COMPUTING RESEARCH NEWS

The News Journal of the Computing Research Association

January 1997 *Vol. 9/No. 1*

How will election results affect science policy?

By Fred W. Weingarten
CRA Staff

The November elections are over, and the science policy community, gearing up for another year of intense budget battles, is speculating about the effects on science policy in the next Congress. Although last year's final numbers turned out to better than expected—at least for the budgets of the National Institutes of Health (NIH) and the National Science Foundation (NSF)—the coming year is likely to be much tougher.

The political desire to balance the budget continues, both in the administration and in Congress, and there are not many places left to cut in the discretionary portion of the budget.

Most initial attention is on the House. The Senate has been relatively indifferent to science policy in recent years, and that attitude is not likely to change. By contrast, the House has a full committee—the Science Committee—exclusively devoted to science policy. If science policy is to be dealt with substantively in the 105th Congress, that committee will have to lead the way. Whether it will be interested and equipped to do so will depend on how the elections affected its makeup, agenda and working style.

If science policy is to be dealt with substantively in the 105th Congress, the House Science Committee will have to lead the way.

Committee composition

The election did not create major changes, at least directly. As was true in general, the election was kind to incumbents. But many races were very close, and a few results could still change with recounts or other challenges. At press time, one race involving a Science Committee member, Steve Stockman (R-TX), was to go to a runoff.

Only four incumbent members lost their seats. Two of them, Andrea Seastrand (R-CA) and Mike Ward (D-KY), were first-term members; Bill Baker (R-CA) was in his second term. Harold Volkmer (D-MO), the most senior incumbent to lose his seat, had served for 20 years. Including the retirement of committee chair Robert Walker (R-PA), only five out of 50 members of last year's Science Committee will be departing the House.

However, in reshuffling committee assignments, more changes are likely to be made. For many members, the Science Committee is not a highly rewarding post, and many leave as soon as they can. The committee has little influence beyond a narrow set of special issues, and NSF is not one of the larger government agencies.

Consequently, membership on the committee attracts little political action committee (PAC) money, unlike major House committees such as Commerce and Ways and Means (the committee that deals with taxation). Furthermore, the scientific community is notoriously stingy with political contributions. If basic research PACs exist, they have not attracted much attention or been very influential either inside or outside Congress. An exception may be strong the industry support of NIH research, but NIH is not under the purview of the Science Committee.

As a result, the committee usually experiences substantial turnover in the junior ranks and nearly always winds up with a higher than average proportion of first-term members. This year is likely to be no different.

Leadership at the top has already been settled. F. James Sensenbrenner (R-WI), second in seniority on the committee to Walker in the last Congress, has been selected to chair the committee. He is a fiscal conservative who has represented the 9th District in Wisconsin, a district in the suburbs of Milwaukee, for 18 years. Although the University of Wisconsin is not in his district, reports are that he has visited the campus several times, is interested in basic science and is a strong supporter of academic research.

The ranking Democrat on the full committee once again is George Brown (D-CA), who won another very close race in his Riverside district. Cliff-hangers have been the

Continued on Page 10

Inside CRN

Expanding the Pipeline 2-3	*Policy Update 9*
Association News 4-5	*Washington Update 10*
CRA Taulbee Survey 6-7	*Awards and Honors 11*
Research News 8	*Professional Opportunities 12-16*

Changes in copyright policy debated

By Louise Arnheim
Special to CRN

Warning. If you are reading this item electronically, you may be in violation of federal copyright law.

That—or a similar caution—is what Internet users might see if, as certain groups suggest, proposed changes to copyright law come to pass.

These groups—which include consumers, educators, librarians, scholars of intellectual property and members of the computer and communications industries—are reacting to a proposal raised in Congress last year that would have broadened copyright owners' right to control distribution of their work. The proposal would have included "transmission" as part of that right, making the act of browsing on the Internet a possible copyright infringement.

The "transmission right" is just one of the changes being talked about in Washington. For the past three years, the Clinton administration, through its national Information Infrastructure Task Force (IITF), has been reviewing how well a law intended to protect the economic rights of authors functions in an environment that enables readers to download and send original works to colleagues anywhere, anytime. At the same time, the administration and Congress have been weighing those rights with a democratic society's need to access information and the ability of institutions (libraries, universities) to meet that need.

The ongoing copyright debate is one with a long list of players: the information industry, which sees the digital environment as one which significantly decreases its ability to recoup investment in an author's work and substantially increase instances of copyright piracy; educational institutions and businesses that distribute limited amounts of copyrighted material to students and colleagues, based on what is acceptable under the fair use doctrine; libraries, which depend on doctrines such as first sale to lend material; and service providers that, to avoid liability, might be required to monitor their subscribers' Internet browsing habits.

Two coalitions have been particularly active in the copyright policy debate. One is the Creative Incentive Coalition (CIC), which represents producers, publishers and distributors of copyrighted audio, music, software, text and video. Another is the Digital Future Coalition (DFC), a group of 25 organizations, including the Computer and Communications Industry Association; several of the major library associations, including the American Library Association; educational interests such as the National Education Association; consumer groups such as the Consumer Federation of America; and cyberspace rights groups such as the Electronic Frontier Foundation and the Electronic Privacy Information Center.

The current debate began in 1993 with the Clinton administration's blueprint for an information infrastructure, *Agenda for Action*. Among the nine principles set forth in the agenda was this directive: "The administration will investigate how to strengthen domestic copyright laws and international intellectual property treaties to prevent piracy and to protect the integrity of intellectual property." The agenda also established the IITF and, within that overall structure, several working groups. One of those groups was the Working Group on Intellectual Property Rights, headed by Bruce Lehman, Commissioner of

Continued on Page 9

NONPROFIT ORG.
U.S. POSTAGE
PAID
WASHINGTON, DC
PERMIT NO. 993

CRA
1875 Connecticut Ave. NW
Suite 718
Washington, DC 20009-5728

Computing Research Association

Board Officers
David A. Patterson
Chair
University of California, Berkeley

Mary Jane Irwin
Vice Chair
Pennsylvania State University

Nancy G. Leveson
Secretary
University of Washington

Michael R. Garey
Treasurer
Bell Labs, Lucent Technologies

Board Members
Alfred V. Aho
Columbia University

Frances E. Allen
IBM T.J. Watson Research Center

Gregory R. Andrews
University of Arizona

Sandra Johnson Baylor
IBM T.J. Watson Research Center

Anita Borg
DEC Network Systems Laboratory

Robert Cartwright
Rice University

Thomas L. Dean
Brown University

Stuart I. Feldman
IBM T.J. Watson Research Center

Jim Foley
Mitsubishi Electric Research Lab

Peter Freeman
Georgia Institute of Technology

C. William Gear
NEC Research Institute Inc.

Irene Greif
Lotus Development Corp.

John V. Guttag
MIT

Randy Katz
University of California, Berkeley

Edward D. Lazowska
University of Washington

Jill P. Mesirov
Boston University

James Morris
Carnegie Mellon University

Guylaine M. Pollock
Sandia National Laboratories

Kenneth Sevcik
University of Toronto

Lawrence Snyder
University of Washington

Mary Lou Soffa
University of Pittsburgh

John A. Stankovic
University of Virginia

Jeff Ullman
Stanford University

Mary K. Vernon
University of Wisconsin, Madison

John R. White
Xerox Palo Alto Research Center

Stephen S. Yau
Arizona State University

Stuart Zweben
Ohio State University

Executive Director
William Aspray

LETTERS TO THE EDITOR
Joan Bass
1875 Connecticut Ave. NW
Suite 718
Washington, DC 20009-5728
Tel. 202-234-2111
Fax: 202-667-1066
E-mail: crn@cra.org

Letters may be edited for space and clarity.

Expanding the Pipeline

Recruiting on the net not done well

By Margaret M. Fleck

A few years ago, recruiting for computer science jobs was done primarily using hard-copy journal ads and mail. Over the past few years, Internet distribution has become increasingly important, to where many job candidates now view the Internet as their primary source for job ads. Properly used, the Internet could save the community substantial time and money and allow us to better implement the intent of equal employment opportunity laws.

Currently, however, we have a hybrid system. Much of the information is distributed across the Internet using outdated procedures copied from the hard-copy system. Hard-copy methods are still in use, even where the Internet would be more effective. We are failing to exploit the Internet's potential for coordinating job information and making it widely accessible. And moreover, we are failing our obligation to give all qualified applicants an equal chance to compete for jobs.

Poor use of resources

Currently, job ads for Ph.D.-level positions [1] are posted on any one of several Internet sites. The most prominent official ones belong to the Computing Research Association, the IEEE Computer Society, the Association for Computing Machinery and the *Chronicle of Higher Education*. The best organized and most comprehensive site is run by an individual, Alan Kaplan [2].

These sites suffer from several problems. They are incomplete, both individually (for faculty posts) and collectively (for industrial and postdoctoral positions). Only Kaplan's site has an organization that is acceptable by the standards of modern Web sites. Except at Kaplan's site, ads disappear after an unacceptably short period of time.

As a result, job seekers must monitor multiple listing services, copy ads before they disappear and use Internet search methods to locate unlisted jobs or jobs whose listings have disappeared. It is particularly difficult to find ads for jobs in teaching colleges (usually posted on the *Chronicle of Higher Education* site, which retains ads for only a week) as well as industrial and postdoctoral jobs, some of which are apparently not posted in any well-known place. This process wastes time that could be more productively spent on the job seeker's research projects, their adviser's research projects or their teaching assignments.

Communication between an applicant and many hiring committees is also inefficient. Many ads do not include an e-mail contact address or the site's Web home page. Many departments use physical mail to gather letters of recommendation, confirm receipt of applications and provide information about their status. It is not uncommon to receive a form rejection letter months after the position has been filled. Communication through e-mail or Web pages is faster and less expensive.

Finally, countless pages of hard-copy listings are distributed to all people who subscribe to *Communications of the ACM* and *IEEE Computer*, most of whom are not seeking jobs. These listings are printed on expensive archival journal paper. This wastes paper, mailing costs and shelf space in university libraries.

Equal opportunities

Many US sites, including all those holding government contracts, are governed by federal equal employment opportunity laws [3]. These laws not only prohibit discrimination but also require that the site take active steps to ensure that women and minorities are able to compete for jobs on an equal footing. In particular, job ads must be posted in a way that ensures they are found by the full range of qualified applicants.

One obstacle to the recruitment of women in computer science is the difficult problem of locating suitable jobs for a married (or otherwise

Continued on Page 7

SIAM focuses on student diversity

By Cristina Villalobos

(The following article ran in the December 1995 issue of SIAM News *and is reprinted with permission.)*

As a Mexican-American woman, and therefore a member of a group that has been underrepresented in science and in higher education, I am greatly concerned about the education of minorities. One reason African-Americans and Hispanic-Americans have long been underrepresented in higher education is that many of us are simply not aware of the opportunities a higher education can provide.

Therefore, when the computational and applied mathematics minority graduate students at Rice University were asked to take a leadership role in organizing the first Graduate Student Focus on Diversity Workshop for the SIAM Annual Meeting in Charlotte, NC, we asked no questions but set about preparing for the event. The primary organizers—SIAM President Margaret Wright, Richard Tapia of Rice and Rice graduate students Monica Martinez, Cassandra McZeal and Pamela Williams—put a lot of time and effort into the day's events, which is why it turned out to be such a spectacular and exciting workshop, with back-to-back activities from 10:30 A.M. to 10:00 P.M.

The day's events consisted of seven presentations by graduate students from Rice and the Georgia Institute of Technology, a luncheon with scientists and, finally, an informal group discussion of issues related to the survival and success of minority students in graduate school. The topics of the graduate students' talks included shape optimization, finite element models for surface water flow and interior point methods for integer programming, to name a few. The students had 15 minutes each to present their doctoral/internship research, followed by five-minute question periods. Several of the students, on their own initiative, had invited scientists to their talks.

I am proud to say that my colleagues made superb, professional presentations and gave good answers to the questions that followed. The scientists who attended said they left the presentations with a real feeling of excitement. I understand the time and effort that go into a talk for a national meeting, especially a scientific meeting like SIAM's. I would like to congratulate my colleagues on a job well done. After the presentations, we headed to the luncheon, where, as graduate students, we were to meet the participating undergraduate students, introduce them to the scientists and discuss graduate school issues. We were seated four undergraduate students, two scientists and one graduate student (the discussion facilitator) to a table. The total of about 70 people did much talking in two hours, with the graduate students especially wanting to tell the undergraduates of their undergraduate and graduate experiences.

At my table, Peter Castro from Eastman Kodak spoke to the group—two professors, three undergraduates and me—about his research at Kodak, stochastic processes and the importance of taking computational mathematics and computer science courses. I found myself stressing to the students the importance of taking as many mathematics and CS courses as possible—a solid background in these areas is needed for anyone who wants to pursue a graduate career in the computational sciences.

When I explained the importance of a class in real analysis to some of the students at my table who were trying to avoid taking it, I was amused to hear an "I told you so" from their professor. I stressed the importance of courses like this even to the two undergraduates at my table who were planning to become high school mathematics teachers. I, too, planned to become a teacher before learning about graduate school and the opportunities it could open for me.

I found it exciting to speak with the undergraduate students and give

Continued on Page 3

Expanding the Pipeline

Distributed Mentor Project: evaluation of impact

By Anne Condon

Outstanding undergraduate women are provided with a window on research and graduate life and with a mentoring relationship with a successful professor.

The Computing Research Association's Distributed Mentor Project (DMP) has completed a third year of support for outstanding undergraduate women in computer science. The students spend 10 weeks during the summer doing research, typically at a university other than their undergraduate institution, under the guidance of a female professor and mentor. Two previous *CRN* articles (September 1993 and September 1995) describe the background, goals and first two years of this project.

The mentor project is sponsored by CRA and its Committee on the Status of Women in Computing Research. The project is supported by a grant from the National Science Foundation.

The purpose of this article is to bring readers up to date on the third year of the project, including a longitudinal third-party evaluation of the impact of the project. Also, readers are encouraged to spread the word about the project to undergraduate women at their institutions who might benefit from the research and mentoring experience. CRA would like to acknowledge the efforts of the professors who have served as mentors during the past three years.

Goals

The goal of the mentor project is to increase the number of women entering graduate school in computer science and engineering. To achieve this, outstanding undergraduate women are provided with a window on research and graduate life and with a mentoring relationship with a successful female professor during the summer following their sophomore or junior year. In 1996, 20 undergraduates were selected from 74 applicants and were matched with mentors according to technical interests.

The research projects ranged from designing and building autonomous minirobots that perform useful tasks in an unstructured environment to interactive algorithm animation for finding correctness and performance bugs to developing architectures and resource management algorithms for multimedia servers. Participating students came from a variety of home institutions, including Columbia University, Duke University, Emory University, Johns Hopkins University, Kent State University, the University of Michigan, the University of Minnesota, the University of Oregon, the University of California at Santa Cruz, Stanford University, Tufts University and Friends University.

The research was carried out at a variety of institutions, including Columbia, Duke, Minnesota, the University of Massachusetts, the University of Pittsburgh, Princeton University, Rice University and the University of Washington.

Project evaluation

A third-party evaluation of the project is being undertaken by the Learning through Evaluation, Adaptation and Dissemination (LEAD) Center at the University of Wisconsin. Two principal methods are used to assess the project's impact: structured, open-ended interviews of a cross-section of the participants to obtain a rich understanding of the experience and a written survey of nearly all the participants to test the experiences across a broader sample.

Ten of the 1994 participants and their mentors were interviewed in summer 1995. Also, 10 of the 1995 participants were interviewed before and after their summer research experience, and their mentors were interviewed in fall 1995. Additionally, in fall 1995 all the 1995 students received the written survey. The principal questions were: What, if any, kinds of qualitative effects are experienced by mentor-project students, and can patterns of mentee/mentor interactions be ascertained and associated with measurable effects of the program? What, if any, special problems or satisfactions do faculty members experience as mentors in this program?

A preliminary report containing the evaluation findings was prepared by the LEAD Center in January 1996 and is available on the Web via the DMP home page at http://www.cs.wisc.edu/~condon/mentor.html.

The preliminary report, which is more than 100 pages long, found that "students are utilizing the program in accordance with its goal of encouraging undergraduate women to consider and pursue graduate studies in CS&E."

The report further elaborates: "Most students entered in the program with little understanding of graduate school and no experience with research. These students expressed that 'living the life' of a graduate student helped them…because they developed a more complete understanding of graduate school, the research process and the faculty role within the university. Many students stated that…they: gained 'strategic' information on applying to graduate schools,…were able to relate to and identify with the graduate student experience…[and] developed confidence in their abilities to succeed in graduate school or in a research career."

Of the 22 1995 student participants who completed the survey in fall 1995, 17 said they intended to attend graduate school, and two were undecided. Perhaps not surprisingly, according to the survey, "Some students realized that they were either not interested or not prepared to do research and decided not to attend graduate school following their undergraduate education."

Regarding the findings from interviewing mentors, the report states, "All of the mentors that we interviewed commented that the DMP provided an excellent opportunity to both encourage women to consider graduate school in CS&E and prepare them for a career in CS&E." The report also says, "Many mentors stated that they were impressed with their students' abilities and initiative but cautioned that they needed to spend time introducing their DMP student to the research topic."

Some mentors recommended that the program only support junior-level students who have taken upper-division classes that "would give them the background and sophistication to do projects that could interest both the mentor and the student." The report provides additional information on strategies for creating a successful mentoring experience.

