

## American Association for the Advancement of Science

*Science* serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

**Publisher:** Richard S. Nicholson

**Editor:** Daniel E. Koshland, Jr.

**Deputy Editor:** Ellis Rubinstein

**Managing Editor:** Monica M. Bradford

**International Editor:** Alun Anderson

**Deputy Editors:** Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*); Thomas R. Cech (*Biological Sciences*)

## EDITORIAL STAFF

**Assistant Managing Editor:** Dawn Bennett

**Senior Editors:** Eleanor Butz, Martha Coleman, Barbara Jasny, Katrina L. Kelner, Phillip D. Szuroni, David F. Voss

**Associate Editors:** R. Brooks Hanson, Pamela J. Hines, Kelly LaMarco, Linda J. Miller, L. Bryan Ray

**Letters:** Christine Gilbert, *editor*; Steven S. Lapham

**Book Reviews:** Katherine Livingston, *editor*; Teresa Fryberger

**Contributing Editor:** Lawrence I. Grossman

**Chief Production Editor:** Ellen E. Murphy

**Editing Department:** Lois Schmitt, *head*; Denise Gipson, Julianne Hunt, Steven Powell

**Copy Desk:** Joi S. Granger, Margaret E. Gray, MaryBeth Shartle, Beverly Shields

**Production Director:** James Landry

**Production Manager:** Kathleen C. Fishback

**Art Director:** Amy Henry

**Assistant Art Director:** Julie Cherry

**Graphics and Production:** Holly Bishop, Diana DeFrancesco, Linda Owens, Catherine S. Siskos

**Systems Analyst:** William Carter

## NEWS STAFF

**Managing News Editor:** Colin Norman

**Deputy News Editors:** Tim Appenzeller, John M. Benditt, Jean Marx

**News and Comment/Research News:** Ivan Amato, Faye Flam, Troy Gately (copy), Ann Gibbons, David P. Hamilton, Constance Holden, Richard A. Kerr, Robert N. Langreth, Eliot Marshall, Joseph Palca, Leslie Roberts

**Bureaus:** Marcia Barinaga (West Coast), Michelle Hoffman (Northeast), Anne Simon Moffat (Midwest)

**Contributing Correspondents:** Jeremy Cherfas, Barry A. Cipra, Robert Crease, Elizabeth Culotta, M. Mitchell Waldrop, Karen Wright

## BUSINESS STAFF

**Marketing Director:** Beth Rosner

**Circulation Director:** Michael Spinella

**Fulfillment Manager:** Marlene Zenda

**Financial Analyst:** Deborah Rivera-Wienhold

**Classified Advertising Supervisor:** Amie Charlene King

## ADVERTISING REPRESENTATIVES

**Director:** Earl J. Scherago

**Traffic Manager:** Donna Rivera

**Traffic Manager (Recruitment):** Gwen Canter

**Advertising Sales Manager:** Richard L. Charles

**Marketing Manager:** Herbert L. Burkland

**Employment Sales Manager:** Edward C. Keller

**Sales:** New York, NY 10036: J. Kevin Henebry, 1515 Broadway (212-730-1050); Scotch Plains, NJ 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); Hoffman Estates, IL 60195: Jack Ryan, 525 W. Higgins Rd. (708-885-8675); San Jose, CA 95112: Bob Brindley, 310 S. 16th St. (408-998-4690); Dorset, VT 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581); Damascus, MD 20872: Rick Sommer, 11318 Kings Valley Dr. (301-972-9270); U.K., Europe: Nick Jones, +44(0)64752918; Telex 42513; FAX (0647) 52053.

**Information for contributors** appears on pages 35–37 of the 4 January 1991 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005. Telephone: 202-326-6500. **Advertising correspondence** should be sent to Tenth Floor, 1515 Broadway, New York, NY 10036. Telephone 212-730-1050 or WU Telex 968082 SCHERAGO, or FAX 212-382-3725. **Subscription/Member Benefits Questions:** 202-326-6417. **Science:** 202-326-6500. **Other AAAS Programs:** 202-326-6400.

## Technology for America's Future

Erosion of the competitive position of U.S. industry is well known to U.S. scientists and engineers. Until recently the federal government has paid little heed. Now there are signs that both the White House (see *Science*, 5 April, p. 20) and influential industrialists are devoting serious attention to the matter. A report issued by the Council on Competitiveness has been followed by a similar document from the Office of Science and Technology Policy. These provide information on our strengths and failures in the many areas of high technology. In what follows are comments based on the council's report.\*

In the era immediately following World War II, the United States had a virtual monopoly on new technology. This was fostered by spin-offs from defense R&D. The computer, the electronics components, the machine tool, and the aircraft industries were beneficiaries. Defense R&D gradually ceased to be a stimulus to the civilian economy. Global competition in high technology emerged. In both Japan and Germany the governments identified and fostered new targets for R&D. The pace of development in those countries accelerated. Recent comparative figures on the percentage of total government R&D budget devoted to various functions are as follows: for industrial development, U.S., 0.2; Japan, 4.8; Germany (figures for West Germany), 14.5; for defense, U.S., 65.6; Japan, 4.8; and Germany, 12.5; for health, U.S., 12.8; Japan, 2.6; Germany, 3.6; for energy, U.S., 3.9; Japan, 22.8; and Germany, 7.8.

These numbers show that the United States is not fostering industrial development directly while competitors are. The realities of today's global markets militate against defense technology being useful in civilian markets. Defense industry is not geared to compete in commercial markets. The council's report states

Cost-plus contracts, quality control based on inspection rather than process improvement, highly specialized products, limited production runs and restricted markets are the dominant features of defense technology management. By contrast, flexibility, high quality at low cost, volume manufacturing expertise and access to many different markets are the primary concerns of managers in the private sector. . . .

Today's leading-edge technologies in microelectronics, computers and telecommunications are found, not in Defense Department laboratories, but in private industry. Moreover, consumer products are frequently driving state-of-the-art technology. . . . Instead of industry adapting defense technology break-throughs to commercial markets, the Defense Department is increasingly adapting commercial technology to its needs.

Because foreign competitors have practically eliminated U.S. competition in some areas, the Defense Department finds itself dependent on foreign suppliers for many strategic technologies, including machine tools, electronic components, and integrated circuit fabrication equipment. For national security, to preserve our standard of living, and to create jobs, it is necessary to establish a national goal of fostering civilian high technology. The council's report suggests that this might be accomplished if government, industry, and universities worked together. A key objective pointed to is generic technologies. These often underlie broad classes of products and can be worked on cooperatively ahead of the development of proprietary knowledge.

One of the most valuable features of the report is identification of 21 critical technologies. Critical technologies include electronic and photonic materials, process equipment, microelectronics, software, and computers. Under each of the 21 critical technologies are listed two to ten components and the status of the United States in each. For example, the United States is strong in various aspects of biotechnology and software. It is losing badly, or has lost position, in memory chips and robotics.

A substantial portion of the report is devoted to recommendations for actions by government, industry, and research universities. Perhaps the most important is a request for presidential leadership:

Presidential leadership is . . . essential to success. The President is uniquely positioned to set national priorities, communicate them to the American public and directly involve key federal agencies in the effort to address them. Therefore, the full involvement and support of the White House is a key part of the effort to raise technology and competitiveness to a national priority.

—PHILIP H. ABELSON

\*The report, "Gaining New Ground: Technology Priorities for America's Future," is available from the Council on Competitiveness, 950 17th Street, NW, Suite 1050, Washington, DC 20006, for \$20.