

# "A margin of safety in a world where that margin has become slin and equivocal."

With your permission on this 25th Anniversary, we would like to send you (under a most exceptional arrangement) a magazine

- Has brought together in a cooperative non-profit venture the world's leading scientists and scholars, Nobel Laure-ates, leaders in the worlds of government and business ...
- Started as a newsletter 25 years ago for a few hundred individuals concerned with preventing atomic war and has grown to a magazine with over 20,000 subscribers, who, in the words of Time Magazine, "...girdle the globe and muster more scientific, dislamatic and categories and contact the second statement of the second statem diplomatic and statesmanship cre-dentials than any world conference in
- Serves the world community as the only magazine reflecting the mutual impact of science and public affairs for peaceful utilization of scientific advances for man's survival...
- Has often initiated proposals and approaches that have helped meet world needs . . . as in the first formulation of the Test-Ban Treaty by David Inglis in the BULLETIN's pages.

We extend this Anniversary invitation—along with a gift copy of the extraordinary double-size 25th Anniversary issue of the Bulletin—because we believe you, as a reader of Science News share our concern with the future of mankind in this age of change...that you, too, refuse to accept the idea that our children and their children's children have no future on this earth.

Like yourself, most of us are active in our own fields of work. And yet, almost all those connected with the BULLETIN give their services without remuneration to increase that "margin of safety."

It is unfortunately true that the dangers not just of escalating arms races and nuclear war, but of overpopulation and hunger, of pollution of air and water, are greater than

But we are not alarmists. On the contrary, we would not be devoting our time and energies to bringing the BULLETIN to indi-

viduals like yourself if we did not feel it possible to use the growing power of scien-tific thought to bring the benefits of full and peaceful utilization of the world's resources

to all of mankind.

This is an ambitious commitment, but it is one reason why the world's leading scientists and scholars address themselves in the BUL-LETIN to a select worldwide audience of responsible individuals who share their concern. These experts are writing for you and we think you, too would enjoy such first-hand, fully authoritative articles as:

- E.U. CONDON on The UFO Report.
- GUNNAR MYRDAL on Planning The Future Society;
- C. P. SNOW on Higher Education in a Technological Age;
- JEROME WIESNER on Prospects for General Disarmament;
- and Abuse of Psychedelic Drugs; DANIEL X. FREEDMAN on The Use
- GERARD PIEL on A World Free of
- A. TAMPLIN & J. GOFMAN on Can We Survive the Peaceful Atom?
- KONRAD LORENZ on Killing Members of One's Own Species.

# A Special 25th Anniversary Invitation

We hope you will join the regular readership of this "... extraordinary magazine (which) supplies a margin of safety," to quote the St. Louis Post-Dispatch. To facilitate this, we have arranged to send you the BULLETIN for the year ahead at a special rate of only \$7.00 — well below the regular price of \$8.50. And, in addition, you will receive at once, with the compliments of the Board, the widely-acclaimed Anniversary issue (soon to be issued in book form) — TRINITY + 25

We know you will share our own rejoicing on the day we can set the hands of the clock on the BULLETIN's cover at the beginning of a new world era of peaceful utilization of the fruits of science for all mankind.

The hands of the world-famed clock on the BULLETIN's cover have symbolized since 1947 man's closeness to nuclear destruction. They have stood as close as 2 minutes to Midnight (at the time the H-Bomb was first exploded), but now they stand at 10 minutes to Midnight. There is hope



# science and public affairs BULLETIN OF THE ATOMIC SCIENTISTS 935 EAST 60TH STREET • CHICAGO, ILL. 60637

BOARD OF SPONSORS: Hans A. Bethe, Chairman, Samuel K. Allison (1901-65), Robert F. Bacher, Detlev W. Bronk, A. H. Compton (1892-1962), E. U. Condon, F. Daniels, Albert Einstein (1879-1955), James Franck (1882-1964), Bentley Glass, S. A. Goudsmit, T. R. Hogness, F. W. Loomis, Philip M. Morse, H. J. Muller (1890-1967), J. Robert Oppenheimer (1904-1967), Linus Pauling, G. B. Pegram (1876-1958), I. I. Rabi, Julian Schwinger, Frederick Seitz, John A. Simpson, Cyril S. Smith, Leo Szilard (1898-1964), Edward Teller, Harold C. Urey, V. F. Weisskopf, Hugh C. Wolfe, Sewall Wright, J. R. Zacharias

PUBLISHED BY THE EDUCATIONAL FOUNDATION FOR NUCLEAR SCIENCE



### Accept These Two Book-Length **Special Issues Entirely Free**

TRINITY + 25 YEARS - An extraordinary review of the nuclear energy revolution in the quarter-century since Alamogordo, written by the scientists most closely involved — Bethe, Frisch, Imai, Kistiakowsky, Seaborg, Weinberg and others. It presents a worldwide picture of the impact of the sterile and on the science and property technology. atomic age on science, technology and society — future developments — even the effect on the lives of the scientists themselves. A rich and fas-

THE WORLD OF THE ANTARCTIC: Prepared by the scientists of many nations who are playing leading roles in the far-flung Antarctic Program, the many articles in this fascinating special issue cover such topics as Relevance to the Concerns of Man-kind; Reading the Past; Climate Changes and Meteorology; Economic Development; International Coordination of Polar Research; The Antarctic as a Political and Natural Science Laboratory, and much more.

