science news yearbook 1969/1970

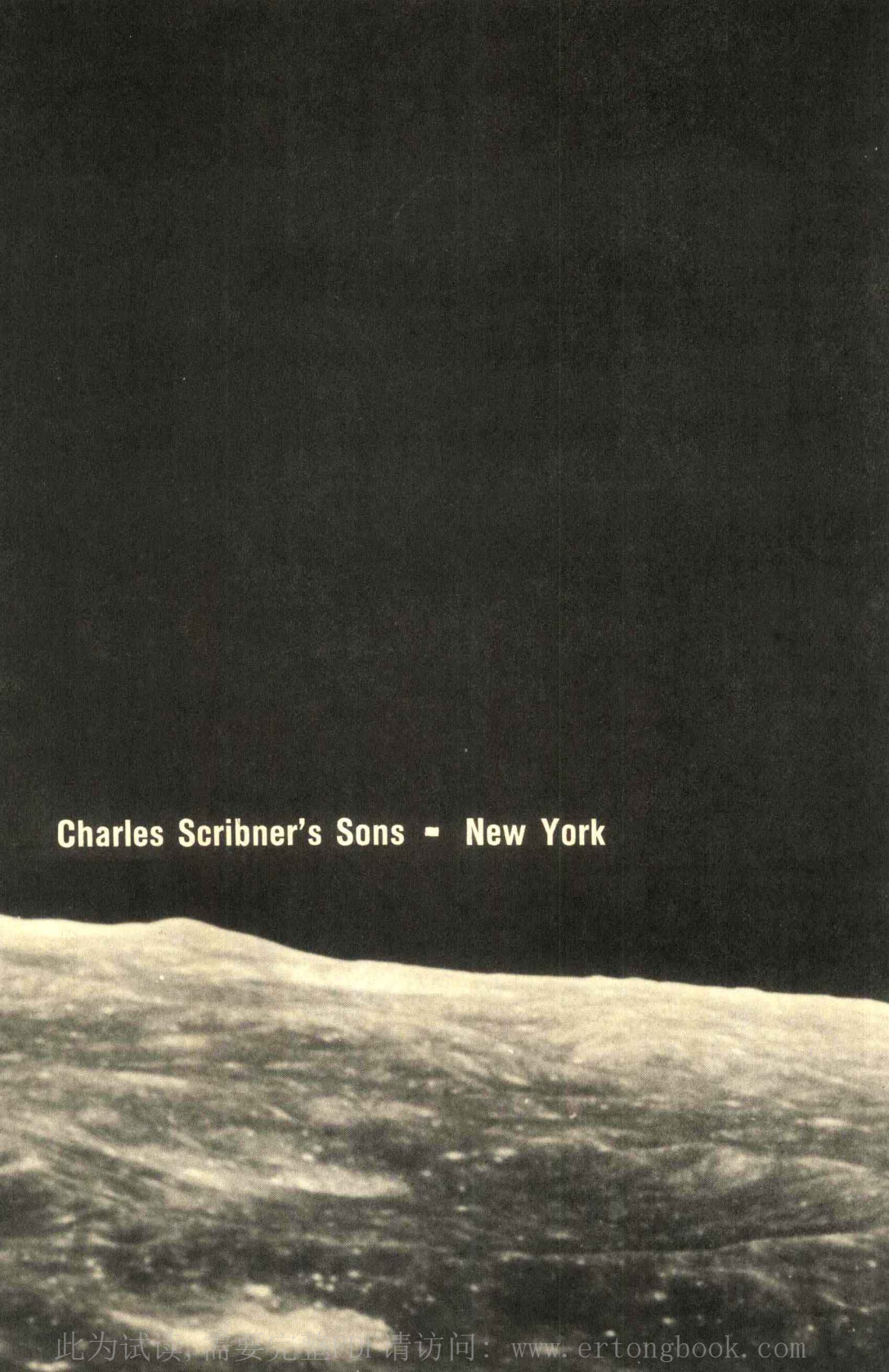
Compiled and edited by
SCIENCE SERVICE

Title-page photograph: *Earth above the lunar horizon, as seen from Apollo 8.* (*NASA*).

A–8.69 [H]

Printed in the United States of America
Library of Congress Catalog Card Number 69-17043

science news yearbook 1969/1970



Preface

Dr. Lee A. DuBridge points out in his introduction to this volume that in an age dominated as this one is by science and its applications, a public awareness of the values and limitations of science is vital not only to the pursuit of scientific research but to the health of the society science serves. Scientists and engineers are not jinns on call with mysterious answers to society's problems. Nor are they a detached and esoteric force whose manipulation of the physical world and the human environment must confound public understanding. Nevertheless, they have an impact on our world that will continue to increase as we grow more dependent on the advances in knowledge their efforts produce. An understanding of their effort and its fruits is the only guarantee that this dependence will not be a helpless one.

As eminent a biologist as Dr. Philip A. Handler, now president of the National Academy of Sciences, has expressed the fervent wish for the failure, for now, of particular lines of research—those that forbode the corruption of the human gene pool or the possibly reckless engineering of human genetics. For research with implications such as these, he declared, "Mankind, as I know it, is just not ready! . . . No one has the requisite wisdom and foresight to make such decisions. . . . But it is clear that it behooves [us] to sharpen the sluggish mechanisms by which we rest political and social decisions on technical information."

It would be presumptuous, surely, to contend that Science Service, in its almost half a century as a channel of information among the sciences and between them and the lay public, has even begun to prepare the base for a structure of understanding of the magnitude demanded by Dr. Handler's concern. But the effort to lay at least the informational base on which understanding and intelligent decisions can be built has been the reason for its existence since its founding in 1921.

