Appropriations Far from Complete as 106th Congress Takes Summer Break

By Lisa Thompson

When Congress left Washington for its August break, it left behind a slew of unfinished legislation, including most of the 13 must-pass appropriations bills that will fund the government for Fiscal Year 2001 (October 1, 2000 to September 30, 2001). When legislators return in early September, they will have to scramble to finish these bills. As in recent years, it is all but certain that Congress and the White House will be engaged in negotiations on an "ominous" spending package up to—and likely past—the deadline.

The last days of July were marked by partisan wrangling over budget issues as Republicans and Democrats positioned themselves for the forthcoming end-game, putting them further behind schedule in the appropriations process. The Republicans have pursued a curious strategy of putting forth tight-fisted spending bills that they know will have to be expanded later in the process. At least five of the bills, as currently written, are under threat of veto for failing to provide funds for the White House's high-priority initiatives.

Funding for research and development programs will be one of the items at stake in these negotiations. In the appropriations bills that have been written so far, Congress has provided an overall increase in federal R&D, but most of the new money would be concentrated in the Department of Defense and the National Institutes of Health (NIH). Most of the other agencies would see their R&D funding grow very little or even decline.

Just before leaving, Congress cleared the Defense appropriations bill (H.R. 4576), which the President is expected to sign by the time Congress returns. It includes a 7 percent increase for defense R&D; defense basic research, especially, will see significant growth.

Although the House and Senate versions of the spending bill that covers the NIH have not yet been reconciled, it is likely the biomedical research agency will get close to a 15 percent increase, or nearly $3 billion in new funding.

The Administration, which proposed record increases for federal R&D this year, is clearly unhappy with the appropriations bills' treatment of R&D so far. The President's budget and science-technology officials have been concerned for some time about the lack of balance in the federal R&D portfolio; they have been emphasizing the need for growth in the computing, physical, and other sciences and stressing their importance to the success of biomedical research.

"Unfortunately, Congress has currently stalled our progress toward our shared national goals and toward balance in a healthy R&D portfolio precisely at the moment in history when we can best afford to invest in America's future," said Neal Lane, Assistant to the President for Science and Technology, in an August letter to the science and engineering community.

The President is likely to have the upper hand in the fall budget negotiations, as long as fiscal projections show the federal surplus continuing to grow. His negotiating team's stance on R&D will be crucial for those agencies hit hard by stringy appropriations bills.

Mixed Results for Computing Research

The defense appropriations bill includes a 10 percent increase for DARPA computing programs. However, the budget request asked for a 27 percent increase. A similar result occurred last year, and apparently defense appropriators have not been persuaded that such increases for defense information technology R&D, which stand out among DARPA's spending accounts, are warranted.

With regard to the National Science Foundation, the House has passed a VA, HUD, and Independent Agencies appropriations bill that includes a 3.4 percent budget increase for the agency, just a fraction of the 17 percent increase requested by the agency. The Senate has not yet written its version of the bill, but the Chair and Ranking Member—Senators Christopher Bond (R-MO) and Barbara Mikulski (D-MD)—are trying to build support for a significant funding increase for NSF.

While the amount provided in the House bill for NSF's Computer and Information Science and Engineering (CISE) directorate is about 13 percent above current-year funding, it is about $90 million below what CISE has requested. The bill also fails to provide second-year funding for the Terascale Computing Systems program.

Note to Department Chairs

Taulbee Survey 1999-2000

Is in the mail.
By Mary Jean Harrold

The Computing Research Association’s Distributed Mentor Project (DMP) has completed a sev-

enth year of support for outstanding undergraduate women in computer science and en-
ingineering. Each student spends approximately 10 weeks during the summer doing re-

search under the guidance of a female professor and mentor. Most students perform their re-

search at universities other than their under-

graduate institutions.

The Distributed Mentor Project is sponsored by CRA and is managed by its Committee on the Status of Women in Computing Research (CRA-W). The project is supported by grants from the National Science Foundation (NSF) and from the National Computing Science Alliance (NFACI). Three previous CRN articles (September 1993, September 1995, and January 1997) have described the background, the goals, and the first three years of the project. The January 1997 article also presented detailed information about the third year of the project (1996), and pro-

vided a summary of a third-party evaluation of the project. The pur-

pose of this article is to report on the sixth and seventh years of the project, and to present highlights of a third-party evaluation of the DMP’s impact on the 1999 participants and the experience of the participants. An upcoming article will present the results of a longitudinal study of the program.

Project Goal

Women are severely underrep-

resented in Computer Science and En-

gineering (CSE & E) in both academia and industry. The goal of the Distributed Mentor Project is to increase the number of women enter-

ning graduate school in computer science and engineering and, thus, increase the number of women holding high-level positions in academia and industry. To achieve this goal, during the summer following their sophomore or junior year, the project provides outstanding under-

graduate women with: 1) a window on research and graduate life, and 2) a mentoring relationship with a successful female professor. Because of its distributed nature, the project reaches a large pool of students who can benefit from the experience.