Follow-up interviews

Since January 1996, LEAD staff members have conducted follow-up interviews and a follow-up survey of the 1995 participants (in spring 1996). They also conducted a survey of two control groups of students who had not participated in the program. One control group was matched with the 1995 participants, while the other was matched with 1996 participants. A cross-section of 1996 student participants were interviewed before and after

Continued on Page 7

COMPUTING RESEARCH NEWS

Vol. 9/No. 1/January 1997

Computing Research News (ISSN 1069-384X) is published five times per year: in January, March, May, September and November. Copyright 1997 by the Computing Research Association (CRA), 1875 Connecticut Ave. NW, Suite 718, Washington, DC 20009-5728; tel. 202-234-2111. All rights reserved. Material in *CRN* is not endorsed by CRA nor intended to reflect any official positions of CRA or its board.

Subscriptions: Call 202-234-2111, send e-mail to crn@cra.org or mail subscription inquiries to CRA, 1875 Connecticut Ave. NW, Suite 718, Washington, DC 20009-5728. A free subscription is available to qualified subscribers. One-year paid subscriptions are $30 in the United States, $45 (US) in Canada and $54 (US) elsewhere.

Change of Address: Note that a change of address must include the old and new addresses with ZIP+4 if available. Please include a street address or PO Box.

Postmaster: Send address changes to CRA, 1875 Connecticut Ave. NW, Suite 718, Washington, DC 20009-5728. Postage paid at Washington, DC.

CRA Publications Committee
Jeff Ullman, Board Chair, *Stanford University*
Alfred Aho, *Columbia University*
Jim Foley, *Mitsubishi Electric Research Lab*
Joan Francioni, *University of Southwestern Louisiana*
Alberto Mendelzon, *University of Toronto*
Kenneth C. Sevcik, *University of Toronto*
Mary Lou Soffa, *University of Pittsburgh*

Computing Research Association Staff
William Aspray, *Executive Director and* CRN *Editorial Director*
Joan Bass, *Editor and Communications Director*
Phillip Louis, *Executive Assistant*
Kimberly Peaks, *Director of Administration*
Fred "Rick" Weingarten, *Director of Public Policy*

SIAM from Page 2

them information about the mathematics classes they should take, summer internships at engineering labs and scholarships/fellowships, as well as offer some motivation to pursue a graduate career. Yes, all this in two hours! In conversations with the undergraduate students, I discovered that many of them were happy to have been exposed to graduate research in the computational sciences and were impressed with the talks, although many felt the presentations would have been more beneficial had they been directed more toward an undergraduate level. Other students enjoyed meeting and speaking to professionals to learn about their work and the broad applications of computational mathematics in industry.

The final activity of the day was an informal discussion of graduate school; participants included all the undergraduate students, several scientists and the Rice group. We spent about two hours discussing major issues affecting undergraduate and graduate education for both African-Americans and Hispanic-Americans. An issue that arose many

Continued on Page 11

Correction

November's *CRN* incorrectly listed the school that awarded a master's degree to Juris Hartmanis, the new head of the National Science Foundation's CISE Directorate. It should have been the University of Kansas City.

Association News

Board nominees sought

The Computing Research Association is seeking nominations for its Board of Directors.

Each spring CRA's member organizations elect about one-third of the association's board members. Candidates are not required to be CRA members. It is important that the CRA Board represents the interests of the entire computing research community, and it is our policy to solicit a broad range of candidates.

Please contact the person you are nominating before submitting his or her name. Nominees will receive information about CRA and its activities and will be required to write a brief (100-word limit) statement supporting their nomination.

Our board is a working board, and all members are expected to actively participate. Although CRA has a small professional staff, board members are involved in all our major projects. Recent and current projects include:

• Planning the biennial CRA Conference at Snowbird.

• Conducting the annual CRA Taulbee Survey.

• Developing workshops on critical policy issues for computing research.

• At the invitation of the White House, defining an executive and legislative branch technology policy internship program for CS faculty members.

• Increasing the participation of women in computing research, with the help of National Science Foundation grants.

In addition to actively participating in board projects, board members are asked to attend at least two board meetings per year and pay their travel costs to the meetings.

These time demands can be daunting to overburdened researchers. However, research in computer science and computer engineering is facing major challenges as the political environment for government support changes. In the United States, Canada and many other countries, computing has been identified as a technology of critical social importance. This increased political attention places new demands on our field and offers new opportunities.

To receive a nomination form, send your request to Joan Bass of CRA at jbass@cra.org. The deadline for submitting nominations is March 3, 1997.

CRA invites nominations for service-related awards

The Computing Research Association invites nominations for the 1997 CRA Distinguished Service Award and the A. Nico Habermann Award. Nominations should be no longer than two pages and describe the contribution that is the basis of the nomination.

CRA Distinguished Service Award

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

Letters in support of the nomination are welcome but not required.
Deadline: Nominations must be received by Feb. 14, 1997.

A. Nico Habermann Award

CRA makes an award, usually annually, to a person who has made an outstanding contribution to aiding members of underrepresented groups within the computing research community. This award recognizes work in areas of government affairs, educational programs, professional societies, public awareness and leadership that has had a major impact on advancing these groups in the computing research community.

Letters in support of the nomination are welcome but not required.
Deadline: Nominations must be received by Feb. 14, 1997.

Send nominations for both awards to:
CRA Service Awards
Computing Research Association
1875 Connecticut Ave. NW, Suite 718
Washington, DC 20009-5728
Tel. 202-234-2111; fax: 202-667-1066
E-mail: info@cra.org

CRA AWARD FOR OUTSTANDING UNDERGRADUATES

The Computing Research Association is pleased to announce the third annual CRA Undergraduate Award program, which recognizes undergraduate students who show exceptional promise in an area of importance to computing research. The 1996-97 award is made possible by the generous support of Microsoft Corp.

A cash prize of $1,000 will be awarded to each of two undergraduate students, one female and one male, who are majoring in computer science, computer engineering or a similar program. Several other outstanding candidates will be recognized. The awards will be presented at one of the major computing research conferences sponsored by CRA, ACM, the IEEE Computer Society, SIAM or AAAI. The two first-prize winners will receive financial assistance toward their travel to the conference. CRA encourages home departments to provide similar assistance to other students who are recognized.

Because this is a relatively new award, many faculty and students have not yet heard about it. We encourage you to make it widely known in your department. The award is an outstanding way to recognize your best students and your department.

Nomination procedure

A nomination package consists of the following items:
1) Nomination form.
2) Nominee's resume (two-page maximum).
3) Nominee's transcript of academic record.
4) Nomination letter by department chair (two-page maximum).
5) Letter of support from one other supporting nominator (two-page maximum).
6) One-page description of student's research or other achievements.

Criteria for selection of winners

1) Evidence of unusual talent in some area of computing research as demonstrated by one or more of the following:
   a) significant research contributions, individually or as a member of a team
   b) creation of highly innovative software or hardware design
   c) demonstration of exceptional leadership or vision in a field of computing research
   d) other evidence of extraordinary interest, excellence or commitment to computer science and engineering, including industrial experience, participation in special programs and mentoring or tutoring of other students
2) Outstanding academic record

Complete nominations must be submitted by the candidate's department chair by **Feb. 14, 1997.** Each year, a department may nominate no more than one female and one male candidate. Nominees must attend a university or college in the United States or Canada. For more information see http://www.cra.org/awards/97uginfo.html.

Four copies of the nomination package should be sent to:
CRA Undergraduate Award Competition
Computing Research Association
1875 Connecticut Ave. NW, Suite 718
Washington, DC 20009-5728

CRA Award for Outstanding Undergraduates 1996-97 Nomination Form

Name of nominee _____
Sex _____
Program of study _____
Year in program _____
Department _____
University _____
Academic year address, telephone _____
_____
Permanent home address, telephone _____
_____
E-mail address _____
Name of department chair _____
Department chair's e-mail _____
Name of supporting nominator _____
Supporting nominator's e-mail _____
Signatures:

_____
Department chair Date

_____
Supporting nominator Date

Association News

CRA Standing Committees

Executive/Finance

David Patterson (chair), UC-Berkeley
Michael Garey, Bell Labs/Lucent Tech.
Mary Jane Irwin, Penn State University
Nancy Leveson, Univ. of Washington
William Aspray, CRA

Government

Ed Lazowska (chair), Univ. of Washington
Corky Cartwright, Rice University
Jim Foley, Mitsubishi Electric Research Lab
Peter Freeman, Georgia Tech
John Guttag, MIT
Deborah Joseph, University of Wisconsin
Randy Katz, UC-Berkeley
Barbara Simons, USACM
Mary Vernon, University of Wisconsin
Fred Weingarten, CRA

Publications

Jeff Ullman (chair), Stanford University
Al Aho, Columbia University
Jim Foley, Mitsubishi Electric Research Lab
Joan Francioni, Univ. of SW Louisiana
Albert Mendelzon, University of Toronto
Kenneth Sevcik, University of Toronto
Mary Lou Soffa, University of Pittsburgh
Joan Bass, CRA

Elections

Mary Vernon (chair), Univ. of Wisconsin
Jim Foley, Mitsubishi Electric Research Lab
David Patterson, UC-Berkeley
William Aspray, CRA
Joan Bass, CRA

Electronic Services

Peter Freeman (chair), Georgia Tech
Jill Mesirov, IBM Corp.
John Stankovic, University of Virginia
William Aspray, CRA

Surveys

Greg Andrews (chair), Univ. of Arizona
Thomas Dean, Brown University
C. William Gear, NEC Research Institute
Irene Greif, Lotus Development Corp.
William Aspray, CRA

Membership

Larry Snyder (chair), Univ. of Washington
Fran Allen, IBM T.J. Watson Research Ctr.
Kenneth Sevcik, University of Toronto
John White, Xerox PARC
Stephen Yau, Arizona State University
William Aspray, CRA

Awards

John Stankovic (chair), Univ. of Virginia
Greg Andrews, University of Arizona
C. William Gear, NEC Research Institute
Kimberly Peaks, CRA

Undergraduate Awards

Dan Huttenlocker (chair), Cornell Univ.
Jill Mesirov, IBM Corp.
Jeff Ullman, Stanford University
Kimberly Peaks, CRA

Coalition to Diversify Computing

(This committee currently is sponsored by CRA, ACM and ADMI.)

Sandra Johnson Baylor, (chair) IBM T.J. Watson Research Ctr.
Richard Alo, Univ. of Houston-Downtown
Jessie Bemley, Joint Educational Facilities
Andrew Bernat, Univ. of Texas at El Paso
Karen Radney Buller, National Indian Telecommunications Institute
Corky Cartwright, Rice University
Don Coleman, Howard University
Ramon Vasquez Espinoza, Univ. of Puerto Rico-Mayaguez
Charles Isbell, MIT (graduate student)
Kevin Kornegay, Purdue University
Forbes Lewis, University of Kentucky
Joseph Monroe, NC A&T State Univ.
Larry Oliver, ADMI
Cathleen Rosenthal, GEM
Valerie Taylor, Northwestern University
Doug Troeger, City Univ. of New York
Mary Vernon, University of Wisconsin
William Aspray, CRA

Committee on the Status of Women in Computing Research

Jan Cuny (co-chair), Univ. of Oregon
Leah Jamieson (co-chair), Purdue Univ.
Ruzena Bajcsy, Univ. of Pennsylvania
Sandra Johnson Baylor, IBM T.J. Watson
Francine Berman, UC-San Diego
Anita Borg, Digital Equipment Corp.
Anne Condon, University of Wisconsin
Mary Jane Irwin, Penn State University
Nancy Leveson, Univ. of Washington
Dian Rae Lopez, University of Minnesota
Joann Ordille, AT&T Bell Laboratories
Ann Redelfs, San Diego Supercomputer Ctr.
Mary Lou Soffa, University of Pittsburgh
Mary Vernon, University of Wisconsin
Kimberly Peaks, CRA

Industrial

Stuart Feldman (chair), IBM T.J. Watson
Fran Allen, IBM T.J. Watson
Sandra Johnson Baylor, IBM T.J. Watson
Anita Borg, Digital Equipment Corp.
Jim Foley, Mitsubishi Electric Research Lab
Michael Garey, Bell Labs/Lucent Tech.
C. William Gear, NEC Research Institute
Irene Greif, Lotus Development Corp.
Jill Mesirov, IBM Corp.
John White, Xerox PARC
William Aspray, CRA

Workshops

(chair to be announced)
Randy Katz, UC-Berkeley
Stephen Yau, Arizona State University

CRA Ad Hoc Committees

Snowbird Reassessment

Nancy Leveson (chair), Univ. of Washington
Greg Andrews, University of Arizona
John Guttag, MIT
John Werth, Univ. of Texas at Austin
William Aspray, CRA

CRA/CRA-W Fundraising Coordination

Mary Jane Irwin, Penn State University
William Aspray, CRA

CRN Subscription Form

Please check one:

❒ I want to subscribe or renew my subscription to *CRN*. I qualify for a free subscription.

❒ I want a year's subscription to *CRN*. I do not qualify for a free subscription. My check, made payable to the ***Computing Research Association***, is enclosed. Subscriptions are $30. Foreign subscriptions are $45 (US) in Canada and $54 (US) elsewhere.

❒ This is a change of address. I have included my address label or a copy of the old address.

❒ Check here if you do not want your name given to organizations that ask to send information to *CRN* subscribers. CRA screens all such requests.

Free Subscription Policy: *CRN* is mailed free to 1) faculty members, administrators and full-time researchers in college and university computing departments; 2) research staff members and administrators of nonprofit, for-profit and government laboratories involved in computing research; and 3) persons who affect policies related to computing research. Free subscriptions are only available in the United States and Canada.

Please note: We cannot process your subscription unless you include a complete street address or a post office box. To request an electronic subscription form, send your request to crn@cra.org.

Name_____
Title/Position_____
Phone_____ E-mail_____
Organization_____
Type of Organization_____
Department_____
Address_____
City_____ State_____ ZIP+4_____

Mail this form to:
CRN Subscription Department
Computing Research Association
1875 Connecticut Ave. NW, Suite 718
Washington, DC 20009
Fax: 202-667-1066; e-mail: crn@cra.org

CRA undertaking historical research and writing project

The Computing Research Association is undertaking a historical research and writing project on the formation of the academic discipline of computer science and engineering in the United States. It will cover the period from 1945, when the first electronic, digital computer was completed, until 1980, by which time most of the graduate degree programs had been established.

Topics in the project will include:

1. Development and growth of courses, programs and departments. Attention will be paid not only to content, but also to the backgrounds of students and faculty in them, and to the politics and social construction of decision making and change. A number of programs and departments will be examined in detail as case studies.

2. National, universitywide and departmental debates over curriculum development. These debates include the role played by educational groups such as EDUCOM, professional societies such as the Association for Computing Machinery and the IEEE Computer Society, and funding agencies such as the National Science Foundation and the Defense Advanced Research Projects Agency.

3. The roles of external funders. These include corporate funders, most notably IBM, that influenced the formation of the discipline through cooperative work-study programs, joint research projects, faculty funding for research and educational discounts for computing equipment; and private foundations. Of special interest is the role played by mission-oriented and research-oriented federal agencies, notably NSF and DARPA.

4. Tensions between computing as servant to scientific, engineering and other disciplines versus computing as an autonomous scientific discipline. These tensions are manifest in course offerings, relationships between computer science departments and university computing centers, relationships between computer science departments and user-departments such as mechanical engineering and economics, and the purposes of external funding programs such as NSF facilities grants versus research grants.

5. Tensions between theoretical and experimental research. The differences in the nature of empirical versus theoretical studies with regard to authority and verifiability of results, size of research team, size of research budgets, time to completion of study, ability to separate individual from team effort and the differing standards of judgment and reward in the scientific and engineering disciplines.

6. Change over time in the population of the computer science and engineering profession by gender, race, ethnicity and nationality; and the differences in how the two disciplines have changed over time.

William Aspray will be principal investigator. He will be assisted by Tim Bergin, professor of computer science at American University, and by a graduate research assistant. Work is just beginning, and it will take two to three years to complete the project. The following computer scientists and

Continued on Page 16

1996 CRA Taulbee Survey

Preliminary faculty salaries from survey

Salary information from the 1996 CRA Taulbee Survey on the Production and Employment of Ph.D.s and Faculty in Computer Science and Computer Engineering

For 26 years, the Computing Research Association and its predecessors have been charting the growth of Ph.D. production and the employment of computer scientists and computer engineers in the United States and Canada.

Each September, this survey is mailed to all organizations included on the CRA Forsythe List of departments that offer a Ph.D. in computer science or computer engineering.[1] Historically, the CRA Taulbee Survey [2] has had an excellent response rate (more than 90%), which makes the data especially useful.

The following tables provide preliminary data (as of December 1996) on salaries in US and Canadian departments. This part of the survey data is provided in this issue as a service to our members; moreover, we have enough responses to make the data statistically valid. The full survey, including updated salary information and an analysis of trends, will be published in the March issue of *CRN*.

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

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

[3]Although the University of Pennsylvania and the University of Chicago were tied in the National Research Council rankings, CRA made the arbitrary decision to place Pennsylvania in the second tier of schools.

Rankings

For Tables 1-8, which group computer science departments by the rank of 1-12, 13-24 and 25-36, we based our ranking on information from a 1995 assessment of research-doctorate programs in the United States done under the auspices of the National Research Council.

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

The departments ranked 13-24 are Brown University, Yale University, University of California at Los Angeles, University of Maryland at College Park, New York University, University of Massachusetts at Amherst, Rice University, University of Southern California, University of Michigan, University of California at San Diego, Columbia University and the University of Pennsylvania.[3]

The departments ranked 25-36 are the University of Chicago, Purdue University, Rutgers—the State University of New Jersey, Duke University, University of North Carolina at Chapel Hill, University of Rochester, State University of New York at Stony Brook, Georgia Institute of Technology, University of Arizona, University of California at Irvine, University of Virginia and Indiana University.

