

The PLATO computer-based education system will be discussed in the Minnesota Computer History Lecture Series.

Mission Completed!

IPTO Study Published

CBI's study of the Information Processing Techniques Office (IPTO), *Transforming Computer Technology*, has been published by Johns Hopkins University Press. Arthur Norberg and Judy O'Neill describe IPTO's critical role in the development of information processing technology from 1962 to 1986.

IPTO created ARPANET, and sponsored the Internet, improving communications between IPTO-funded universities. Its promotion of timesharing, computer graphics, and artificial intelligence also developed these core computing technologies.

IPTO's model for computing was the Air Force Semi-Automatic Ground Environment (SAGE), which differed

from the batch-processing model used by the leading computer companies. IPTO's first directors, including J.C.R. Licklider, Ivan Sutherland, Robert Taylor, and Lawrence Roberts, promoted similar interactive computing techniques starting in 1962. IPTO's programs led to the triumph of interactive computing in the 1980s and 1990s. Their success owed a great deal to its lean, informal style of management.

The IPTO project began in 1989 when the Defense Advanced Research Projects Agency (DARPA) commissioned a history of IPTO by CBI. The project has also produced several articles by Norberg and O'Neill, as well as numerous oral histories now available at CBI. □

CBI Lecture Series

Celebrating Minnesota Computing

What put the Twin Cities in the forefront of the computer industry, and is its past glory still relevant today? Six lectures by historians, journalists, and the participants themselves explore this question in CBI's lecture series, cosponsored by the Minnesota History Center and the Science Museum of Minnesota, and Unisys.

Two lectures have already been given: Arthur L. Norberg's "Where It All Started: The Legacy of Engineering Research Associates," delivered September 19, and David Lundstrom's "Dilbert in Minnesota's Computer Industry," given September 26.

Upcoming lectures include David Boslaugh, "Prescription for Success: The Navy, Computers, and Minnesota," October 10 in the Science Museum Auditorium, on the Naval Tactical Data System; Chuck Murray, "The Biggest and Fastest: Minnesota's Supercomputer Industry," scheduled for October 24, in the Science Museum Auditorium; Ken Brumbaugh, "As Ancient as PLATO: Computer-based Education from Minnesota," on November 7 in the Science Museum Auditorium; and Tomash Fellow Pat Hemmis, "The Machine is the Metaphor: The Digital Computer and Minnesota Culture," on November 21 in the Minnesota History Center, 3M Auditorium. All lectures are free and open to the public and begin at 7:00 p. m. □

GE & Univac Records Donated to CBI

CBI acquired records of General Electric's computer department, Univac projects in St. Paul, Minnesota, the general computer industry, and the early Internet among thirty new collections this year.

H. R. "Barney" Oldfield donated records relating to his research for his history of the General Electric Computer Department, *King of the Seven Dwarves* (see Recent Publications). Oldfield was the general manager of GE's computer department in the 1960s. The papers include records and publications saved by Oldfield, others given to him, and written reminiscences from former Computer Department employees. CBI has one of the most comprehensive collections regarding GE's Computer Department, as most of its records were destroyed in the 1980s.

Warren P. Burrell donated records relating to Engineering Research Associates and Sperry Univac machines and projects including the ERA 1101, 1102, 1103, and Univac File Computer, 1105, LARC, 1107, and 1110, trip

reports, day files, patents and preliminary product descriptions.

Louis Schleuter, a Univac engineer, donated materials relating to the Mapper database system that he helped develop as a renegade program at Sperry. Customers' demands that the program be bundled with major hardware purchases made it a formal product. Versions continue to be produced by Unisys for platforms such as Windows and NT. The donation contains product literature, technical reports, and a historical description of Mapper.

Alex McKenzie, formerly of Bolt, Beranek, and Newman, donated records relating to the International Packet Network Working Group (INWG). The group's development of international standard protocols for internetworking led to Transmission Control Protocol/Internet Protocol (TCP/IP). The collection includes Internet experiment notes and INWG protocol notes, general notes, and newsletters. These records complement McKenzie's oral history. □

New Staff Improves CBI Service



Jackie Geier, CBI's secretary and administrative assistant, with her son Ishaq.