For more than four decades the organization has bent its efforts in this direction. In the last two years its weekly magazine, *Science News*, has emerged as a focus of the effort. And to provide a new perspective —essentially a long look over the shoulder at the year's developments as reported in *Science News*—the *Science News Yearbook* has now been born.

The contents of *Science News Yearbook 1969/1970* cover developments of the year 1968; the dates in the title refer to the period of the volume's availability before the appearance of *Science News Yearbook 1970/1971*.

This *Yearbook* does not attempt to be a definitive history of science and its applications during 1968; rather it represents a review of the year's developments and implications and an effort to present them in the longer perspective necessary to a permanent reference volume. Over the year, more than 1,200 pages of *Science News* are devoted to more than 5,000 reports and articles on the behavioral and social sciences, physical sciences, biological and medical sciences, ecological and environmental sciences and critical questions of science and public policy.

From that pool the material for this volume was selected, arranged, and revised by the *Yearbook*'s managing editor, Lillian Levy. The criteria were the usefulness of the volume as a reference work and the significance of the material itself, both in its own terms and in terms of the need for a balanced picture of the year in science and technology. The job was herculean; it could not have been done alone. Final organization and over-all editorial supervision were ably provided by Warren Kornbeg, editor of Science Sevice.

The book could not have been produced without the contributions of the members of *Science News* staff, who developed the material in the first place: Faye Marley and Barbara J. Culliton in the biomedical sciences; Jonathan Eberhart in aerospace; Edward Gross in the engineering sciences; Ann Ewing and Dietrick E. Thomsen in the physical sciences; Christopher Weathersbee in ecology; Patricia McBroom in the behavioral and social sciences; Frank Sartwell, managing editor; Carl Behrens, assistant managing editor; Marilyn Raleigh, illustrations editor; and Nadine Clement, who guided the manuscript through its finals stages of preparation. Special acknowledgment goes to Barbara J. Culliton, Jonathan Eberhart, Dietrick Thomsen, William Small and

Marjory Scarlet, who, respectively, prepared and organized for the *Yearbook* the sections on biomedical sciences, space sciences, physical sciences and astronomy, public policy and awards, and to Margit Friedrich, book editor of *Science News*, who made the index.

Quotations in the *Yearbook* not otherwise credited represent direct reporting of the source by *Science News* staff members in the original preparation of the material. Illustrations not otherwise credited were provided by Science Service.

The members of the editorial advisory board were: Stanley Falkow, associate professor of microbiology, Georgetown University School of Medicine; John W. Findlay, assistant director, National Radio Astronomy Observatory; Herbert Goldstein, professor of nuclear science and engineering, Columbia University; Thomas C. Kavanagh, treasurer, National Academy of Engineering; Richard R. Lower, professor and chairman, division of thoracic and cardiac surgery, Medical College of Virginia; and Elwyn L. Simons, professor of paleontology, Yale University. They earned our gratitude not only for the time and effort given to reviewing portions of this book but for the guidance they have provided for the volumes that will follow.

EDWARD G. SHERBURNE
Director, Science Service

March 10, 1969

Introduction

> If science and technology were to founder or stagnate, many of our hopes would collapse. To the extent that we neglect this source of our greatness, and to the extent that we fail to preserve the conditions of openness and order that made our progress possible, we are living off the land of civilization without refertilizing it. We must not let such a negative drift gain momentum.
>
> Richard M. Nixon
> New York, October 6, 1968

Science is a critically important part of our heritage from the past, the mainstay of our present and our legacy to the future. It cannot rest on its accomplishments.

The day that we, as a society, begin to feel that we have had all the revolutions in thought that we want to have, that we have accumulated all of the knowledge it is necessary to accumulate, on that day we cease to be a dynamic, viable society. On that day the new Dark Ages begin.

As the world's investment in science expands, the impact of technological progress will be more profound. The results are not always readily perceptible. But this does not make the work any less valuable.

A recent study by the National Science Foundation determined that, for a group of key developments, not only was 75 percent of the work done in universities and colleges, but the number of significant jumps in understanding peaked 20 to 30 years before the innovation to which understanding contributed began to appear. This was true of such ultimately revolutionary developments as the electron microscope, oral contraceptives, and magnetic ferrites (without which the computer revolution

would at least have been delayed, if not impossible). It is as true of others.

That mankind continues to benefit from the results of scientific and technological enterprise is vital. That it can continue to prosper, in an open society, without a deep and broad public understanding of the promise as well as the limitations of science is inconceivable.

Not only must an informed public be able to make intelligent decisions about the support of science. It must also make intelligent decisions about the applications of scientific knowledge and be able to understand the trade-off that must often be made of an old value for a new one imposed by a new technology, whether it be in weapons development or organ transplantation.

That is why it is so important that the lines of communication between the scientists and the layman—and even among scientists working in different fields—be kept open. Without a steady flow of information about science, its impact and its implications, critical decisions that scientists and laymen alike must make about the role and impact of science cannot be intelligently made.

And that is why an organization like Science Service, dedicated almost half a century ago to the public understanding of science and the rapid flow of information among scientific disciplines, serves so important a function. To the extent that its latest venture, this first *Science News Yearbook*, helps it fulfill its mission, it is contributing to the strength and health of our society.

LEE A. DUBRIDGE
Science Adviser to President Nixon

science news yearbook 1969/1970

Contents

CONTENTS