

GENERAL SCIENCE

Science Forecast for 1961

New fundamental particle to be created, Kennedy administration to apply research to peace, seismograph network to tell atomic tests from earthquakes, Watson Davis predicts.

► FOR 1961, the world will see some significant developments in science and technology that on the basis of past efforts are likely to come to fruition. For example:

1. Creation of a new kind of fundamental particle, the magnetic monopole.

2. Building of atomic reactors to provide heat and power at isolated American bases in the Antarctic and the Arctic.

3. A new socioscience research attempt to understand the factors fundamental to peace and understanding in the world, a consequence of the new Federal administration.

4. Some progress in understanding and perhaps in treating cancer, heart and circulatory disorders and other ills.

Considering first the high energy research upon matter, it can be foreseen that:

The giant accelerators in the range of tens of billions of electron volts that went into operation in 1960 will begin to duplicate under control the kinds of radiations that have only heretofore been produced by natural processes in the reaches beyond the earth.

At Brookhaven National Laboratory on

Long Island with its 33 Bev machine it is likely that the completely new kind of fundamental particle, the magnetic monopole, will be discovered.

Even more important, perhaps, the Brookhaven accelerator and the 28 Bev proton synchrotron at CERN, Geneva, will create more anti-matter so that it can be studied and better understood. The production of antinucleons, K-mesons and hyperons and other "strange particles" will be more efficient with the new machines.

The six Bev electron synchrotron at Cambridge, Mass., will begin operation during the year to set a new world's record for high energy electrons.

Experiments will continue the Atomic Energy Commission's attempts to harness the fusion reaction of the hydrogen bomb so that it can be slowed and used for power. Success in this endeavor is perhaps overdue, since considerable progress was evident in 1958 at the Geneva atomic sessions.

The question of atomic testing unresolved during 1960 will be reopened, and the major

planning for an atomic explosion to be used to dig a harbor in Alaska will continue. If agreement between the United States and the USSR will allow, this peaceful use for the H-bomb may be given a trial, if not in 1961 then in 1962.

Detection of atomic explosions is still very much an unsolved problem, and this is a barrier to the policing of agreements on atomic testing.

About a hundred seismographs having uniform characteristics will be installed at strategic stations throughout the world. These seismographs will record long and short period seismic waves in two horizontal and one vertical direction and will time events within one-tenth of a second.

Seismologists will have greater capabilities of distinguishing between underground explosions and natural earthquakes from analyses of the records. This will be offset, in part, by recently developed techniques in masking explosions through "decoupling" methods. The capability to distinguish between underground nuclear and chemical explosions is doubtful.

Improved techniques in telemetering seismic signals from outposts or satellite stations to a central station will be developed. Continuously operating tape recorders will supplement conventional visual recording or on photographic paper. Techniques toward eliminating seismic noise, hence improving capabilities of recording weak seismic signals, will be developed.

Continue Space Exploration

The drive to explore space as a by-product of the nation's military missile program will continue. Satellites are now relatively conventional scientific instruments, and the fact that some of the launching attempts are not successful should not be too disturbing. Some failures are taken into account in the planning and the record is better than it appears. The Russians have failures, too.

In the fields of cosmic radiation and space research, the following developments should be watched in 1961:

A search, with the help of rockets and satellites, for gamma rays, in the primary cosmic radiation may reveal the presence of such electromagnetic radiation. Hitherto the presence of such gamma radiation has not been clearly established through balloon flights.

The international cooperative experiment in which 80 liters of nuclear emulsion were exposed at high altitude, should yield new information about interactions of the ultra-high energy cosmic-ray primaries—those above a million million electron volts.

The prospect of establishing a clear connection between auroras and the outer Van Allen radiation zone may improve as a result of further observations. Thus far, the latitude at which most auroras appear, and the latitudes at which the horns of the outer



ANTARCTIC'S FIRST ATOMIC POWER PLANT—Late in 1961 a 1,500 electrical kilowatt nuclear plant will be transported by the Martin Company to McMurdo Sound, principal base for all United States scientific efforts in Antarctica, and early in 1962 it will begin to replace oil as the fuel for heat and power at this outpost.

radiation belt project down toward the earth, do not appear to coincide.

The long-standing question as to whether an appreciable abundance of the elements, lithium, beryllium and boron, is present in the primary cosmic radiation may be settled.

It will not be surprising if in 1961 Red China becomes the fifth atomic power by exploding its own fission atomic bomb, as France did in 1960. Probably this can be accomplished without necessarily the aid of Russia.

Russia may announce that it has atomic submarines. The atomic fleet of the United States will continue to grow and so will the production of atomic power in our nuclear plants.

