to complete the establishment of a common gravity standard throughout the world. Gravimeter measurements, essential for tying together international networks, will be made in rapid succession at different points. Gravimeters placed on ships and on the bottom of oceans will supply data up to 50 miles from the American continental shore; and submarines will carry pendulum instruments to measure gravity on various east-west oceanic lines. In the Antarctic gravity studies will be made at the fixed stations and also on field trips across the ice to help scientists chart the subice topography and to tie the Antarctic gravity information in with that of nearby points in the Southern Hemisphere.

LATITUDE AND LONGITUDE DETERMINATIONS

Even today man does not know exactly how far apart the continents are or exactly where certain islands are; there is a possibility of error of as much as 200 to 300 feet while the location of some islands is uncertain by as much as a mile. Observations for the more precise determination of longitudes and latitudes will be made at 20 IGY stations around the world. Astronomical longitudes and latitudes are obtained by observations of the positions of celestial bodies with respect to the plumb line, or the direction of gravity. In the determinations of differential shifts between continents the values of the coordinates for each station will be determined with probable errors of only a few feet. A comparison of these values with others to be obtained in the future will enable scientists to determine by what amounts, if any, the continents are shifting with respect to each other.

In the moon-position program of the International Geophysical Year, scientists will try to solve several special problems concerning uniform time, the irregular rotation of the earth, and the size and shape of the earth. The moon-position program owes its existence to a new instrument, the dual-rate moon position camera, developed by William Markowitz of the United States Naval Observatory. The camera takes a simultaneous exposure of the moon and surrounding stars. The moon's image is held fixed relative to the stars during the exposure. The position of the moon relative to the stars may be obtained much more exactly than by other methods. Several observations of the moon on a single night by a station will determine the position of the station with reference to the center of the earth. From the position values of a sufficient number of stations, the figure of the earth may be obtained.

ROCKETS AND SATELLITES

Until recently studies of the upper atmosphere have been seriously handicapped because direct observations and measurements were impossible. Conventional balloon techniques, like those used in weather observations, do not extend beyond some 24 miles, and so studies of the upper atmosphere have depended upon indirect measurements such as those made in probing the ionosphere. Here pulses of radio energy, similar to radar pulses, are sent up to the ionosphere some 50 to 200 miles above the earth's surface. These pulses are reflected back, and by measuring the time of travel scientists can tell something about the reflecting features of the ionosphere. By analyzing the reflected signal something of the composition of the ionosphere can be determined.