

## 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.

### Editorial Board

1971

THOMAS EISNER	NEAL MILLER
AMITAI ETZIONI	BRUCE MURRAY
EMIL HAURY	JOHN R. PIERCE
DANIEL KOSHLAND, JR.	MAXINE SINGER

1972

ALFRED BROWN	FRANK PRESS
JAMES F. CROW	FRANK W. PUTNAM
THOMAS KUHN	WALTER O. ROBERTS
ELLIOTT W. MONTROLL	

### Editorial Staff

#### Editor

PHILIP H. ABELSON

#### Publisher

WILLIAM BEVAN

#### Business Manager

HANS NUSSBAUM

*Managing Editor:* ROBERT V. ORMES

*Assistant Editors:* ELLEN E. MURPHY, JOHN E. RINGLE

*Assistant to the Editor:* NANCY TEIMOURIAN

*News and Comment:* JOHN WALSH, ROBERT J. BAZELL\*, DEBORAH SHAPLEY, ROBERT GILLETTE, NICHOLAS WADE, CONSTANCE HOLDEN, SCHERRAINE MACK

*Research Topics:* ALLEN L. HAMMOND

*Book Reviews:* SYLVIA EBERHART, KATHERINE LIVINGSTON, KATHRYN MOUTON

*Cover Editor:* GRAYCE FINGER

*Editorial Assistants:* MARGARET ALLEN, ISABELLA BOULDIN, BLAIR BURNS, ELEANORE BUTZ, RONNA CLINE, MARY DORFMAN, JUDITH GIVELBER, MARLENE GLASER, CORRINE HARRIS, OLIVER HEATWOLE, CHRISTINE KARLIK, MARSHALL KATHAN, MARGARET LLOYD, JANE MINOR, DANIEL RABOVSKY, PATRICIA ROWE, LEAH RYAN, LOIS SCHMITT, RICHARD SOMMER, YA LI SWIGART, ALICE THEILE

*Membership Recruitment:* LEONARD WRAY; *Subscriptions:* BETTE SEEMUND; *Addressing:* THOMAS BAZAN

\* New York Office (News only): P.O. Box 267, Brooklyn, N.Y. 11217. Telephone: 212-596-1409

### Advertising Staff

#### Director

EARL J. SCHERAGO

#### Production Manager

BONNIE SEMEL

*Advertising Sales Manager:* RICHARD L. CHARLES

Sales: New York, N.Y. 10036: Herbert L. Burklund, 11 W. 42 St. (212-PE-6-1858); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); MEDFIELD, MASS. 02052: Richard M. Ezequelle, 4 Rolling Lane (617-444-1439); CHICAGO, ILL. 60611: John P. Cahill, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772)

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phones: (Area code 202) Central office: 467-4350; Book Reviews: 467-4367; Business Office: 467-4411; Circulation: 467-4417; Guide to Scientific Instruments: 467-4480; News and Comment: 467-4430; Reprints and Permissions: 467-4483; Research Topics: 467-4455; Reviewing: 467-4440. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page xv, *Science*, 24 September 1971. ADVERTISING CORRESPONDENCE: Room 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

## Training Scientists for New Jobs

The American scientific enterprise has been experiencing a prolonged period of anxiety. At one time, scientists were among the most favored groups in society and many of them felt secure in their view that the pursuit of fundamental research was the only really worthwhile activity. Since an increasing number of positions were available on campus, academia trained and indoctrinated the best students to become professors.

Relatively sudden changes in public attitudes, in governmental support, in the financial status of universities, and in the job market have damaged the morale and poise of many scientists, particularly chemists and physicists. A few news stories about Ph.D.'s driving taxicabs have led professors, students, and the public toward the attitude that we are training too many physical scientists. The leading universities, which traditionally have produced the best doctorates, have drastically cut their enrollments of entering graduate students in physics and chemistry.\* Should their example be followed in other schools, it would lead ultimately to a decimation of science faculties.

Instead of a gloom and doom attitude, a more constructive approach seems called for. Unemployment statistics indicate that that problem is not as dreadful as it has been portrayed. Moreover, if the universities would provide a broader-gauge indoctrination and training, more kinds of positions would be available to science graduates.

A recent survey conducted by the National Science Foundation† provides data on the employment status of scientists. The results indicate that the overall unemployment rate for physical scientists is 3 percent. Among those having the Ph.D. degree, the rate is only about 1 percent. The overall rate is age dependent, and those who are in the 25-to-29 age bracket are experiencing the toughest problems. Their unemployment rate is 5 percent. These findings are corroborated in conversations with professors of chemistry and physics at leading universities. They indicate that their best students are being placed, but that their lesser products are not always so fortunate.

Those professors who continue to indoctrinate and train their students only for the pursuit of fundamental research will find that the job market for the next several years will be poor. A limited number of academic posts will be available. Government support of research will not increase greatly, and industry's basic research is more likely to be curtailed than expanded. Unless professors are willing to watch their departments shrink, they must prepare their students for a broader range of positions. Almost all of the major problems of society involve a component of science and technology. The discipline of a good education in science, with its emphasis on facts and on a systematic approach to problem solving, could be an important component in training for many non-research careers in the public and private sectors.

Examples of what might be done are provided by some of the great technology-oriented companies. Only a small fraction of their technically trained employees are active in fundamental research. Others are engaged in development, in market surveys, in sales, and in all levels of management. Research managers point out that, for every dollar spent on successful basic research, \$10 must be spent on development and \$100 eventually spent on all the tasks involved in introducing a new product. These figures illustrate why industry and perhaps even society can afford to engage in only a limited amount of basic research. They also indicate potential usefulness of employing individuals of great competence in activities other than pure research.—PHILIP H. ABELSON

\* Much of the content of this editorial was derived from a Conference on Unemployment organized by the AAAS and held 12 October 1971. † National Science Foundation Report No. 71-26.