CBI's varied activities require a multi-talented staff. We are fortunate to have the services of Jackie Geier, secretary for the office and the de facto administrative assistant, and two students who assist CBI's archivists in record processing.

A Minnesota native, Jackie received her B.A. degree in Government from Harvard University, and went overseas as a Peace Corps volunteer in Mali, where she worked in water resource management and health education. She taught English as a Second Language in Barcelona for a year, and then worked as a health education consultant. She returned to St. Paul, where she created a dynamic youth program including a theater troupe, job program, and leadership group.

Having decided to continue her studies for a Master's degree in Public Administration and International Development, Jackie sought work at the University of Minnesota, when CBI was fortunate enough to hire her. She continually seeks ways to use her many organizational and problem-solving

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Production of this newsletter is supported by Analysts International.

Recent Publications

Hawisher, Gail E., Paul LeBlanc, Charles Moran, and Cynthia L. Selfe, *Computers and the Teaching of Writing in American Higher Education, 1979-1994: A History*, (Norwood, N. J.: Ablex Publishing Corporation, 1996).

Norberg, Arthur L., Judy E. O'Neill, and Kerry Freedman, *Transforming Computer Technology: Information Processing for the Pentagon 1962-1986*, (Baltimore: Johns Hopkins University Press, 1996).

Oldfield, H. R. Barney, *King of the Seven Dwarves*, (Los Alamitos, California: IEEE Computer Society Press, 1996).

Rawlins, Gregory J. E., *Moths to the Flame: The Seductions of Computer Technology*, (Cambridge: The MIT Press, 1996).

Ruhleder, Karen, "Reconstructing Artifacts, Reconstructing Work: From Textual Edition to On-Line Databank," *Science, Technology, & Human Values* 20:1 (1995): 39-64.

Simons, Robert, "The Evolution of
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CHARLES BABBAGE INSTITUTE NEWSLETTER

The Charles Babbage Institute, Center for the History of Computing, is sponsored by the University of Minnesota and the information processing community.

Charles Babbage Institute Newsletter is a publication of the Charles Babbage Institute, University of Minnesota, 103 Walter Library, 117 Pleasant Street S. E., Minneapolis, MN 55455 USA. The Newsletter reports on Institute activities and other developments in the history of information processing. Permission to copy without fee all or part of this material is granted provided that the source is cited and a copy of the publication containing the copied material is sent to the Institute.

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Annual Report: "The Year of the Computer"

This year the Charles Babbage Institute has celebrated the 50th anniversary of ENIAC and ERA, two progenitors of modern computing.

Historical sessions and activities at the University of Pennsylvania in February and May celebrated the 50th anniversaries of the public announcement of the ENIAC and the Moore School Lectures.

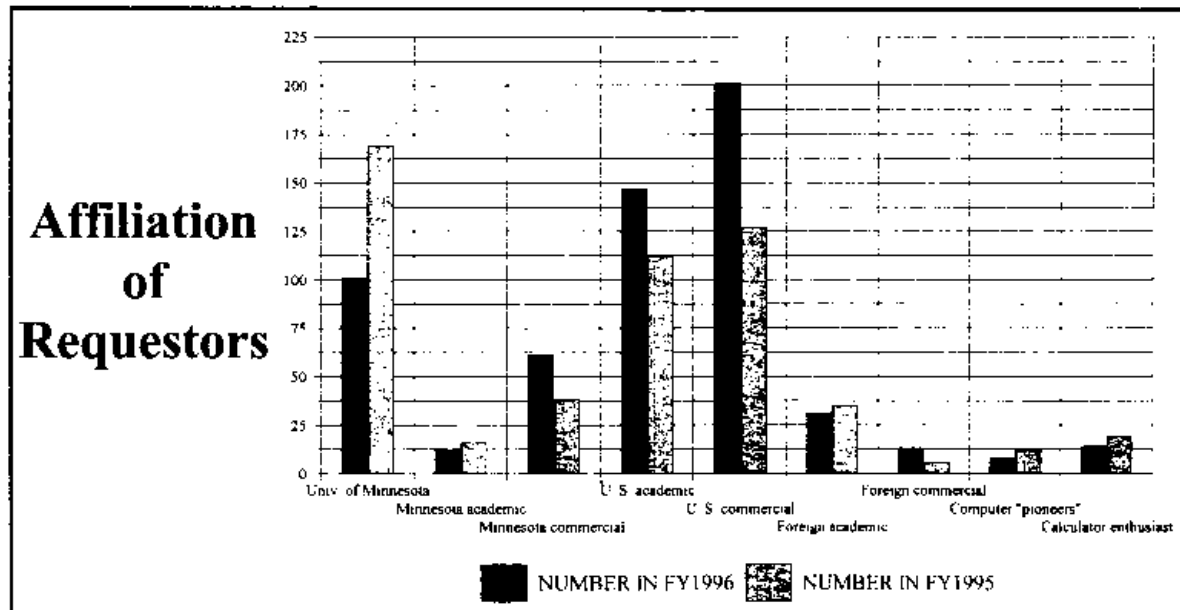
CBI Archivist Bruce Bruemmer served on the ACM Pioneers Committee, chaired by Tim Bergin of American University, to organize a "history track" for the ACM conference in February. CBI Director Bob Seidel was the head of the program committee for the historical sessions in the Moore School lecture series. Tomash Fellow Atsushi Akera organized both celebrations in cooperation with Penn.

