CSTB • Computer Science and Telecommunications Board

Update

Volume 1, Issue 3, May 2003

New CSTB Reports Presented at Public Seminars

Steven Bellovin talks about the new report Who Goes There? Authentication Through the Lens of Privacy *at a public seminar held on April 11.*

CSTB has released several new reports on topics ranging from information technology's relationship with creativity to the legal issues involved in information infrastructure protection. To promote the reports and their findings, CSTB organized three public seminars.

A public briefing was held on March 11 to convey the insights from two related reports, *Critical Information Infrastructure Protection and the Law: An Overview of Key Issues* and *Information Technology for Counterterrorism: Immediate Actions and Future Possibilities*. Nearly 65 attendees, representing federal agencies and scientific and policy organizations, heard presentations by committee members at the Keck Center of the National Academies in downtown Washington. Critical Information Infrastructure Protection (CIIP) Committee chair Stewart D. Personick, who is the E.Warren Colehower Chair and professor of telecommunications at Drexel University, presented the CIIP report with committee member Marc J. Zwillinger, a partner at Sonnenschein Nath & Rosenthal. The findings of the counterterrorism study were presented by committee co-chair David A. Patterson, the Pardee Chair of Computer Science at the University of California, Berkeley, and committee member Steve Bellovin, fellow at AT&T Labs Research.

On April 11, CSTB held a public seminar to present *Who Goes There? Authentication Through the Lens of Privacy*. Committee chair Stephen Kent of BBN Technologies led the discussion, and committee members James Wayman, Soumitra Sengupta, Steven Bellovin, Joseph Pato, Drew Dean, and Stephen Holden provided additional perspective. The audience of nearly 70 included representatives of companies

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Spotlight on a Board Member

David Patterson, the Pardee Chair of Computer Science at the University of California, Berkeley, has been a member of CSTB since 1998. He has served on several committees, most recently as co-chair of the committee on Science and Technology for Countering Terrorism: Panel for Information Technology. He is a member of the National Academy of Engineering and has served on its membership and peer committees.

Patterson led the design and implementation of RISC I, probably the first VLSI Reduced Instruction Set Computer. This research became the foundation of the SPARC architecture, used by Sun Microsystems and others. He was a leader, along with incoming CSTB member Randy Katz, of the Redundant Arrays of Inexpensive Disks (RAID) project, which led to reliable storage systems from many companies. He is coauthor of five books, including two with John Hennessy, a CSTB alumnus who is now president of Stanford University. Patterson has been chair of the CS division at Berkeley, the Association for Computer Machinery (ACM) Special Interest Group in computer architecture, and the Computing Research Association.

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In This Issue

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Marjory's Perspective

Where is information technology going, and who cares? There are many answers to that question—different people think about IT in different ways. Most of the answers are rather utilitarian, because most people see IT as means to practical ends: IT provides tools for people in offices, factories, farms, and so on to do what they do faster, cheaper, more collaboratively, more safely, and so on. This view is familiar and easy to understand. But it may also be limiting.

CSTB has just completed an unusual exploration of the intersections of IT with the arts and design, thanks to a grant from the Rockefeller Foundation. As the title—*Beyond Productivity: Information Technology, Innovation, and Creativity*—suggests, there is more to IT than most people see. Artists and designers working in those intersections show how IT can enhance their creativity, and computer scientists working in those intersections show how drawing from the arts and design can enhance IT itself. A new kind of research has begun to emerge, alongside new kinds of art and design. Whether they flourish will depend on the flow of talent, funding, and other kinds of support. The potential is there and ready to be nurtured.

Making the most of the intersections of IT with the arts and design depends critically on people. Pioneering individuals from computer science and the arts and design fields have invested in learning about very different fields in order to explore this space. They stand out—and sometimes endure criticisms—from their colleagues doing more traditional work. In some cases, people have collaborated across disciplinary boundaries, but cultural differences make this obvious task easier to suggest than to achieve. CSTB staff lived that challenge in the making of *Beyond Productivity*, which was an exercise in transdisciplinary communication and collaboration.

Not surprisingly, more artists and designers have experimented with IT than computer scientists have explored what the arts and design can do for them. But we at CSTB hope that *Beyond Productivity* will motivate more people of all kinds to explore the emerging domain that the report calls "IT and creative practices." *Beyond Productivity* shows how a broad view of what IT is, how it can be used, and who cares can yield exciting results and benefit the public in many ways. ■

Spotlight on a Board Member

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His teaching has been honored by the ACM, the IEEE, and the University of California. Patterson shared the 1999 IEEE Reynold Johnson Information Storage Award with Randy Katz for the development of RAID and shared the 2000 IEEE von Neumann medal with John Hennessy for "creating a revolution in computer architecture through their exploration, popularization, and commercialization of architectural innovations."

