charged particles of ultraviolet light or X-rays, or both. The energy from the solar bursts may cause winds and electrical currents in the high atmosphere. Curiously enough, the main features of the magnetic disturbances are such as would be caused by 3 great electrical currents, measured in hundreds of thousands of amperes, flowing in the upper atmosphere, 2 of which flow in the auroral zones of high latitudes north and south, and 1 in a zone around the Equator. The equatorial current would appear to have an extraordinary belt of greatly increased intensity concentrated in a narrow width of only about 125 miles. The demonstration of the existence of these currents, their nature and their cause, is an outstanding problem of geomagnetism.

The program in geomagnetism has been designed to explore the physical magnetism which causes geomagnetic storminess and to attempt to develop better interrelations between solar, ionospheric, and auroral events. The United States program emphasizes measurements in Alaska, the Antarctic, the equatorial Pacific islands, and the United States. All told there will be 12 stations outside the United States and a special network of 8 stations in the United States. This network will consist of an east-west chain of 5 stations stretching across the United States with a shorter north-south crossarm chain of 3 stations. These chains will be of particular value in studying rapid magnetic fluctuations and in charting electric currents in the ionosphere that affect the earth's magnetic field.

COSMIC RAYS

The existence of cosmic rays has been known for 50 years, but where they come from and their precise nature remain uncertain. The answers to these questions are of major importance in understanding our universe. These answers involve both astrophysics and the structure of the atomic nucleus.

Cosmic rays are known to consist largely of streams of electrically charged particles. Most of these particles are believed to be protons—the positive particles of atomic nuclei—the atomic nuclei of heavy elements, and high-energy electrons or a combination of electrons and protons. These particles bombard the earth continuously and come from every direction; the earth is literally bathed in them.

The source of these particles is one of the major questions in astrophysics. Some scientists think they come from interstellar space. Others think that they come from the sun. In any case, solar activity has a pronounced effect on their intensity and behavior. One of the difficulties in studying these particles is the effect of the earth's masking atmosphere. In general, the fundamental cosmic ray particles, which are called "primaries," do not reach the surface of the earth. These primaries encounter atmospheric atoms and molecules. Their energies are so high—literally millions of times greater than the energies which the largest atomic accelerators can produce—that they in effect smash atmospheric particles and create new cosmic rays called "secondaries." It is these secondaries that have been observed and measured. Even these secondaries possess so much energy that they have been detected not only on mountain tops and at the surface of the earth, but also at appreciable depths in the earth's interior.