CBI commemorated the 50th anniversary of the incorporation of Engineering Research Associates in 1946. On May 22, a luncheon at the Strictly Business Show in Minneapolis honoring ERA founder and CBF Trustee William Norris featured the proclamation of the Year of the Computer by Minnesota Governor Arne Carlson. CBI coordinated a display of the Cray-1 and Control Data 1604, with the support of Cray Research and Skyline Displays.

In cooperation with the University of Saint Thomas, the Hubert Humphrey Institute for Public Affairs, and the University of Minnesota, CBI organized a conference, "50 Years of Computing in Minnesota," held September 12-13, 1996 at the Hubert Humphrey Institute. Keynote speakers included John Gunyou of the Minnesota Technology Office, Marie Ancho dugoy of the University of Washington, Bill Norris of the Norris Institute, and Frank Soltis of IBM Rochester. Willis K. Drake, Analysts International, Control Data Systems, IBM, and the Norris Institute provided funding for this event.

A New Home

In its last session, the Minnesota State Legislature approved the new Minnesota Library Access Center. CBI



Use of CBI's archives continued at the record pace set in 1995. Nearly 1/3 of reference requests are now received through e-mail, contributing to the growing percentage of non-local requests. National and international use of the archives grew from 58% of requests in 1995 to 70.5% of requests in 1996. Commercial use grew from 31.5% 1995 to 47.5% of requests from 1995 to 1996. (CBI archives)

will occupy the second floor of the new archives center which will provide mined storage space for our archives affording optimal environment conditions.

Research and Publication at CBI

Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986, the Summer 1996 special edition of the *IEEE Annals of the History of Computing*, a special issue of *Physics Today* on the history of computing to appear in October top CBI's list of publications.

CBI's current research focuses on the development and use of computers as a scientific instrument.

Fund-raising

Charles Babbage Foundation (CBF) directors launched an Endowment Campaign to help CBI support scholarship in the history of computing and expansion of CBI collections.

Erwin Tomash provided a new brochure to introduce its work to potential users and supporters. Willis K. Drake organized a local committee of friends of the University of Minnesota to help raise an endowment earmarked specifically for the use of CBI. John Carlson assisted Bill Drake in the fund-raising campaign which is coordinated with other University of Minnesota

campaigns. Director Walter Carlson has designed a fund-raising campaign aimed at world-wide friends of CBI.

Contributors to the 1996 CBI Friends campaign include:

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Kwan Soo Lee

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The History of Computing in Europe

The quadrennial meeting of the History of Science Societies of Britain, Canada, and the United States in Edinburgh, of the Society for History of Technology in London, and the International Committee of the History of Technology in Budapest between July 20 and August 10 provided an opportunity to survey activities under way in Europe in the history of computing.