Update: As you reflect on your years of service to CSTB as a board member, co-chair, and committee member, what would you say were the challenges of wearing those three hats?
David Patterson: The main challenge was time management between all the commitments. The good news was that several board members volunteered to be on the committee, and so we got to know each other even better by working on a project together. Given the tight deadline, it was also helpful to have co-chairs, as one could take over for the other if he was caught in, say, an e-mail avalanche.

Update: During the study on science and technology for countering terrorism, you co-chaired the Panel on Information Technology with John Hennessy. What was the experience like?
DP: Most of the panel members had worked together before, so we were able to skip the getting acquainted phase that is so important to these reports. We all made time in our schedules because we had to rise to the challenge to our country.

Update: More generally, what are your thoughts about the CSTB committee process and its ability to knit together different perspectives?
DP: Four two-day meetings turn very busy strangers from different backgrounds into a team that at least understands each of the perspectives, so the process often tempers strongly held views.

Update: What significant changes in the intersection of computer science and technology policy have you observed since you became a board member in 1998?
DP: As Moore's law drives down the cost of information technology, IT is becoming more widespread in our society and hence a topic of examination by researchers from other fields. For example, the Internet befuddles economists because it runs more like a cooperative than like a marketplace. When the Internet was the playpen of 10,000 computing professionals, no one else cared. Now that it is the communication lifeblood for millions of

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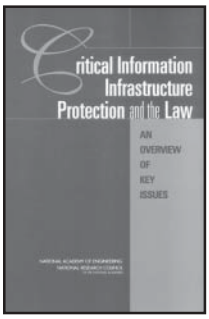
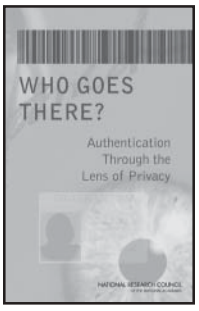
Latest Reports

For a complete list of reports, visit www.cstb.org/publications.

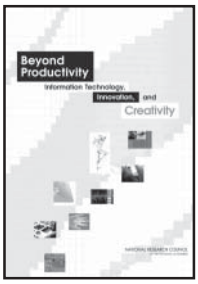
Fair Weather: Effective Partnerships in Weather and Climate Services (released January 2003) recommends that the National Weather Service (NWS) continue to issue general forecasts and provide unrestricted access to observational data and model results, even though private companies also produce weather forecasts. However, the NWS should come up with a new process for deciding whether a particular forecast or weather product should be created by the NWS or the private sector. This report was produced by the Board on Earth Sciences and Resources (BESR) in association with the Board on Atmospheric Sciences and Climate and CSTB. *Anne M. Linn (BESR), Study Director. Cynthia A. Patterson, Program Officer.*



Critical Information Infrastructure Protection and the Law: An Overview of Key Issues (released March 2003) outlines the legal and business issues associated with the protection of information infrastructures. These issues include incentives and disincentives for information sharing between the public and private sectors, and the role of FOIA and antitrust laws as a barrier to or facilitator of progress. The report also provides a preliminary analysis of the role of criminal law, liability law, and the establishment of best practices in encouraging various stakeholders to secure their computer systems and networks. *Cynthia A. Patterson, Study Director. D.C. Drake, Senior Project Assistant.*



Who Goes There? Authentication Through the Lens of Privacy (released March 2003) explores authentication technologies (including passwords, PKI, biometrics, etc.) and their implications for the privacy of the individuals being authenticated. As authentication becomes ever more ubiquitous, understanding its interplay with privacy is vital. The report examines numerous concepts, including authentication, authorization, identification, privacy, and security. It provides a framework to guide thinking about these issues when deciding whether and how to use authentication in a particular context. The report explains how privacy is affected by system design decisions. It presents steps one can take to mitigate adverse privacy effects of authentication systems. The report also describes government's unique role in authentication and what this means for how government can use authentication with minimal invasions of privacy. In addition, the report outlines usability and security considerations and provides a primer on privacy law and policy. *Lynette I. Millett, Study Director. Jennifer M. Bishop, Senior Project Assistant.*



Beyond Productivity: Information Technology, Innovation, and Creativity (released March 2003) represents CSTB's first major study bringing together the arts, design professions, and the humanities with information technologists. The multidisciplinary committee found that collaborations of individuals drawn from these groups can yield extraordinary benefits to the economy and society at large, but they entail challenges. The report explores ways that policy makers and leaders in cultural organizations, industry, and academia can foster and promote work at the intersection of IT, the arts, and design through

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www.cstb.org

CSTB Calendar—Spring/Summer 2003

May 19-21. Board meeting. Woods Hole, Massachusetts.

