30 June 1978, Volume 200, Number 4349

SCIENCE

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

1978: RICHARD E. BALZHISER, JAMES F. CROW, HANS LANDSBERG, EDWARD NEY, FRANK W. PUTNAM, MAXINE SINGER, PAUL E. WAGGONER, F. KARL WILLENBROCK

1979: E. PETER GEIDUSCHEK, WARD GOODENOUGH, N. BRUCE HANNAY, MARTIN J. KLEIN, FRANKLIN A. LONG, NEAL E. MILLER, JEFFREY J. WINE

Publisher

WILLIAM D. CAREY

Editor

PHILIP H. ABELSON

Editorial Staff

Managing Editor
ROBERT V. ORMES

Business Manager
HANS NUSSBAUM

Assistant Managing Editor
JOHN E. RINGLE

Production Editor
ELLEN E. MURPHY

News and Comment: BARBARA J. CULLITON, *Editor;* LUTHER J. CARTER, CONSTANCE HOLDEN, DEBORAH SHAPLEY, R. JEFFREY SMITH, NICHOLAS WADE, JOHN WALSH. *Editorial Assistant,* SCHERRAINE MACK

Research News: ALLEN L. HAMMOND, *Editor;* RICHARD A. KERR, GINA BARI KOLATA, JEAN L. MARX, THOMAS H. MAUGH II, WILLIAM D. METZ, ARTHUR L. ROBINSON. *Editorial Assistant,* FANNIE GROOM

Associate Editors: ELEANORE BUTZ, MARY DORFMAN, SYLVIA EBERHART, JUDITH GOTTLIEB

Assistant Editors: CAITILIN GORDON, RUTH KULSTAD, LOIS SCHMITT, DIANE TURKIN

Book Reviews: KATHERINE LIVINGSTON, *Editor;* LINDA HEISERMAN, JANET KEGG

Letters: CHRISTINE KARLIK

Copy Editors: ISABELLA BOULDIN, OLIVER HEATWOLE

Production: NANCY HARTNAGEL, JOHN BAKER; YA LI SWIGART, ELEANOR WARNER; JEAN ROCKWOOD, LEAH RYAN, SHARON RYAN

Covers, Reprints, and Permissions: GRAYCE FINGER, *Editor;* CORRINE HARRIS, MARGARET LLOYD

Guide to Scientific Instruments: RICHARD SOMMER

Assistant to the Editors: RICHARD SEMIKLOSE

Membership Recruitment: GWENDOLYN HUDDLE

Member and Subscription Records: ANN RAGLAND

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Area code 202. General Editorial Office, 467-4350; Book Reviews, 467-4367; Guide to Scientific Instruments, 467-4480; News and Comment, 467-4430; Reprints and Permissions, 467-4483; Research News, 467-4321; Cable: Advancesci, Washington. For "Instructions for Contributors," write the editorial office or see page xv, *Science*, 30 September 1977.

BUSINESS CORRESPONDENCE: Area Code 202. Business Office, 467-4411; Circulation, 467-4417.

Advertising Representatives

Director: EARL J. SCHERAGO
Production Manager: MARGARET STERLING
Advertising Sales Manager: RICHARD L. CHARLES
Marketing Manager: HERBERT L. BURKLUND

Sales: NEW YORK, N.Y. 10036: Steve Hamburger, 1515 Broadway (212-730-1050); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); CHICAGO, ILL. 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772); DORSET, VT. 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581)

ADVERTISING CORRESPONDENCE: Tenth floor, 1515 Broadway, New York, N.Y. 10036. Phone: 212-730-1050.

Patent Policy Versus Innovation

The United States is engaged in a massive research and development effort which, measured in current dollars, is edging close to the level of $50 billion annually, counting outlays in both the federal and the private sector. The budget for R & D in government calls for more than $28 billion in the next fiscal year. There is no doubt that the R & D input is strong. The *output* side may be a very different story.

We support R & D to learn something that we do not know, and to make use of what we learn. Like any other type of investment, R & D is expected to yield returns. In the case of government-financed R & D the question arises, Are the investors getting full and timely return? Are the results of federally funded R & D finding their way into the market?

The evidence, as usual, seems mixed. About 8000 inventions are said to be generated each year from government-financed R & D, many of which are patentable. Not enough of these apparently reach the market. Some 30,000 government-owned patents are piled up awaiting takers. To that extent, the national economy is not being enriched and utilization is forestalled. It is a baffling situation until one realizes that the blockage occurs largely in the government's patent policy.

The government operates on the proposition that the economic rewards from federally funded R & D should be captured by the government, or shared only grudgingly with others, since public funds were used. The view prevails that if rights to the discovery were released to private developers on an exclusive basis unreasonable private enrichment could occur. There is scant evidence to support these apprehensions, but the doctrine is riveted into the government's thinking. The effect is that the market incentive to develop government-financed discoveries is circumscribed and inventions are isolated from normal risk-taking and pursuit.

It is not hard to see how this can inhibit the prospects for pass-through of discoveries from biomedical research or energy-related R & D. We see a prodigious R & D enterprise, fueled by tax dollars, constrained from diffusing its results because of a public policy barrier. Throughout the enterprise, discoveries sit stranded and aging. Meanwhile, we search for clues as to what is wrong with U.S. technological innovation, and how it is that foreign industry can undercut American competitiveness and employment.

As usual, public policies are muddled, conflicting more often than complementing one another. In the new study ordered by President Carter of the problems assailing industrial innovation, a fresh opportunity is provided to reexamine both the premises and the consequences of government patent policies. There is ample evidence that the costs of producing and marketing an invention are many times as great as the outlays on the R & D that led to the invention. Not many developers will take these risks with inventions resulting from federal R & D, in the absence of clear ownership.

It begins to appear that we have thought of "science policy" too much in terms of stimulating R & D and too little in terms of liberating its results. The benefits of federally funded R & D are hard enough to realize without the added drag of a dubious policy on patents. A public which is regularly lectured on the promise and performance of science may not be grateful to learn that government's rules are blocking research applications. That could be far more harmful to science than the Golden Fleece awards.

Public policy, if wisely designed, can stimulate economic pursuit of government-financed inventions while at the same time minimizing the risk of abuses. What is clear is that the present patent policies will not get us innovation, nor health and energy benefits, nor economic growth, nor trade competitiveness. We can hardly make the case that R & D contributes significantly to the nation's economy if, at the same time, we isolate its results from utilization. Here is a notable "Catch 22" in federal R & D policy, and it is time to bring it into the open.—WILLIAM D. CAREY