhaus, Massachusetts Institute of Technology
Order #GMH-Dresselhaus — 55 minutes

2) Making Electronic Learning Environments Succeed for Girls and Boys
Maria Klawe, University of British Columbia
Order #GMH-Klawe — 38 minutes

3) Strategic Defense Research
Anita Jones, Defense Department
Order #GMH-Jones — 52 minutes

4) The Management Option
Panel Discussion. Moderator: Bronwyn Fryer, *Working Woman* magazine
Order #GMH-Panel-2 — 81 minutes

Topic Category: Object Technology (1 tape, #5)

5) The Structure of Distributed Programs
Barbara Liskov, Massachusetts Institute of Technology
Order #GMH-Liskov — 47 minutes

Topic Category: Software Engineering & Programming (3 tapes, #6-8)

6) Computers and Risk
Nancy Leveson, University of Washington
Order #GMH-Leveson — 39 minutes

7) Abstraction and Codification in Software Engineering
Mary Shaw, Carnegie Mellon University
Order #GMH-Shaw — 45 minutes

8) Language Implementation
Susan Graham, University of California at Berkeley
Order #GMH-Graham — 44 minutes

Topic Category: Information Superhighway (2 tapes, #9-10)

9) Encryption—A Sword That Cuts Two Ways
Dorothy Denning, Georgetown University
Order #GMH-Denning — 42 minutes

10) Information Highway: Computers and Policy Issues
Panel Discussion. Moderator: Barbara Simons, IBM Corp.
Order #GMH-Panel-1 — 80 minutes

Topic Category: Human Computer Interaction (2 tapes, #11-12)

11) Cooperative Agents: Man and Human
Ruzena Bajcsy, University of Pennsylvania
Order #GMH-Bajcsy — 46 minutes

12) Collaborative Plans and Dialogue Participation
Barbara Grosz, Harvard University
Order #GMH-Grosz — 38 minutes

Topic Category: Natural Language (1 tape, #13)

13) Finding the Information Wood in the Natural Language Trees
Karen Sparck Jones, Cambridge University
Order #GMH-Sparck-Jones — 41 minutes

Topic Category: Parallelism (1 tape, #14)

14) Design Challenges in Massively Parallel, Fine-Grain Architectures
Mary Jane Irwin, Pennsylvania State University
Order #GMH-Irwin — 40 minutes

Topic Category: Compilers (1 tape, #15)

15) Compilers—New Challenges and New Directions
Fran Allen, IBM T.J. Watson Research Laboratory
Order #GMH-Allen — 41 minutes

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Department:_____
Organization:_____
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Department:_____
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For more information, contact Anna Gloukhov.
E-mail: lemon@hera.eecs.berkeley.edu.

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The format of an ad must conform to the following: 1) the first line must contain the name of the university or organization and will be printed in bold, 2) the second line must contain the name of the department or unit and will be printed in italics, and 3) the body of the ad should be in paragraph form. The words in the first two lines are included in the total word count for the ad. You may request in writing that some headings or text be set in bold; a word set in bold will count as two.

The rate is $2 (US) per word. Purchase orders, money orders and checks are acceptable *(please do not send cash)*. All CRA members receive at least 200 free words per dues year. Advertisers may also request that their Professional Opportunities ads be posted to "CRA Jobs" (jobs@cra.org) mailing list. This service is free to our advertisers.

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Computing Research News is published five times per year: in January, March, May, September and November. Professional Opportunities ads with application deadlines falling within the month of publication will not be accepted unless the ad says applications will be accepted until the position is filled. Advertising copy must be received at least one month before publication. The deadline for the November issue is October 1.

Georgia Institute of Technology
College of Computing

The College of Computing at Georgia Tech seeks an internationally recognized leader to fill a senior faculty position and serve as director of the Graphics, Visualization and Usability (GVU) Center. The interdisciplinary GVU Center, one of the premier research centers focusing on the effective communication of information between people and computers, involves more than 30 faculty and more than 100 students from computing, engineering, multimedia communications and psychology. It has a multimillion-dollar lab and extensive government and industry research support.

The successful candidate will have an appropriate record of outstanding scholarship and accomplishments that blend traditional graphics or visualization with human computer interaction and should have the depth of experience and terminal degree requisite for the full professor rank. Previous administrative experience in an academic or industrial setting is preferred.