May 21-23. Second meeting of the Committee on **The Future of Supercomputing**. Palo Alto, California.

May 30-31. Fourth meeting of the Committee on **Digital Archiving and the National Archives and Records Administration**. Mountain View, California.

July 17-18. Second Meeting of the Committee on **Telecommunications Research and Develppment**. Location TBD.

September 24-26. Third Meeting of the Committee on **The Future of Supercomputing**. Santa Fe, New Mexico.

TBD. First meeting of the Committee on **Building Certifiably Dependable Systems**. Washington, D.C.

TBD. Public seminar of *Beyond Productivity: Information Technology, Innovation, and Creativity*. San Francisco, California.

Note: Refer to www.cstb.org for the latest news and events.

CSTB Reports Presented at Public Seminars

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developing authentication technologies, privacy advocacy groups, and federal agencies.

The Rockefeller Foundation, the sponsor of CSTB's study looking at the intersection of information technology and creativity, hosted an event at its headquarters in midtown Manhattan on May 14 to present *Beyond Productivity: Information Technology, Innovation, and Creativity*. The presentation was attended by representatives of cultural, philanthropic, and art and design institutions—audiences that are seldom briefed on CSTB reports. The group of over 80 attendees heard from committee chair William Mitchell of the School of Architecture and Planning at MIT and committee members Roger Dannenberg, Michael Century, and Phoebe Sengers. The committee members demonstrated examples of new media projects at the intersection of information technology and creativity. The event was held in New York to capitalize on that city's rich heritage in the arts, design, and multimedia. A second event, attended by more than 70, was held the next morning at the Cooper-Hewitt, National Design Museum of the Smithsonian Institution.

For a complete listing of recent reports, visit www.cstb.org/publications.

What You Can Do

CSTB welcomes suggestions and ideas for projects, funding, and dissemination as well as feedback on how CSTB can better fulfill its role in advising the nation on computer science and telecommunications policy. Please send comments on study topics and projects, sponsorship and funding, and outreach and dissemination to cstb@nas.edu.

Active Projects

Projects that have recently released reports

Authentication Technologies and Their Privacy Implications
Critical Information Infrastructure Protection and the Law
IT and Creativity
Partnerships in Weather and Climate Services
Workshop on the Intersections Between Geospatial Information and Information Technology
Science & Technology for Countering Terrorism: Panel on Information Technology

Projects launched in 2003

Improving Cybersecurity Research in the United States
The Future of Supercomputing
Telecommunications Research and Development
Sufficient Evidence? Building Certifiably Dependable Systems
Wireless Technology Prospects and Policy Options

Ongoing Projects

Digital Archiving and the National Archives and Records Administration
Frontiers at the Interface of Computing and Biology
Fundamentals of Computer Science: Challenges and Opportunities
Internet Navigation and the Domain Name System: Technical Alternatives and Policy Implications
Privacy in the Information Age

For a complete listing of all projects, visit www.cstb.org/projects. Information about recent publications can be found at www.cstb.org/publications.

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From Hard Problems to Findings and Recommendations

The Path of a CSTB Study

CSTB staffers are often asked questions about the National Research Council's study process: Who requests and supports the work of the NRC? How are committee members selected? What is the length of a typical study? How can we be sure that the committee's findings are not biased or narrow? The answers explain what makes CSTB's work special. The study process, complex as it may be, is crucial to ensuring balance and objectivity in a committee's findings and recommendations. *See page 7 for an illustration of a typical study's path.*

Projects begin with a proposal to investigate an area or impact of computer science and telecommunications that has important social and policy implications. Some studies are initiated by CSTB, arising from discussions at Board meetings; others are specifically requested by sponsors or are mandated by congress. Proposals for projects are reviewed and approved first by CSTB and the Division on Engineering and Physical Sciences (DEPS) and then by the NRC's Governing Board or its Executive Committee. Sponsors and funding levels are identified, and committee selection begins.