BSHS/HSS/CSHS in Edinburgh

The British Society for History of Science hosted the American History of Science Society and the Canadian Society for History of Science in Edinburgh in July.

The origins of computers--mathematical instruments--were examined in a session entitled, "Bridging Theory and Practice: Roles for Instruments in the History of Mathematics." Henk J. M. Bos discussed the role of instrumental design in the formation of Descartes' *Cogitationes private* of 1618-19, where instruments provided a clear and distinct visualization for the mind's eye in a way that equations did not. Katherine Hill's talk, "Between Theory and Practice: the Role of Instruments in Oughtred's Scheme for Mathematical Education," reviewed the debate between Oughtred and Delamain over the use of instruments in education. Oughtred rejected Delamane's mathematics teaching methods, holding that theory should

precede instrumental understanding of mathematics. Stephen Johnston's "Utility, Certainty and Mathematical Instruments," argued that mathematical practitioners of 16th century England used instruments to legitimate their place at the top of the hierarchy of natural philosophers.

In a session entitled, "Did the Royal Society Matter in the 18th Century," Richard Sorrenson discussed "Imperial Science at the Royal Society in the 18th Century," pointing out the importance of mixed mathematics, including mathematical instruments, to Britain and to the Royal Society, which encouraged and supervised work in this area. Larry Stewart's "Other Centers of Calculation, or, Where the Royal Society didn't Count," argued that Amsterdam and Antwerp pioneered in the cultivation of these fields to support trade. Sir Thomas Gresham drew upon them when he established mathematical lectures at Gresham College early in the 17th century. London mechanics also sponsored mathematical lectures, indicating their dual use for commerce and cognition.

In addition to writing the history of computing, historians are also using computers in the history of science. A session considered whether such techniques provided a digital sieve, impermeable boundary, or windows of

opportunity. Gloria Clifton discussed Project SIMON, an historical database of 6,000 masters and 12,000 makers which may be placed on the World-Wide Web. Michael Gorman described "Computer Supported Interpretation of Inventor's Sketches," using branching degree diagrams, maps, and a functional programming environment using the Clarity database. Using Alexander Graham Bell's notebooks, he reconstructs the invention of the telephone step by step.

Ryan Tweeney analyzed the discovery of electromagnetic induction by Faraday using neural networks. However, only twelve of fifty-four experiments could be duplicated, and the introduction of unsuccessful experiments made the system unable to learn.

SHOT

The history of computing was well-represented at the Society for the History of Technology meeting in London. Eric S. Boyles of the University of Minnesota presented "From *The Forbidden Planet* to Flexible Mass Production: Innovation in the U. S. Industrial Robotics Industry, 1955-1985." He described the development of industrial robotics by Unimation, Milacron, Borg-Warner and Hughes Tool Company, leading to the acquisition and production of industrial robots by GE, Westinghouse, IBM, and GM.

"Technologies of Control and the Control of Technology: International Perspectives," was organized by David Mindell, whose paper, "Control Engineering in World War II: an International Comparison," described how modern control engineering formalized feedback control techniques in the United States, Britain, and Germany during World War II. Chris Bissell presented "Technology, Pedagogy, and Historiography: Aleksandr Andronov and the Development of the Soviet School of Postwar Control Engineering," indicating the differences between control engineering in the West and the Soviet Union. Slave Gerovitch analyzed "A Negative Feedback: the Anti-Cybernetics Campaign in the Soviet Union," by comparing it with other political campaigns. He showed that it originated within the academy,

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Annual Report . . .

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Paul McConnell
Arthur L. Norberg
Emerson Pugh
Peter D. Smith
John A. S. Webster

New CBF Trustees include Lester Davis, Professors Gerald and Thelma Estrin, George Glaser, John Sell, and Jack Shemer.

Archives

The National Historical Publications and Records Commission granted \$123,201 to microfilm the ENIAC Trial Records held by CBI, the Hagley Library,

and the University of Pennsylvania. This was one of the highest amounts granted by NHPRC, and the importance of the material to historians makes it a valuable project

The archives continued to see heavy use during the current year with 269 phone, 11 on-site, 171 electronic mail, and 35 letter requests from 291 academic users, 275 commercial firms, 8 computer pioneers, and 14 calculator enthusiasts. This is a record number of requests for any year. American commercial and academic use grew most rapidly, with commercial use growing to nearly half of the total number of requests. □

History of Computing in Europe . . .