Salary tables

For Tables 1-9, each department was asked for the minimum, mean and maximum salary for each category of professor. Because tables show the minimums and maximums of the minimums and maximums reported by each department, these figures reflect salaries of individual professors. Also shown are the means of the minimums and maximums reported by each department. Finally, the average of all salaries is the average of the means reported by each department. If a department gave only a partial answer for a category of professor, it was discounted. All Canadian salaries are in Canadian dollars. We did not receive enough responses from Canadian departments regarding salaries for newly appointed faculty, but we hope to include this information in the March *CRN*.

Table 1. Nine-Month Salaries, 90 Responses of 131 US CS Departments

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	384	$40,833	$53,734	$68,000	$55,653	$46,957	$58,025	$76,400
Associate	614	$37,871	$58,814	$82,500	$64,665	$52,404	$71,524	$100,750
Full	775	$39,300	$71,300	$95,000	$88,049	$61,721	$114,381	$200,000

Table 2. Nine-Month Salaries, 12 Responses of 12 US CS Departments Ranked 1-12

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	63	$50,500	$56,653	$64,700	$59,459	$58,000	$63,446	$76,400
Associate	75	$55,690	$62,052	$66,400	$68,474	$71,250	$77,244	$90,000
Full	165	$39,300	$70,431	$80,000	$95,957	$100,000	$134,507	$163,300

Table 3. Nine-Month Salaries, 10 Responses of 12 US CS Departments Ranked 13-24

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	40	$54,000	$56,809	$63,650	$58,557	$55,821	$60,848	$66,100
Associate	70	$54,247	$63,514	$72,450	$69,072	$68,000	$75,949	$91,150
Full	129	$61,911	$72,620	$89,600	$97,508	$111,600	$134,441	$200,000

Table 4. Nine-Month Salaries, 8 Responses of 12 US CS Departments Ranked 25-36

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	44	$53,000	$55,011	$57,770	$57,287	$55,825	$60,316	$65,500
Associate	55	$57,948	$61,909	$69,000	$67,024	$64,654	$72,189	$81,400
Full	80	$66,632	$74,631	$90,300	$91,879	$86,752	$122,242	$170,400

Table 5. Nine-Month Salaries, 63 Responses of 95 US CS Departments Ranked Higher than 36 or Unranked

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	237	$40,833	$52,632	$68,000	$54,401	$46,957	$56,462	$76,000
Associate	414	$37,871	$57,312	$82,500	$63,228	$52,404	$70,058	$100,750
Full	401	$50,296	$70,821	$95,000	$84,906	$61,721	$107,231	$176,300

Table 6. Nine-Month Salaries, 4 Responses of 13 US CE Departments

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	13	$49,396	$54,143	$58,976	$55,915	$54,461	$57,882	$60,800
Associate	20	$60,000	$62,118	$66,273	$66,763	$63,500	$71,626	$77,650
Full	25	$65,537	$73,205	$80,900	$89,437	$78,200	$114,954	$146,145

1996 CRA Taulbee Survey

Table 7. 12-Month Salaries, 8 Responses of 16 Canadian CS Departments (Canadian Dollars)

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	37	$42,000	$51,591	$60,000	$55,782	$49,189	$60,251	$69,370
Associate	89	$49,432	$60,196	$76,086	$70,133	$60,330	$81,407	$125,233
Full	101	$62,664	$76,424	$92,607	$90,501	$78,449	$111,849	$159,802

Table 8. Nine-Month Salaries, 95 Responses of 144 US CS and CE Departments

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Assistant	397	$40,833	$53,752	$68,000	$55,664	$46,957	$58,019	$76,400
Associate	634	$37,871	$58,953	$82,500	$64,753	$52,404	$71,528	$100,750
Full	800	$39,300	$71,397	$95,000	$88,120	$61,721	$114,410	$200,000

Table 9. Salaries for Newly Appointed Faculty, 15 Respondlng US CS and CE Departments

Faculty Rank	# Reporting Salary Data	Reported Salary Minimums			Avg. of all Salaries	Reported Salary Maximum		
		Min.	Mean	Max.		Min.	Mean	Max.
Tenure	45	$45,000	$54,824	$82,500	$55,156	$45,000	$55,650	$82,500
Researcher	7	$35,000	$50,916	$62,500	$51,250	$35,000	$51,583	$64,000
Postdoc	19	$29,997	$38,574	$54,756	$40,417	$33,000	$42,479	$55,000
Other	22	$35,000	$43,092	$51,000	$44,971	$35,000	$47,117	$60,330

Recruiting from Page 2

permanently attached) pair of researchers. This affects many female job candidates because of the tendency for female scientists to marry other scientists or professionals [4]. Therefore, to achieve equal opportunity, we must ensure that such couples have an equal chance to compete for jobs [5].

Our chaotic online job listing service fails to achieve these goals. First, qualified applicants may fail to apply for jobs because they never see the ad. Personal connections have a significant impact on one's ability to find job ads. This violates the intent of equal employment opportunity laws.

Second, research couples may fail to apply for appropriate pairs of jobs. They may never see the ad for one job. They may not notice that two job sites are close to one another, due to poor geographical indexing in the job listings. Finally, computer science faculty application deadlines vary over a four-month range. Thus, a couple may not apply to, or may fail to accept, the most suitable pair of jobs because the two searches are on incompatible schedules.

Under the old hard-copy system, we might have been able to argue that it was too costly to distribute ads to all qualified applicants and too difficult to coordinate deadlines. The speed and accessibility of the World Wide Web now make that excuse seem flimsy.

More effective methods

As computer scientists, we should be leading the transition to Internet-based hiring. A variety of improvements should be made to the system, some at individual sites and some by the central societies. The following suggestions are based largely on techniques I have seen in use at the better-organized sites.

First and foremost, there should be a single, centralized Web page for listing Ph.D.-level jobs. Ads should be properly indexed (e.g., geographically, by rank, by specialty area and by type of site), and each ad should remain available until the position has been filled or the search abandoned.

The Web page should be mirrored at several geographically diverse locations. Centralizing job listings would save time and frustration and would undoubtedly result in more reliable matches of qualified applicants to suitable jobs.

Paper-copy job ads should be distributed only to those who need them. Centralization and electronic distribution would eliminate much of the expense of the current listing system (borne largely by the sites posting ads). A single electronic site would be very simple and inexpensive to run.

Electronic ads could appear almost instantly, without the long delays typical of the paper-copy system. It would be straightforward to offer a paper-copy service (at cost) to the small number of computer science job seekers who do not have effective Internet access.

Application deadlines should be made more consistent. Academic departments with extreme deadlines (for example, November 1 or March 1) should try to move them closer to the norm. For consistency with the other sciences (important in recruiting couples), most departments should also attempt to move their recruiting deadlines earlier in the year.

Each site should make effective use of the Internet in its recruiting effort. Job announcements should include an e-mail contact address. E-mail should be used to correspond with most applicants (e.g., confirm applications) and to receive application materials when feasible (e.g., letters of recommendation). To both applicants and hiring committees, promptness is more important than a pretty letterhead [6].

Job ads should also include a pointer to the department's Web page. Conversely, the department's Web page should contain information about its job openings (staff as well as faculty). Applicants would be kept better informed, and departments would receive fewer routine inquiries if the Web page included information on the current status of each job search (still accepting applications, interviewing or position filled).

Finally, these Web pages should include information about the local area. The spouses of most married applicants have a career. Pointers to nearby academic and research sites should be provided for the benefit of research couples. Other information about the local area would be helpful to applicants with partners who do other types of work. A simple sketch map of the local area, with driving distances, would also be extremely helpful.

Exploiting the power of the Internet in such ways would save substantial work for applicants, their advisers and hiring committees. Moreover, such steps would make the process of matching applicants to jobs more reliable and ensure that we are properly fulfilling our obligation to provide equal employment opportunity to all.

Notes

[1] This article focuses on Ph.D.-level ads for simplicity of exposition, but similar arguments also apply to M.S.- and B.S.-level jobs and undergraduate internships.

[2] http://www.cra.org/Jobs; http://www.computer.org/pubs/computer/career/career.htm; http://www.acm.org/cacm/careeropps; http://chronicle.merit.edu/.ads/.links.html; and http://see.cs.flinders.edu.au/People/Alan_Kaplan/jobs.

[3] For example, Executive Order 11246. Similar laws exist in various other countries.

[4] Susan Landau, "Universities and the two-body problem," *Computing Research News* 6/2 (March 1994).

[5] How hiring committees rate such applications, compared with those from single applicants, is a separate and much more contentious issue.

[6] E-mail can be forged, but so can physical signatures and letterhead. The writing style of a recommendation letter may be a better guarantee of authenticity than one's signature, as it is more likely to be well known to one's colleagues.

Fleck received her B.A. from Yale University and her M.S. and Ph.D. from the Massachusetts Institute of Technology. After working as a postdoc at Oxford University, she moved to the University of Iowa, where she is now an associate professor of computer science. E-mail: mfleck@cs.uiowa.edu; URL: http://www.cs.uiowa.edu/~mfleck.

Mentor from Page 3

their summer experience. Additionally, the 1996 student participants completed a written survey in fall 1996. A report containing the findings from these evaluations will be published by the LEAD Center this month and will be available on the DMP home page.

In addition to evaluating the principal questions of the program's impact on students' career decisions (as compared with the control groups) and the significance of having a female role model and mentor, the report contains additional, unanticipated findings regarding the effect on students' confidence in approaching faculty and asking questions in class when they return to their undergraduate institutions. You are encouraged to read the report for more information about the findings.

An application for the 1997 program is available on the Web at http://www.cs.wisc.edu/~condon/mentor.html. Or send your request to CRA, Distributed Mentor Project, 1875 Connecticut Ave. NW, Suite 718, Washington, DC 20009-5728. Fax: 202-667-1066; e-mail: info@cra.org.

For more information about the mentor program, contact Condon at the Department of Computer Science and Engineering, University of Washington, Box 352350, Seattle, WA 98195-2350. E-mail: condon@cs.washington.edu.

Research News

Recommender systems helping busy net users

BY Louise Arnheim
Special to CRN

Existing tools are useful in identifying potential sources of information, but these new technologies do not involve the human act of recommendation.

A poet once wrote: "Time is too slow for those who wait." No matter how fast the connection or how proficient one's searching abilities, culling the vast resources of the Internet can seem slow and time-consuming. And many times, even the most efficient search does not yield optimal results.

Along with "quality time" and "personal time," "Internet time" has joined the time-management issues challenging Americans in the 1990s.

Over the past decade, a growing family of information technologies has come to the aid of busy Internet users. The newest of these technologies are recommender systems (also known as collaborative filtering or social filtering systems). At the heart of this new technology is a very old concept: individuals seek the recommendations of friends and colleagues in making choices about what to read, listen to or buy.

While existing search, filtering and retrieval tools are useful in quickly identifying potential sources of information, these technologies do not involve the human, and more personal, act of recommendation.

A well-known example of a recommender system is GroupLens. Based at the University of Minnesota, GroupLens combines a reader's views of articles in Usenet newsgroups with the views of others who have read the same articles. Using those ratings, GroupLens then employs various algorithms to predict how likely it is that reader will like a Usenet article yet to be read. (Notably, to produce a statistically meaningful result, the system must have enough recommendations, or ratings, on hand.) In effect, GroupLens previews articles for the reader, saving him or her the time of both sifting through several articles and reading them (see http://cs.umn.edu/Research/GroupLens).

Another recommender system, Phoaks (People Helping One Another Know Stuff), looks at how often users mention URLs within Usenet news groups to see whether, or to what extent, this information in itself can be used as a source for a future recommendation. Findings to date, says Will Hill of AT&T Research, show that 23% of Usenet messages mention Web resources and 19% of the URL mentions are recommendations (see http://www.phoaks.com).

There are also recommender systems serving a more casual purpose. Firefly and EachMovie provide moviegoers with a source other than the local television critic in finding new releases they are likely to enjoy (see http://www.firefly.com or http://www.eachmovie.com). Firefly also makes recommendations regarding CDs.

The term "recommender system," said Paul Resnick of AT&T Public Policy Research, is more appropriate than collaborative or social filtering for many reasons. First, those participating in such systems may not be explicitly collaborating. Second, the recommendations are used to find good material, not just filter out the bad, he said. And, finally, the term recommender system is a play on words that accurately describes what the technology is actually doing: taking in recommendations as input and producing recommendations as output.

Experts in the field generally agree that the first recommender system was described in a 1992 article in *Communications of the ACM* (CACM) by David Goldberg, David Nicholas, Brian Oki and Douglas Terry ("Collaborative Filtering to Weave an Information Tapestry"). Created by the Xerox Palo Alto Research Center, Tapestry enables users to filter e-mail as well as receive selected documents from chosen newsgroups.

In addition to work being conducted in both the academic and corporate worlds, there is considerable activity in the federal government. According to Maria Zemankova, deputy division director for Information, Robotics and Intelligent Systems at the National Science Foundation, NSF has been looking at information filtering systems on both a programmatic basis and as part of its digital library project (see http://www.cise.nsf.gov/iris).

But is the improved ability to find choices recommended by one's peers an entirely positive social outcome? Erik Brynjolfsson, the Douglas Drane Professor of Information Technology at the Massachusetts Institute of Technology's Sloan School of Management, and Marshall Van Alstyne, a Ph.D. candidate at Sloan, think that such activity might lead to "cyberbalkanization."

Brynjolfsson and Van Alstyne contend that "just as separation in physical space, or basic balkanization, can divide geographic groups, we find that separation in virtual space, or 'cyberbalkanization,' can divide special interest groups."

For example, they said, the more one chooses to associate with one's colleagues online, the less one is associating with one's neighbors—a group of folks more likely to be different. "Geography," they write, "imposes an unavoidable heterogeneity" (a condensed version of their paper appeared in the November 29 issue of *Science*; see http://www.sciencemag.org/science/scripts/display/full/274/5292/1479.html).

Like other emerging technologies, recommender systems raise the issue of privacy. By using a recommender system, one provides certain information about oneself. Although many systems have implemented safeguards (in GroupLens, for example, the system only knows the user's pseudonym), experts at a University of California at Berkeley workshop last spring conceded that an individual bent on discovering a user's identity could succeed, either by tracking patterns of response among groups or by trying to crack a pseudonym.

The technical and social issues surrounding recommender systems generated considerable activity in 1996 and are likely to do so again this year. In March, 50 researchers from the academic and corporate worlds met in Berkeley, CA, for a one-day workshop on collaborative filtering. Organized by AT&T's Resnick and Hal Varian of Berkeley's School of Information Management and Systems, the workshop featured presentations about GroupLens, Phoaks, GAB (Group Asynchronous Browser, Bellcore Inc.), Pointers and Digests (Lotus Development Corp.) and a training agent called Do-I-Care (University of California at Irvine). The workshop also examined infrastructure issues and the incentives of individuals to participate in such systems (for more information on the workshop and related activities, see http://www.sims.berkeley.edu/resources/collab).

A workshop on integrating personal and community recommendations in collaborative filtering was scheduled to be held at the Computer Supported Cooperative Work '96 meeting in November. And early this year, a special section of CACM will feature several papers on recommender systems, including five papers on specific systems and one paper on incentives to provide recommendations.

Meeting the technological needs of education

The following is an excerpt from the recently released report, Setting a Computer Science Research Agenda for Educational Technology. *The report was edited by Mark Guzdial of the Georgia Institute of Technology and Fred W. Weingarten of the Computing Research Association.*

On Sept. 30 – Oct. 2, 1995, CRA, the American Educational Research Association and the Georgia Institute of Technology hosted a workshop in Washington, DC, aimed at defining a computing research agenda for education. This report presents the results of the workshop, which brought together leaders in computing and educational technology to develop an expanded and long-range computing research agenda that includes fundamental investigations in computer science and engineering directed at solving problems posed by new educational applications. This report is intended to be the start of a long and productive dialogue between the computing research community and those concerned with bringing technology to bear on the problems of education.

During the last several decades, since the invention of the digital computer, many researchers have believed computer technology holds great promise for education. The National Science Foundation and the Defense Department began supporting research on the feasibility of the instructional use of computers in the 1960s. This and successive research over the ensuing 30 years have repeatedly proven that computers can be powerful educational tools. Information technology (IT), when properly used, can improve learning, motivate students and help them gain higher-level cognitive skills critical to lifelong learning.

Despite instructional computing's proven success, it has not yet been adopted in any meaningful way into K-12 education.

This delay in adoption is particularly striking when compared with rates of technological adoption by other institutions, both private and government. Two probable causes for the delay are: 1) financial constraints and 2) the significant changes that must occur within both the institution and the technology itself if instructional computing is to become a significant and meaningful part of education's learning environment.

Costly investments in hardware, software development and staff retraining generally are required to bring technology into any organization, and the nation's educational system is a very large organization. Furthermore, for the past several years school budgets have been under severe constraints, providing administrators little flexibility to accommodate such cost demands. Additionally, previous research has often been done with expensive, state-of-the-art technology. Although the

Continued on Page 9

Policy Update

WIPO and electronic databases

At press time, delegates to the United Nation's World Intellectual Property Organization (WIPO) were meeting in Geneva, Switzerland, to discuss a highly controversial proposal on electronic databases. If accepted, the proposal could have a significant impact on the ability of Internet users (from the casual user looking up baseball scores to researchers seeking government data) to use data otherwise thought to be in the public domain.

If approved, the proposal would give database owners the right to control "utilization and extraction" of their material. Currently, copyright protection is extended only to databases where the developer has exerted a creative effort, either through selection or the compilation of the data in question.

In October the US Patent and Trademark Office published a notice in the *Federal Register* seeking public comment that included this change to international law as well as other proposed amendments. Similar wording was proposed in a House bill (HR 3531, the Database Investment and Intellectual Property Antipiracy Act of 1996) during the 104th Congress. However, no hearings were held.