Prospective committee members are identified in a variety of ways, including suggestions from individuals considered knowledgeable in the fields in which nominees are sought. Most suggestions for committee members come from individuals in the relevant fields. Most of CSTB's committees have 10 to 18 members.

Many of CSTB's studies are planned on an 18- to 24-month time line and include five or more committee meetings. At these meetings, committee members might hear presentations on topics relevant to the study given by representatives from research institutions, industry, government, and public policy organizations in sessions that are open to the public. In closed sessions, the committee discusses the presentations, prior research, and short-term and long-term concerns and problems. Drawing upon their own experience and knowledge as well as other relevant work in the topic area, committee members write pieces of the report, explaining the topic and its potential policy implications, providing background information, and formulating findings and/or recommendations. The committee's deliberations and writing result in a draft report that is sent to review.

Peer review, the next step in the path, is important to the production of a balanced and comprehensive report that avoids polemical discussions and presents well-supported facts. Every NRC committee report is reviewed by individuals independent of the institution. The reviewers, who are experts in the relvant fields, suggest ways to improve the content, structure, and potential impact of the report. The committee is required to respond to every review comment, whether they decide to implement the reviewers' suggestions or not. Once this has been accomplished, CSTB staff submit the final report draft

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New Projects

The Committee on the Future of Supercomputing held its first meeting on March 6 and 7. Representatives of the U.S. Department of Energy, the sponsor of this study, charged the committee with assessing the status of supercomputing in the United States, including the characteristics of relevant systems and architecture research in government, industry, and academia and the characteristics of the relevant market. The committee heard presentations on the applications, market concerns, and policy implications of supercomputing given by representatives of the National Security Agency, IBM, Intel, the Asian Technology Information Program, the Department of Defense, the National Cancer Institute, and DARPA.

The Committee on Telecommunications Research and Development met for the first time on April 28 and 29. The committee will conduct an assessment of the state of telecommunications research and development in the U.S., analyze the implications of changes in the level of support and research focus across the industry, and examine possible solutions to strengthen telecommunications R&D.

Additional projects launching in the next few months are Building Certifiably Dependable Systems; Wireless Technology Prospects and Policy Options; and Improving Cybersecurity Research in the United States.

CSTB Members Elected to NAE

The National Academy of Engineering (NAE) elected 77 new members on February 14, some of whom are CSTB board members. **Hector Garcia-Molina**, professor and chair, Computer Science Department, Stanford University, was honored for contributions to distributed-information systems and **Burton J. Smith**, chief scientist, Cray Inc., for contributions to the development of parallel computer architecture. That brings to seven the number of current CSTB members in the NAE (**David D. Clark**, MIT; **John Cioffi**, Stanford; **Butler Lampson**, Microsoft; **Dave Patterson**, Berkeley) and the Institute of Medicine (**William Stead**, Vanderbilt University).

Spotlight on a Board Member

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people, it's worth understanding.

Update: What are your observations on CSTB's body of work and its evolution over time?
DP: The pendulum is swinging from IT alone towards IT and society.

Update: What are your thoughts on the future of tech policy as it relates to hardware research?
DP: I believe the policy issues of security, privacy, and digital rights will affect the evolution of microprocessors. For security reasons, a microprocessor would like to verify that the software running on the hardware is the software that the operating system expects; that is, it is not the software equivalent of the Trojan Horse. But this same technology might also be used to verify that you have paid for this software, or to prevent software from one company running with software from another company. Without policy guidance, how is the microprocessor designer to know what to do?

Update: What do you find worthwhile or significant about being a computer scientist in the public policy arena?
DP: As all of us have benefited from government support of our research field, I feel good about partially repaying that debt by helping create a technically accurate perspective on policy issues that may affect us all.

Update: What advice would you give to current and potential committee/board members of CSTB?
DP: Although people encourage you to serve because it is important for society to get disinterested scientific assessment of important issues of our time, it is also good for you personally. You expand your area of expertise by learning about related fields and increase your visibility within your community and beyond. If I look back at my first report, *Computing the Future*, in1992, of the 14 computer scientists on the committee, six were elected to NAE and three won the Turing Award, the highest award in computer science and engineering. Hence, you can serve your field, your country, and your career by agreeing to be on a CSTB panel!