Start date shall be on or before September 1996. While the position will remain open until filled, primary consideration will be given to applications received by Nov. 1, 1995. Curriculum vitae and cover letter may be addressed to Professor John Dimb, GVU Search, College of Computing, Georgia Tech, Atlanta, GA 30332-0280. E-mail: gvu-search@cc.gatech.edu.

University of Waterloo
Department of Computer Science

The University of Waterloo invites applications for one or more tenure-track faculty positions in computer science. Consideration will be given to applicants whose research interests lie within the area of artificial intelligence or who engage in experimentally focused research in one or more of the following areas: database systems, data structures design, distributed systems, operating systems, programming languages or software engineering.

The successful candidate is expected to develop a productive research program, supervise graduate students and teach graduate-level courses, maintain a strong commitment to teaching undergraduate students and contribute to the administration of the department. A Ph.D. in computer science or equivalent is required, with evidence of outstanding research accomplishments or potential and evidence of excellence in teaching. Candidates at all levels of experience are encouraged to apply. Rank and salary will be commensurate with experience.

The Department of Computer Science comprises more than 40 full-time faculty members engaged in research and teaching covering a broad spectrum. The department and its research laboratories are housed in the 300,000-square-foot William G. Davis Computer Research Centre. The department is a key participant in the Information Technology Research Centre, a provincial Centre of Excellence that supports basic and applied research in information technology. For further information about the department, please see http://math.uwaterloo.ca/DC/Dept.

Applications should include a curriculum vitae and the names of three references and should be directed to the chair: Professor Frank Tompa, Department of Computer Science, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1. E-mail: fwtompa@uwaterloo.ca. The position commences during the 1996 calendar year and applications will be accepted until Jan. 15, 1996.

In accordance with Canadian immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. The University of Waterloo encourages applications from all qualified individuals, including women, members of visible minorities, native peoples and persons with disabilities.

This appointment is subject to the availability of funds.

Colorado State University
Department of Computer Science

The Department of Computer Science solicits applications for one tenure-track faculty position at the assistant professor level in the areas of compilers and software engineering. Outstanding candidates in other areas may also be considered. Applicants must have a Ph.D. in computer science or computer engineering at the time of appointment. Demonstrated excellence in research and potential for excellence in teaching and extramural research funding are required. Applicants will be expected to participate in a successful research program and to teach both graduate and undergraduate courses in their general area of computer science.

The Computer Science Department has 320 undergraduate majors and 80 graduate students in its M.S. and Ph.D. programs. The department currently has 13 regular faculty engaged in research in the areas of artificial intelligence, software engineering, parallel processing and graphics. Research funding has more than doubled in the last three years. Colorado State University is located in Fort Collins, CO, an attractive community of about 100,000 people, located 65 miles north of Denver along the front range of the Rocky Mountains. Total enrollment at Colorado State University is about 21,000 students.

Send your curriculum vitae and names of at least three professional references to Faculty Search Committee, Computer Science Department, Colorado State University, Fort Collins, CO 80523; Tel: 970-491-5862; e-mail: faculty_search@cs.colostate.edu. Please have your references send letters directly to the same address. Applications will be considered until Oct. 30, 1995.

Colorado State University is an equal opportunity, affirmative action employer. It strongly encourages applications from women and members of minority groups. Equal Opportunity Office: 21 Spruce Hall.

Colorado State University
Department of Computer Science

Colorado State University invites nominations and applications for chair of the Department of Computer Science. Anticipated starting date is July 1, 1996. Candidates for this position must have a Ph.D. in computer science or a related field, an excellent record in teaching, a well-regarded research program with broad-based funding and be qualified for an appointment as a full professor. Prior administrative experience is desirable.

The Computer Science Department has 320 undergraduate majors and 80 M.S. and Ph.D. graduate students. The department currently has 13 regular faculty engaged in research in the areas of artificial intelligence, software engineering, parallel processing and graphics. Research funding has more than doubled in the last three years.

Please send a curriculum vitae, and the names, addresses (postal and e-mail) and telephone numbers of five references, or a letter of nomination, to Professor P.N. Curthoys, Chair, Search Committee, College of Natural Science, Colorado State University, Fort Collins, CO 80523. Screening of applications begins Sept. 15, 1995, and will continue until the position is filled. Questions and inquiries can be sent via e-mail to chair-search@cs.colostate.edu.