The proposal's contents—as well as its rapid march to Geneva without full Congressional debate—generated a significant amount of activity in Washington this past fall. For example, in an October letter to the White House, several major library associations cited the "…lack of consultation with affected constituencies in the public and private sectors regarding the impact of such a proposal" as a major reason for writing the letter. These associations included the Association of Research Libraries, the American Library Association, the American Association of Law Libraries, the Medical Library Association and the Special Libraries Association.

Another appeal to reconsider the issues and postpone ratification came from the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine. In a joint letter to Secretary of Commerce Michael Kantor, these institutions cautioned that the proposed changes "…would seriously undermine the ability of researchers and educators to access and use scientific data and would have a deleterious long-term impact on our nation's research capabilities. Moreover, the proposed changes are broadly antithetical to the principle of full and open exchange of scientific data espoused by the US government and academic science communities and promoted internationally." In late November NAS/NAE/IOM also sponsored a one-day special seminar on the issue.

If approved, the proposal would be retroactive, applying to databases already in existence.

—L. Arnheim

Education from Page 8

cost/performance ratio for most computer technology has been improving rapidly (doubling about every two years), it can still take several years for these applications coming out of the laboratory to become affordable.

Thus, computing researchers are, in essence, working with time machines, exploring applications that will become cost effective only in the medium-term future. Educators' expectations for the short term may have been uninformed by these realities and, thus, in all likelihood went unfulfilled.

The second, and perhaps even more difficult, problem is that successfully adopting technology in a deep way means adapting both institutions and the technology in a deep way. This observation is not new; significant organizational adaption has accompanied nearly every major application of computer technology. Nor is this observation an indictment of the inertia of the educational establishment.

Not much technology that is compatible with the educational and institutional goals of any given educational system exists. Substantial research on learning processes and on problems in the computing field is needed to meet that design goal.

It is time for such a major research initiative in education technology, particularly one that is broadly based and that focuses on the use of communications and computer technology.

The convergence of digital technology with its rapidly changing communications infrastructure and growing political and societal demands for effective, relevant and affordable education is creating an ideal opportunity for a fundamental transformation of education.

Future of CS in education

Many of the research issues raised in this report, such as creating models for new teaching practices and defining new teacher education curricula, are already being addressed through educational research. Education researchers are well aware of the dramatic changes that technologies are bringing to traditional educational systems. These efforts should be encouraged and supported. Many of the other research issues mentioned above lie in the realm of traditional computer science research or are on the boundary where the two research fields converge.

For the vision described herein to be supported and guided, efforts must be made to increase the number of researchers who integrate education and computer science. The breadth and depth of research identified in

Continued on Page 10

Copyright from Page 1

Patents and Trademarks.

After a year's inquiry, the working group circulated a draft for comment in July 1994, *Intellectual Property and the National Information Infrastructure*. Known more popularly around Washington as "the green paper," the draft was criticized both for what it said and the way it said it. Critics charged it was written by lawyers for lawyers and that it alienated many of those whose interests were primarily at stake. After a round of comment, a final version—referred to as "the white paper"—was published in fall 1995.

At about the same time, legislation to implement many of the proposed changes was introduced in the House and Senate (HR 2441 and S 1284, both titled the NII Copyright Protection Act). Hearings were held before the House Judiciary Subcommittee on Courts and Intellectual Property in February 1996 and in the Senate Judiciary Committee three months later, but no further action was taken.

Why did copyright legislation fail to make it further in the 104th Congress? Noting that it took a decade to pass major telecommunications reform legislation, Carol Risher, vice president of the Association of American Publishers, observed that changes in copyright law would not occur overnight. The NII legislation proposed last Congress was "premature," she said; it didn't "fully appreciate" the Internet.

What's at stake as the 105th Congress convenes? What other changes are being proposed, and what would they mean to the computing research community?

Below is a point/counterpoint to three key activities that might be affected: browsing, making a copy of an electronic document for classroom or business use and forwarding an electronic document.

Browsing: Under current law, copyright owners have the exclusive right to distribute copies of their material to the public "by sale or other transfer of ownership, or by rental, lease or lending." As noted above, Congress proposed adding transmission to that right.

In written testimony before the Senate Judiciary Committee, DFC argued that the courts, in interpreting this "new" right, might apply the statute to any temporary copy, including copies stored in a computer's RAM or cache (in fact, the administration had made an argument to this effect in its white paper). As a consequence, browsing could become a copyright infringement.

In its written testimony before the Senate committee, CIC argued that copyright owners already permitted a "great deal" of browsing of copyrighted materials even though, in some instances, such browsing might be a "technical violation of copyright." According to CIC, the owners allowed such browsing as part of the "practical marketing and rational exploitation of their works" in the new, digital environment. Rather than clarifying the Senate bill to permit the "ephemeral reproduction of a work in temporary computer memory or digital storage," as DFC had suggested, CIC suggested a "more constructive response": the promotion of new copyright management information systems that enable owners to exercise greater control over whether they wish to have their documents read.

But the ramifications of the proposed language, DFC contended, transcended the user's immediate activity of browsing and raised serious liability concerns for online service and Internet providers. Could providers be expected to monitor their subscribers' activities, and if so, would this not constitute an invasion of privacy?

Fair use: In 1976 Congress amended the copyright act to include the doctrine of fair use. That part of the statute reads as follows: "…the fair use of a copyrighted work, including such use by reproduction in copies or phone records, or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship or research is not an infringement of copyright." It is that doctrine that—given certain modifications by the courts—allows educators to compile and distribute course packs and businesses to copy and distribute magazine articles for in-house use.

Arguing that Congress had tilted the balance in favor of copyright owners (by making the transmission right part of the distribution right), DFC suggested a counterbalance: making transmission part of the fair use doctrine. In other words, electronic reproductions would not constitute infringements.

First sale: Under current copyright law, once an author's work is sold initially—for example, an author's first sale—an institution is not required to seek the author's permission in order to redistribute the work (this is the basis for library loans). The administration's white paper, however, argued that first sale pertained only to the physical distribution of such material and not to digital distribution. Therefore, if one were to loan a colleague a work by forwarding it electronically, he or she could be violating copyright law.

DFC urged Congress to develop the "virtual" equivalent of first sale by extending the doctrine to include digital copies of works. Noting owners' concerns about the ease of forwarding such material, DFC proposed that users be required to destroy their copy at "substantially the same time." CIC called the proposal "unworkable" and "virtually impossible to enforce."

What's ahead for copyright as the 105th Congress convenes? To some extent, the answer depends on the outcome of the electronic database proposal now pending before the World Intellectual Property Organization (see related story, box). As the Association of American Publisher's Risher observed, approval of the proposal would place ratification at the top of Congress' agenda.

Washington Update

Decision near for renewal of NSF supercomputer centers

By Fred W. Weingarten
CRA Staff

The end of a nearly two-year process is in sight as the National Science Foundation approaches the final stages of its review of the supercomputer center renewal proposals. The process has been complicated. The grants will commit hundreds of millions of dollars over the multiyear terms of the grants, and more than 100 universities and research centers reportedly are involved in the competition.

The existing program started in the mid-1980s, with grants to create five national supercomputer centers (later, that number shrank to four, with the closing of the center at Princeton University). That support continued through two five-year agreements, the second of which expires later this year. Two years ago, anticipating the expiration of the second round of agreements, NSF began reassessing the needs of research in light of the current state of scientific computing. Sometime later the foundation announced a newly structured program and a recompetition for support of the centers.

Last month NSF finished all site visits and convened a plenary panel of the site visitors. The foundation is expected to submit its recommendation to the National Science Board in March 1997. Assuming the board approves the recommendation, negotiations will begin with the successful centers (at least one and no more than four), and the renewal is anticipated to be in place by September.

The size and importance of these grants has made the process messy and will likely continue to create problems. So many universities are substantively involved with the proposals that it has been hard to find reviewers—or, for that matter, NSF officials and NSB members—without conflicts of interest. It was for that reason that Paul Young, who recently stepped down as head of NSF's Computer and Information Science and Engineering Directorate, was invited back to help with the final decision processes.

Political attention is also focused on the decision. Whatever NSF decides, some congressional feathers will likely be ruffled. Hearings almost surely will be held. NSF has been successful in the past in protecting its peer-review decisions from political pressure, and it should be able to do so this time. But it will be a frustrating and time-consuming process.

New reports related to research

Advancing the Frontiers of Information Technology: This report is the latest in a series published by the National Science and Technology Council's Committee on Computing, Information and Communications describing the work of the High-Performance Computing and Communications program. To receive a copy, contact the National Coordination Office for Computing, Information and Communications or see the Web page at http://www.hpcc.gov.

Contributions to DOD Mission Success from High-Performance Computing: As the title suggests, this report discusses Defense Department HPC modernization programs and describes several successful applications of high-performance computing in a defense context. To receive a copy of the report, contact the Defense Technical Information Center. Tel. 703-767-8274; URL: http://www.hpcm.dren.gov.

Lessons Learned from the Telecommunications and Information Infrastructure Assistance Program: The Internet connections program, run by the Commerce Department's National Telecommunications and Information Administration, has, for the last two years, offered grants for innovative projects that connect schools, libraries and other community organizations to the Internet. This is a report on that program. See http://www.ntia.doc.gov/tiiap/lessons.html for an online order form.

Cryptography's Role in Securing the Information Society: This report, released by the National Research Council's Computer Science and Telecommunications Board, is the official printed version of the study report mandated by Congress. This report already has greatly influenced the policy debate since it was first released early last year. This printed version is about 700 pages, is fully indexed and has several informative appendices. URL: http://www.nap.edu.

Education from Page 9

this report cannot be undertaken by the relatively small community of researchers currently working within the intersection of education and computer science.

To stimulate the growth of this important work, several steps need to be taken, including, but not limited to: funding programs for postdoctoral studies in the intersection of computer science and education; university administrations sending strong signals of support to their faculty to develop, evaluate and use advanced educational technology; and the creation of programs that match private sector organizations that want to invest in experimenting with advanced technologies for learning with researchers.

The report is available electronically at http://www.cc.gatech.edu/gvu/edtech/nsfws.

Congress from Page 1

norm for Brown, who represents a predominantly agricultural area in southern California. For many years, Brown has been a thoughtful and influential voice in science policy in the Congress, and many in the research community are glad to see him return.

The subcommittee structure, extensively reshaped by Walker, will look much the same under Sensenbrenner, with only minor tinkering with jurisdiction. Two past chairs will retain their positions. Two seats are open.

Steve Schiff (R-NM), who chaired the Basic Research Subcommittee, will continue in that position. He represents the Albuquerque area, and, although Los Alamos is not in his district, the future of the national laboratory complex located there is of interest to the entire state. This subcommittee has jurisdiction over the national labs.

Connie Morella (R-MD), who chaired the Technology Subcommittee, easily won her election and will keep that post. The National Institute of Standards and Technology is in her district, and Morella, a moderate Republican, has resisted the House Republican attack on NIST civilian technology programs.

Dana Rohrabacher (R-CA), who chaired the Energy and Environment Subcommittee and used it as a forum to sharply criticize Environmental Protection Agency research, is likely to become a subcommittee chair for another committee, leaving this seat open.

Sensenbrenner had been chair of the Space and Aeronautics Subcommittee, so this seat also is open. It is not clear yet who will take over.

Even with some churn in committee membership, the changeover will be much smoother than two years ago, when the problems of transition in party control were compounded by an enormous influx of new, inexperienced committee members.

Working together?

Since the elections, both the president and congressional leadership have been talking about a more constructive mood in Washington. Both are promising to work together to solve particularly contentious issues, such as a balanced budget and Medicare, and promising that Congress will adopt a more bipartisan and civil tone.

Such soothing talk has also been heard in the Science Committee. According to press reports, Sensenbrenner already has met with Brown over dinner to talk about operating the committee in a more collegial style. This would be quite a contrast to the previous two years under Walker, which saw frequent, sharp exchanges between Walker and the Democrats, including Brown and presidential science adviser Jack Gibbons.

Many political commentators predict the cozy mood on the Hill will be short-lived. First, there are strong post-election ill feelings on the part of some Republicans who think the Democrats treated them unfairly, particularly on Medicare. Second, when certain issues are debated, strong partisan differences once again will emerge.

According to polls, the constituencies that the two parties represent in Congress are sharply polarized in a number of ways that may make compromise difficult. Finally, any of the current or pending investigations of alleged White House misbehavior could erupt in a way that brings the majority in Congress into a hostile confrontation with the administration.

Despite these warnings for the Congress as a whole, the outlook for smoother waters within the Science Committee seems more promising. The committee had a long-standing bipartisan operating style before the 104th Congress. Not that disagreements did not arise, but grumbling was subdued. Much of the legislation that emerged from the committee in that period, including the High-Performance Computing Act, had full support from both sides of the aisle. Disagreements over issues such as the space station and the superconducting supercollider tended to cut across party lines.

Sensenbrenner, although solidly conservative on economic issues, does not have the fiery, confrontational style that characterized some Republicans in recent years. His operating philosophy has been to treat research funding as a bipartisan issue, given that both parties essentially support the concept of federal support of research. According to some who work with him, the chair is likely to seek areas, possibly limited in scope, where the committee can work together to achieve constructive results.

Future agenda

What issues will the committee choose to explore this year? It is early; the committee and its subcommittees are still forming, and some staff changes remain to be made. But there are some clues.

The committee will be able to set an agenda relatively early in the year. In the last Congress, the committee faced two impediments from the start: it had a large number of first- and second-term members, all of whom had very little experience with science policy at the national level; and the Republicans, particularly the newer members, were intensely focused for most of the year on passing the "Contract With America." Committee staff had trouble getting any focus on committee business not directly related to the contract.

This year, with the initial House focus on substance, the committee will get down to business right away,

Continued on Page 11

Awards and Honors

Farber, Heilmeier honored

David J. Farber and George H. Heilmeier have been named as the 1996 recipients of the John Scott Award for scientific achievements. The winners each receive a $10,000 cash prize.

Farber, the Alfred Fitler Moore Professor of Telecommunication Systems at the University of Pennsylvania, is being honored for his seminal contributions to the field of computer networks and distributed computer systems. He was involved in the creation of the DCS System and CSnet, forerunners of the Internet.

Heilmeier, the president and chief executive officer of Bellcore Inc., is being honored for his pioneering work in the development of LCDs. This work has influenced mankind through its applications in computers and consumer products.

The prestigious award was founded in the early 1800s by the Scottish druggist John Scott. Earlier recipients have included Albert Einstein, Guglielmo Marconi, Marie Curie, Orville and Wilber Wright, Thomas Edison and Irving Langmuir.

Leadership awards given

The 1996 recipients of the *Computerworld* Smithsonian Information Technology Leadership Awards are Don Stredney and John McDonald, Vinton Cerf, David Evans and Ivan Sutherland, Robert Kahn, and West Virginia Governor Gaston Caperton.

The leadership awards are given annually to individuals or teams (depending on the award) who have made unique and lasting technological contributions to society.

Cray Research Information Technology Leadership Award for Breakthrough Computational Science: Stredney and McDonald were honored for their "virtual surgery" innovation that makes it possible for medical students to practice difficult surgical techniques without a human patient.

MCI Information Technology Leadership Award for Innovation: Cerf was honored for co-developing the TCP/IP computer network protocol.

Price Waterhouse Information Technology Leadership Award for Lifetime Achievement: Evans and Sutherland, founders of the company of the same names, were honored for their breakthrough work in computer graphics.

SAIC Information Technology Leadership Award for Global Integration: Kahn was honored for co-developing the basic protocols that make up the Internet.

Zenith Data Systems Information Technology Leadership Award for Education: Caperton was honored for initiating a national model for computing technology training in elementary schools.

CRN adding Transitions column

CRN is starting a new people-in-the-news feature. Let us know if you have changed jobs, been promoted or appointed to a key committee or task force. For example, we are interested in listing the new chairs of computer science, computer engineering or related departments or colleges; new heads of industrial or government research laboratories; or key changes in granting agency personnel. Send your announcements to Editor, CRA, 1875 Connecticut Ave. NW, Suite 718, Washington, DC 20009-5728. E-mail: crn@cra.org.

SIAM from Page 3

times was the importance of a solid background in mathematics, which involves taking classes beyond the undergraduate degree requirements, because this is crucial to preparation for graduate school. I believe the discussion made many of the undergraduates aware of the changes they can make in their education now in order to keep the option of graduate school open.

The choice of a graduate school is a critical issue for minority groups. To many, the right school means a school that has support groups at the university level. Few students from underrepresented groups enroll in college, let alone graduate school, especially in the mathematical sciences. And as we all know, graduate school is a tough environment, one that involves not only studying but also maturity, questioning and evaluating one's self and others throughout the process. It is demanding, and some students even consider dropping out; what helps us all come through is the support groups we have or create.

Several participants suggested that students look for a graduate department that has a certain number of minority students, that is sensitive to minority issues and that has supportive faculty. Others argued that the student's motivation is the decisive factor in a successful graduate career. I strongly agree with this opinion and believe that the student has to have the desire, determination, perseverance and assertiveness to succeed in graduate school. Support can come not only from groups within a student's department (as at Rice, where Tapia and other faculty and students have made graduate school a friendly environment), but also from other departments, from families, nonlocal friends and from within ourselves.

Finally, we discussed the recurring theme that the No. 1 thing that motivates us to pursue a graduate career and, later, a career in the mathematical sciences is that we love and enjoy our work. The graduate students and scientists in the audience seemed to be in universal agreement on this notion.

All in all, the organizers and participants in the workshop agreed that the event should be continued at SIAM meetings. This event was specifically created for undergraduate students, to expose them to talented graduate students in applied mathematics doctoral programs and to make them aware of the possibility of pursuing a graduate career. I know we accomplished this goal—many of the undergraduates left the workshop with more enthusiasm and knowledge about graduate school and applied mathematics than they had before. Most importantly, I believe they left with more confidence, knowing that people like them—minorities and women—can succeed. The many role models at the workshop included not only the scientists but also the graduate students—the people the undergraduates were most likely to relate to.

