

Science Forecast for 1967

Aerospace

Except for a practice shot or two and the actual manned moon landing, the entire Apollo program may well be out of the way by the end of 1967. The success of Surveyor 1 has prompted the National Aeronautics and Space Administration to chop three tentatively scheduled Surveyors off a possible 10. Two of the soft landing robots have already gone, and the five remaining could be squeezed into one year without too much trouble—five Gemini shots in 1966 proved that. The remaining three Lunar Orbiters are a lead-pipe cinch.

Actually, all of 1967 will be little more than a warm-up session for 1968, when the really big stuff will happen, including Apollo; the Air Force's Manned Orbiting Laboratory, which will keep its crew on high for a month; and a communications satellite network, as opposed to a building-block assemblage of random audio-video spectaculars, run by ComSat, or Hughes Aircraft, or IT&T, or the Ford Foundation, or even the Department of Defense.

The coming year should see a melange of satellites sticking their orbiting noses into all sorts of things that they barely sniffed at in the past. EROS, ESSA and others have been proposed to look at everything from melting ice caps to migrating whales.

A few hundred miles lower, the aviation people will also be only building up to bigger things in the future. The supersonic transport (or transports) will still be in the early tin-snipping stage by year's end; the huge Boeing 747 jetliner will somewhat resemble an airplane by that time, but that's all; and the incredible C-5A "barnliner" will be in "final assembly," which could mean anything from fastening on the wings to touching up the last coat of paint.

One place where a lot of aerospace research (and money) will be going is—down. The vast research and engineering organizations being maintained by the huge aerospace companies simply are running out of upward places to look. As a result, oceanography, mineralogy, criminal rehabilitation and many other areas are being investigated with an eye toward untapped markets and even presently-nonexistent fields. For at least the next half decade many of man's New Frontiers will be found right back where he started. When the Space Age came along, man is now discovering, he leaped outward so fast that he may have left his wallet behind.

Astronomy

As they have for the past several years, the strange and puzzling quasars will continue to intrigue astronomers and other scientists. It is possible that the true distance to these fascinating objects will be determined before 1968 and this, in turn, should shed some light on the source of their tremendous outpouring of energy.

More certain is the discovery of point sources of high energy radiation in both the gamma ray and X-ray range. To help in detecting and pinpointing the location of these objects, a pair of "light buckets" will be constructed during 1967 by the Smithsonian Institution at a site in southern Arizona. The "light buckets" consist of a mosaic of concave glass hexagons, each two feet in diameter, mounted on a concave frame 34 feet in diameter. They will be used to observe secondary gamma radiation in the atmosphere, which yields clues to the source of primary radiation.

Astronomers are just as interested as other scientists, perhaps more so, in the origin of life on this planet and the possibility of life elsewhere. They, therefore, pay particular attention to discoveries made in laboratories shedding light on how earth's primitive atmosphere first formed prebiological materials and how these materials could have been transformed into living compounds. New discoveries in the exotic field of exobiology are expected.

Not so exciting as quasars or the origin of terrestrial life, nevertheless the routine use by at least 13 observatories of the image tubes that convert a conventional telescope into an "electronic camera" will have a profound effect on observational astronomy. Telescopes with image tubes have already been trained on quasars, but observations this year from many observatories could yield more concrete clues to their nature and structure.

Announcement of plans for the United States to build a giant radio-radar telescope and research center is expected before the year's end.

Chemistry and Physics

Research in chemistry, which has been stepped up in all fields in recent years because of the expansion of such fields as molecular biology and chemical evolution as well as in all phases of technology, will probably not be seriously affected by the recent cut-backs in funds for basic research rec-

ommended by the administration, since much of the work is done by universities and private companies.

On the other hand the reduction in grants may be felt in basic physics research, because a high percentage of the studies in this area is undertaken by the National Bureau of Standards.

Whether this will have an effect on the total acceptance of the metric system in the United States remains to be seen. The 89th Congress by-passed the bill approved by the Senate which would have given the Department of Commerce funds to test the feasibility of changing the present system to the metric system, and now awaits the action of the new Congress.

Plans for the huge 200 billion-electron-volt proton-accelerator, the world's most powerful atom smasher are underway by the Atomic Energy Commission. To be located at Weston, Ill., beginning appropriation for the project is expected during 1967.

Holography, the new method of photography, will further revolutionize the field of optics. Three-dimensional color television and greater depth perception in microscopy by holograms are only two of the many uses predicted within a few years.

In polymer chemistry, new plastics continue to show their faces. Structural plastics have received an impetus with the wider acceptance of this material in building codes throughout the United States. While a new method of producing textiles directly from polymer films is expected to have great influence on the textile industry.

Earth and Environment

Water—its conservation, use and misuse—will be much in the news this coming year, accentuated by the international conference, Water for Peace, to be held in May in Washington, D.C., to explore methods of saving water, ending pollution, and controlling droughts, floods, and hence famine. More studies will be made to find new sources of fresh water, including cheaper methods of desalination and farout storage and transport projects to bring water from northwestern North America into arid regions.