1999 Project

In 1999, the selection committee chose 18 undergraduates from the applicants and matched them with mentors according to technical inter-

ests. Students came from a variety of home institutions: Brooklyn College, Brown University, Bucknell University, Dartmouth College, Duke University, Harvey Mudd College, Mississippi State University, Northwestern University, Purdue University, Rice University, Rose Hulman Institute of Tech-

nology, Trinity College, University of Minnesota at Morris, University of Missouri, University of Oregon, University of Southern California, University of Tulsa, and Williams College.

Students conducted their research with professors at a number of institutions: Brooklyn College, Brown University, Duke University, Georgia Institute of Technology, Rice University, University of California San Diego, University of Central Florida, University of Massachusetts, Worcester Polytechnic Institute, University of Tulsa, and University of Utah.

Sara Smolensky is a computer sci-

ence student from Mississippi State University who participated in the 1999 DMP with Professor Kathryn McKinley of the University of Massachusetts at Amherst. Sara maintained a detailed account of her DMP experience, which is available at our project website at http://cra.org/Activities/craw/dmp/index.html. Her journal provides such an interesting account of her experi-

ence, and was so useful to prospective DMP participants, that keeping such a journal is now a requirement for all DMP participants. The CRA-W website (http://cra.org/Activities/craw/dmp/index.html) contains the journals of this year’s DMP participants.

1999 Project Evaluation

During fall 1999, the Learning Through Evaluation, Adoption and Dissemination (LEAD) Center con-

ducted a third-party evaluation of the project. The LEAD Center has eval-

uated the DMP since its inception, using both qualitative and quantita-

tive methods, and has produced three previous reports.

The LEAD Center and the DMP coordinator developed a survey that was then sent to the 18 participants in the 1999 DMP. The survey con-

sisted of two parts: 1) questions to gather information about the students as they entered the program: their demographics, undergraduate experience, and attitudes toward graduate school; and 2) issues related to the DMP, impact of the DMP and the DMP experience. Whereas the typi-

cal response rate for surveys con-

ducted by the LEAD Center is 70 percent, the response rate for the 1999 DMP survey was 100 percent. Furthermore, the students provided complete responses, and often gave explanations for their ratings.

The study used the survey to assess the DMP’s impact, and found that most students reported a greater understanding of and preparation for graduate school and many reported being more committed to graduate school. Of the 1999 student partici-

pants, 78 percent cited the DMP as a positive factor in their upcoming decisions about whether to pursue graduate studies in CS&E. Also, 78 percent of the students reported hav-

ing an increased level of commitment to graduate school, with 72 percent feeling “committed” to “very commit-

ted” to graduate school following their participation in the program.

Most students reported a higher level of preparation, ability, and interest in CS&E following the program. The survey asked them to rate themselves relative to their peers in these three areas, and most left the program with “high” to “very high” ratings in preparation (77%), ability (94%), and interest (94%). One student described her gains as follows:

“I am extremely pleased with all that I have learned and accompli-

shed. Being a co-author was really exciting for me. I have now given oral presentations to my elders, which has bolstered my confidence level in public speaking. The study also used the survey to assess the change in attitudes about graduate school resulting from the DMP experience. Most students rated their understanding of, prepara-

tion for, and commitment to graduate school higher after the program. This is most evident in the student com-

ments explaining the change in these areas. These comments echo that of previous DMP students who also described the tremendous value of gaining experience with research and getting an inside view of graduate school when deciding whether to pursue graduate studies. One student wrote: ‘That was my first exposure to research, and I not only learned a lot, but I ended up with something well worth working for [for] and useful for the project I worked on…’ I have never before realized how much I would like to do research and work with people who are doing research, and I believe this experience came at the right moment in my life to give me the right direction for my future goals.’ “ Distributed Continued on Page 9
In 1989 the Ricoh Corporation (USA) founded the Ricoh California Research Center (CRC) to perform applied research that would "insure the continued success of Ricoh Corporation Limited (Japan)," a worldwide leader in office and electro-optical technologies. Ricoh located CRC in Menlo Park, California, in order to capture the energy and entrepreneurial spirit of Silicon Valley and to provide ready access to leading universities, specifically Stanford University and the University of California at Berkeley. The lab's focus on information technology, and software in particular, supports and complements the strengths of our Japanese colleagues, whose expertise in optical devices, miniaturization, manufacturing, toner chemistry, and so on have long held the parent company in good stead.

Every research project at CRC has been initiated by its roughly 20 scientists and engineers, rather than by directive from Ricoh Company. Of course, each project is evaluated on a number of risk/return criteria before it is begun, and its ultimate value to Ricoh is of paramount consideration. One of CRC's earliest successes was the APT algorithm, a JPEG-compatible still-image compression algorithm that is particularly fast and efficient for modern digital implementations. APT can compress still images at video rates and, compared with traditional compression methods, uses much less power in digital hardware. Many products now use APT, including every Ricoh digital camera.

