

AMERICAN ASSOCIATION
FOR THE
ADVANCEMENT OF SCIENCE

Board of Directors

PAUL E. KLOPSTEG, *President*
CHAUNCEY D. LEAKE, *President Elect*
WALLACE R. BRODE, *Retiring President*
H. BENTLEY GLASS
GEORGE R. HARRISON
MARGARET MEAD
THOMAS PARK
DON K. PRICE
MINA REES
WILLIAM W. RUBEY
ALAN T. WATERMAN
PAUL A. SCHERER, *Treasurer*
DAEL WOLFLE, *Executive Officer*

Editorial Board

DONALD J. HUGHES H. BURR STEINBACH
KONRAD B. KRAUSKOPF WILLIAM L. STRAUS, JR.
EDWIN M. LERNER EDWARD L. TATUM

Editorial Staff

DAEL WOLFLE, *Executive Officer*
GRAHAM DUSHANE, *Editor*
JOSEPH TURNER, *Assistant Editor*
ROBERT V. ORMES, *Assistant Editor*

CHARLOTTE F. CHAMBERS, SARAH S. DEES, NANCY S. HAMILTON, WILLIAM HASKELL, OLIVER W. HEATWOLE, YUKIE KOZAI, ELLEN E. MURPHY, ELEANOR D. O'HARA, BETHSABE PEDERSEN, NANCY L. TEIMOURIAN, MARIA A. WOLSAK, LOIS W. WOODWORTH

EARL J. SCHERAGO, *Advertising Representative*



SCIENCE, which is now combined with THE SCIENTIFIC MONTHLY, is published each Friday by the American Association for the Advancement of Science at National Publishing Company, Washington, D.C. The joint journal is published in the SCIENCE format. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

Editorial and personnel-placement correspondence should be addressed to SCIENCE, 1515 Massachusetts Ave., NW, Washington 5, D.C. Manuscripts should be typed with double spacing and submitted in duplicate. The AAAS assumes no responsibility for the safety of manuscripts or for the opinions expressed by contributors. For detailed suggestions on the preparation of manuscripts and illustrations, see *Science* 125, 16 (4 Jan. 1957).

Display-advertising correspondence should be addressed to SCIENCE, Room 740, 11 West 42 St., New York 36, N.Y.

Change of address notification should be sent to 1515 Massachusetts Ave., NW, Washington 5, D.C., 4 weeks in advance. If possible, furnish an address label from a recent issue. Give both old and new addresses, including zone numbers, if any.

Annual subscriptions: \$8.50; foreign postage, \$1.50; Canadian postage, 75¢. Single copies, 35¢. Cable address: Advancesci, Washington.

After 20 Years—Technicians or Scholars?

As teacher education programs are strengthened and teacher certification requirements are made more demanding of aptitude, scholarship, and subject-matter competence, we will produce an increasing and permanent supply of highly competent teachers. Or will we? When does teacher education stop? With a bachelor's degree? A master's degree? More simply, when should a science teacher stop learning about science? When can a teacher stop being also a student?

The answer, of course, is never! Formal academic degree programs should be considered as basic preparation for the teaching profession and the beginning of a self-determined, self-disciplined program of continuing improvement in both subject-matter competence and teaching skills. Career-long dedication to self-improvement is one of the outstanding characteristics of a "professional," be he science teacher or research scientist.

Too often young science teachers with up-to-date subject-matter training but no teaching experience develop into mature science teachers with extensive teaching experience but no up-to-date information. This constitutes a waste of talent equal to and perhaps even greater than that resulting from inadequate formal preparation. Far too many teachers "retire" long before they stop teaching. Other things being equal, the mature teacher should be the most competent teacher, the "master teacher," not simply an efficient and skillful "educational technician" but a scholar, a serious student of his own subject.

Unfortunately, there is almost no community interest in or genuine recognition of continuing teacher self-improvement beyond formal degree programs. We have allowed teachers to become so burdened with nonprofessional, nonacademic, and nonscholarly duties that they have neither the time nor the enthusiasm for rigorous intellectual rejuvenation. We are now well beyond affording the luxury of wasted professional talent—well beyond the efficacy of "pumping the well dry."

Recent programs are making great strides in providing opportunities for teachers to again become students of their subject-matter areas through summer institutes, refresher courses, research participation programs, in-service training courses, and television courses such as Continental Classroom's "Modern Chemistry" and "Atomic Age Physics." Not long ago only single teachers could afford several nonremunerative summers on a college or university campus. Now the opportunity for refresher and advanced training is becoming increasingly available to all teachers. Whether they take advantage of these opportunities, however, depends on the incentives, inspiration, interest, encouragement, and recognition that can be transmitted to teachers by their colleagues and members of the school community.

We need to develop an intellectual atmosphere at the community level that encourages and recognizes scholarship on the part of both teachers and students; an atmosphere that encourages science-teacher participation in the activities of professional educational organizations as well as professional scientific organizations; an atmosphere that allows more time for study, laboratory preparation, guidance of science projects, participation in research, development of equipment and visual aids, course revision, and similar scholarly activities; an atmosphere that returns to the teacher the role of scholar rather than technician.

Teacher education is a complex subject involving many factors, including money and time; it must not be shortened by falsely assuming that it ends with formal college training or that local school administrators and citizens have no responsibility for an important part of it.—R. E. HENZE, *American Chemical Society*.