Funded and goaded by the military forces, further research will continue on earthquake studies, including bigger and better seismic arrays to listen in to the tremors of the earth, including unexpected nuclear explosions. Further information about the structure of our earth's interior will result from im-

proved equipment, as well as more accurate prediction of natural disasters such as earthquakes, volcanoes and tsunamis. Closer tabs will be kept on the creeping San Andreas Fault of California, possibly due to start another earthquake as large as the 1906 San Francisco quake. There will be major progress in developing designs for earthquake-resistant buildings, dams and bridges.

More hardware will be added to man's attempt to explore the oceans and harvest its food, water, minerals and other resources. Further attempts will be made to consolidate numerous overlapping oceanographic agencies, both federal and private, into one structure, possibly headed by a panel. Sea grant colleges will be strengthened, attracting more youth into the growing oceanographic field.

Medicine

"Progress Is Tomorrow" is the hopeful title of the closing section of the 1966 report on Progress Against Cancer by the National Advisory Cancer Council.

"There is every reason to believe that the threat of malignant disease will be further reduced and perhaps ultimately removed through prevention and increasingly effective treatment," the report states.

During testimony before an appropriations subcommittee of the House of Representatives concerning the 1967 budget, the National Cancer Institute's director testified on progress that has been building up.

"For the past several years as knowledge accumulated on the chemistry and biology of DNA and RNA," he said, "major progress has been made in understanding in some detail how a carcinogenic chemical or virus converts a normal cell to malignant one. . . . If we can discover a physiochemical phenomenon common to all the thousands of carcinogenic agents, we may ultimately devise a chemical or biological manipulation to prevent or reverse the malignant change."

Both disappointment and hope lie in the field of vaccines. Field trials will be well under way for both mumps and rubella vaccines. Mumps vaccine will be on the market ahead of rubella vaccine in all probability. It may take several more years of testing.

Hepatitis vaccine, which has been hopefully anticipated for several years, is at a virtual standstill. The Division of Biologics Standards is not even sure of a virus isolate. One hopeful "virus" turned out to be another organism altogether.

Public Health

The health of the nation and the world promises to be the focus of much attention from both government and science in 1967.

President Lyndon B. Johnson has bluntly challenged the increasing costs of being ill, citing inefficiency and duplication of effort as one explanation of staggering hospital bills. Competition among hospitals to own expensive, highly specialized and prestigious equipment places an unnecessary burden on bill payers and stretches the limits of competent medical personnel, he said. Moves to straighten out this country's health care may be in the offing.

The Food and Drug Administration shows signs that it intends to play to the hilt its role as watch dog of what we eat and what we take on doctors' orders. Food standards in general will be evaluated, and diet foods and fortified foods in particular will come under FDA's eagle eye.

Medical devices, prosthetics and fancy hospital equipment have also been named by FDA as targets for evaluation and possible regulatory action.

Public Policy

Capitol Hill will loom higher in control over federal science next year than ever before. And the chances are it will insist on more payoff technology than basic research.

On both sides of the Capitol, Congressmen and Senators are taking steps to insure they are better informed on the R&D field. There is evidence that they want government science to attack pragmatic problems that face the voters in their districts: air and water pollution, transportation, urban crowding, poverty, mental and physical health.

There are, of course, votes to be gathered in these fields, and no politician is loathe to gather votes. But there are also some thoughtful, worried men on the Hill, wondering just where we are heading.

Senator Edmund S. Muskie (D-Maine) for example, wants to set up a new Select Committee of the Senate to serve as a forum for the meeting of scientists and politicians to examine what our technology and population growth are doing to our environment.

"It is for man to choose from science what he determines to be best for him," the Senator declared, "not for science to determine what man will be and the kind of environment he shall have."

In the House the Subcommittee on Science, Research and Development also is turning its attention to the technology of improving the environment under the chairmanship of Representative Emilio Q. Daddario (D-Conn.). This group also expects to delve into the international aspects of American scientific policy.

Social Science

This year may just be the beginning of the end for the "social sciences"—as they have existed over the past half century—and the beginning of a new integrated science directed toward handling the problems of urban living.

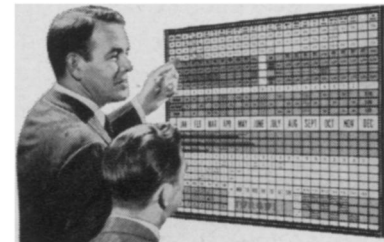
It seems likely that in 1967 the federal government, under the new Department of Housing and Urban Development, will at last take steps toward applying scientific rigor and analysis to city troubles, much like the united research effort that put man into space.

At the same time, brain research and molecular genetics will continue probing the secrets of memory, learning, emotions and heredity, areas previously left to the social sciences.

Already many social scientists have gone over to biology. Others are bound to do so as more money is pumped into understanding the central nervous system and the drugs that act upon it.

If the government decides this year to break into the "soft" sciences as it broke into the "hard" sciences many years ago, the result could be a new division of studies of human behavior—into psychobiology on one hand and behavioral science on the other—with bold new efforts to push back the frontiers in both fields.

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