The new look at the aspects of the planet on which we live, which began in the International Geophysical Year, will continue to sharpen with continued developments and more analysis of data.

Automated Weather Forecasting

Automation in weather forecasting will increase at several centers, with the result that there will be an effect on predictions issued experimentally and for public use. Old and new satellites will continue to give meteorological information to be analyzed and fed into the forecasting computer machines. The record of Explorer VII when evaluated in the year will give a determination of the global heat balance, a new value for the solar constant, and the first direct heat calculations of individual storms. By use of radar, airplanes and ground observations, tornadoes, hail and other severe storms of spring will be observed more extensively and fully than ever before.

New observations in Antarctica may tell whether the lines of force of earth's magnetic field, near the poles, close from one hemisphere to the other or are lost in the interplanetary magnetic field.

We should know whether the "whistler" mode of radio propagation, previously a scientific curiosity, has a significant role to play in radio communication.

Study IGY Data

Further study of International Geophysical Year data is likely to show that many distinctive ionospheric phenomena can be observed in the airglow as well as by radio. The differences among these phenomena will throw light on relative roles of excited atoms as contrasted to electrons.

The reduction of IGY data, their flow to World Data Centers and publication of summaries in the IGY Annals will be virtually complete. The international use of IGY data will reach its peak level.

Planning will begin for the little sister to the IGY, the Solar Activity Minimum Program of 1964-65. This will involve only the atmospheric sciences where the rhythm of solar changes is important. This will give the necessary amount of comparison data at minimum solar activity to interpret fully IGY observations in fields where there are marked changes with solar activity.

There will be further probing of the great unobserved universe revealed to us by radio

waves caught by the new giant radio telescopes, particularly the one in West Virginia. There will be concentration upon why different types of peculiar galaxies have similar radio spectra and magnitudes. Radio observations of the planets Venus and Jupiter will be resumed, and accurately determined radio sources will help to continue the exploration of the radio universe and its comparison with that shown by light.

For the growing complexity of computers being put into use in many varieties for a multiplicity of purposes, an attempt will be made to have them use the same mathematical "language" oriented to the problems they tackle. Each of the giant machines will need a translator or compiling mechanism to adapt descriptions of the problems fed it to the special way it handles the data.

In medical research, more adequately supported than ever before in the world's history, basic information, only available after continued work, is likely to begin to give clinically applicable results. Prediction of specific results is difficult.

Under the new Democratic administration of President John F. Kennedy a continued expansion of scientific research and application can be expected. There will probably be new emphasis upon the sociological and psychological angles of international relations, with attempts at practical application to a "warm" peace.

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Postmortem on 1960 Forecast in Science

► THE SCIENCE FORECAST for 1960 made by Watson Davis, director of Science Service, issued a year ago was fulfilled in many respects.

The drive to make the U. S. Navy nuclear powered continued with more nuclear submarines launched and put into service. The nuclear ship Savannah did progress as predicted.

The Dresden, Ill., atomic reactor and the Yankee atomic installation in Massachusetts both began preliminary production as foreseen. Two great atomic accelerators for research began work, that at Brookhaven on Long Island, New York, and CERN at Geneva, began operation during the year as predicted.

The Neanderthal discoveries in Iraq were new finds of anthropological significance which it was suggested in last year's predictions would be made.

The ban on atomic explosions did continue during the year, but international cooperation did not get to the point where

tests of underground blasts to determine their detectability were made.

Satellites launched included one that was used as a relay point for radio transmissions. This was the satellite Echo I in the form of a 100-foot balloon which shone like a bright star and was seen by millions of people.

Satellite observations also showed that there are, as suggested in the prediction, other bands of radiation high above the earth additional to the original Van Allen belt discovered previously.

There was significant development in mechanization of weather mapping by means of computers and utilization of information gathered by satellites, as foreseen.

The hope expressed that man would make his first short hop into an orbit around the earth was not fulfilled, and remains to be accomplished some time in the future.

The hope, not listed as a definite prediction, that among the thousands of drugs being tested on animals a chemotherapeutic agent of promise in controlling cancer might be found was not fulfilled.

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Questions

AGRICULTURE—How was the self-improving barley developed? p. 437.

PHYSICS—What kind of light waves were generated for the first time with the uranium maser? p. 434.

TECHNOLOGY—How many bits of information can the cryogenic thin film memory plane store? p. 438.

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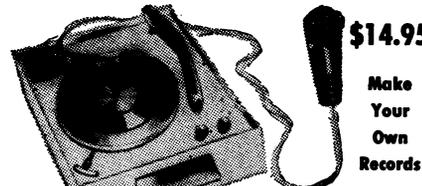
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