Because of CRC's impact and location, Ricoh Company asked us to expand the center. And in 1997 we created the Strategic Business Center (SBC), the corporate venture capital arm of Ricoh. SBC invests in ventures that both we and our partners can benefit from Ricoh's worldwide strengths as an office technology provider. While many major corporations have such investment groups, they are virtually always a part of a finance division. SBC is rare, in that it grew out of a technology research lab. The connection between CRC and SBC remains close: research scientists and engineers from CRC alert SBC to new technical developments and provide analyses of the technologies of potential corporate partners.

CRC invents and develops technologies for Ricoh's current core needs as well as for emerging areas. As expressed by Ricoh's corporate slogan, "Image communication, superior image processing is central to a wide range of Ricoh products and services. CRC's greatest commercial impact so far has been in the core domains of color image processing and compression. After the APT algorithm (mentioned above), we developed a very fast binary compression method called ABS, which is now in high-end copiers, third-party digital games, and elsewhere. Next, we developed CREW (Compression with Reversible Embedded Waveslet), a compression method that supports a wide range of features. For instance, the compression ratio in CREW can be set throughout a range (from lossless to highly lossy) at encode or decode stages or both. CREW serves as a key technology in the emerging JPEG-2000 international standard.

Another core technology for Ricoh is remote services. CRC developed FIXIT, a Bayesian belief net-based remote diagnostic system enabling "query-free" information retrieval. Thus, a customer telephone a Ricoh service representative and describes a product's problems and symptoms. The service representative types those symptoms into a PC running FIXIT, which then automatically displays the most probable faults and associated corrective measures. FIXIT dramatically reduces the time and cost of providing such product service information over the telephone.

CRC's greatest success in emerging technologies began as our Infinite Memory Multifunction Machine (IMMM) project. The IMM module stores electronic copies of every document photocopied, faxed, or printed by any peripheral on an office-intranet—every document. To build on our simple concept of "store everything," we invented many methods for human-machine interaction, as well as document search and retrieval. The MMM module led directly to the eCabinet™, the first in our continuing series of network office appliance products.

Ricoh Company recognized that major technology market trends start in the United States, and especially in Silicon Valley, and thus in early 1997 formed Network Office Systems Division (RSV) in Cupertino, California, close to CRC. NOA prototypes develop new classes of office products noteworthy for their ease of use, such as the eCabinet™. We find that the greater the ease and reliability we seek in a Ricoh product, the harder and more risky the research program must be to invent it.

In 1997 Ricoh Company founded Ricoh Silicon Valley, Inc. (RSV), a wholly owned American subsidiary that comprises CRC, SBC, and NOA division. The RSV corporate organization allows ready collaboration and consolidation of effort among its three groups. For instance, CRC's technology transfer in emerging technologies is to the NOA division, and is much simpler and faster than its transfer of core technology to Japan. It is unusual that the success of a research lab leads directly to the founding of a full operating company such as RSV.

Part of RSV's corporate culture is that each employee, and indeed each of CRC's small research groups, has an identified customer, generally internal to RSV or Ricoh Company. At CRC we encourage open publication and public presentation of technical results (usually after patents have been filed), and most researchers are either leaders or active in major international technical organizations. We have found that such openness is essential not only for generating the best research ideas, but also for recruiting and retaining the most talented scientists and engineers.

It is difficult to predict—let alone lead—technical developments in a world moving at Internet speed. Nevertheless, at CRC we have tried to foster a culture of creativity, openness, and integrity that contributes to both the advancement of Ricoh and the professional fulfillment of its employees.

Dr. Stork is Chief Scientist at Ricoh Silicon Valley http://www.rsv.ricoh.com
By Jerry R. Sheehan

Information technology (IT) research has fueled incredible advances in the capabilities of computing and telecommunications technologies. Work in device architecture, communications networks, databases, human-computer interaction, the other areas of IT systems, is more functional and more usable. As a result, IT has moved out of the laboratory and into the back rooms of large organizations to touch virtually all aspects of life. IT systems are transforming finance, commerce, education, and health care, manufacturing, and a myriad of other important activities, raising new questions about the adequacy of the nation’s IT research enterprise. Is sufficient research being conducted to ensure continued progress in IT and keep pace with the growing opportunities and challenges it presents? Is the work addressing the kinds of problems needed to make IT even more productive and more usable? Are the right organizations in industry and universities, and conducting the needed research? A new report from the Computer Science and Telecommunications Board, Making IT Better: Expanding Information Technology Research To Meet Society’s Needs, addresses these questions. It examines trends in the evolution and application of IT, as well as in the nature of IT research and development (R&D) in industry and universities, and concludes that the IT research agenda must be explicitly expanded to address a number of new and important problems associated with the application of large scale IT systems to a growing number of social applications. This work will require experimentation with new models of research that more actively involve end-users of IT systems and researchers with interests in the social sciences, economics, business, and law.

