

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

1976

ALFRED E. BROWN	FRANK PRESS
JAMES F. CROW	FRANK W. PUTNAM
HANS LANDSBERG	MAXINE SINGER
EDWARD NEY	ARTHUR M. SQUIRES

1977

WARD GOODENOUGH	DONALD KENNEDY
CLIFFORD GROBSTEIN	NEAL E. MILLER
H. S. GUTOWSKY	RAYMOND H. THOMPSON
N. BRUCE HANNAY	

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher

WILLIAM D. CAREY

Business Manager

HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

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

Assistant to the Editors: RICHARD SEMIKLOSE

News and Comment: JOHN WALSH, Editor; PHILIP M. BOFFEY, LUTHER J. CARTER, BARBARA J. CULLITON, ROBERT GILLETTE (on sabbatical), CONSTANCE HOLDEN, DEBORAH SHAPLEY, NICHOLAS WADE. Editorial Assistant, SCHERRAINE MACK

Research News: ALLEN L. HAMMOND, WILLIAM D. METZ, THOMAS H. MAUGH II, JEAN L. MARX, ARTHUR L. ROBINSON, GINA BARI KOLATA, FANNIE GROOM

Book Reviews: KATHERINE LIVINGSTON, LYNN MANFIELD, JANET KEGG

Cover Editor: GRAYCE FINGER

Editorial Assistants: JOHN BAKER, ISABELLA BOULDIN, MARGARET BURESH, ELEANORE BUTZ, MARY DORFMAN, SYLVIA EBERHART, JUDITH GIVELBER, CAITILIN GORDON, CORRINE HARRIS, NANCY HARTNAGEL, OLIVER HEATWOLE, CHRISTINE KARLIK, MARGARET LLOYD, JEAN ROCKWOOD, LEAH RYAN, LOIS SCHMITT, YA LI SWIGART, ELEANOR WARNER, ROBERTA WEDGE

Guide to Scientific Instruments: RICHARD SOMMER

Membership Recruitment: GWENDOLYN HUDDLE; Subscription Records and Member Records: ANN RAGLAND

Advertising Staff

Director

EARL J. SCHERAGO

Production Manager

MARGARET STERLING

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); CHICAGO, ILL. 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 11 N. La Cienega Blvd. (213-657-2772); DORSET, VT. 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581)

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 News: 467-4321; Reviewing: 467-4443. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page xi, *Science*, 26 MARCH 1976. ADVERTISING CORRESPONDENCE: Room 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

Energy Diplomacy

The Soviet Union is becoming powerful in energy matters while the United States continues its drift into dependence on others. Proved Soviet oil reserves are 80 billion barrels (11 billion metric tons) in contrast to 33 billion barrels for the United States. Soviet production is about 9.8 million barrels a day (b/d) and rising, that of the United States is 8.1 million b/d and dropping. The Soviet Union is a net exporter of oil; it reinforces its military control of Eastern European countries by sending them 1.4 million b/d. In contrast, the United States is importing about 7.2 million b/d of oil and its products.

The proved reserves of natural gas in the Soviet Union (800 trillion cubic feet or 22.4 trillion cubic meters) are by far the largest in the world; those of the United States are 228 trillion cubic feet. During 1975, production in the United States (20.1 trillion cubic feet) exceeded that in the Soviet Union (10.2 trillion cubic feet). But U.S. reserves are declining rapidly. If present trends continue, which is likely, Soviet production will be exceeding that of the United States in about 4 years. Already the Soviet Union is an exporter of natural gas, and it has been negotiating with Japan and West Germany to supply part of their needs.

In late 1973 it was hoped that a combination of conservation and expanded domestic production of fuels would render the United States energy independent by 1980. This hope has been frustrated. For a short time during the embargo the public was conservation-minded, but this did not last and public consumption of energy has been increasing. A combination of industrial conservation measures and lower production levels cut overall consumption of energy by a few percent in 1974-1975. But in the first 3 months of 1976, electricity demand was up 5.9 percent from a year ago. The public, responding to a price rollback on domestic oil, has been burning more gasoline and buying the larger automobiles.

A major factor in the optimism of government officials during late 1973 was the expectation that higher prices would lead to greater production of oil. This was to be accomplished by exploiting new discoveries and by enhanced recovery of oil from existing fields. The higher prices did lead to more drilling activity, but in 1975 only 1.3 billion barrels of oil was found while a total of 6 billion barrels was being consumed. In 1973 enhanced recovery of oil from existing fields was a hopeful prospect. In existing fields, conventional techniques had produced roughly a third of the oil in place, leaving about 300 billion barrels. Thus an improvement of a few percent would make a big difference. More intense exploitation of earlier methods and use of some new ones has led to an increase of 270,000 b/d, but the Energy Research and Development Administration (ERDA) now estimates that only an additional 300,000 b/d will be forthcoming by 1985. Moreover, the cost of additional oil has been as much as \$20 to \$25 per barrel.

In early 1974 there was hope that substantial amounts of oil might be obtained from coal or shale. Now ERDA states that comparatively little synthetic oil will be available before 1985. As for using other major energy sources instead of oil, there has been little progress. Because of environmental constraints, consumption of coal has not expanded appreciably. Nuclear energy, which has replaced some oil in generating electricity, is under heavy attack. In consequence, there is no alternative but to expand dependence on foreign oil. At a recent press briefing, Exxon predicted that in 1985 the United States will be importing 11 million b/d. Most of it will come from the Middle East.

The United States has joined Western Europe and Japan in facing a long era of vulnerability to crippling damage from interruptions to energy supplies. The Soviet Union is not subject to such stoppages and indeed has much to gain by fomenting trouble. A new embargo is not the only hazard. The precedent of Angola suggests other scenarios for interruptions of oil from the Middle East.—PHILIP H. ABELSON