I, too, left the workshop energized and excited, knowing that the conference had benefited everyone in one way or another. Events like this, in making people aware of opportunities they would not have considered otherwise, are beneficial for all who organize and attend them. As an undergraduate, I had participated in summer mathematics programs, and it was in those programs that I first learned about graduate school and applied mathematics. I consider myself fortunate to have learned about graduate school and even more fortunate to be pursuing a graduate career; I am happy to have had the opportunity to give something to the next generation of graduate students by participating in the Graduate Student Focus on Diversity Workshop.

At the time this article appeared in SIAM News, *Villalobos was a second-year graduate student at Rice.*

Congress from Page 10

and some of its early work will be routine.

For instance, the committee is the principal authorization and oversight committee for NSF.

(An agency's money, in theory, comes in two steps. A substantive committee—in this case the Science Committee—specifies in an authorization what the agency, based on its mission, can and should undertake to do and how much it can spend doing it. The Appropriations Committee then doles out funds the agency can use to carry out its mission. That is the theory. As with all things in Congress, reality is much fuzzier.)

NSF has not received a new authorization for some time, and not everyone agrees that one is needed now. If everybody is comfortable with an agency's current mission, and few changes are in store, authorization can be a meaningless and time-consuming process.

However, the committee always tries to hold at least one set of hearings early in the year to check in, just to see if everyone is still comfortable. This process allows NSF officials to describe how the agency is doing, lay out its future plans and identify problems that it or the research community may be facing. The hearings also are an opportunity for outside observers to comment on NSF.

An area into which the committee is sure to delve, probably with special hearings, is the upcoming supercomputer center renewal decisions. Whatever NSF decides, the results are likely to be contentious and politically loaded. Science Committee support of the decision process would be very helpful in protecting the integrity of the peer-review process. An initial set of hearings were held last year. Mary Vernon, a Computing Research Association Board member, testified on behalf of CRA.

Beyond those two issues, the computing research community can expect the committee to explore some of the new information technology initiatives NSF is working on: the next-generation Internet, knowledge networking, distributed intelligence, learning technologies or some combination of such topics.

The committee may come to play an important role in science policy over the next four years or so. When times were good, some science policy experts tended to discount the role of the authorizing committees in both houses, saying the only thing that really counts is appropriations. Some of that confidence in appropriations began to wane four years ago. The Senate Appropriations Committee, in particular, seemed intent on rearranging NSF's mission, pushing it toward so-called "strategic" research that focused more on economic development. The research community then turned to the Science Committees for help in defending NSF's basic science mission, arguing that any shift in NSF's mission should be discussed and decided in the substantive committee of jurisdiction, not by the money people.

This experience illustrates how, as budgets tighten, conflicts over priorities will erupt. The Science Committee may be pressed to exert more influence. Prioritizing becomes more critical when the game becomes zero (or even negative) sum among the research communities. Scientists always complain when Congress sets priorities, arguing that researchers are best qualified to do so.

However, the community and its leadership show little stomach for doing it, and it may be unreasonable to expect it. The most comfortable approach is to allocate cuts or increases more or less evenly over all areas. But, when the cuts get too deep, such an approach becomes untenable. Like it or not, Congress will have a voice.

Professional Opportunities

CRN Advertising Policy

Send copy and payment for Professional Opportunities advertisements to Advertising Coordinator, *Computing Research News*, 1875 Connecticut Ave. NW, Suite 718, Washington, DC 20009-5728. Tel. 202-234-2111; fax: 202-667-1066; e-mail: crn@cra.org. E-mail submissions are preferred.

The format of an ad must conform to the following: 1) the first line must contain the name of the university or organization, 2) the second line must contain the name of the department or unit, 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 text be set in bold; a bold word in the body of the ad counts as two words.

The rate is $2.25 (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. CRA's standard advertising package consists of running an ad in *CRN*, and distributing it electronically to CRA's jobs listserv and Web page (where it remains for two months). As an alternative to this package, advertisers may request that their Professional Opportunities ads just be published in *CRN* or just distributed electronically. The cost of the ad is the same whether the standard or the alternative package is selected.

Professional Opportunities display ads cost $60 (US) per column inch, with a two-inch minimum. Ads must be submitted in camera-ready, offset (positives or negatives) or mechanical form. If your ad is larger than three inches, please request our Advertising Rate Card.

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 of *CRN* will not be accepted for publication in *CRN* unless the ad says applications will be accepted until the position is filled. If the closing date of a Professional Opportunities ad does not correspond with the publication of an issue of *CRN*, advertisers can choose the alternative advertising package and only have the ad distributed electronically. Advertising copy that is to appear in *CRN* must be received at least one month before publication. The deadline for the March issue is February 1. Ads for electronic distribution only may be submitted at any time.

Purdue University
School of Electrical and Computer Engineering

The Purdue University School of Electrical and Computer Engineering seeks outstanding candidates in all areas of computer engineering. Candidates are expected to have demonstrated exceptionally strong research and superior teaching potential. Several openings are anticipated for tenure-track faculty at all levels.

Applicants will be required to have a doctoral degree. Send a resume, including a statement of research and teaching interests and a list of at least three references, to Head, School of Electrical and Computer Engineering, Purdue University, 1285 EE Building, West Lafayette, IN 47907-1285. Applications will be considered as they are received.

Purdue University is an equal opportunity, affirmative action employer.

Northwestern University
Department of Computer Science

Applications are invited for tenure-track positions at the level of assistant professor, as part of a new initiative in computer science emphasizing research in the fundamental enabling technologies for interactive systems including:

- Interfaces, including HCI, interface design and user-interface management systems.
- Computer graphics and animation, augmented and virtual reality.
- Programming and authoring environments.
- Distributed systems.
- Multimedia and hypermedia database technology.

The initiative is aimed at complementing the department's existing strengths in artificial intelligence and interactive learning environments with outstanding candidates in systems, software engineering and theory.

Proposed starting date: September 1997.
Closing date for receipt of applications: May 1997.
Salary range: open.

Applications should be sent to Roger C. Schank, Chair, Department of Computer Science, Northwestern University, 1890 Maple Ave., Evanston, IL 60201. E-mail: schank@ils.nwu.edu.

Northwestern University is an affirmative action, equal opportunity employer. Hiring is contingent upon eligibility to work in the United States. Applications are especially encouraged by women and minorities.

Northwestern University
Department of Computer Science

The department invites applications for a tenured position at the level of associate or full professor, as part of a new initiative in computer science emphasizing research in the fundamental enabling technologies for interactive systems, including HCI, distributed systems, hypermedia and development environments.

The initiative is aimed at complementing the department's existing strengths in artificial intelligence and interactive learning environments with outstanding candidates in systems, software engineering and theory.

Candidates should have a proven record in research in CS or related fields, and significant leadership and administrative experience.

Proposed starting date: September 1997.
Closing date for receipt of applications: May 1997.
Rank and salary range: open.

Applications should be sent to Roger C. Schank, Chair, Department of Computer Science, Northwestern University, 1890 Maple Ave., Evanston, IL 60201. E-mail: schank@ils.nwu.edu.

Northwestern University is an affirmative action, equal opportunity employer. Hiring is contingent upon eligibility to work in the United States. Applications are especially encouraged by women and minorities.

Ohio State University
Department of Computer and Information Science

The Department of Computer and Information Science invites applications for tenure-track faculty positions at both the junior and senior levels. Strong candidates in the following research areas will be considered: AI, architecture, database systems, graphics, human-computer interaction, networking, parallel and distributed systems, programming languages, scientific computing and software engineering. One of our positions is designated for a candidate working on human-computer interaction.

The department currently has 32 faculty members, three instructors and about 90 master's and 80 Ph.D. students. It is located in a new building equipped with state-of-the-art networks of computers.

Applicants should send a curriculum vitae, along with copies of their most important publications, to Chair, Faculty Search Committee, Department of Computer and Information Science, The Ohio State University, 395 Dreese, 2015 Neil Ave., Columbus, OH 43210-1277. E-mail: fsearch@cis.ohio-state.edu.

The Ohio State University is an equal opportunity, affirmative action employer. Qualified women, minorities and individuals with disabilities are encouraged to apply.

Purdue University
Department of Computer Sciences

The Department of Computer Sciences at Purdue University invites applications for tenure-track positions at the assistant professor level, although other ranks will be considered for highly qualified individuals. Areas of interest are systems (including networking), software engineering, system software and information security. Applicants should hold a Ph.D. in computer science or a related discipline, and should be committed to excellence in teaching and research. Salary is competitive and depends on background and experience.

The Department of Computer Sciences encompasses a wide range of research areas including operating systems, networks, programming languages, database systems, software engineering, solid and geometric modeling, theory of computation, numerical computing and scientific visualization. Each faculty member has access to the departmental and university computing facilities, which include a variety of high-performance computing platforms. For more information see http://www.cs.purdue.edu.

Applicants should send a curriculum vitae, statement of career objectives and ask references to write letters (at least three for junior positions and five for senior positions). To ensure full consideration, applications must be received by Jan. 17, 1997, although the search will continue until positions are filled.

Please send applications to Chair, Personnel Committee, Department of Computer Sciences, Purdue University, West Lafayette, IN 47907.

Purdue University is an equal opportunity, affirmative action employer.

University of Michigan
Division of Computer Science and Engineering

Applications are solicited for several faculty positions in the Computer Science and Engineering (CSE) Division 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 (including OS), databases, object-oriented programming, graphics and programming languages.

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

A nondiscriminatory, affirmative action employer.

Clemson University
Department of Computer Science

The Department of Computer Science seeks applicants for two assistant professor level tenure-track faculty positions and one non-tenure-track lecturer position for fall 1997. For the tenure-track positions, strong preference will be given to applicants in the areas of graphics, software engineering and networking/distributed systems. Applicants should hold or expect to receive the Ph.D. degree in computer science or a related field by the appointment date. Evidence of accomplishment or strong potential for accomplishment in both teaching and research are expected. For the lecturer position, applicants should hold the M.S. degree in computer science and provide evidence of a strong commitment to high-quality undergraduate instruction.

The department has more than 300 undergraduate majors and more than 100 graduate students, and offers B.A., B.S., M.S. and Ph.D. degrees. Clemson University is the land-grant university of South Carolina and has an enrollment of more than 17,000. Clemson, SC, is a small college town located on Lake Hartwell at the edge of the Blue Ridge Mountains.

Applicants should send a curriculum vitae and names of three references to the Faculty Search Committee, Department of Computer Science, Clemson University, Clemson, SC 29634-1906. Screening will begin Jan. 31, 1997, and continue until the positions are filled.

Clemson University is an equal opportunity, affirmative action employer.

College of William and Mary
Department of Computer Science

Applications are invited for two tenure-track faculty positions in computer science for fall 1997 at either the assistant, associate or full professor level. Applicants must hold a Ph.D. in computer science or computational science. Appointment at the assistant level requires that the applicant must hold a Ph.D. at the time of appointment and demonstrate strong interests in both research and teaching. Appointment at the associate or full level requires a documented record of sustained excellence in both research and teaching. Applicants from all areas of computer science or computational science are solicited. We are primarily interested in individuals with research expertise in one of the following areas: high-performance systems, parallel computing, parallel and distributed numerical algorithms, and scientific databases. A demonstrated interest in multidisciplinary applied research is highly desirable.

The department currently consists of 12 faculty members who support B.S., M.S. and Ph.D. programs enrolling approximately 25 Ph.D. and 40 M.S. students. Teaching loads and salary are consistent with those in other Ph.D.-granting departments. More information about the department and the college can be obtained by connecting to the departmental Web server: http://www.cs.wm.edu.

The department maintains a network of Sun, Linux/Pentium and SGI workstations used for both teaching and research. A four-processor SGI Onyx with Reality Engine II graphics and a 1,024-node MasPar MP-2 are also supported. Opportunities exist for joint research activity with scientists and engineers at the nearby NASA Langley Research Center and DOE's Thomas Jefferson National Accelerator Facility.

A resume and any supporting documents should be sent to Faculty Search Committee, Department of Computer Science, College of William and Mary, PO Box 8795, Williamsburg, VA 23187-8795. Candidates should also have three letters of recommendation sent to the same address.

Questions can be e-mailed to search@cs.wm.edu. Review of candidates will begin Feb. 1, 1997, and continue until the position is filled.

The College of William and Mary is an equal opportunity, affirmative action University. Members of underrepresented groups, including people of color, persons with disabilities, Vietnam veterans and women, are encouraged to apply.

Princeton University
Department of Computer Science

The Department of Computer Science at Princeton University invites applications for an assistant professor, tenure-track position. We are entertaining applications in all areas of computer science, but particularly experimental areas. Candidates for more senior ranks with exceptional records of research will also be considered.

Applicants must demonstrate superior research and scholarship potential as well as teaching ability. A Ph.D. or equivalent in computer science or related areas is required. Successful candidates at all ranks are expected to pursue an active research program and to contribute significantly to the teaching programs of the department.

Applications should include a resume and the names of at least three people who can comment on the applicant's professional qualifications. Applications should be sent to Chair, Search Committee, Department of Computer Science, Princeton University, 35 Olden St., Princeton, NJ 08544-2087.

The committee will begin to consider applications in February 1997. Princeton University is an equal opportunity, affirmative action employer.

University of Washington
Department of Computer Science and Engineering

The University of Washington's Department of Computer Science and Engineering seeks applicants for tenure-track faculty positions. A moderate teaching load allows time for quality research and close involvement with students. We expect candidates to have a strong commitment to both research and teaching, and an outstanding record for their level. Most CS&E research areas are of interest, especially computer graphics and computer engineering.

Please send a letter of application, a resume and the names of four references to Faculty Recruiting Committee, Department of Computer Science and Engineering, University of Washington, Box 352350, Seattle, WA 98195-2350.

The University of Washington is building a culturally diverse faculty and encourages applications from female and minority candidates. AA/EOE.

University of California, Davis
Department of Computer Science

Nominations and applications are invited for tenure-track faculty positions in the Department of Computer Science at the University of California, Davis. The department is seeking candidates at the assistant professor level, but will consider senior candidates who have a truly distinguished record in one of the following three areas:

- Software engineering, including applied formal methods, testing and techniques for evolving systems.
- Large-scale information or database systems, or related tools for creatively processing the emerging information flood. Specific areas include but are not limited to techniques for storing and processing large quantities of information in distributed or network environments, multimedia applications involving large data sets, database systems, scientific and engineering applications, and security of large-scale information systems.
- Computer systems, with a focus on the interactions between operating systems, programming environments, architectures and languages/compilers, or graphics-based systems.

The CS Department currently has 17 faculty, with a substantial research facility covering all major areas of computer science. The Davis campus is the third largest in the University of California system. Davis is a pleasant, family-oriented community with a mild climate, and is within easy driving distance of the Sierra Nevada mountains, Berkeley, San Francisco and Silicon Valley.

Please consult our Web page for additional information and application procedures: http://www.cs.ucdavis.edu. Or send e-mail to apply@cs.ucdavis.edu.

These positions are open until filled. For full consideration, applications should be received by Feb. 20, 1997. UC-Davis is an affirmative action, equal opportunity employer.

University of Colorado, Boulder
Institute of Cognitive Science

The Institute of Cognitive Science of the University of Colorado at Boulder invites applications for a tenure-track position with an academic home in the Department of Computer Science. Preference will be given to candidates at the assistant professor level, but all candidates at all levels will be considered. Candidates should have a demonstrated interest in theoretical and methodological applications of cognitive science to rethinking, reinventing and re-engineering education from a lifelong learning perspective and strong experience with computational media and environments in support of innovative educational approaches.

The position will be closely associated with the Center for LifeLong Learning and Design (L^3D). L^3D is an educational and research unit of CU-Boulder sponsored by the Institute of Cognitive Science and the Department of Computer Science. Its mission is the ongoing development of theory and technology

Professional Opportunities

to support learning (i.e., lifelong learning, learning on demand, collaborative learning, organizational learning) and design in the context of authentic, self-directed, realistic problems. L³D collaborates with educational institutions at all levels, research organizations, industrial partners and community organizations to develop innovative educational models supported by adequate technology to prepare learners and workers for the 21st century.

Preference will be given to candidates with a strong interdisciplinary training, experience and interests, and a commitment to contributing to interdisciplinary research. Candidates should expect to teach a range of undergraduate and graduate courses in cognitive and computer science, actively engage in and contribute to research central to the interest of L³D, and fully participate in the activities of the Institute of Cognitive Science, including its graduate training program.

The University of Colorado supports the principle of diversity. We are particularly interested in receiving applications from women, ethnic minorities, disabled persons, veterans and veterans of the Vietnam Era.

Applicants should send a resume, samples of scholarly work and three letters of reference to Dr. Martha Polson, Associate Director, Institute of Cognitive Science, Campus Box 344, University of Colorado, Boulder, CO 80309. To ensure consideration, applications should be received by Jan. 31, 1997. Early applications are encouraged.

For more information on the Institute of Cognitive Science, the Center for LifeLong Learning and Design, and the Department of Computer Science, consult their respective World Wide Web pages: http://psych-www.colorado.edu/ics; http://www.cs.colorado.edu/~13d; and http://www.cs.colorado.edu.

Yale University
Department of Electrical Engineering

Yale University's Electrical Engineering Department, in close cooperation with the university's Computer Science Department, invites applications from outstanding engineers and computer scientists for one senior and up to two junior faculty positions in all areas of computer engineering including CAD; VLSI; architecture; digital communications; graphics; visualization; and real-time, fault-tolerant or embedded systems.

All candidates should be strongly committed to both teaching and research. Senior candidates should have distinguished records of research accomplishments and should be willing and able to take the lead in the shaping of Yale's expanding program in computer engineering. Women and minorities are especially encouraged to apply.