Both these issues will appear later in book form. You are invited to receive them now by returning your Anniversary Invitation below.

Science	and Public	Affairs
<b>BULLETIN OF</b>	THE ATOMIC	SCIENTISTS
935 Fast 60th	St Chicag	o. III., 60637

Please enter my Introductory Subscription to the Bulletin at the special rate of only \$7.00 for one year (10 issues), a saving of \$1.50 from the regular annual rate of \$8.50. Also send me at no extra charge the 25th Anniversary issue TRINITY + 25 YEARS

and the special AN	TARCTIC issue.
Name	
Address	
City	
State	Zip
☐ Paymentenclosed	d.* □ Please bill me.
bcokkeeping costs !	saving us billing and by enclosing payment ly appreciated. Thank

# science news

A Science Service Publication Vol. 99/Jan. 30, 1971/No. 5 Incorporating Science News Letter

Watson Davis, 1896-1967 Publisher: E. G. Sherburne Jr.

Editor: Carl Behrens, Ph.D.

Managing Editor: Kendrick Frazier

DEPARTMENTS

Aerospace: Everly Driscoll

Earth Sciences: Louise Purrett

Environmental Sciences: Richard H. Gilluly

Physical Sciences: Dietrick E. Thomsen

Copy Editor: Nadine Clement **Production: Robert Trotter** 

Production Assistant: Melinda Armistead

Books: Margit Friedrich

Editorial Assistant: Esther Gilgoff

Advertising: Scherago Associates, Inc.

Circulation: Gustave T. Wescott

Copyright © 1971 by Science Service, Inc., 1719 N Street, N.W., Washington, D.C. 20036. Republication of any portion of SCIENCE NEWS is strictly prohibited.

SUBSCRIPTION DEPARTMENT

231 WEST CENTER STREET MARION, OHIO 43302

Subscription rate: 1 yr., \$7.50; 2 yrs., \$13.50; 3 yrs., \$19.50. Special trial offer: 39 weeks, \$3.97. Single copy. 25 cents. \$1.00 per year for foreign postage. Change of address: Four to six weeks' notice is required. Please state exactly how magazine is to be addressed. Include zip codes.

Printed in U.S.A. Second class postage paid at Washington, D.C. Established as Science News Letter ® in mimeograph form March 13, 1922. Title registered as trademark U.S. and Canadian Patent Offices. Indexed in last Science News of June and December, in Reader's Guide to Periodical Literature, Abridged Guide and the Engineering Index. Member of Audit Bureau of Circulation. UNSOLICITED MANUSCRIPTS will not be returned unless accompanied by a stamped, self-addressed envelope.

Published every Saturday by SCIENCE SER-VICE, Inc., 1719 N St., N.W., Washington, D.C. 20036. NOrth 7-2255. Cable Address: SCIENSERV.

ADVERTISING STAFF Director: EARL J. SCHERAGO Advertising Sales Manager: RICHARD L. CHARLES Production Manager: BONNIE F. SEMEL

Address all advertising to Scherago Associates, 11 W. 42nd St., New York, N.Y. 10036.

Sales: New York, N.Y. 10036: Robert S. Bugbee, 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, III. 60611: Herbert L. Burklund, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); Beverly Hills, Calif. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772).

# OF THE WEEK

- **77** Debate over the Grand Tour
- 78 Radiation protection standards
- 79 Brontosaur habitats
- 80 Cancer and the State of the Union Bad news on air pollution
- 81 Science talent winners Venus probe on surface
- 82 Transportation: Mass transit R&D lacks innovation; Staggered work hours; Urban planning and auto pollution; Automated mass transit; Analysis of high-speed rail use; Combination local-express train
- 83 Physical Sciences: Gravitational constant; Standing electron waves; Muon-electron similarity; Photon rest mass; Observation of soft X-ray background flux

# IN SCIENCE FIELDS

84 Resources: Resurgence of coal

76 Letters to the Editor Films of the Week

87 Books of the Week



Growing energy needs, and problems with other sources, are reviving the coal industry, which has been in a decline since World War II. The Hy-Gas plant in Chicago is one of several projects to convert the mineral to more usable energy forms. See page 84.

## SCIENCE SERVICE

Institution for the Popularization of Science founded 1921; a non-profit corporation

Board of Trustees—Nominated by the American Association for the Advancement of Science: Athelstan F. Spilhaus, West Palm Beach, Fla.; Wallace R. Brode (Treasurer), American Chemical Society, Washington, D. C.; Bowen C. Dees, Franklin Institute, Philadelphia, Pa. Nominated by the National Academy of Sciences: Henry Allen Moe, The Clark Foundation; Harlow Shapley, Cambridge, Mass.; Allen V. Astin, Bethesda, Md. Nominated by the National Research Council: Glenn T. Seaborg (President), U.S. Atomic Energy Commission; Leonard Carmichael, National Geographic Society. Nominated by the Journalistic Profession: O. W. Riegel (Secretary), Washington and Lee University; Gordon B. Fister, Call-Chronical Newspapers. Nominated by the Edward W. Scripps Trust; John Troan, Pittsburgh Press; Edward W. Scripps II (Vice President), Edward W. Scripps Trust.

Director: E. G. Sherburne Jr.; Assistant Director: Dorothy Schriver; Staff, Youth Division, Howard Weisbrod; Things of Science, Ruby Yoshioka.