Colorado State University is an affirmative action, equal opportunity employer. Equal Opportunity Office: 314 Student Service Building.

University of Michigan
Division of Computer Science and Engineering

Applications are solicited for several faculty positions in the Division of Computer Science and Engineering (CSE) at all ranks. Qualifications include an outstanding academic record, a doctorate or equivalent in computer engineering or computer science and a strong commitment to teaching and research. Particular areas of interest include multimedia, computer networks, software for distributed computing, compiler-based computer architecture and VLSI/CAD.

Please send resume and names of five references to Professor Trevor J. Teorey, Chair, Faculty Search Committee, CSE Division, Department of Electrical Engineering & Computer Science, The University of Michigan, 1301 Beal Ave., Room 3401, Ann Arbor, MI 48109-2122.

The university is an equal opportunity, affirmative action employer.

Dartmouth College
Department of Computer Science

The Department of Computer Science at Dartmouth College invites applications for a senior position in computer science at the level of associate or full professor. Candidates for this position should have a substantial record of research in a major area of experimental computer science and systems. The Department of Computer Science currently includes 10 tenure-track faculty members. In addition, several faculty members in the Thayer School of Engineering and the Department of Mathematics have research interests related to computer science and hold joint or adjunct appointments in computer science.

Dartmouth College is a highly selective Ivy League university with approximately 4,000 undergraduates and 1,000 graduate students. It combines the advantages of a small liberal arts college (small class size, excellent students and close student-faculty interaction) with the research activities of a university. As an indication of this dual commitment, research and teaching both count strongly in decisions on hiring, promotion and tenure.

Persons interested should submit a curriculum vitae and a list of at least four references, at least one of whom can comment on teaching. Review of the applications will begin immediately and continue until the search is complete.

Please send application materials and general inquiries to Phyllis Bellmore, Computer Science Recruiting, Department of Computer Science, Dartmouth College, 6211 Sudikoff Laboratory, Hanover, NH 03755-3510. Specific questions can be referred to Scot Drysdale, chair, at the same address. E-mail: scot@cs.dartmouth.edu. Information on faculty and their research, facilities, graduate students and so on is available on the World Wide Web at URL http://www.cs.dartmouth.edu.

Dartmouth is an equal opportunity, affirmative action employer and encourages applications from women and members of minority groups.

University of Washington
College of Engineering

The University of Washington invites applications and nominations for the position of dean, College of Engineering. The college offers undergraduate, master's and Ph.D. degrees in all major engineering disciplines. The college has a faculty of 240, and 1,250 graduate and 1,700 undergraduate students. It is ranked in the top 10% of colleges of engineering for its excellence in education and research.

The dean is responsible for the direction of teaching, research, development and relations with the external professional community and is the college's representative to the university administration.

We seek a candidate with the leadership and vision necessary to influence the shape of engineering education and science in the 21st century at the University of Washington and in the Pacific Northwest. Candidates should have an established reputation in engineering education as an engineer or applied scientist, a strong record of research accomplishments and competence in organizational leadership and management. Applicants should be prepared to assume the position by July 1, 1996.

Nominations or applications with resumes should be received by Feb. 15, 1996. Please submit to Committee on the Deanship of the College of Engineering, Professor Jean-Loup Baer, Chair, 301 Gerberding Hall, Box 351230, University of Washington, Seattle, WA 98195-1230.

The University of Washington is an equal opportunity, affirmative action employer. Women and minority candidates are encouraged to apply.

University of Texas, Arlington
Department of Computer Science and Engineering

You are invited to apply for tenure-track or visiting faculty positions in all areas of computer science and engineering. Applicants with expertise in one or more of the following areas will be given preference: architecture, compilers, database systems, intelligent systems and robotics, networks, operating systems, parallel and distributed systems, programming languages or software engineering.

Rank is dependent upon qualifications and experience. An earned doctorate and a commitment to teaching and scholarly research are required. Openings are anticipated for January and/or September 1996. Applications will be accepted until all positions are filled.

Interested persons should send a resume and reference letters to Bill Carroll, PO Box 19015, Arlington, TX 76019-0015. Tel. 817-273-3787; fax: 817-273- 3784; e-mail: carroll@cse.uta.edu.