Applicants should send a letter and curriculum vitae to A.S. Morse, Chair, Computer Engineering Search Committee, Yale University, PO Box 208267, New Haven, CT 06520-8267.

Oregon State University
Department of Computer Science

The Department of Computer Science, Oregon State University, anticipates one or possibly more openings for tenure-track assistant professors, to start in September 1997. Specialization in software engineering, networking, computer graphics, distributed computing or multimedia is desirable, but all qualified applicants will be considered.

Applicants should have completed or expect to complete all requirements for the Ph.D. in computer science or a closely related field and should have demonstrated research and teaching potential.

To apply for these positions, send a complete resume, statement of research interests and at least three sealed letters of reference (electronic mail is acceptable) to Faculty Search Committee, Department of Computer Science, Oregon State University, Corvallis, OR 97331-3202. Tel. 541-737-5556; e-mail: sheryl@cs.orst.edu; WWW: http://www.cs.orst.edu.

Review of applications will begin on Jan. 2, 1997. Positions will remain open until filled. For full consideration, apply by January 2. Applications from women and minorities are particularly encouraged.

OSU is an AA/EEO employer and has a policy of being responsive to the needs of dual-career couples.

University of North Dakota
Department of Computer Science

Applications are invited for one, possibly two, positions at the assistant professor level in the Computer Science Department at the University of North Dakota.

The first one is a tenure-track position, while the other, pending approval, is a visiting position for at least one academic year. Starting date is Aug. 16, 1997. A Ph.D. in computer science or related field is required. Applicants must have good communication skills, commitment to excellence in teaching, broad teaching interests and ongoing scholarship. Preference will be given to candidates specializing in applied database systems, human-computer interface and/or software engineering. Opportunities for interdisciplinary research in aerospace-related sciences are exceptional. Research interests will be a major determining factor in the selection process.

The department has over 250 undergraduate and graduate students, nine faculty members and two part-time lecturers. It offers undergraduate and master's degrees (B.S. is accredited by CSAB). Students and faculty have access to outstanding facilities and equipment, including a Cray J90, workstations, high-end PCs and X-terminals. For more information on UND and the department, see http://www.cs.und.edu.

Screening will begin immediately, and continue until the positions are filled. For full consideration, applications must be postmarked no later than Feb. 1, 1997. Applicants should send a letter of application, a current curriculum vitae, names and e-mail addresses of three references and a one-page statement of teaching and research interests to Dr. Mahir S. Ali, Chair, Computer Science Department, University of North Dakota, Grand Forks, ND 58202-9015.

The University of North Dakota is an equal opportunity, affirmative action employer.

University of Pennsylvania
Department of Computer and Information Science

The University of Pennsylvania invites outstanding applicants for tenure-track appointments in both experimental and theoretical computer science to start July 1, 1997. Senior-level appointments will also be considered.

Faculty duties include undergraduate and graduate teaching, as well as research. The university is looking for applicants whose research would be enhanced by the department's existing strengths in algorithms and computational biology, computer graphics and animation, computer vision and robotics, databases, real-time systems, advanced networks and distributed systems, logic and computation, programming languages and natural language processing. We intend to grow in the general area of experimental computer science and encourage applications from candidates who implement and measure complex systems.

To apply, please complete the Web form at http://www.cis.upenn.edu/positions/faculty_application.html. While electronic applications are strongly encouraged, hard-copy applications (including the names of at least three references) may alternatively be sent to Chair, Faculty Search Committee, Department of Computer and Information Science, School of Engineering and Applied Science, University of Pennsylvania, Philadelphia, PA 19104-6389.

Applications should be received by Jan. 15, 1997, to be assured full consideration. Questions can be addressed to faculty-search@central.cis.upenn.edu.

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

University of Hawaii, Manoa
Department of Information and Computer Sciences

The Department of Information and Computer Sciences invites applications for a tenure-track position at the assistant professor level. The successful candidate will be hired in time for the 1997-98 academic year, pending approval to fill the position and availability of funds. Salary will be commensurate with qualifications and experience.

Duties include teaching undergraduate and graduate courses and conducting research. Applicants must have a doctorate in computer science or a closely related discipline from an accredited college or university and demonstrate a commitment to effective teaching and a strong aptitude for research. Preference will be given to applicants specializing in software engineering, multimedia or computer networking, though all areas for computer science will be considered.

The department has 16 faculty, approximately 330 students pursuing B.S., M.S. and Ph.D. degrees, and excellent computing and communications facilities. Additional information can be found at http://www.ics.hawaii.edu.

Interested applicants are invited to send a resume and three letters of reference to Stephen Y. Itoga, Chair, Department of Information and Computer Sciences, University of Hawaii at Manoa, 2565 The Mall, Honolulu, HI 96822. E-mail: itoga@hawaii.edu. The closing date is March 14, 1997.

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

Simon Fraser University
School of Computing Science

Applications are invited for a tenure-track faculty position at the assistant professor level. A Ph.D. in computing science or equivalent is required, with a strong commitment to excellence in research and teaching. The ideal candidate for the position will have research expertise and preferably industrial experience in a systems area, such as software engineering, operating systems, graphics, multimedia systems, distributed systems or networking.

The School of Computing Science has 33 faculty members and offers Ph.D., M.Sc. and B.Sc. degrees.

In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. SFU is committed to the principle of equity in employment and offers equal employment opportunities to qualified applicants.

Applications will be accepted until the position is filled, although a practical cutoff date is Feb. 1, 1997. The position is subject to budgetary authorization. To apply, send a CV; evidence of research productivity (e.g., selected reprints) and industrial experience; and names, addresses and phone numbers of three referees to Dr. Wo-Shun Luk, Director, School of Computing Science, Simon Fraser University, Burnaby, British Columbia V5A 1S6 Canada. Fax: 604-291-5417; e-mail: woshun@cs.sfu.ca; WWW: http://www.cs.sfu.ca.

University of Texas, Pan American
College of Science and Engineering

The University of Texas-Pan American invites nominations and applications for appointment to the position of dean of the College of Science and Engineering. The university is located in Edinburg, TX, in the lower Rio Grande Valley and enrolls approximately 12,700 students. The student population is over 80% Hispanic descended. The college is comprised of the departments of Biology, Chemistry, Computer Science, Engineering, Mathematics, and Physics and Geology. Since 1993 over $58 million has been allocated for building 340,000 square feet of new office and laboratory space to support science and engineering. An almost twofold increase in the number of faculty in Science and Engineering has occurred since 1989. The Biology, Mathematics and Computer Science departments offer Master of Science degrees; master's programs are planned for Engineering.

Qualifications include an earned doctorate with credentials sufficient for an academic appointment in one of the departments of the college at the rank of professor, and administrative experience at the level of department chair or above.

The applicant should forward 1) a letter of interest that addresses the required qualifications, 2) a detailed curriculum vitae and 3) a list of three references with addresses and telephone numbers to Director, Personnel Office, University of Texas-Pan American, 1201 W. University Drive, Edinburg, TX 78539-2999. Review of applications began Nov. 30, 1996. Applications will be accepted until the position is filled. For further information, contact Dr. Richard Fowler, Chair, Search Committee. Tel. 210-381-2320; e-mail: fowler@upanam.edu.

The University of Texas-Pan American is an equal opportunity, affirmative action employer (F96/97-07).

University of California, Riverside
Department of Computer Science

The University of California at Riverside invites applications for a tenure-track (assistant professor) or tenured faculty position (associate/full professor) in the Department of Computer Science, starting in the 1997-98 academic year. Applicants should have a Ph.D. in computer science or a related field. Demonstrated excellence in both research and teaching is required. Candidates in all areas are encouraged to apply. However, the areas of programming languages and computer systems—including such specialties as architecture, databases, operating systems and software engineering—are of particular interest. Salary level will be competitive and commensurate with the appointment rank and qualifications of the candidate.

UCR is a major research institution and a member of the nine-campus University of California system. Riverside County offers affordable housing, easy access to mountains, ocean beaches, cultural activities and other attractions.

Applications and inquiries should be directed to Faculty Search Committee, Department of Computer Science, University of California, Riverside, CA 92521-0304. E-mail: hire@cs.ucr.edu. A complete application shall include a curriculum vitae, list of publications, the names and addresses of at least three references, and a statement of research and teaching objectives. Applications received by Feb. 1, 1997, will receive full consideration.

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

California Institute of Technology
Department of Computer Science

The California Institute of Technology invites applications for a tenure-track position from persons with promise for innovative research and teaching. Exceptionally well-qualified applicants may be considered at the associate or full professor level. Initial junior faculty appointment is normally for four years and is contingent upon completion of Ph.D.

Our department seeks to strengthen and broaden its research and teaching program from present strengths in concurrent computation, VLSI, computer graphics and formal methods of programming into complementary areas.

Please send a resume, list of publications, copies of your best publications and names of at least three references to Mani Chandy, Chair, Computer Science Steering Committee, Caltech 256-80, Pasadena, CA 91125.

Caltech is an equal opportunity, affirmative action employer. Women and minorities are encouraged to apply.

George Mason University
Department of Computer Science

We invite applications for faculty at the ranks of assistant professor and associate professor. We are particularly interested in persons who are dedicated to teaching, research and professional service. Our priorities in research are computer graphics/visualization, human-computer interaction, multimedia and educational technology. Applicants should be prepared to teach in these areas plus other areas of computing. Appointments start Sept. 1, 1997.

George Mason University is located in Fairfax County, VA, 17 miles west of Washington, DC. The Department of Computer Science is in the School of Information Technology and Engineering, which has made a commitment to engineering education in a world shaped by information technologies. There are numerous opportunities for government and industrial interaction in this region.

To apply, send a letter of application, a resume, samples of two of your recent written works and the names of four references. The application letter should 1) describe your professional objectives, 2) your experiences and goals in research, 3) how you would contribute to cross-disciplinary activities at George Mason University and 4) your experience with distance-learning technologies. All of these items should be submitted together for proper consideration of your application. Send all material to Chair, Recruitment Committee, Department of Computer Science, Mail Stop 4A5, George Mason University, Fairfax, VA 22030-4444. Send inquiries to recruit@cs.gmu.edu. The application deadline is Feb. 15, 1997. AA/EOE.

University of Wisconsin, Milwaukee
Department of Electrical Engineering and Computer Science

The Department of Electrical Engineering and Computer Science at the University of Wisconsin-Milwaukee is seeking qualified applicants to fill a tenure-track junior faculty position. Candidates should have outstanding promise and a strong commitment to research as well as teaching. The areas of interest are compilers, computer networks, operating systems and software engineering.

The department offers undergraduate and graduate programs in computer science and has well-established strengths in artificial intelligence, computational geometry, cryptography and data security. We are committed to continuing the development of computer science in our university and establishing it as an outstanding program.

The university is located in a very pleasant neighborhood not far from the shores of Lake Michigan. Candidates are requested to send a resume along with names of at least three references to Professor K. Vairavan, Co-chair for Computer Science, Department of Electrical Engineering and Computer Science, University of Wisconsin-Milwaukee, PO Box 784, Milwaukee, WI 53201-0784. The cutoff date for applications is Jan. 31, 1997. Additional information may be obtained from http://www.cs.uwm.edu.

The university is an affirmative action, equal opportunity employer. Women and minorities are encouraged to apply. The names of those applicants who have not requested that their identities be withheld and the names of all finalists will be released on request.

University of California, Santa Barbara
Department of Computer Science

The Department of Computer Science at the University of California at Santa Barbara invites applications for junior tenure-track faculty positions. Candidates must demonstrate exceptional promise in both research and teaching. Applicants in all areas of computer science are welcome. However, the departmental plan emphasizes building strengths in experimental computer science: multimedia, networking and software systems.

The Department of Computer Science is part of an expanding College of Engineering, which encompasses over 100 faculty in various engineering disciplines. Excellent instruction and research computing facilities are available. UCSB is a major research institution, elected member of the Association of American Universities, as well as an integral part of the nine-campus University of California system, widely regarded as the most distinguished system of public higher education in the United States. Graduate degrees in computer science are offered at the M.S. and Ph.D. levels.

Applicants should hold a doctoral degree in computer science or a related field; appointments are scheduled to begin in 1997-98. Send resume and names of at least four referees to Recruitment Committee, Department of Computer Science, University of California, Santa Barbara, CA 93106-5110. To apply by electronic mail send the application in a Postscript file to recruitment@cs.ucsb.edu.

Additional information about the UCSB Computer Science Department may be found at http://www.cs.ucsb.edu.

NEC Research Institute
Computer Science Division

Applications are invited for a scientist position in the Computer Science Division of the NEC Research Institute, with the position level open. The successful candidate will have a Ph.D., an outstanding publication record, and will complement and bolster the division's existing strength in systems, theory and intelligence. We are especially interested in candidates with research expertise in distributed computing. Particular subdisciplines in this area include distributed databases, network design and intelligent agents.

The Computer Science Division is organized around four key areas: architecture, software systems, intelligence and theory. The institute, founded eight years ago, has as its mission basic research in computer science and physics underlying future computer and communication technologies. The institute offers unusual opportunities in that: 1) members are free to decide on their own basic research directions and projects, 2) members are entirely internally funded by the institute and 3) all results are published in the open literature.

The institute, located in Princeton, NJ, has close ties with many outstanding research universities located in the area. The institute's laboratories are state-of-the-art and include several high-end parallel computer servers. For more details about the NEC Research Institute,

Continued on Page 14

Professional Opportunities

Jobs from Page 13

please see http://www.neci.nj.nec.com.

Applicants must show documentation of eligibility for employment. NEC is an equal opportunity employer. Interested applicants should send their resumes, along with copies of selected publications and names of at least three references, to Chair, CS Search Committee, NEC Research Institute, 4 Independence Way, Princeton, NJ 08540. E-mail: cs-candidates@research.nj.nec.com.

University of Oklahoma
School of Electrical and Computer Engineering

Applications for faculty positions within the Department of Computer Engineering at the assistant professor rank are invited. Preferred areas are intelligent control systems, hardware design and simulation, and system design and implementation for multimedia and telecommunications.

Applicants must possess a Ph.D. or equivalent degree in computer engineering, electrical engineering, computer science or closely allied area, have demonstrated ability or a high degree of potential to direct research and attract sponsorship, and have a strong devotion to classroom and laboratory teaching. Screening will begin on Feb. 1, 1997, and continue until the position is filled.

Norman, OK, located 20 miles south of Oklahoma City, offers the unique benefits of living in a small college town with the conveniences of a nearby large city.

Interested persons should send a vita with a list of three references to Dr. Victor DeBrunner, School of Electrical and Computer Engineering, The University of Oklahoma, 202 W. Boyd St., Room 219, Norman, OK 73019-0631.

The University of Oklahoma is an EO/AA employer and is responsive to the needs of dual-career couples. Minorities, women and persons with disabilities are specifically encouraged to apply.

Brown University
Department of Computer Science

Applications are invited for a three-year, tenure-track, renewable faculty position at the level of assistant professor or a tenured position at the level of associate or full professor in computer science commencing no later than Sept. 1, 1997.

Outstanding applicants are sought in all areas of computer science. However, preference will be given to candidates whose research is in theoretical and analytical aspects of computer science and is motivated by applications. Candidates are expected to have an outstanding research record and a strong commitment to teaching. They must also have doctoral degrees in computer science or closely related areas; junior candidates are expected to have completed all the requirements for the doctoral degree by no later than Sept. 1, 1997.

Successful applicants will find at Brown a stimulating environment conducive to professional growth. Brown has a strong department with a variety of interesting research projects in analysis of algorithms, artificial intelligence, combinatorial optimization, computational complexity, computational geometry, computer graphics, concurrent data structures and architectures, database systems, graph drawing, logic programming, operating systems, parallel computation, parallel and distributed debugging, programming environments, programming languages and software engineering. The undergraduate and graduate students are first-rate.

Applicants should send a resume and have at least three referees (five for senior positions) send letters of recommendation to Professor John E. Savage, Department of Computer Science, Brown University, Box 1910, Providence, RI 02912. E-mail: faculty_search@cs.brown.edu.

All application materials must be received by Jan. 1, 1997, for full consideration. Electronic submissions in Postscript are encouraged.

Brown University is an equal opportunity employer and strongly encourages applications from women and members of other underrepresented groups.

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

The EECS Department invites applications for tenure-track faculty positions in computer engineering and computer science at all levels, as well as instructors. A Ph.D. degree in electrical engineering, computer engineering, computer science or the equivalent is required for tenure-track positions. Outstanding candidates in all areas of EECS will be considered but we are especially interested in the following areas: communication networks (ATM, multimedia, multiple access, mobile and wireless), computer architecture, CAD of VLSI systems, theory of computing, programming languages/compilers, security, HCI, computer graphics and virtual environments. All candidates should have strong research and teaching potential.

UIC is a growing research university and the largest institution of higher education in the Chicago area. The EECS Department has 50 faculty members and 500 graduate students, and offers B.S., M.S. and Ph.D. degrees. The department has annual research expenditures of over $6 million and a faculty that consists of 10 IEEE or ACM Fellows. The department's computing resources include over 200 workstations and over 25,000 square feet of research space, much of it in a new engineering research building. For more information about the department, visit our Web page at http://www.eecs.uic.edu.

The UIC campus is located about one mile west of Chicago's Loop, and is close to other research institutions and universities. Chicago offers all the cultural amenities of a major city and a wide range of affordable housing.

For fullest consideration, send a vita and the names and addresses of at least three references by March 15, 1997, to Professor Sol Shatz, Search Committee Chair, Department of EECS (M/C 154), 851 S. Morgan St., Room 1120 SEO, Chicago, IL 60607-7053. E-mail: shatz@eecs.uic.edu.

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

Williams College
Department of Computer Science

The Department of Computer Science at Williams College invites applications for a two-year visiting position at the assistant professor level starting in fall 1997. The usual teaching load is two courses per semester plus associated labs. Candidates should possess a Ph.D. in computer science or a closely related discipline with a strong background in computer science, and should have a commitment to excellence in teaching and an active research program. We prefer a specialization in the general area of systems, but other areas will be considered.