New Research for New Problems

By almost any measure, the nation’s research base for IT is strong. The number of IT researchers and funding for IT research are at all-time highs. Federal expenditures for IT-related research climbed 40 percent in real terms between 1990 and 1998 to approximately $2 billion. The Clinton Administration proposed another $1 billion increase in combined funding for fiscal years 2000 and 2001. Industry investments in IT research and development (R&D) also climbed throughout the decade. Between 1990 and 1998, R&D investments by firms involved in computing, software, telecommunications goods and services industries doubled from $26 billion to $52 billion—roughly one-quarter of which was classified as research. This growth occurred despite major reorganizations of research at large companies like AT&T, Bellcore, and Xerox. It also reflects significant increases in R&D funding by companies like Intel, Microsoft, and Cisco, as well as new entrants into the IT industry. Despite the increasing research expenditures, the rapid deployment of IT systems is making evident a number of deficiencies in the research base. Large companies and federal agencies continue to experience difficulties in developing, deploying, and operating IT systems. Surveys suggest that only one-quarter of all large-scale system development efforts are completed on time and within budget, and that 30 percent are abandoned altogether. Even after deployment, large-scale systems continue to suffer problems of scalability, reliability, security, and fragility.

New Mechanisms for New Research

This work will require the insight of technologists, and the support of policy-makers, investigators, research teams, and organizations in complex social applications. The problems that need to be addressed are not exclusively technical in nature. Increasingly IT systems are being deployed in support of various “social applications”—applications that support groups of people in shared activities, such as in health care, education, manufacturing, or electronic commerce. Social applications can motivate technical research along a number of dimensions, such as improving overall efficiency and productivity, protecting privacy, and improving interoperability. In social applications, however, IT becomes part of a larger “sociotechnical system” that combines technology, people, and organizations in complex ways to achieve a given set of functions. The technology cannot be considered apart from the context in which it operates, and research on social aspects of IT systems must therefore be inherently multidisciplinary. It requires the insight of technologists, as well as end-users of IT systems and researchers in the social sciences, business, and law who recognize how people, organizations, and society interact with technology.

Recommended Actions

The nation’s research enterprise is not currently well equipped to address issues of large-scale systems and social applications. The bulk of IT R&D investments continue to come from companies that manufacture the components of IT systems: microprocessors, communications switches, software applications, for example. Firms engaged in developing systems (e.g., systems integrators) tend to invest little, if anything, in R&D, despite the burgeoning growth for their services. Nor do most organizations that are major end-users of IT systems and individuals continually struggle to modify their IT systems to incorporate new functionality or support new tasks. The difficulties they encounter are an indication of the system modifications and stifle organizational change and innovation. While inadequate management practices are surely responsible for some of the problems in developing IT systems efficiently, more fundamental processes are also at work. IT systems are still as much an art as a science, and the knowledge base for understanding systems is weak. Engineers lack suitable tools for predicting the performance of systems or encapsulating functionality in ways that limit unexpected interactions among components. These issues are not new to computing—they have plagued systems for decades. But as the complexity of IT systems grows and the scope of their deployment expands into even more critical applications, the need to solve them becomes ever greater. Issues of scalability, reliability, and security will become even more challenging as advances in networking technology and the Internet “sociotechnical system” of large-scale IT systems. The problems that need to be addressed are not exclusively technical in nature. Increasingly IT systems are being deployed in support of various “social applications”—applications that support groups of people in shared activities, such as in health care, education, manufacturing, or electronic commerce. Social applications can motivate technical research along a number of dimensions, such as improving overall efficiency and productivity, protecting privacy, and improving interoperability. In social applications, however, IT becomes part of a larger “sociotechnical system” that combines technology, people, and organizations in complex ways to achieve a given set of functions. The technology cannot be considered apart from the context in which it operates, and research on social aspects of IT systems must therefore be inherently multidisciplinary. It requires the insight of technologists, Recommendation for New Research

A committee convened by the Coalition to Diversify Computing (CDC) has recently released a report entitled Recruitment and Retention of Underrepresented Minority Graduates in Computer Science. The report offers 25 practical suggestions for graduate departments to consider. These suggestions cover specific recruitment tactics, means to facilitate early success in graduate school, retention methods, and organizational issues such as best ways of providing financial support. The committee was cochaired by Andrew Bernat (University of Texas at El Paso) and William Aspray (Computing Research Association). The study was sponsored by the National Science Foundation and PACI with staff support from CRA. Single copies are available free of charge. Supplies are limited. Copies are available online at: http://www.cra.org/main/cra_tab5.html. The Coalition to Diversify Computing is a program of the Computing Research Association, the Institute for Encouraging Women in Engineering, the Association of Computing Machinery, and EOT-PACI, a national education, outreach, and training program funded by the National Science Foundation. CDC focuses on creating networking opportunities for minority researchers, faculty, and students in computer science and engineering (http://www.npact.edu/Outreach/CDC).
H-1B Visa Legislation Still in the Air

By Lisa Thompson

Legislation to amend federal statutes governing the visa program (H-1B) for nonimmigrant professional workers could see Congress act this month, but it still faces obstacles on the path to enactment. Having trouble meeting its high-tech employment needs, industry has been pushing Congress to raise the caps on these visas, but progress is threatened by the fact that the legislation is being weighed down with controversial unrelated provisions.

