

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

MELVIN CALVIN	NEAL E. MILLER
ERNEST COURANT	PHILIP M. MORSE
FARRINGTON DANIELS	COLIN S. PITTENDRIGH
JOHN T. EDSALL	KENNETH S. PITZER
DAVID R. GODDARD	DEWITT STETTEN, JR.
ALEXANDER HOLLAENDER	WILLIAM L. STRAUS, JR.
ROBERT JASTROW	EDWARD L. TATUM
EDWIN M. LERNER II	JOHN R. WINCKLER
WILLARD F. LIBBY	CLARENCE M. ZENER

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher

DAEL WOLFE

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: DANIEL S. GREENBERG, JOHN WALSH, ELINOR LANGER, MARION ZEIGER, ROSEMARY GALLI

Europe: VICTOR K. McELHENY, Flat 3, 18 Kensington Court Place, London, W.8, England (Western 5360)

Book Reviews: SARAH S. DEES

Editorial Assistants: ISABELLA BOULDIN, ELEANORE BUTZ, SYLVIA EBERHART, GRAYCE FINGER, NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, MARCIA ISAAK, RUTH KINGERLEE, HOWARD NATHENSON, EDGAR RICH

Advertising Staff

Director

EARL J. SCHERAGO

Production Manager

RAYMONDE SALAMA

Sales: New York, N.Y., 11 W. 42 St. (212-PE-6-1858): RICHARD L. CHARLES, ROBERT S. BUGBEE
Scotch Plains, N.J., 12 Unami Lane (201-889-4873): C. RICHARD CALLIS

Chicago, Ill., 6 W. Ontario St. (312-DE-7-4973): HERBERT BURKLAND

Los Angeles 45, Calif., 8255 Beverly Blvd. (213-653-9817); WINN NANCE

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

Predocutorial and Postdoctoral Fellowships

The present mechanisms of federal support of research have functioned well in many respects. The system, however, has weaknesses, and one of the most serious of these is related to the support of predoctoral and postdoctoral fellows. Today a large proportion of these fellows receive their stipends in connection with grants given by federal agencies for specific objectives. Individuals paid with such funds are under moral obligation to perform work relevant to the grant. This tends to stifle initiative on the part of the fellows and gives the principal investigators an extremely effective weapon in converting their underlings into intellectual serfs.

The predoctoral and immediate postdoctoral years are crucial in the lives of scientists, who are particularly plastic at this period, for they are undergoing metamorphosis. Heretofore they have been absorbers of knowledge. To become scientists they must become creators of knowledge. A drastic change in viewpoint and the development of a new set of value judgments are necessary. If students are to become scientists they must become sturdily independent. They must be heirs of Galileo, not followers of Aristotle.

The graduate student needs broad guidance in the selection of suitable research goals. But he also needs maneuvering room, an opportunity to test his own mind and to develop intuitive judgments. He needs to be able to make mistakes for which he will suffer. He should have his share of triumphs, perhaps small, but nevertheless his own. The present grants system serves to thwart desirable patterns of growth. Too often the graduate student finds himself a member of a large "team" whose detailed goals are set by the principal investigator.

Even under favorable circumstances, the new Ph.D. rarely has completed the transformation to intellectual maturity. He very much needs experience as a fully responsible, self-directing, self-disciplined adult. He must be able to choose his own research goals and to formulate the questions. Given this freedom, if he has potential it will be quickly demonstrated.

When a person obtains his Ph.D. degree he has limited alternatives if he wishes to continue research in academic life. A seemingly attractive course is to accept a postdoctoral fellowship from one of the entrepreneurs of science. These empire-builders succeed in corralling space, equipment, and technicians, and they can offer sizable stipends. The young scientist feels that he is being given a great opportunity. Too often he is actually signing up for a continuation of scientific childhood. Too often the entrepreneur regards the postdoctoral fellow only as a means of advancing his own general program. As a matter of course he directs the research projects, and though his creative contributions may be trivial, he puts his name on papers coming out of the laboratory. In some instances federal funds have been used to create in the United States the equivalent of the Teutonic "Herr Professor." We need to take constructive, positive steps to offset this tendency.

A valuable precedent has been set in the fellowship program of the National Aeronautics and Space Administration. This agency has awarded funds to institutions and not to individuals, providing at the same time some expense money. Use of this mechanism should be expanded, so that a substantial fraction of the predoctoral and postdoctoral fellowships are financed in this way.

—PHILIP H. ABELSON