The University of Texas at Arlington is an equal opportunity, affirmative action employer.

University of California, Berkeley
Electronics Research Laboratory

The University of California at Berkeley seeks a project manager for its Digital Library Project. Programmer/Analyst V (MAP IV); $62,700–94,000; 07-804-80/CP.

This is a management position. As staff technical expert, assume responsibility for technical leadership, coordination and management of a major Digital Library Project and related research activities in ERL. The project involves 18 faculty and industrial affiliates, 12 graduate students and six technical staff members.

Specify and direct the development and execution of the project and perform critical analyses of fundamental research issues

Professional Opportunities

requiring innovative solutions. Coordinate contributions from the project's partners, represent the project at public forums and national working groups, and prepare technical and administrative progress reports.

Qualifications: Extensive experience with modern database management systems, networking information systems (e.g. WWW), networking (TCP/IP), Unix platforms, information retrieval, and the design of large distributed computer software systems and tertiary/hierarchical storage management systems. Experience managing and directing highly technical research projects and ability to analyze fundamental research issues and propose solutions. Administrative and organizational experience in managing a project with many contributors. Excellent oral/written communication skills. Advanced degree in a relevant area of computer science and/or relevant research experience preferred.

See gopher://infocal.berkeley.edu:70/00/.p/jvl/previous.nd and http://elib.cs.berkeley.edu/ for further information.

Purdue University
School of Electrical and Computer Engineering

Purdue University, West Lafayette, IN, is seeking an individual to assume the duties of professor and head of the School of Electrical and Computer Engineering. The school has annual sponsored research expenditures of $7.5 million, 71 faculty members, 72 staff, 870 undergraduates and 550 graduate students.

The successful candidate must have outstanding leadership and administrative abilities, distinguished research and teaching records, an earned doctorate in electrical or computer engineering (or a closely related field), demonstrated skill in working with a diverse group of individuals and legal authorization to work in the United States. Screening will commence Oct. 15, 1995.

Direct all communications to Chair, Search Committee, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN 47907-1285. E-mail: search@ecn.purdue.edu. Additional information at http://ece.www.ecn.purdue.edu.

Purdue University is an equal opportunity, affirmative action employer

University of Illinois, Urbana-Champaign
Department of Computer Science

The Department of Computer Science at UIUC anticipates one or more full-time tenured and/or tenure-track appointments. To be considered for a tenured position, applicant must have recognized national and international stature. Successful candidates will be expected to initiate and carry out independent research and perform academic duties associated with our B.S., M.S. and Ph.D programs.

Qualifications: Ph.D. in computer science or a closely related field (or imminent completion of degree), outstanding academic credentials and an ability to teach effectively at both the graduate and undergraduate levels. Salary open, based on qualifications.

Starting date: Aug. 21, 1996. To ensure full consideration, applications must be received by Nov. 17, 1995, although a search will continue until positions have been filled.

Send resume, including names of three references, to Duncan H. Lawrie, Head, Department of Computer Science, 1304 W. Springfield Ave., Urbana, IL 61801. Tel. 217-333-6454.

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

University of Rochester
Department of Computer Science

The Department of Computer Science at the University of Rochester invites applications for a tenure-track position in the systems area at the rank of assistant professor. Candidates must have received, or be about to receive, a doctorate in computer science or a related discipline and must demonstrate exceptional potential for both research and teaching

Our department is small—12 faculty—with a strong record of research publication and external funding. We offer an outstanding research environment, with excellent students and facilities, and an unusually close-knit and collegial atmosphere. Current research interests include artificial intelligence (vision/robotics, natural language/knowledge representation), parallel systems and theory of computation. Approximately 40 students are enrolled in the Ph.D. program. There is no professional master's program. Plans are under way to establish a selective undergraduate major beginning in 1995.

Applicants should send a curriculum vitae, copies of relevant papers and the names and addresses of at least three references to Faculty Recruiting Committee, Department of Computer Science, University of Rochester, Rochester, NY 14627-0226.

The University of Rochester is an equal opportunity, affirmative action employer Women and members of minority groups are strongly encouraged to apply

Syracuse University
School of Computer and Information Science

Attention prospective students interested in graduate and undergraduate degrees: Syracuse University's School of Computer and Information Science (CIS) offers comprehensive programs in computer science, computational science, and systems and information science. CIS is strongly interdisciplinary, reflecting the fact that information and computation are integral parts of many disciplines.

