

OF THE WEEK

nobel prize in medicine	260
chinese physicians	260
volcanoes and earth tides	261
ozone layer	262
scientists for nixon	262
urban transportation	263
schizexperiences	263

NOTES

behavioral sciences	264
physical sciences	264
environment	266
aerospace	266

ARTICLES

science and apollo 17	268
physicists' particle searches	270

DEPARTMENTS

books	258
-------	-----

Cover: Emblem for Apollo 17 mission in December. Nine of the 13 instruments to be used in 26 experiments are new to the moon. The mission, the last one in the Apollo program, is scientifically the most adventurous so far. See p. 268. (Emblem: NASA, designed by Robert T. McCall)

Publisher	E. G. Sherburne Jr.
Editor	Kendrick Frazier
Aerospace	Everly Driscoll
Behavioral Sciences	Robert J. Trotter
Earth Sciences	Louise A. Purrett
Environment	Richard H. Gilluly
Medical Sciences	Joan Arehart-Treichel
Physical Sciences	Dietrick E. Thomsen
Copy Editor	Nadine Clement
Assistant to the Editor	Esther Gilgoff
Production Manager	Davida Daemon
Books	Margit Friedrich
Circulation Manager	Lawrence Cope
Advertising	Scherago Associates, Inc.

11 W. 42nd St., New York, N.Y. 10036
Fred W. Dieffenbach
Sales Director

Copyright © 1972 by Science Service, Inc.,
1719 N St., 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., \$10; 2 yrs., \$18; 3 yrs., \$25. (Add \$2 a year for Canada and Mexico, \$3 for all other countries.) Change of address: Four to six weeks' notice is required. Please state exactly how magazine is to be addressed. Include zip code.

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.

Published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington, D.C. 20036. (202-785-2255). Cable: SCIENSERV.

COMMENT

On the twilight of Apollo

It seems difficult to realize that in less than two months the Apollo program will come to an end. The last three moonbound Apollo astronauts are scheduled to leave earth on Dec. 6. Although there will continue to be a manned space program after the completion of that mission, no part of it currently envisions a flight to the moon. No American astronauts will tread on that now-familiar lunar surface for many years to come.

What has it all meant, this venture of men to earth's nearest neighbor, this multibillion-dollar effort initiated with such nationalistic zeal by President Kennedy that day in 1961? History, as usual, will provide the final judgment. But let us not be cowed by history.

On purely the level of technological accomplishment, the Apollo program has without doubt been a vast, overwhelming success, probably one of the most successful technological undertakings of all time. The bare goal was to land astronauts on the moon safely and return. That has been accomplished not once but five times, with a sixth try coming in December. The world now takes a landing on the moon for granted, but we need only recall the difficulties and uncertainties of those immediate post-Sputnik years, or the near tragedy of the aborted Apollo 13 mission, to realize how complicated the task is. The Apollo program has been a triumph for the engineers. It is one of the great ironies of our technological society that, now that their task is finished, many of those same aerospace engineers are out of work.

On the scientific value of Apollo, we enter less solid ground. Superlatives must be discarded and assailable stands taken. Due to Apollo, we have rocks from the moon and we have had instruments on the moon, orbiting around the moon, and probing into the moon. We have mountains of computerized data. We have abundant theories. But nevertheless—and this judgment may be disputed—I think it fair to say that the lunar landing missions so far have not produced the kind of quantum leap ahead in *fundamental* understanding of the origin of the moon and solar system that many had anticipated. The situation has grown more complicated, not more simple. This does not mean the missions have not had great scientific value. Science moves in small steps. It is just that the enormous step in data-gathering capability represented by manned travel to the moon and back has not yet produced a commensurately large step ahead in theoretical understanding.

Such an observation should not be misconstrued. Many scientists have criticized what they considered a disproportionate emphasis on engineering over science in the Apollo program. The quest for knowledge is one of the more laudable enterprises of society, and the scientific content of the Apollo program perhaps should have been higher. Yet it is naive and myopically self-centered for scientists to assume that Congress and the American people supported the Apollo program purely out of a love of basic research.

The Apollo program has really been an enterprise not of research but of exploration. Exploration seems a curiously old-fashioned word; the main geographical frontiers on earth have long since been explored. But it seems a useful term when applied to Apollo. Exploration is not solely an activity of science and technology; dozens of motives are involved, not all of them always laudable. But the human spirit probably has as much innate need for involvement in exploration in this sense as it has in the quest for scientific understanding of the natural world. Lewis and Clark's expedition, the Wright brothers' first flight, Lindbergh's Atlantic solo were not primarily scientific, but they all vastly altered our sense of proportion to ourselves and the world around us.

The misfortune of Apollo is that it was conceived in one era of American history and fulfilled in another. During that time came assassinations, racial strife, urban violence, social distress, economic uncertainty, and an interminable and divisive war. Yet—and again many may disagree—I don't think these problems would have been in any way lessened had the nation not been expending the resources it did on Apollo. Nevertheless, the shift in social climate has taken the shine off the achievements of Apollo.

I would have to guess that in a future and less buffeted age, the tarnish will have disappeared, and the Apollo landings on the moon will stand as an unambiguous and unparalleled human achievement.

Kendrick Frazier