Williams is a highly selective, coeducational, liberal arts college of 2,000 students located in the scenic Berkshires of western Massachusetts. The Department of Computer Science offers a congenial working environment with small classes, excellent students and state-of-the-art facilities.

Applicants should send a curriculum vitae and a list of three references, including at least one qualified to comment on teaching effectiveness, to Professor Kim B. Bruce, Chair, Department of Computer Science, Bronfman Science Center, Williams College, Williamstown, MA 01267. Applications received by Feb. 15, 1997, will receive full consideration. Further information is available at http://www.cs.williams.edu or via e-mail: kim@cs.williams.edu.

Williams College is an equal opportunity, affirmative action employer. Women and members of minority groups are strongly encouraged to apply.

Cornell University
Department of Computer Science

Applications are invited for tenure-track positions beginning August 1997. These positions are at the assistant professor level, although appointments at the associate and full professor level will be considered for highly qualified applicants. Applicants should have a Ph.D. in computer science or in a closely related field. The department requires demonstrated research accomplishment at a very high level as well as outstanding teaching ability and leadership qualities.

The Department of Computer Science at Cornell University encompasses a wide range of research areas, including algorithms, applied logic and semantics, artificial intelligence, theory of computation, concurrency and distributed computing, databases, information organization and retrieval, multimedia systems, numerical analysis and scientific computing, programming languages and methodology, and robotics and computer vision.

We are especially interested in databases, systems and support for computational biology, and computational science generally. Applicants in all areas of computer science will be considered. REF: AP#1.

Research: Also available are research positions in scientific computing and software systems. REF: RES#3.

Further information about the department is available on the World Wide Web at URL: http://www.cs.cornell.edu.

Applicants should submit a vita and the names of at least three references to Chair, Faculty Recruiting Committee, Department of Computer Science, 4130 Upson Hall, Cornell University, Ithaca, NY 14853-7501. Please include reference number with application.

Cornell University is an equal opportunity employer and welcomes applications from women and ethnic minorities.

Worcester Polytechnic Institute
Department of Computer Science

Applications are invited for one, or possibly two, tenure-track positions at the assistant professor level, to begin in August 1997. Preference will be given to candidates with research in computer networks and operating systems, or user interfaces and multimedia. Excellent candidates in other areas will be considered. Candidates should have a Ph.D. in computer science or a closely related field, and strength in both research and teaching.

WPI, the nation's third oldest college of engineering and science, has approximately 2,700 undergraduate and 1,000 graduate students and 200 faculty. WPI's innovative, project-based undergraduate program, the WPI Plan, offers students a flexible, academically challenging alternative to traditional curricula.

Worcester, 40 miles west of Boston, offers access to the cultural and recreational resources of New England, and provides opportunities for urban, suburban or rural lifestyles.

Submit a resume and the names, addresses and e-mail addresses of three professional references to Recruiting Committee, Computer Science Department, Worcester Polytechnic Institute, 100 Institute Road, Worcester, MA 01609. E-mail: recruit@cs.wpi.edu; Web: http://cs.wpi.edu.

Preference will be given to applications received by Jan. 15, 1997.

WPI is an affirmative action, equal opportunity employer.

State University of New York, Stony Brook
Department of Computer Science

Applications are invited for two or more junior and senior faculty positions in computer science. We are particularly looking for people interested in graphics, user interfaces, visualization and multimedia and in logic programming, databases, networks, Internet or related areas.

The Stony Brook Computer Science Department, consistently rated among the top 30 in North America, currently has 23 faculty members with a wide variety of research interests including computer graphics, visualization, user interfaces, image processing, databases, logic programming, automated reasoning, artificial intelligence, distributed systems, software engineering and computer architecture. The department offers undergraduate degrees in both computer science and information systems and graduates approximately 100 bachelor's recipients each year. It currently has about 177 Ph.D. and master's students in computer science. The department provides an excellent networked computing environment including over 200 workstations from Sun, HP, Silicon Graphics (including a 16-processor Challenge/Infinite Reality) and several undergraduate laboratories with PC, Macintosh and HP workstations. In June 1993 the department was awarded its third Institutional Infrastructure grant from NSF to develop a computing environment consisting of a network of parallel workstations connected to a large parallel server, along with an NSF Educational Infrastructure grant for a curriculum in computer-human interaction.

Stony Brook is located about 50 miles east of Manhattan on the historic and attractive north shore of Long Island with easy access to the recreational activities on Long Island and the excitement of New York City.

Applicants should have a Ph.D. in computer science or a related discipline. Please submit a detailed curriculum vitae, together with a list of five references and reprints of recent publications, to Professor I.V. Ramakrishnan, Chair, Faculty Recruiting Committee, Department of Computer Science, SUNY at Stony Brook, Stony Brook, NY 11794-4400. Tel. 516-632-8451 or 632-8470. E-mail: ram@cs.sunysb.edu. Processing of applications will begin mid-January and will continue until all positions are filled. Prospective applicants are encouraged to visit the department home page at www.cs.sunysb.edu.

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

Kansas State University
Department of Computing and Information Sciences

The Department of Computing and Information Sciences at Kansas State University invites applications for a tenure-track position beginning in fall 1997. Applicants should have a Ph.D. degree in computer science by the starting date of the appointment; salary will be commensurate with qualifications. Applicants must be committed to both teaching and research. All areas of CS will be considered, but primary consideration will be given to experimental computer scientists in the areas of database engineering, parallel and distributed systems, programming languages and software engineering. Applications must include descriptions of teaching and research interests along with copies of representative publications. Non-US citizens must include visa status.

The department has a faculty of 17 and offers B.S., M.S., M.S.E. and Ph.D. degrees. Computing facilities center around a network of Unix- and Solaris-based single- and multi-processor Sun workstations, X-terminals, Macintoshes and PCs. Details can be found at the URL http://www.cis.ksu.edu.

Please send applications to Dr. Virgil Wallentine, Head, Department of Computing and Information Sciences, 234 Nichols Hall, Kansas State University, Manhattan, KS 66506. E-mail: virg@cis.ksu.edu. Review of applications will commence Feb. 15, 1997, and continue until the positions are filled.

Kansas State University is an affirmative action, equal opportunity employer.

Johns Hopkins University
Department of Computer Science

The Department of Computer Science at Johns Hopkins University invites applications for two anticipated tenure-track faculty positions of rank as appropriate. For the first position, we seek candidates with experimental research and teaching interests in networks and distributed systems, including Internet and Web-based applications, distributed and mobile computing, multimedia and network architectures. For the second position, we seek individuals from a broader range of areas, including experimental aspects of computer systems, security, programming language systems and computer graphics. All applicants must have a Ph.D. in computer science or a related field and are expected to have compiled an outstanding research record. Commitment to quality teaching, and evidence of the ability and willingness to develop a research program of the highest quality will be required of all the candidates considered.

The Johns Hopkins University is a private university well known for its commitment to academic excellence. Accordingly, Hopkins attracts extremely talented undergraduates and graduate students. The Department of Computer Science stands amongst the first rank of departments at Hopkins in terms of funded research activities and student involvement in educational programs. This anticipated expansion is directed at further increasing national and international recognition of our research and teaching programs.

Applicants with Internet access should have LaTeX, ASCII or Postscript copies of a comprehensive curriculum vitae, a statement of future plans for research and teaching, and at least three letters of reference sent via e-mail to search@cs.jhu.edu; see also the Web page: http://www.cs.jhu.edu/search. Applicants who do not have access to the Internet should have their information sent to Faculty Search Committee, Department of Computer Science, Room 224 New Engineering Building, Johns Hopkins University, Baltimore, MD 21218-2694. Fax: 410-516-6134. To ensure full consideration, complete applications should arrive by Feb. 1, 1997.

The Johns Hopkins University is an equal opportunity, affirmative action employer.

State University of New York, Buffalo
Department of Computer Science

The Department of Computer Science seeks applications for a faculty position at the assistant, associate or full professor level. At the junior level, we are seeking an experimental computer scientist in distributed systems, databases or multimedia systems. At the senior level, we are seeking a highly visible and successful individual who will make an immediate impact in an area central to computer science.

Address applications, including cover letter, curriculum vitae, a one-page research statement and names and addresses of three references, to Professor Russ Miller, Chair, Faculty Search Committee, 226 Bell Hall, State University of New York at Buffalo, Buffalo, NY 14260. E-mail: cs-search@cs.buffalo.edu; fax: 716-645-3464.

For more information about the department, please visit our home page at http://www.cs.buffalo.edu.

SUNY is an equal opportunity, affirmative action employer.

Kent State University
Department of Mathematics and Computer Science

Applications are invited for three tenure-track faculty positions in computer science at the assistant professor level, beginning fall 1997. By fall 1997 applicants must have completed all requirements for a Ph.D. in computer science or a closely related field. Preference will be given to candidates in the following areas: operating systems, networking, performance evaluation, graphics and scientific visualization, programming languages/compilers, distributed databases and systems design. These positions are envisaged as enhancing or complementing the department's existing expertise in parallel and distributed computing. At least one position is intended to enhance the systems area with particular emphasis on parallel and distributed operating systems. Persons at the advanced assistant professorship level are also encouraged to apply for this position. Filling of the remaining two positions is dependent on availability of funding. Though we are planning to fill the three positions at the assistant professor level, it is possible dependent on funding and the quality of applicants that at least one of these positions could be filled at the associate professor level.

The Computer Science Program has recently received a favorable review and been marked for enhancement as a result of a statewide doctoral review process. It currently has over 200 undergraduate and over 90 graduate students and is experiencing growth in student numbers. Computer science degrees are offered at the B.S., M.A., M.S. and Ph.D. levels. In broad terms, the faculty areas of research lie in massively parallel and distributed computing; numerical and scientific computation, modeling and visualization; symbolic computation;

Professional Opportunities ads available on Web

Not all departments and organizations choose to run their Professional Opportunities ads in *CRN*—their ads are only distributed electronically to the Computing Research Association's Web site and jobs listserv. If you are interested in seeing more Professional Opportunities ads, access the Jobs Web page at http://www.cra.org/Jobs. If you would like to subscribe to jobs@cra.org so you can read the announcements before they are published in *CRN* (or see the ones that don't appear in *CRN*), send the following mail message to listproc@cra.org: subscribe jobs firstname lastname.

Professional Opportunities

networking and distributed operating systems; theoretical computer science; and artificial intelligence and image processing. Additional information about the Computer Science Program at KSU is available at http://www.mcs.kent.edu/cshome.html.

The State of Ohio recently funded Kent as one of the lead institutions in the OCARNet statewide ATM research network for computer science. Equipment purchased for the OCARNet project includes ATM switches, a Hewlett-Packard workstation cluster consisting of C110-class machines, and two shared-memory multiprocessors. State funding is also supporting the creation of a 266 megabit/sec. Fibre Channel research network for distributed computation and scientific visualization. The department operates computer laboratories consisting of X-terminals and Sun and Hewlett-Packard workstations, various MIMD and SIMD parallel processors and miscellaneous peripherals. Access to the computers at the Ohio Supercomputing Center in Columbus is also available. The department moved to a new building recently and expects to increase its equipment holdings and staff considerably in the near future as a result of the state initiative.

Applicants should submit a cover letter and a resume and should arrange to have three letters of recommendation sent to the Computer Science Search Committee, Department of Mathematics and Computer Science, Kent State University, Kent, OH 44242. Fax: 330-672-7824. Applications may be submitted via e-mail to cs-pos@mcs.kent.edu. In the cover letter applicants should state in which area they are applying. The search committee will begin to consider applications on Jan. 27, 1997, and will continue until the position is filled.

Kent State University is an affirmative action, equal opportunity employer.

Vanderbilt University
Department of Computer Science

The Computer Science Department at Vanderbilt University invites applications for two positions: 1) a tenure-track assistant professor and 2) a visiting appointment for teaching and research. The primary target area is experimental systems, particularly in the subareas of parallel and distributed systems, networks and architecture. Secondary target areas include artificial intelligence, software engineering and database systems.

The department currently has eight faculty members with research interests in the areas of systems, artificial intelligence, computer-based instruction, learning theory, software engineering, databases, algorithms, numerical methods and image processing. State-of-the-art workstation and PC platforms are available for research and instruction. The department offers B.S., M.S. and Ph.D. degrees, with roughly 100, 25 and 25 students in each program, respectively. A jointly administered undergraduate degree in computer engineering is also offered. The department is dedicated to making an impact in both research and teaching.

Applications should include a current curriculum vitae, copies of at most three representative publications, and names and addresses of at least four references. A Ph.D. in computer science or a related area is required. Review of applications will begin Jan. 15, 1997, and continue until the positions are filled. Please send responses and inquiries to Faculty Search Committee, Department of Computer Science, Box 1679, Station B, Vanderbilt University, Nashville, TN 37235. E-mail: cs-search@vuse.vanderbilt.edu.

AA/EOE.

University of California, Berkeley
Department of Electrical Engineering and Computer Sciences

The University of California at Berkeley invites applications for tenure-track positions in the Department of Electrical Engineering and Computer Sciences beginning in fall semester 1997.

Four faculty positions have been approved. Applications for appointments at the assistant professor level will be given highest preference, but other levels will so be considered under exceptional circumstances.

Applicants should have received (or be about to receive) a doctoral degree in computer science, electrical engineering or computer engineering or a related field. All areas of research in computer science and electrical engineering will be considered. A principal requirement is demonstrated excellence in research. In addition, potential for excellence in teaching and leadership are important requirements. Successful applicants will be expected to establish a quality research program and to teach both graduate and undergraduate courses in their general area of specialty.

Interested persons should send a resume, a select subset of papers, a one- to two-page statement of their future research plans and interests, and the names of three references by Jan. 31, 1997, to the appropriate address below. The applicant should request their references to forward letters of reference directly to the same address. Applications submitted after the deadline will be not considered; earlier applications are encouraged.

Applications should be sent to Professor Randy Katz, Chair, Department of Electrical Engineering and Computer Sciences, 231 Cory Hall, University of California, Berkeley, CA 94720-1770.

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

Penn State

McGill University
School of Computer Science

The School of Computer Science at McGill University wishes to invite applications for a tenure-track position at the assistant professor level. We are particularly interested in candidates in networks, distributed or parallel systems and physically based modeling. Candidates should have an outstanding research profile, a commitment to good teaching and a strong desire to build an active research program.

Applications, including a curriculum vitae, a list of publications and the names and e-mail addresses of three references, should be sent to Head, Search Committee, School of Computer Science, McGill University, McConnell Engineering Building, #318, 3480 University St., Montreal, QC H3A 2A7 Canada.

A duplicate of the curriculum vitae should be sent by electronic mail (ASCII preferred) to search@cs.mcgill.ca. The school's Web page is http://www.cs.mcgill.ca. Copies of your best publications are welcome.

To ensure full consideration, applications must be received by Jan. 15, 1997, although the search will continue until the position is filled.

In accordance with Canadian immigration law, priority will be given to Canadian citizens and permanent residents of Canada.

University of Maryland, College Park
Department of Computer Science

The University of Maryland at College Park (UMCP) Department of Computer Science is seeking faculty members at all ranks. Truly outstanding candidates in all areas will be considered, but we are especially seeking candidates in the areas of software engineering, networks, databases, information security or graphics. The department is located in suburban Washington, DC, in close proximity to many large governmental and industrial laboratories and within easy access to Baltimore and Annapolis. The department has 39 faculty members and maintains strong degree programs at both the undergraduate and graduate levels.

Candidates who are interested should send a curriculum vitae, research summary, and at least three letters of recommendation to University of Maryland at College Park, Department of Computer Science, A.V. Williams Building, Room 4179, Attention: Recruiting Committee, College Park, MD 20742-3255.

Please ask your references to send their recommendation letters directly to the above address.

For full consideration, applications must be received by Feb. 1, 1997. The University of Maryland is an equal opportunity, affirmative action employer. Information about this ad, the department and other collaborating research institutes is available at http://www.cs.umd.edu/~nick/ad.html.

Santa Clara University
Department of Computer Engineering

The Department of Computer Engineering seeks applications for a tenure-track faculty position at the assistant professor level. Applicants must have a Ph.D. in computer engineering, computer science or a related discipline with a primary emphasis in software engineering. The ability to teach courses in graphical user interface design or Unix tool design is desirable. Responsibilities of the position include teaching and research at both the undergraduate and graduate level.

Santa Clara University is a private Jesuit university located in the heart of Silicon Valley. The university enrolls about 8,000 students at both the undergraduate and graduate levels. The department offers B.S., M.S. and Ph.D. degrees, has nine full-time and 40 adjunct faculty, and serves more than 150 undergraduate majors and 350 graduate majors. Additional information on the university and the department is available through http://www.scu.edu.

Applicants should submit a CV and the names of at least three references before March 1, 1997, to Chair, Search Committee, Department of Computer Engineering, Santa Clara University, Santa Clara, CA 95053.

Santa Clara University is an equal opportunity, affirmative action employer; it welcomes applications from women, persons of color, members of other historically underrepresented US ethnic groups, persons with disability, veterans and Jesuits.

Polytechnic University
Department of Computer and Information Science

Applications are invited for tenure-track positions at all levels. We are particularly interested in candidates in the following areas: compilers, computer architecture, operating systems, parallel and distributed systems, programming languages and software engineering. A candidate must have a strong research record including significant publications and the ability to secure external funds through grants or contracts.

The Department of Computer and Information Science offers B.S., M.S. and Ph.D. degrees. Areas of active research include computational biology; computational geometry; image analysis and understanding; large distributed databases; network management; serial, parallel, distributed and randomized algorithms; parallel and distributed systems and architecture; pattern matching and recognition; and software reliability and testing. Polytechnic University (formerly known as Brooklyn Poly) is located on three campuses in the New York City metropolitan area.