Latest Reports

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research, funding, and building new relationships. It makes recommendations for enhancing students' skill sets and fluency in IT and the arts through expanded curricula and workshops, for increasing and diversifying monetary and program support by grant makers and government agencies, and for industry involvement in projects and innovations. *Alan S. Inouye, Study Director. Margaret Huynh, Senior Project Assistant.*

The Path of a CSTB Study

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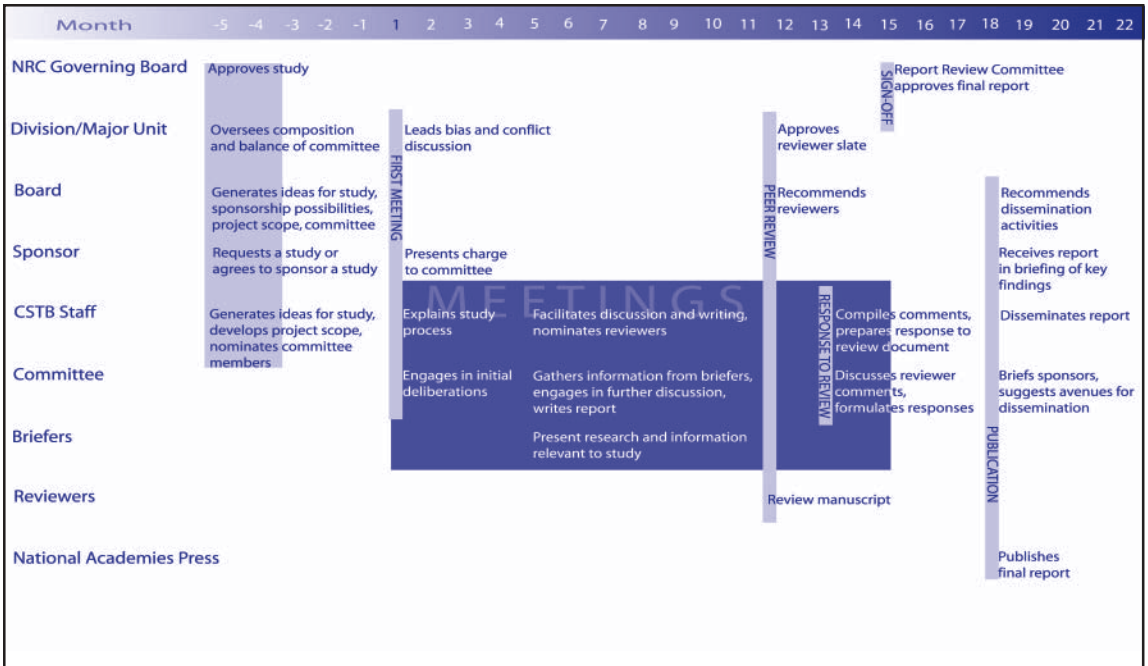
for institutional approval.

Once sign-off is achieved, the report undergoes some copy edits before being released to the public. Ideally, the report has already been edited once for grammar, style, and consistency before it goes through the review process. Copyediting a CSTB report is no easy task, and the work of the DEPS editors is essential to ensuring a readable and visually accessible final product.

Report releases and initial media exposure are handled through the National Academies' Office of News and Public Information. Dissemination of the final report is a collaborative effort with participation by committee members, staff, board members, the National Academies Press, and others. Dissemination efforts continue long after the study comes to a close; many of the findings of CSTB's reports are far-reaching and will remain relevant to public policy decisions and trends for years to come.

2003 DEPS Awards

Several CSTB staff members were honored during the Division on Engineering and Physical Sciences (DEPS) awards ceremony on January 13. **Marjory S. Blumenthal**, executive director, was recognized for her 15 years of service with the National Academies. **Herbert S. Lin**, senior scientist, received the DEPS Exceptional Service Award for his active involvement and leadership in numerous study reports, including *Cryptography's Role in Securing the Information Society* (1996) and *Youth, Pornography, and the Internet* (2002). **Janet Briscoe**, administrative officer, was a recipient of the Special Group Award for coordinating the move to the new building last July. **Margaret Huynh**, senior project assistant, received the DEPS Notable Achievement Award for her outstanding contributions to CSTB and for serving as a role model for other project assistants in the National Academies. Another recipient of the DEPS Notable Achievement Award, **Jennifer M. Bishop**, senior project assistant, was recognized for her creative talents in designing several of the CSTB book covers, including *The Internet Under Crisis Conditions: Learning from September 11* (2002) and *Who Goes There? Authentication Through the Lens of Privacy* (2003).