The principal vehicle being used by the Senate to lift the H-1B visa caps is the American Competitiveness in the 21st Century Act (S. 2045), sponsored by Judiciary Committee chairman Orrin Hatch (R-UT). The act would raise caps on H-1B visas to 195,000 per year for three years, and exempt from the cap those visas granted to foreign workers who are to be employed by research and other non-profit institutions or who recently received a master's or higher degree from a U.S. educational institution. The current ceiling is 115,000 visas per year, with no special exemptions.

Industry advocates strongly support the Hatch bill, which was approved by the Judiciary Committee in April. But squabbling between party leaders over the number and nature of amendments Democrats will be allowed to offer, and the rush to pass appropriations bills, have prevented the bill from proceeding to the floor.

The outlook is even more complicated in the House, where the committee of jurisdiction produced a bill that is distasteful to industry and to the leadership of both parties. In May, the Judiciary Committee approved the Technology Worker Temporary Relief Act (H.R. 4237), which was sponsored by Rep. Lamar Smith (R-TX), chairman of the panel’s Immigration Subcommittee and a skeptic of industry’s claims of a widespread high-tech labor shortage.

While Smith’s bill would entirely eliminate the caps on H-1B visas for the next three years, it would limit their distribution to foreign workers with college degrees who are paid at least $40,000 a year, or who are employed by institutions of higher education. Current law allows applicants to substitute work experience for a college degree in determining eligibility, but critics see this as a “loophole” that invites fraud in the system.

Further complicating action is the fact that some lawmakers in both chambers, primarily Democrats, want to use the legislation as an opportunity for enacting other changes in U.S. immigration policy that are unrelated to H-1B visas. The Administration, for instance, is pushing to include controversial measures concerning immigrants from Central America and the rules under which illegal immigrants can apply for amnesty, an unpopular proposal among Republicans. Supporters fear that even one such addition could open the floodgates for other legislation, and create and support new jobs in the United States.

Industry Succeeds in Making Case for IT Job Shortage

The Information Technology Association of America (ITAA) estimates that more than $40 billion in information technology jobs in the United States will go unfilled this year. The H-1B visas available this year were all claimed by March. With statistics like these, and effective political pressure, industry groups like the Technology Network and ITAA have built a compelling case for raising the H-1B visa caps that has dominated debate in Washington.

"Skilled foreign professionals, many of whom are educated at American colleges and universities, represent a small percentage of the total U.S. workforce, but provide significant contributions to domestic growth and U.S. competitiveness in the global marketplace. Technically skilled foreign professionals enable U.S. employers to create products, implement new manufacturing processes, compete and win in global markets, train and educate American workers and create and support new jobs in America," reads a TechNet position paper.

While the position to raising the visa caps, led by anti-immigration groups like the Federation for American Immigration Reform and some engineers’ organizations, has not been silent, Congress and the Administration are more than prepared to respond to the needs of industry. Both of the industry-backed bills include provisions to direct H-1B petitioner fees to education and training initiatives, which gives legislators who vote for lifting the H-1B caps some political cover.

Efforts to enact H-1B legislation are expected to move forward after the August recess. But the issue is a volatile one, as are nearly all proposed changes in U.S. immigration law, and compromise will be required at a moment’s notice. The sooner the bills move, the less likely it is that H-1B visas will become an issue in the November elections.

CRA Welcomes New Staff Members

Susan Garfinkel, Webmaster and Diversity Programs Coordinator, holds a Ph.D. in American Civilization from the University of Pennsylvania. Since 1997, she has taught at George Washington and Georgetown Universities on topics including hypertext and the cultures of cyberspace. Susan brings to her position a photographer’s strong interest in visual communication, along with considerable experience in university-level planning and governance.

Simi Khetarpal, a native of India, is CRA’s new Administrator. Prior to joining CRA, she was a Government Sales Associate with a private firm. Simi lives in Maryland with her two young sons, Ishan (3) and Mihir (almost 4). Among other responsibilities, Simi will coordinate the professional opportunities section of Computing Research News.
CRA New Board of Directors Members

Incumbents:

Peter Freeman, Dean and Professor, College of Computing, Georgia Institute of Technology was reelected to a fifth term on the CRA board. During that time, he has served as vice chair of the board, chair of the Government Affairs Committee and a Snowbird Conference Co-Chair. Freeman also sits on the ACM Information Technology Worker Study released in 1999, and a member of the Elections Committee. Professor Freeman, who received his Ph.D. in computer science from the University of Michigan, is a Fellow of the IEEE, AAAS, and ACM.