Computer science and systems and information science degree programs are offered at the bachelor's and master's levels, and a master's degree in computational science and a doctoral degree in computer and information science are available. CIS also offers an undergraduate concentration in computational science and master's and doctoral level certificates.

Faculty research interests lie in the areas of logic programming, programming languages, parallel and distributed computing, semantics, neural networks, artificial intelligence, algorithms, structural complexity theory, coding and combinatorics, computer applications and statistics.

Two independent research centers maintained by Syracuse University—the Northeast Parallel Architectures Center (NPAC) and the Center for Computer Applications and Software Engineering (CASE)—provide computing and research opportunities for all students.

For more information, contact Barbara Powers, School of Computer and Information Science, 2-120 Center for Science and Technology, Syracuse University, Syracuse, NY 13244-4100. Tel. 315-443-2368; fax: 315-443-1122; e-mail: barb@top.cis.syr.edu; WWW URL: http://www.cis.syr.edu/.

University of Oklahoma
School of Computer Science

Faculty position in software engineering or computer architecture: The University of Oklahoma invites applications for a tenure-track faculty position in the School of Computer Science, with an appointment to begin in spring semester 1996 or the following fall.

The department seeks an individual with a research specialty in software engineering or computer architecture. Candidates must hold a doctorate in computer science or a related discipline and must demonstrate a strong commitment to research and teaching

The School of Computer Science offers baccalaureate through doctoral programs. Current faculty research interests include parallel and distributed computing, telecommunications protocols, computer vision, computer graphics, databases, functional programming, computational graph theory and theoretical computer science.

Applicants should send their curriculum vitae to Faculty Search Committee, School of Computer Science, University of Oklahoma, 200 Felgar St., Room 114, Norman, OK 73019-0631. E-mail: cs@uoknor.edu. Screening will begin Oct. 31, 1995.

The University of Oklahoma is an equal opportunity, affirmative action employer Women and minorities are especially encouraged to apply

University of Illinois, Urbana-Champaign
Department of Computer Science

The University of Illinois invites applications and nominations for the position of head of the Department of Computer Science. The Department of Computer Science conducts an outstanding educational and research program, embracing all major technical specializations of the profession. The department currently has approximately 40 full-time faculty members, and it offers degrees at the bachelor's, master's and doctoral levels.

The head is a tenured professor in the department and must demonstrate the credentials to hold such a position. The head is the chief executive officer of the department and must be able to assert the type of leadership required in a first-rate academic program.

Applicants should submit a full resume, including a list of publications, a statement of interest and vision regarding the post and the names and addresses of at least five references. Salary is commensurate with experience. A starting date of Jan. 6, 1996, is desirable. To ensure full consideration applications should be received by Sept. 15, 1995. Applications will be accepted until the position has been filled. Interviews may take place before the application deadline. However, no final decision will be made until after that date.

Send applications and nominations to S C Head Search Committee, University of Illinois, 109 Engineering Hall, 1308 W. Green St., Urbana, IL 61801. Tel. 217-333-6057.

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

University of California, Los Angeles
Department of Computer Science

The Department of Computer Science at the University of California at Los Angeles invites applications for tenure-track positions at all levels. Applications are especially welcome from distinguished candidates at more senior levels. Quality is our key criterion for applicant selection.

Applicants should have a strong commitment to both research and teaching and an outstanding record of research for their level. We seek applicants in any mainstream area of computer science, but we particularly welcome those with a strength in hardware and software systems research.

Interested applicants should send a letter of application, a resume and the names of four references to Professor Richard R. Muntz, Chair, UCLA Computer Science Department, 4732 Boelter Hall, Los Angeles, CA 90095-1596.

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

Science from Page 6

adviser's office, with occasional crosscutting programs such as HPCC?

Some of the resistance to change comes from senior people, scientists, politicians and bureaucrats whose funding or authority is based on the current system. But looking at the success of the present system, it is hard to argue for change.

Nor is there likely to be such change, despite Walker's support. Forming a new agency in the face of strong opposition within the administration and the community the agency is supposed to serve would be an enormous challenge. That is not to say, however, that there will not be some significant restructuring of some agencies, particularly if the parent department is eliminated. Chances are that the DOE labs, NIST and NOAA would not be totally dismantled; they would have to go somewhere. But a Department of Science is not likely to be their destination.