The path of a typical CSTB study. Work begins long before the project's official start date. Much care is taken in putting together a committee, as the outcome of the study depends mainly upon the efforts of these volunteers. Some studies produce two or more reports, resulting in a longer timeline. Dissemination of reports continues long after the close of the study.

CSTB Collaborates with Other Academies Boards on Interdisciplinary Projects

CSTB has participated in several collaborative studies with other program units of the National Academies, at times lending IT expertise to a broader inquiry into science and technology policy and at other times calling on the insights of other boards to examine hard problems at the intersection of IT and other disciplines. A list of recent collaborative efforts follows:

Youth, Pornography, and the Internet (2002) and its two companion workshop reports were the result of a collaboration between CSTB and the Board on Children, Youth, and Families.

Making the Nation Safer: The Role of Science and Technology in Countering Terrorism (2002) was the result of an Academies-wide study initiated in response to September 11. The authoring committee was assisted by eight supporting panels in specific topical areas. CSTB convened the Panel on Information Technology, which authored its own report, *Information Technology for Counterterrorism: Immediate Actions and Future Possibilities* (2003).

Fair Weather: Effective Partnerships in Weather and Climate Services (2003) resulted from a cooperative study between CSTB, the Board on Earth Sciences and Resources, and the Board on Atmospheric Sciences and Climate.

Alan S. Inouye, Senior Program Officer, is serving on the staff of the upcoming Symposium on Electronic Scientific, Technical, and Medical Journal Publishing and Its Implications (May 2003), led by the Committee on Science, Engineering, and Public Policy in collaboration with CSTB and the Board on Life Sciences.

Herbert S. Lin, Senior Scientist, is Study Director for Frontiers at the Interface of Computing and Biology, a project of CSTB and the Board on Biology.

Media Milestone

Youth, Pornography, and the Internet, released one year ago, continues to generate interest in the educational arena. Committee member **Linda Hodge**, president of the National Parent-Teacher Association (PTA) and **Herbert S. Lin**, study director for the report, coauthored an article in the April/May 2003 issue of *Our Children*, the magazine of the National PTA. The article describes the benefits of the Internet for children, strategies for teaching a child about online safety, and the role of schools, technology, policy, and law enforcement. The article provides guidelines and a sample of "acceptable use policies" (AUP) for kids' safe usage of the Net. In addition, committee member **Winnie Wechsler**, an independent consultant, briefed the report at the Spring 2003 CUE (Computer-Using Educators) Conference in Anaheim, CA.

Steven Woo, Program and Dissemniation Officer, is serving on the staff of the Transportation Research Board's scoping study on Freight Transportation Information Systems Security.

www.cstb.org

The IRS and Beyond: CSTB's Privacy Portfolio

The E-Government Act of 2002 requires federal agencies to conduct privacy impact assessments (PIAs) before developing or procuring an information system or initiating a new collection of personally identifiable information that will be proceseed electronically. CSTB has a long history of looking at privacy and technology-related issues, starting with its exploration of systems modernization at the Social Security Administration and the Internal Revenue Service. *Review of the Tax Systems Modernization of the Internal Revenue Service* (1992) recommended that the IRS institutionalize its considerations of privacy issues and impacts. Today, the IRS's PIA serves as a model to other agencies.

Over the years since then, numerous CSTB reports have looked at privacy. *Realizing the Information Future* (1994) stresses the importance of architectures that protect privacy. *Rights and Responsibilities of Participants in Networked Communities* (1994) considers that reasonable expectations of privacy on electronic networks are not always clear. *Cryptography's Role in Securing the Information Society* (1996) was a comprehensive report that explored the implications of cryptography—the foundation of many privacy-enhancing technologies. *Fostering Research on the Economic and Social Impacts of Information Technology* (1998) points out several unanswered questions about privacy in the context of the information economy and society. *Global Networks and Local Values* (2001) provides a comparative look at the respective approaches of the United States and Germany to privacy and freedom of information. *Who Goes There? Authentication Through the Lens of Privacy* (2003) explores authentication's relationship to privacy. That committee noted the need for careful consideration of privacy from a systems perspective and outlined several design principles that would aid in developing privacy-sensitive authentication systems. CSTB's Committee on Privacy in the Information Age (launched in the summer of 2002) is currently examining the broad policy implications of ubiquitous information technology and its effects on privacy. Possible future activities include a study on biometrics and a look at identity theft and what technology could do to help solve this problem.

Privacy issues are in the news almost daily. CSTB's portfolio illuminates this complex and far-reaching topic in many ways. Stay tuned for more to come in the months and years ahead.

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