Mary Jane Irwin, who first joined the board in 1991, has served as vice chair of the board, co-chair and member of CRA’s Committee on the Status of Women in CSE (CRA-W), and co-chair of CRA’s 1998 Conference at Snowbird. Professor Irwin, who has a Ph.D. in computer science from the University of Illinois, Urbana, is currently Distinguished Professor of Computer Science & Engineering at Penn State University. She is a Fellow of the IEEE and ACM and winner of the ACM/SIGUCA Leadership Award. In 1999, Professor Irwin was awarded an honorary doctorate from Chalmers University in Sweden. Professor Irwin works actively to increase recruitment, retention, and advancement of women in computer science and engineering. Fostering communications between CRA and its affiliate societies will continue to be one of her interests.

Nancy G. Leveson, Professor of Aerospace Software Engineering, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, is beginning her fourth term on the CRA board member. She is a co-founding ACM Fellow, and the recipient of ACM’s Allen Newell Award and the AIAA Information Systems Award. Professor Leveson was a co-founder and chair of CRA’s Committee on the Status of Women in Computer Science and Engineering (CRA-W), and twice served as program chair of CRA’s Conference at Snowbird. Professor Leveson received her Ph.D. in computer science from the University of California, Los Angeles.

David Patterson, Professor of Computer Science at UC Berkeley, has been a CRA board member since 1991, serving as chair from 1993-97. He is a member of the Computer Science and Telecommunications Board (1997-present). Professor Patterson is a member of the NAEd, and was awarded the IBM Multidisciplinary Medal, the IEEE von Neumann Medal, the ACM SIGMOD Test of Time Award, and the ACM Karlstrom Outstanding Educator Award. As former chair of the CRA board, Professor Patterson has a long term perspective to the issues facing CRA in the next decade. Dr. Patterson received his Ph.D. in computer science from the University of California, Los Angeles.

Appointees:

Andrew G. Hume is a Technology Consultant at AT&T Labs Research in the software systems research department. He has worked in the areas of software tools, pattern matching and string searching, and for the past few years has focused on systems processing massive datasets. He has been on the USENIX Board of Directors since 1998, and served as President from 1996-2000. He is Vice President elect for 2000-2002.

Guylaine M. Pollock, the IEEE-Computer Society’s 2000 president, has been appointed to her second term on the CRA board as one of the Computer Society’s representatives. She is a senior member of the technical staff at Sandia National Laboratories, working with the Computational Plant parallel architecture project. Dr. Pollock received her Ph.D. in computer science from Texas A&M University. A society Golden Core member, Pollock has received numerous awards, including Notable Women of Texas, Upjohn Pi Epsilon membership, the society’s Richard E. Merwin Scholarship, and a Gulf Oil Foundation Fellowship.

David L. Waltz, Vice President of Computer Science Research at NEC Research Institute, received his Ph.D. in electrical engineering from the Massachusetts Institute of Technology. He is a fellow of ACM and AAAS, and a Senior Member of IEEE. Dr. Waltz has held 18 university distinguished lectureships, the most recent at Texas A&M University and the University of Illinois. Dr. Waltz participated in a number of CRA activities in his role as President of the American Association for Artificial Intelligence, a CRA member society. His experience spans academia, start-up R&D, corporate board membership, industrial research management, professional society leadership, and funding-agency service.

Newly Elected:

Randal E. Bryant, who received his Ph.D. in computer science from the Massachusetts Institute of Technology, is currently President’s Professor and Head of the Department of Computer Science at Carnegie Mellon University. He is a Fellow of the ACM and IEEE, and has received the ACM Kanellakis Award, the IEEE W.R.G. Baker Prize, and the Semiconductor Research Corp.’s Technical Excellence Award. He is a Member of the Executive Committee of the ACM/IEEE Design Automation Conference (1994-present, including technical program co-chair, 1998-99). He was also Associate Editor and Editor-in-Chief of IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems.

Janice Cuny is an Associate Professor of computer and information science at the University of Oregon. She won an IBM Faculty Development Award and National Science Foundation Faculty Award for Women, and has been an IEEE Distinguished Visitor. Professor Cuny has a long involvement with CRA’s Committee on the Status of Women in Computing Research (CRA-W). She has been a member since 1993 and was co-chair from 1996-99. Dr. Cuny has organized five faculty mentoring workshops for CRA-W. For the past three years she has chaired the selection committee for CRA’s Undergraduate Awards and has served as a mentor in CRA-W’s Distributed Mentoring Program. Dr. Cuny has a Ph.D. in computer science from the University of Michigan.

Jeffrey S. Vitter is a Head of Computer Science and Vice President, Services and Software, IBM Research Division at the IBM T.J. Watson Research Center. He leads the worldwide research efforts of more than 1,000 computer scientists at IBM Research. Dr. Vitter, who holds a Ph.D. in electrical engineering from the University of Texas at Austin, is an IEEE Fellow, and has received the IBM Corporate Award, IBM Outstanding Technical Achievement Award, and the IBM Outstanding Innovation Award (in both 1987 and 1990). His research interests include database systems, distributed computing, high performance databases, Dr. Vitter is a strong proponent of close interactions between the university and industrial computer science research communities, and has led the establishment of programs at IBM to foster these interactions.