Continued from page 4

while military cybernetics pressed forward unhindered. Paul Edwards discussed "The World in a Machine: Origins and Impacts of Early Computerised Global Systems Models."

Tomash Fellow Atsushi Akera organized a session on "Postwar Visions of Computing" chaired by CBI Director Bob Seidel. Pap N'Diaye considered "The National Bureau of Standards v. The Defence Establishment: Fostering a Civilian Computing Industry after World War II." Akera discussed "Technicians and the Seeds of Cooperation: Early Systems Programming and Volunteerism in the IBM 704 Users' Group SHARE," based upon his research at CBI. Jon Agar spoke of "The Flowers Report and the Provision of Computers for British Universities."

Jan Van den Ende organized a session on "Information Technology and the Transformation of Management, 1900-1940." Roy Edwards described "Instruments of Control: Freight management on British Railways in the Early Twentieth Century," an early example of a management information system. "Le travail de Bureau: Office Systems, Machines and Clerks in French Large-Scale Enterprise, 1900-1940," by Ludovic Cailluet, discussed the modernization of information systems in the Pechiney firm in France after World War I. "The Shaping of Office Automation in the Dutch Banking Sector," by Van den Ende and Dirk de Wit described the Efficiency Movement in the Netherlands after World War I.

In a session entitled "Innovation and Modern Technologies," Christophe Lécuyer, Stanford University, the 1996-97 Tomash Fellow, analyzed "The Making of a High-Tech Manufacturing Complex: the Military, Process Innovations and the Rise of Silicon Valley's Microwave Tube Industry, 1948-1972" in terms of the role of the military and aerospace firms, venture capital, team research and development, and university-industry-government interactions.

A session on "Computing and Technology Policy: International Perspectives," organized by Martin Campbell-Kelly, featured "The United

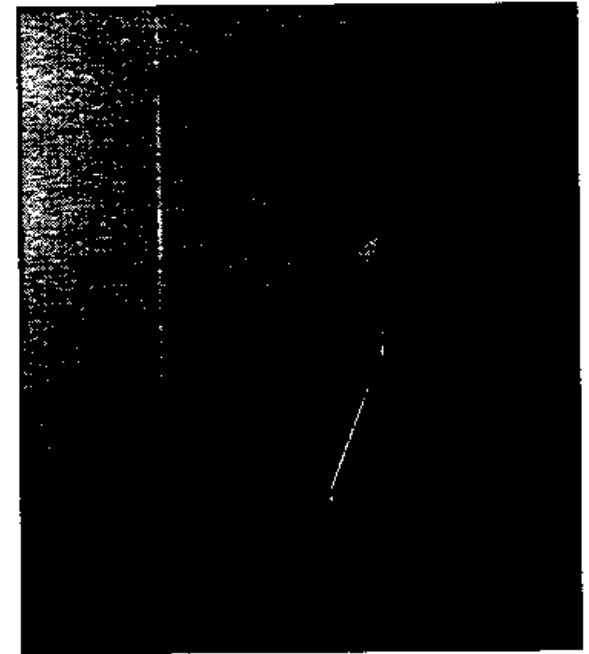
States Pentagon's Role in Transforming Computing, 1962-1986," by former CBI Director Arthur Norberg, "Government Intervention and the Computer Industry in Post-War Britain," by Richard Coopey, and "Government Computer Policy in France since the Second World War," by Pierre Mounier-Kuhn. Norberg summarized the contributions made by DARPA (see article on page 1). Coopey examined the computer industry to determine if it fit the more general model of the relative decline of British industry. Mounier-Kuhn divided his topic into three periods: 1947-1964, when the government pursued a policy of laissez-faire and computer procurement preferred advanced computers from abroad; 1965-1975, when France pursued the Plan Calcul to induce French government agencies to buy French computers, and 1976-1981, when a niche strategy was pursued.