Qualified applicants should send their curriculum vitae to the Head of Faculty Search Committee, Department of Computer and Information Science, Polytechnic University, Six MetroTech Center, Brooklyn, NY 11201. E-mail facsrch@morph.poly.edu.

Polytechnic is an equal opportunity employer. For more information, see http://cis.poly.edu.

University of Mississippi
Associate Provost for Information Technologies

The University of Mississippi seeks applicants who possess strong planning, organizational and communications skills and who have a record of successfully progressive managerial experience in information technology, preferably in a higher-education environment. The associate provost for information technologies reports to the provost, manages a full-time staff of 109 with an annual budget of $7.9 million, and is expected to be the institution's advocate for information technology. He or she will lead the university in envisioning and planning the effective use of information technologies.

The successful candidate must have excellent interpersonal and oral/written communication skills; experience with, and commitment to, participatory management; a proven record (at least five years) in planning and problem-solving, managing complex technological resources, managing budgets and managing a diverse information technologies staff; knowledge and experience with information and telecommunications technology; and a master's degree in an appropriate discipline.

For a list of desired qualifications, additional information and application procedures, please see http://www.olemiss.edu/itsearch. Or contact Robert D. Sindelar, Ph.D. Chair, Search Committee; e-mail: mcrds@cotton.vislab.olemiss.edu.

The University of Mississippi is an AA/ADA/EOE.

Ashland University
Department of Mathematics/Computer Science

Computer Science. Tenure-track assistant professor, beginning August 1997. Anticipate two positions in Mathematics/Computer Science Department to teach wide range of undergraduate courses in software (programming, languages and data structures) and hardware (including architecture and networking). Some teaching in mathematics or business computing a possibility depending on candidate's interest and department need. Ph.D. preferred; A.B.D. considered. Salary competitive.

Send letter of application, vita, three letters of reference and transcripts to Computer Science Search Committee, c/o John Stratton, Dean, Sciences, Ashland University, Ashland, OH 44805. Applications will be reviewed beginning Jan. 15, 1997, and continue until the positions are filled. WWW: http://www.ashland.edu.

AA/EOE.

University of Central Florida
Department of Computer Science

The University of Central Florida (UCF) seeks applications for one tenure-track position in computer science at the level of assistant professor. We are interested in all strong candidates who have demonstrated research strength in the discipline and a commitment to teaching. Postdoctoral or industrial experience is desirable.

The University of Central Florida is a young, dynamic institution with a student population of approximately 28,000. The Computer Science Department is one of the largest departments on campus, offering bachelor's, master's and Ph.D. degrees. It currently has 24 full-time faculty, 700 undergraduate majors and 150 graduate students. Major research areas within the department include computer vision, databases, design and analysis of algorithms, computer graphics, digital media, intelligent systems (including natural language processing, knowledge representation and information retrieval), learning delivery systems (including distance learning), networking technology, parallel and distributed processing, programming languages, simulation, virtual reality, software engineering and very large-scale integration.

The university is located in Orlando, the center of Florida's strong software development industry. Our campus is adjacent to the Central Florida Research Park, which houses the Naval Training Systems Center; the Army's Simulation, Training and Instrument Command; and several industrial organizations. Computer science faculty work closely with, and receive substantial research support from, these groups and the NASA Kennedy Space Center, which is located within 50 miles of the campus. In addition, the faculty are significantly involved in the Institute for Simulation and Training, and the Center for Research and Education in Optics and Lasers.

Central Florida affords an excellent standard of living. Orlando ranks high among the most livable cities and has a variety of attractions and restaurants. We have a good public school system, easy access to the beaches and a climate that makes it possible to enjoy the outdoors all year long.

Applications will be reviewed beginning March 1, 1997, and until the position is filled. Interested, qualified applicants should send resumes and names of at least three references to Dr. Terry J. Frederick, Professor and Chair, Department of Computer

Continued on Page 16

Professional Opportunities

Jobs from Page 15

Science, University of Central Florida, Orlando, FL 32816-2362. Tel. 407-323-2341; fax: 407-823-5419; e-mail: search@cs.ucf.edu; URL: http://www.cs.ucf.edu.

An equal employment opportunity, affirmative action employer. Women and minorities are particularly encouraged to apply. As an agency of the state of Florida, UCF makes application materials available for public review.

University of Florida
Department of Computer and Information Science and Engineering

The Department of Computer and Information Science and Engineering invites applications for tenured faculty positions at all ranks in all areas of computer science and engineering. Applicants in the area of database management with interests and accomplishments in heterogeneous information systems, data mining, data warehousing and/or parallel and distributed databases are particularly encouraged to apply. Applicants must possess a doctoral degree in computer science, computer engineering or equivalent and show a strong record and commitment to teaching and research. The positions are available starting in the 1997-98 academic year.

Applicants should send their resumes and the names and addresses of at least four references to Professor Randy Chow, Chair, Faculty Search and Screening Committee, Department of Computer and Information Science and Engineering, 301 CSE, University of Florida, PO Box 116120, Gainesville, FL 32611-6120, Tel. 352-392-1487, e-mail: chow@cise.ufl.edu.

Closing date: April 15, 1997. The University of Florida is an equal opportunity, affirmative action employer. This faculty search will be conducted in compliance with the "Florida's Government in the Sunshine Law."

University of Utah
Department of Computer Science

Applications are invited for a tenure-track position at either the assistant or associate professor level in the Department of Computer Science at the University of Utah. Research areas of particular interest are compilers and operating systems, but outstanding candidates in other areas will be considered. Commensurate with the department's high standards and first-rate research program, a record of excellence in research and a strong commitment to teaching are required. Applicants should have or expect to receive an earned doctorate or equivalent in computer science or a closely related field by August 1997. The position is available starting September 1997.

Send curriculum vitae and names and addresses of at least four references to Faculty Recruiting Committee, c/o Shawn W. Darby, Department of Computer Science, 3190 MEB, University of Utah, Salt Lake City, UT 84112. Application deadline is March 15, 1997. The University of Utah is an equal opportunity, affirmative action employer and encourages nominations and applications from women and minorities, and provides reasonable accommodation to the known disabilities of applicants and employees.

The Department of Computer Science at the University of Utah has an extremely active research program, with 1995-96 research expenditures exceeding $8 million. Active areas of research include:

- Asynchronous systems, CAD and formal verification.
- Computer-aided geometric design and computer graphics.
- Computer vision and robotics.
- Flexible and secure operating systems: high-performance (VLSI, architectures, communication), natural language processing and information retrieval, numerical analysis and computational complexity, and scientific computing and visualization.
- Software engineering and systems: virtual reality and tele-operation.

Additional information about the department can be found in our Web pages (http://www.cs.utah.edu). Applicants for the faculty position may wish to pay particular attention to pages describing the FLUX and Avalanche projects.

Located at the foothill of the Wasatch Mountains in the beautiful Salt Lake Valley, there are numerous outdoor recreational resources within easy access, including 10 National Parks less than a day's drive away. As the capital of Utah, Salt Lake also has many cultural activities, including a symphony, ballet, opera and several professional sports teams.

Yale University
Department of Computer Science

The Yale Computer Science Department is looking for highly qualified candidates for junior faculty positions beginning in the 1997-98 academic year. We seek to expand and broaden the applied and experimental side of our research and teaching program, building on existing strengths in applied discrete mathematics, combinatorial optimization, complexity theory, computer vision and robotics, cryptography and security, distributed computing and coordination, languages, formal methods and logic, functional programming languages and compilers, high-performance scientific computing, medical applications, network protocols, numerical methods and parallel architectures. Some new areas of particular interest include computational biology, computational geometry, computer graphics and visualization, databases, digital libraries, human-computer interaction, multimedia, networking and communications, real-time systems and software quality.

Applicants are expected to excel in both research and teaching. They will find many opportunities for research collaborations both inside and outside of the computer science department. Interdisciplinary activities are encouraged with Yale's many world-class research groups in computationally active fields such as biology, chemistry, economics, engineering, geophysics, mathematics, medicine and physics. Yale is known for excellence in teaching, and applicants will have the opportunity to teach bright students in relatively small graduate and undergraduate classes.

Candidates should hold a Ph.D. in computer science or related discipline. Applications should be submitted before March 1, 1997. Send vita and have at least three letters of reference sent to Faculty Recruiting Committee, Department of Computer Science, Yale University, PO Box 208285, New Haven, CT 06520-8285. Qualified women and minority candidates are encouraged to apply. Yale is an affirmative action, equal opportunity employer.

Oklahoma State University
Colleges of Arts & Sciences, Business Administration and Engineering

Oklahoma State University has started an innovative master's degree program in telecommunications management. This program is interdisciplinary and draws upon the colleges of Arts and Sciences, Business Administration and Engineering. The program is offered to full-time students in Stillwater, as well as part-time students in Tulsa and other locations through distance-learning technologies.

OSU is looking for a program director to lead this program. Besides teaching and conducting research, the program director will give overall direction to the activities of the MSTM program including building industry linkages to cultivate internship and placement opportunities, as well as developing external funding.

The program director will have an academic appointment (associate or full professor) in an academic department. Preference will be given to a candidate with a Ph.D. in a field associated with telecommunications management and relevant academic and industry experience.

The search will continue until the position is filled. For full consideration, applications or nominations should be received by Feb. 1, 1997. Applications should be sent to Professor Wayne A. Meinhart, College of Business Administration, Oklahoma State University, Stillwater, OK 74078-0555. Tel. 405-744-5201; fax: 405-744-7474; e-mail: wam9143@okway.okstate.edu. For further information on the MSTM program, contact mstm-osu@okway.okstate.edu; http://www.mstm.okstate.edu.

Boston University
Department of Computer Science

Applications are invited for a tenure-track assistant professorship beginning September 1997. Qualifications required of all applicants include: a Ph.D. in computer science; a strong research record; and commitment to research and teaching. The department has a special interest in candidates from the areas of database, visualization and computer graphics.

The Computer Science Department currently consists of 11 faculty, and offers B.A., M.A. and Ph.D. programs. Our research interests include parallel, distributed and real-time systems; parallel languages and compilers; networks; image and video computing; logic of computation; and theoretical computer science. The department has excellent computing resources that include Sun and SGI workstations and servers, as well as dedicated laboratories for research in distributed systems, real-time systems, networks and graphics.

In the last year the department has been the recipient of significant grants for research infrastructure and for graduate student support. We have a close association with other groups on campus working on aspects of computing, and access to university facilities including an SGI Power Challenge array, supercomputers, SGI Origin 2000 and campuswide high-speed networks (FDDI and HiPPI).

Additional information on the department and this search is available from http://cs-www.bu.edu.

For maximum consideration, applications should be received by Jan. 30, 1997. Review of applications will continue until the position is filled. Qualified applicants should send a detailed resume and arrange for at least three references to be sent to Faculty Search Committee, Computer Science Department, 111 Cummington St., Boston University, Boston, MA 02215.

Please include a cover letter that states the names of your references and your major area of specialization.

These positions are offered pending final university approval. Boston University is an equal opportunity, affirmative action employer. Minorities, persons with disabilities and women are particularly encouraged to apply.

University of Virginia
Department of Computer Science

The Department of Computer Science invites applications and nominations for faculty positions at all ranks. Outstanding candidates in all areas of computer science will be considered, but software engineering, computer architecture, real-time systems, multimedia operating systems and human-computer interaction are of particular interest. Both tenure-track and research-track openings are expected. The department is aggressively creating a first-rate experimental computer science research program and has in place an innovative undergraduate CS curriculum. We are looking for candidates who are, or have the potential to become, outstanding in both research and teaching.

Send a resume and the names of three references to Professor Jack Stankovic, Chair, Department of Computer Science, Thornton Hall, University of Virginia, Charlottesville, VA 22903.

Virginia is an equal opportunity, affirmative action employer.

Georgia Institute of Technology
College of Computing

Georgia Tech's College of Computing invites applications for tenure-track faculty positions. We are primarily interested in entry-level candidates but will consider exceptional individuals at all levels. With an academic faculty of 43, a research faculty of nine and eight postdoctoral fellows, the college has a current enrollment of 800 undergraduates, 120 master's students and 140 Ph.D. students. The college is ranked among the top computer science programs nationally. One of the college's missions is to interact significantly with other academic units, so candidates with an interdisciplinary research focus and an interest in potential joint appointments are most welcome.

Candidates should send complete resumes and names of at least three references, preferably by Jan. 15, 1997, or until positions are filled, to Dr. Mostafa Ammar, Chair, Faculty Search Committee, College of Computing, Georgia Institute of Technology, Atlanta, GA 30332-0280. Tel. 404-894-3152; fax: 404-894-9846; e-mail: recruiting@cc.gatech.edu.

For more information about the College of Computing, see the World Wide Web site at URL: http://www.cc.gatech.edu.

Georgia Tech is an affirmative action, equal opportunity employer. Applications from women and underrepresented minorities are strongly encouraged.

University of Idaho
Department of Computer Science

The Department of Computer Science at the University of Idaho invites applications for a tenure-track faculty position at the assistant professor level. The faculty member will be located at the University of Idaho's Idaho Falls Center for Higher Education (IFCHE). This position will provide strong leadership for undergraduate and graduate programs in computer science in Idaho Falls. Candidates should specialize in networking, distributed systems, database systems or software engineering, but candidates in other areas will also be considered.

Qualifications for this position include a Ph.D. in computer science, US citizenship or lawfully authorized alien worker status with the ability to obtain a general security clearance, teaching and research ability, potential for establishing a strong research program and organizational abilities. Successful candidates are expected to teach, to pursue an active research program, and to administer the CS offerings at IFCHE.

Applicants must submit a curriculum vitae and three letters of reference to John Dickinson, Search Committee Chair, Department of Computer Science, University of Idaho, Moscow, ID 83844-1010. E-mail: search97@cs.uidaho.edu. Complete applications will be accepted until Feb. 21, 1997, or until suitable candidates are selected. The University of Idaho is an EO/AA employer.

Florida International University
School of Computer Science

Applications are invited for tenure-track faculty positions at the level of assistant professor. A Ph.D. in computer science or related area is required. We prefer candidates in distributed computing or databases, but those with high research potential in any area of computer science will be considered. The school is currently strong in database, distributed computing, software engineering and theory. At least one new hire will be affiliated with our High-Performance Database Research Center, which is primarily sponsored by NASA.

Successful candidates must be committed to excellence in teaching at both the graduate and the undergraduate levels, as well as developing a high-quality, externally supported research program. Our salary and benefits package is highly competitive.

The School of Computer Science is a designated program of excellence at FIU and enjoys strong support from the university administration. It has 25 faculty members and offers B.S., M.S. and Ph.D. degrees in computer science. The current enrollment is approximately 600 undergraduate majors and 81 graduate students. The school operates a large network of state-of-the-art workstations and also shares in the significant computing resources maintained on campus.

Applications, including a letter of interest, curriculum vitae, e-mail address and the names of at least three references, should be sent to Dr. Wei Sun, Chair, Recruitment Committee, School of Computer Science, Florida International University, University Park, Miami, FL 33199.

Applications must be postmarked no later than Jan. 16, 1997. Further information can be obtained by phone at 305-348-2744, via e-mail from recruit@cs.fiu.edu or on the World Wide Web at http://www.cs.fiu.edu.

Florida International University is a member of the State University System of Florida and is an equal opportunity, affirmative action, equal access employer. Minorities and women are encouraged to apply.

Computists International
Computists' Communique

AI students/faculty: e-mail digests of M.S./Ph.D. research jobs, grant competitions, software announcements, industry news, insights, etc., to save you Internet/Usenet/Web reading time. Details from http://www.computists.com or laws@computists.com. Free departmental trials.

History from Page 5

historians have agreed to serve as advisers: Peggy Kidwell (Smithsonian Institution), Michael Mahoney (Princeton University), John McCarthy (Stanford University), Arthur Norberg (University of Minnesota), David Patterson (University of California at Berkeley), Terry Reynolds (Michigan Technological University), John Rice (Purdue University), Bruce Seely (Michigan Tech), Robert Seidel (Babbage Institute) and Joseph Traub (Columbia University).

There are a number of ways in which you can assist with this project:

1. Send Dr. Aspray (e-mail: aspray@cra.org) the names of living individuals who played an important role in this history, such as founding chairs of departments, early program officers or longtime computer science faculty who have a good perspective on key events. Please include a few words about the backgrounds of these individuals, plus current contact information for them. The project staff will contact as many of these people as possible and identify a few of them for formal oral history interviews.

2. Send information about the personal and organizational records that document this history. Indicate where the records are presently located: in the possession of the individual or the department; in the university archives; in regional archives such as your local or state historical society; or in specialty archives such as the Babbage Institute, the Smithsonian, the Hagley Library or Stanford's Silicon Valley archives.

3. Help with the placement of archival records into your local archives or one of the specialty archives listed above if the records are still in personal hands. (The IEEE Center for the History of Electrical Engineering has prepared a brochure that explains the process of placing archival collections. IEEE CHEE, Rutgers University, 39 Union St., New Brunswick, NJ 08903.)

4. Offer to subsidize the oral history process by offering to have your staff transcribe the raw tapes and enter corrections made in the editing process.

5. Produce your own oral history interviews. Dr. Aspray is willing to give you advice on the process—it involves considerably more than turning on a tape recorder and having a conversation with a historical figure.

6. Send copies of, or at least references to, historical studies about your department, funding agency, company's relationship with the academic community or key figures in this story. These might include departmental histories, university histories with information about the history of your department, studies on your region (such as studies of Route 128 or Silicon Valley) that might include relevant information.

7. Advise on key topics for the study.

Archival materials generated in the course of this project will be offered to the Charles Babbage Institute for the History of Information Processing at the University of Minnesota.