Flaw from Page 8

trained for the work they wind up doing is something we need to address.

Citation: *The Production and Utilization of Science and Engineering Doctorates in the US.* William F. Massy, Stanford University, and Charles A. Goldman, RAND. Copies can be obtained for $20 from Massy, Stanford Institute for Higher Education Research, Stanford University, Stanford, CA 94305. E-mail: hk.rac@forsythe.stanford.edu. The report is about 200 pages and includes lots of data tables, but the primary presentations and conclusions are in Chapter 1. The remainder of the study appears to be details of various components of the overall model, such as a model for estimating faculty career transitions.

Peter Freeman is dean of the Georgia Institute of Technology College of Computing. He also is a member of the CRA Board.

1996 CRA Conference at Snowbird
July 14–16 ◆ Snowbird, Utah

The 1996 CRA Conference at Snowbird will include:
- the Department Chairs Workshop.
- the Research Managers Workshop.
- the Effective Teaching in CS&E Workshop for new faculty members.

The CRA Conference at Snowbird is the flagship conference for academic and research laboratory administrators interested in computing research issues. If you would like to receive information about the conference when it becomes available, return this form to CRA.

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CRA Conference at Snowbird, 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.

Canadian News

Much learned from project to digitize OED

By Douglas Powell

A decade of annual gatherings to explore and celebrate the science of computational linguistics, text databases and how to make an electronic dictionary ended last fall with reflections on progress made and future prospects.

The centerpiece of this research is the Oxford English Dictionary. Although the second version was released in 1989, the lessons learned from digitizing the 21,728 pages packed into 20 volumes are now shaping a new generation of applications such as decision support systems and software engineering.

"We met most of the goals of the project," said Frank Tompa, director of the University of Waterloo Center for the New Oxford Dictionary and Text Research Project and chair of the UW Department of Computer Science. "The editors are happy and others can use it. We developed a sound theoretical base and good algorithms that have become commercially viable."

In 1983, the Oxford University Press circulated a call for proposals to convert the venerable OED, first published in 1928, into electronic form. With some prodding from UW President Doug Wright, a partnership between the university and Oxford University Press was struck in 1984. The New Oxford English Dictionary Project was then launched with money from the British government and with hardware, software and personnel donated by IBM-United Kingdom Ltd. The International Computaprint Corp. of Fort Washington, PA, won a contract to enter the entire OED and the supplement into electronic form, a task that consumed 120 people for 18 months. UW received support from the Natural Sciences and Engineering Research Council and the university.

> *The problem with text, unlike numbers, is that retrieving information is difficult because of the nuances of language itself.*

What was needed for the updated dictionary was to incorporate text-aware features typically found in information retrieval systems into a standard database management system, but supported by a data model based on formal languages. In other words, the project needed software that could search the OED and compile information rapidly. Tompa and others at UW brought experience with nonstandard databases, beginning with video text back in 1981.

"We in computer science have always been interested in the management of data," Tompa said. "Others had experience in text processing and the heuristics." The proposal was interdisciplinary, with strong support from the humanities. The problem with text, unlike numbers, is that retrieving information is difficult because of the nuances of language itself. This is magnified when dealing with the 55 million words of the OED.

According to Tompa, there is simple formalism behind the now ubiquitous relational databases that provide a structural security. Structured text is different, compromised in one way or another. But the OED has a structure all its own. Each entry has standardized parts and subparts, with paragraphs, sections, definitions, citations and so on. This organization allowed the UW researchers to look at the text as a formal language. Of course, not every citation has all these fields. When the UW team looked at the entire dictionary, they found more than 100 different patterns for what the outline of an entry looks like.

"There was more variety than even the editors expected," Tompa said. "Some things are superficial inconsistencies that don't get in the way because the reader can adjust to them. And many have purposely reversed something."

The secret to the UW search strategy was to develop parsed strings: a string of text or a sequence that is placed into a hierarchy. A search for the word "computer" would create a parsed string that would find more than just the single word "computer." It would find the first instance of the word "computer" and then include all the text that follows to the end of the dictionary.

