

## 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:** William D. Carey

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

**Deputy Editors:** Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*); Gardner Lindzey (*Social Sciences*)

## EDITORIAL STAFF

**Managing Editor:** Patricia A. Morgan

**Assistant Managing Editors:** Nancy J. Hartnagel, John E. Ringle

**Senior Editors:** Eleanor Butz, Lawrence I. Grossman, Ruth Kulstad

**Associate Editors:** Martha Collins, Sylvia Eberhart, William Greaves, Barbara Jasny, Katrina L. Kelner, Edith Meyers

**Letters Editor:** Christine Gilbert

**Book Reviews:** Katherine Livingston, *editor*; Linda Heiser-

**man**

**This Week in Science:** Ruth Levy Guyer

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

**Editing Department:** Lois Schmitt, *head*; Caitlin Gordon,

Stephen Kepple, Lisa McCullough

**Copy Desk:** Isabella Bouldin, *chief*; Mary McDaniel, Sharon

Ryan, Beverly Shields

**Production Manager:** Karen Schools

**Graphics and Production:** John Baker, *assistant manager*;

Holly Bishop, Kathleen Cosimano, Eleanor Warner

**Covers Editor:** Grayce Finger

**Manuscript Systems Analyst:** William Carter

## NEWS STAFF

**News Editor:** Barbara J. Culliton

**News and Comment:** Colin Norman, *deputy editor*; Mark H. Crawford, Constance Holden, Eliot Marshall, R. Jeffrey Smith, Marjorie Sun, John Walsh

**Research News:** Roger Lewin, *deputy editor*; Deborah M. Barnes, Richard A. Kerr, Gina Kolata, Jean L. Marx, Arthur L. Robinson, M. Mitchell Waldrop

**European Correspondent:** David Dickson

## BUSINESS STAFF

**Chief Business Officer:** William M. Miller, III

**Business Staff Supervisor:** Deborah Rivera-Weinhold

**Associate Business Supervisor:** Leo Lewis

**Membership Recruitment:** Gwendolyn Huddle

**Member and Subscription Records:** Ann Ragland

**Guide to Biotechnology Products and Instruments Editor:** Richard G. Sommer

## ADVERTISING REPRESENTATIVES

**Director:** Earl J. Scherago

**Production Manager:** Donna Rivera

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

**Marketing Manager:** Herbert L. Burklund

**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); Chicago, IL 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-337-4973); Beverly Hills, CA 90211: Winn Nance, 111 N. La Cienega Blv. (213-657-2772); San Jose, CA 95112: Bob Brindley, 310 S. 16 St. (408-998-4690); Dorset, VT 05251: Fred W. Diefenbach, Kent Hill Rd. (802-867-5581).

Instructions for contributors appears on page xi of the 20 December 1985 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, NY 10036. Telephone 212-730-1050.

## Evolving State-University-Industry Relations

The scientific community faces a combination of uncertainties and irreversible change the like of which has not been experienced in several decades. Passage of the Gramm-Rudman legislation, which is aimed at a balanced budget, makes the level of federal support for academic research a chancy business. Already pressures had developed and were increasing for expanded university interaction with industry. This will continue.

Federal appropriations fluctuate, and some unforeseen event could change the picture. But the emphasis on applications has deep roots and will endure. Faltering ability to compete in international trade and attendant industrial unemployment will not be alleviated soon. An earlier confidence that support of basic research would inevitably guarantee applications and prosperity has faded. Governor Bruce Babbitt of Arizona voiced the opinion of many governors and other politicians when he said, "... the application of scientific knowledge is the basis for economic expansion and diversification, the key to formation of new businesses and the competitive survival of old ones." Babbitt further stated that there is a "new awareness that the fruits of university research and development activity have little economic value unless they are systematically harvested in the marketplace."

When the history of this era of science and technology is written, the role of the National Governors' Association will have special attention. This organization was ahead of the federal government in recognizing and indoctrinating in its members the need for greater academic-industrial interactions. Another key element was a study by David Birch of the Massachusetts Institute of Technology. He found that small companies—that is, those with fewer than 20 employees—generated two-thirds of all new jobs. Many of the governors concluded that state and local policies could lead to new companies and new jobs through the use of science and technology.

In an effort to create new companies and new jobs, many states have begun to provide funds for a variety of programs to foster application of research. In a 1983 report, the U.S. Office of Technology Assessment estimated that states and localities had formulated about 150 programs. Today there are perhaps as many as 500 programs, and virtually all the states are involved. No two states are fostering identical programs, although some common features have emerged. These include research parks located close to universities, incubator facilities on campus or close by, various kinds of financial support for start-up companies, encouragement of faculty to initiate commercial enterprises, cofunding with industry of academic-industrial research centers, and extension services to companies in the state.

Incubators create favorable environments for small companies. They usually involve low-cost space, services, and technical, business, and marketing advice. Interactions among the fledgling entrepreneurs are helpful as is access to university facilities and personnel.

In attempting to foster R&D in their states and create jobs, state governments are faced with questions of where to allocate limited funds. One approach is to depend on the judgment of private enterprise. If a group of companies is willing to provide funds to enter into collaborative efforts with a university or group of universities, the state administrators feel relatively comfortable about furnishing funds that match or partially match.

For public universities and particularly land-grant schools, agricultural extension services have a long history. A natural counterpart is technical and business services to small companies. Only a few states have adopted such programs, but in Ohio and Pennsylvania they have proven to be effective. Though relatively low in cost, they bring the expertise of the state universities closer to their publics and have a substantial potential for increased political clout.

In their efforts to involve their campuses in job creation and entrepreneurial activities, state administrators are likely to make mistakes. Some will raise unrealistic expectations while interfering with educational processes. However, a great many experiments are being conducted. Some will turn out well, and their successful procedures may serve as models. In any event, a significant change in state-university-industry relations is in progress. The strong campus bias of the 1960's and 1970's against applications and industry has diminished and will not be reestablished soon.—PHILIP H. ABELSON