Ambuj Goyal is Head of Computer Science and Vice President, Services and Software, IBM Research Division at the IBM T.J. Watson Research Center. He leads the worldwide research efforts of more than 1,000 computer scientists at IBM Research. Dr. Goyal, who holds a Ph.D. in electrical engineering from the University of Texas at Austin, is an IEEE Fellow, and has received the IBM Corporate Award, IBM Outstanding Technical Achievement Award, and the IBM Outstanding Innovation Award (in both 1987 and 1990). His research interests include database systems, distributed computing, high performance databases, Dr. Goyal is a strong proponent of close interactions between the university and industrial computer science research communities, and has led the establishment of programs at IBM to foster these interactions.

Elaine J. Weyuker is a Technology Leader at AT&T Labs Research. She is an ACM Fellow and a Senior Member of IEEE. Dr. Weyuker served on the original CRA-W committee. As the only member of CRA-W who was also a member of the ACM Committee on the Status of Women and Minorities, she also served as liaison between the two committees. Dr. Weyuker was Professor of Computer Science at the Courant Institute of Mathematical Sciences at NYU, and Director of Graduate Studies and Head of the Graduate Fellowship Selection Committee for the Computer Science Department, NYU. She currently serves on the Editorial Boards of the Journal of Empirical Software Engineering and the Engineering Editorial Board, Journal of Software and Systems. Dr. Weyuker publishes widely in software engineering, and has authored two books on the theory of computation. Dr. Weyuker holds a Ph.D. in computer science from Rutgers University.

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There is a lot of money, attention, media, and power being focused on CS/CE departments because they are knowledge-creation engines. Despite that, sadly, I think the quality of the interaction between computer science/engineering departments and industry has changed. I did a lot of work with industry as a young faculty member, and it was a marvelous two-way street—they had problems and we had ideas. Nobody talked about intellectual property or IPOs. Our benefit was peer recognition of our intellectual contributions. There is still a lot of interaction between industry and academia, but the quality is different, and I think lesser, because we are so damned relevant.

This so-damned relevant is not very comfortable for academics. We need to behave in ways that are different from, and hence not understood by, our academic colleagues. There are some practical consequences of this.

Challenge 2: What is ethical behavior when you don’t know what you are doing, and can’t?

If you ever get anywhere close to a technical issue in this talk, it is on this topic. I need to do so in order to explain what I mean by this challenge. I’ve had a verycheckered research career. One of the things I’ve done is correctness of programs; another is security. So I will use these for my example, but I could have used any complex system.

We all know what the correctness problem is—given assumptions, A, and a post-condition, Q, does A imply the weakest precondition of Q? If you can prove that theorem, the program will produce Q on termination.

You might not be able to autonomously prove this theorem, but at least the problem is well formulated. The problem is not well formulated for computer security! The correctness statement for security is “Prove that there does not exist a sequence of commands such that those commands applied to the program will not make something bad happen (where “something bad” is undefined and undefensible.” That’s half of what I mean by “you don’t know, and can’t.”

The second half of “you can’t know” deals with emergent properties—properties of programs that may be incorrectly correct in the sense of doing what the post-condition says to do, but they also do some unanticipated things.

There is a 1993 Naval Research Lab study of 50 security problems—22 were problems with the specifications. (Note: the selection criteria were such that one should not infer that 22/50ths of all security problems are due to specifications. One could easily be lower or higher!) I don’t want to say “errors” in the specifications because they were things that someone thought were exercising the correct operation of the program! In fact, however, a clever person could exploit them to do “something bad.”

The popular myth that security problems are “bugs” just isn’t true. Some are, but many of them result from incorrect implementations of specifications with unforeseen implications.

I don’t know what it means to behave ethically when you can’t know the full consequences of your engineering decision to a problem. I think it’s a profound problem, and this field has to think it through because it is facing it before the rest of the engineering profession.

Challenge 3: Growing responsibility!

I feel strongly that CS/CE has a responsibility to society that it has not yet stepped up to, and in some ways it is deeper and more profound than other disciplines. Permit me to give you a few examples of these responsibilities.

First, our responsibility for broad liberal education. I don’t see how someone can call himself or herself a liberally educated adult in the 21st century without having a deep understanding of the fundamentals of computation. Knowledge of the physical world is embedded in our culture—kids acquire it as a part of growing up. Newton’s law of gravitation in its particular form may be a surprise in high school, the notion that there is a force pulling you down, even the name Newton and the apple bouncing off his head, are part of the culture. Everyone is exposed to an amazing amount of fundamental knowledge of nature this way.

The fundamentals of computation are such relatively new concepts that they are not part of the culture. People don’t absorb them in the same way as physical knowledge. We must compensate in our educational system. I don’t mean word-processing or spreadsheets; I mean fundamental concepts! Computer scientists and computer engineers need to take an aggressive leadership position to make that happen.