When a text-searching tool, such as the pattern searching tool developed by Tompa and coworkers, uses parsed strings, it is searching not for an individual word but for strings that begin with that word. The result is that text can be searched to yield results that were not possible before.

A. Walton Litz, a professor of English at Princeton University and a member of the Oxford University Press advisory council, told *Time* magazine, "I've never been associated with a project, I've never even heard of a project, that was so incredibly complicated and that met every deadline."

In 1989, a spinoff company, Open Text Systems, was formed to commercialize the technology initially for the academic market. By 1991, the company changed to Open Text Corp. and focused on larger commercial applications.

Now Tompa has set his sights on commercial databases. Traditional database management systems have weak facilities for storing and manipulating text, and text-based systems ignore facilities for concurrent access and updates. The goal now is to create an application program interface that supports SQL (the industry standard for relational data) and SGML (the industry standard for structured text). "We want to add features and compatibilities without them appearing to be warts," he said.

Looking back, Tompa said the interaction with the editors at Oxford University Press was critical to the success of the project. "It was very important and extremely productive. Most of us work in a very small circle," he said.

Douglas Powell is a graduate student at the University of Guelph.

Mentors from Page 2

students (see Table 1).

The students applied from US schools in 34 different states. Of all the applicants, 39% were from colleges and 44% from public universities, with 17% from private universities. By contrast, 50% of the mentors were professors at private universities. The funded projects ran the full gamut of CS&E: artificial intelligence (seven projects), software engineering (seven), algorithms (five), databases (five), user interfaces (four), graphics (three), numerical analysis (three), combinatorics (three), parallel computation (two), networks (two), distributed systems (two) and architecture (two).

With few exceptions, both the mentors and the students found the experience rewarding. One 1994 mentor said, "The experience was an overwhelming success." Another "found the experience to be extremely positive and rewarding." A third said, "This is a great program which can really make a difference for the young women involved." Several faculty members wrote conference papers with their mentees.

Most students were quite appreciative of the opportunity provided by the project. Typical comments from a survey completed by the 1994 students include: "I had the best summer of my life," "Having [x] as a mentor was probably the best thing that ever happened to me," and "This program has left me with probably one the most worthy experiences of my life."

Several students decided during their summer to apply to graduate school. One said, "Graduate school…is no longer a mysterious place that some graduates go." Another said, "Graduate school did not even come across my mind until this summer, and now I am looking forward to continuing my education after my undergraduate degree is completed."

The grant renewal includes funds for careful follow-up attempts to evaluate success beyond anecdotal evidence.

Three aspects of the mentor project have been controversial: restricting mentors to universities, restricting mentors to women and not providing funding for mentors. Excellent mentoring occurs in both industry and government. But the goals of the project are best served by embedding the students in a university environment, where they can learn firsthand what graduate school is like.

Men can successfully mentor undergraduate women. But men cannot as easily provide for female students the "psychosocial" functions so important in mentoring. Given the continued dearth of senior women in CS&E—95% of full professors are male, and more than 80% at all levels of the "pipeline" are male (see Table 2 [A95])—most students have no female role model at their home institutions. Our project brings the students to the mentors, in effect distributing the scarce resource of female mentors throughout the country.

The mentor project funds go solely and directly to the students: neither the mentors nor their institutions receive any money. Although the original proposal recognized that mentors should be compensated for their time, funding realities at NSF made it impossible to obtain support for mentors. Fortunately, enough women are willing to volunteer their time for what they perceive as a worthy goal: mentoring younger women to look to follow in their footsteps.

Summer 1996 applications are available from the Computing Research Association, 1875 Connecticut Avenue NW, Suite 718, Washington, DC 20009, ATTN: Distributed Mentor Project.

For more information, contact Anne Condon, Computer Sciences Department, 1210 W. Dayton St., University of Wisconsin at Madison, Madison, WI 53706. E-mail: condon@cs.wisc.edu.

References

[A95] G. R. Andrews, "CRA Taulbee Survey: Ph.D.s holding steady," *Computing Research News*, March 1995, 7(2) 6-16.

Joseph O'Rourke is a professor in the Department of Computer Science at Smith College. He is a member of CRAW and was the principle investigator for the first two years of the Distributed Mentor Project. His textbook Computational Geometry in C, *recently was published by Cambridge University Press (1994).*