Fourteen members of the Computing Special Interest Group met to discuss their ongoing work in the history of computing. It also decided upon a new name, the Computer History and Information Processing SIG (CHIPS).

ICOHTEC

The International Committee on the History of Technology held its annual meeting in Budapest, Hungary in celebration of the 1100th anniversary of the arrival of the Hungarian tribes. It focused on the history of mining and metallurgy and the development of communication.

The session on the History of Informatics featured papers by Per Vingaard Klüver who spoke on the "Introduction and Early Production of Computers in Denmark," Gyoza Kovacs who spoke of the M-3 Computer built by the Cybernetics Research Group at the Hungarian Academy of Sciences in the late 1950's, Maria Anna Courage, who gave a survey of information technology in the former Soviet Union and Eastern Europe, and Akos Herman, who spoke about dissemination of technical information in Europe and the CIKK database founded by the Federal Chamber of Technical and Scientific Societies. Yerdacul Ceyhun spoke of the convergence of communications and computer technology and the origins of the Global



CBI Director Bob Seidel addresses a session on the history of lasers at the International Committee of the History of Technology in Budapest.

Information Society, and Turkey's attempt to catch up.

These studies, many of which either discuss developments preceding or ancillary to the development of electronic digital computers, enrich the context in which that development can be seen, and augur well for the study of computing within the history of science and technology. □

New Staff . . .

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talents, much to the benefit of CBI and its constituents. Her initiative has been invaluable in organizing the 50th Anniversary celebrations.

Jackie recently started a local cooperative office supply project called the Walter Library Free Store where University staff can donate extra and obsolete supplies to a central store, and find the supplies they need that have been donated by other departments.

Jackie uses her numerous skills even more at home raising her 2 1/2 year old son, Ishaq.

Students Lynn Leitte and Heather Beaton supplemented the work of the archives staff in collection processing since last spring.

Lynn received her undergraduate degree in Art History from the University of Minnesota, Morris, and is now

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New Staff . . .

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completing a Master of Arts in Art History, Theory, and Criticism from the School of the Art Institute of Chicago. This Minnesota native comes to CBI through the direction of David Klaassen, her SAA mentor.

Heather is finishing her undergraduate degree in History with American Studies and Art History minors. She hopes to pursue a career that combines her love of history and travel with skills developed at the University of Minnesota.

Heather added records to the NBS Computer Literature Collection database, created a database of films, completed finding aids for several series, and labeled more than 6000 folders in the Burroughs Collection. Lynn processed Computer Network Development Records donated by Alex McKenzie, and processed the ERA and Remington Rand UNIVAC Records donated by Warren P. Burrell. She is now processing the Charles W. Bachman Papers. The diligent work of Heather and Lynn allows CBI to provide better service, and the archives staff to process the Burroughs Corporation and Control Data Corporation collections. □



GE Managers and Engineers outside the Paradise Valley facility in Arizona. Please call CBI if you can identify them! (CBI Archives)

Recent Publications...

Continued from page 2

IBM High Performance Cooling Technology," *IEEE Transactions on Components, Packaging, and Manufacturing Technology-Part A* 18:4 (December 1995): 805-811.

Toole, Betty Alexandra, "Ada Byron, Lady Lovelace, An Analyst and Metaphysician," *IEEE Annals of the History of Computing* 18:3 (1996): 4-12.

Verdon, Frank, and Mike Wells, "Computing in British Universities: The Computer Board 1966-1991," *The Computer Journal* 38:10 (1995): 822-830.

Von Anthes, Erhard, "Die letzte Hamann-Rechenmaschine: Modell 600," in *Historische Burowelt* (May 1993): 13-18.

Winegrad, Dilys, "Celebrating the Birth of Modern Computing: The Fiftieth Anniversary of a Discovery at the Moore School of Engineering of the University of Pennsylvania," in *IEEE Annals of the History of Computing* 18:1 (Spring 1996): 5-9.

Zachary, Pascal G., *Show-Stopper: The Breakneck Race to Create Windows NT and the Next Generation at Microsoft*, (New York: Free Press, 1994). □

CHARLES BABBAGE INSTITUTE NEWSLETTER

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