GEOPHYSICS

IGY Brings Many Discoveries

The International Geophysical Year, an 18-month probe of the earth and its environment that ends Dec. 31, brings many discoveries.

By ANN EWING

➤ MAN'S MOST extensive look and study of the planet earth came in the past 18 months of concentrated research upon outer space, weather, oceans and the frigid ends of the earth.

Here are the top accomplishments of the International Geophysical Year (IGY):

1. Artificial satellites of the earth were put into orbit and outer space probes launched.

2. The Antarctic continent was explored extensively and the South Pole colonized for the first time. This unknown white land will never again be unpopulated.

3. International cooperation in probing the earth and its environment was achieved by 66 countries, including Russia, with plans for such world-wide efforts to continue in future years.

4. An intense band of unexpected radiation, mysterious in its origin, was found to start 250 miles in space, increasing in intensity from there on out to an unknown distance. This radiation may hinder future space travel.

5. Gravity was measured successfully with high accuracy from submarines and for the first time from surface ships, giving new information on the constitution and shape of the earth, 75% of which is covered by water.

6. The atmosphere 200 to 2,000 miles high was proved denser than was guessed before probing with satellites.

7. The sun was found to emit X-rays that cause blackouts of radio communications by generating an additional electrically ionized layer of the upper atmosphere.

8. The earth holds 40% more snow and ice than was previously believed.

Key to the IGY program was the sun, and planet earth's star cooperated beyond anyone's expectations. It hit the highest level of activity of man's recorded history.

Although IGY was planned for the period when the sun would be at a peak in its 11-year cycle of activity, no one anticipated that "Old Sol" would usher in the program with a bang, then continue its superb performance for many months.

Changes in the sun's activity during its 11-year cycle of ups and downs are known to have profound influences upon earthly events, and learning more about them was a reason for holding IGY.

Just before the program started, on June 28, 1957, the sun erupted in a major flare, shooting out a giant tongue of gas with the energy of millions of hydrogen bombs exploding simultaneously.

Illustrative of IGY's international character, the flare was first detected at the Krasnaya Pakhra Observatory in the Soviet Union and the world was notified of the event by the World Warning Agency with headquarters at Fort Belvoir, Va.

Particles ejected by the sun during the flare reached earth the night of June 30-July 1, to usher in the IGY with a spectacular aurora. Studies of other auroral displays since then indicate auroras occur simultaneously in both the Northern and Southern Hemispheres.

In a related field, the so-called electrojet, a planet-circling electrical current high in the atmosphere over the equator, was discovered and its position mapped. The equatorial electrojet, combined with similar currents circling the North and South magnetic poles, is believed responsible for changes in the earth's magnetic field.

An investigation into the intensity of cosmic ray bombardment showed that the cosmic ray equator is consistently in a different position than the geomagnetic equator. This suggests there are important magnetic fields, probably not of earthly origin, far out in space.

In the field of the earth's heat and water budget—its oceans, atmosphere and great ice masses—many important discoveries have been and will be made. One, now being investigated by several different traverses of Antarctica, may mean that the "white continent" is not a solid land mass at all or that it is two continents.

Also it has been found that the South Pole, almost 10,000 feet above sea level, has 9,000 feet of ice beneath it. Byrd Station, which sits on 10,000 feet of ice, is only 5,000 feet above sea level. The thickest ice layer known, some 14,000 feet deep, was discovered.

Because of permanent outposts at the bottom of the world, weathermen have for the first time a relatively complete picture of the weather in the Southern Hemisphere and, therefore, of earth on a planet-wide basis.

An undersea mountain range has been discovered in the Arctic Ocean. Much information about the cold waters, as well as the earth's shape, was obtained when two nuclear submarines sailed under the Arctic ice. One, the Nautilus, went from the Pacific to the Atlantic underwater by way of the North Pole.

In studying the three-quarters of the earth covered by water, oceanographers discovered a counter-current under the Gulf Stream off the east coast of the U. S.

Another counter-current, called the equatorial undercurrent, was found flowing from Asia toward Panama in the equatorial region. It carries about a billion cubic feet per second, about 1,000 times the Mississippi River's transport.

Meteorologists, oceanographers and glaci-

GLACIOLOGISTS STUDY ANTARCTICA—An example of one of the thousands of research projects being conducted under the International Geophysical Year program, these two glaciologists are studying the ice-written history of Antarctica. At each scientific station on a 1,000-mile traverse of the unknown continent, scientists dug a pit nearly ten feet deep to study the temperature, density, layering and crystalline structure of the snow.

ologists are learning to explain the relationships of the cold and warmth of the water, ice and vapor around the earth.

In the earth's crust and interior, programs of unprecedented scope are being pursued. Besides the new gravimeter, special long-period seismographs are detecting earthquakes around the world.

Scientists of 29 countries at 45 IGY stations are determining more accurately the latitudes and longitudes. At some stations, very precise moon position cameras are being used to locate the earth's land mass more precisely than previously possible.

The satellites launched during IGY are scientific instruments that tie together all the rest of the program. In a more time-limited way, so also do the hundreds of rockets hurled aloft from pole to pole during the past 18 months.

Satellites have helped to determine air density and temperatures hundreds of miles in space, the variation in and structure of the radio-reflecting ionosphere. Future ones should tell about differences in the earth's gravitation, map the primary cosmic ray occurrences and the earth's magnetic field.

IGY's most important discovery, however, may well be the unequaled cooperation of scientists from all nations of the world. So successful has the venture been that a new program of further research in geophysics and related sciences will begin Jan. 1, 1959. It will be called International Geophysical Cooperation, 1959.

Cooperation 1959

Geophysicists are also making plans for continued international cooperation after 1959. Three joint groups, known as COSPAR, SCAR and SCOR, will operate in the fields of space, Antarctic exploration and oceanography under the same international organization that conducted the IGY.

This is the International Council of Scientific Unions, and is the principal agency by which the world's scientists coordinate their activities. Its members are drawn from 13 international unions covering fields from astronomy to physics.

One important aspect of IGY, still in the future although the program closes Dec. 31, is the analytical and theoretical research to be done with the information accumulating at the World Data Centers.

Dr. Joseph Kaplan, University of California physicist who is chairman of the U. S. National Committee for the IGY, said research on these data had two aspects, normal and special.

The normal research is that which hundreds of thousands of scientists will do using various portions of the data in a broad variety of studies.

However, to capitalize fully and promptly on the IGY, Dr. Kaplan urged a special and major effort to last about two years and be inter-disciplinary in nature. That is, it would be a concentrated directed attack upon several interrelated fields at once.

This program is called for because of the astonishing discoveries already made, such as the mysterious radiation band surrounding earth. Other new discoveries are bound to come, and U. S. scientists should act promptly to take advantage of the unique opportunity presented by IGY data.