Second, I am asked to do all kinds of funny things in this job. One of them was to speak to new Members of Congress on issues of IT that were likely to come up in the 106th Congress. I jotted down a list that surprised me. It surprised me in three ways. It was longer than I anticipated—five pages of cryptic notes. Second, the issues were deep! Third, what I thought of as the “fix-off” stuff wasn’t all that far off at all. I want to give several quick examples of what I mean by deep issues. A law professor friend said to me: “You know, there are a handful of philosophies for legal systems around the world, and they really can be quite different from each other, but there are one or two things that are common to all of them. One is juridicality, the notion that laws apply in a place. Guess what, there is no “place” in cyberspace! That is, a fundamental philosophical basis for our legal systems doesn’t apply to what everyone seems to agree is the basis of our new society.”

What scares me is that, although I can talk to a group like you and nod your heads, I know of no scholars being done on the issue.

Let me consider another example. One of the special things about the United States is the civilian control of the military. One pillar of that control is an 1880-era law called Posse Comitatus, which essentially says that the military does not operate inside the U.S. borders, and law enforcement inside the military is (almost) never used to enforce civilian law. With IT, however, the borders are not obvious. It is often not clear who has authority or what the rules of engagement are. Thus, this pillar of civilian control is not so obviously applicable.

Again, I know of no scholarship being done on this.

We have incredibly important social institutions, like universities, that I think are going to be profoundly transformed by IT. I can’t think of a better example of an entity that is in the “information business” than a university. Universities create information, they store it, they wholesale it, they retail it. Whenever a technology changes its core competency, either a business will change dramatically in response or it is not going to exist. What are the implications for universities?

The point of these brief examples was to emphasize the potentially profound effect of our discipline on our society, its legal system, and its institutions. Only the CS/CE community has a hope of anticipating these effects, and I believe we have a deep responsibility to help society think them through.

Challenge 4: The tripartite challenges of:

• a CS/CE mid-life crisis,
• being both a discipline and an infrastructure, and
• identity.

These may look like separate challenges, but I think they are “of a piece.”

I was recently at a conference in Zurich, where the speakers were “old guys” like myself. One of them said that all of the hard problems in computer science had been solved. I disagreed—we old guys and gals may have picked the low-hanging fruit, but there are new kinds of problems.

For example, if we were to try to aggressively support humanities scholar, we would find a class of problems that no one is thinking about yet.

However, I can’t think of anything else on campus, except maybe mathematics, that is both a discipline and an infrastructure. That is a real challenge! It is a challenge at the NSF/NSF, which houses both computer science and engineering research, and the supercomputer centers, in the same directorate. Is that bad? No, it just is. That is a challenge in universities with academic departments and computer centers. Is that bad? No, it is not.

I seem to frequently get involved in discussions about whether this discipline is a science, engineering, or something else. In my view, one of the wonderful things that I think is—that it has managed to embrace everything from computability theory to graph theory, and every point between. There’s a great strength in that!

Try the fields that have split science from engineering, and flavors of science/engineering from one another! There is only one nature. There isn’t a physics nature and a chemistry nature and a biology nature. Those are human constructs. If our goal is to understand nature—but we carve up the search for that understanding in such a way that people can talk to each other because their vocabularies are different, their technologies are different, their funding agencies are different, and their cultures are different—we have built barriers to achieving the goal we started with. This is not a way to improve the understanding of nature! I think we are a science, we are an engineering, we are an infrastructure, we are a whole bunch of things! We are different, and we don’t have a choice about that. But that difference is wonderful. If we model ourselves on the traditional academic disciplines, we lose something very special, very important.

NAE President from Page 1

Pictured above (1 to r), CRA’s vice chair, Mary Lou Soffa (University of Pittsburgh); Roscoe Giles (Boston University), winner of CRA’s 2000 Habermann Award; Juris Hartmanis (Cornell University), winner of CRA’s 2000 Distinguished Service Award; and Stephen Yau (Arizona State University), chair of the selection committee for the latter award. Professors Soffa and Yau presented the awards.

CRA Service Awards Presented at Snowbird
Another student wrote: "I knew nothing about graduate school before, and now I know more about it, so I can make a more educated decision... It was also really good to go to another institution. I was surprised to discover that they have a lot more female CS professors at [my mentor's institution] than they do at [my institution]. That definitely gave me a different perspective on women in CS."

A final student wrote: "The experience was valuable to me at least in part because it helped me decide that I did indeed want to go to graduate school. I wasn’t sure if I would choose industry or academia following my undergraduate degree, but now I am certain."

The study also used the survey to assess the experience of the DMP participants, and found that all of them rated their DMP experience highly. Students were pleased with their participation in the program and thought that they had gained much from it. One student wrote: "I had an excellent experience. Very helpful and knowledgeable mentor..."

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Department of Computer Science

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