



Seismological Laboratory of the California Institute, located in the San Rafael Hills in the western part of Pasadena, where the piers for seismographs are set in firm granite in cuts and tunnels under the building. Photo by Harold A. Parker Studio.

Unusual Opportunities for Training in Geophysics at the California Institute

By JOHN P. BUWALDA

FORMAL instruction in Geophysics has been given in the institutions of higher learning in this country only in the last decade or two, and even at the present time only a few universities offer extensive courses in this subject. The California Institute has forged ahead in this field. In the number and eminence of staff members giving attention to instruction and research in geophysical branches and in the variety of courses and breadth of curriculum, the Institute probably gives larger opportunity for advanced instruction than any other educational institution in America today.

Geophysics is the investigation of the solid body of the earth, its oceans, and its atmosphere, to determine the arrangement or structure and the physical properties of their parts and ascertain the nature of the changes that are occurring both on the surface of the earth and in its interior. Geologists, oceanographers, and meteorologists also investigate these problems, but the unique feature of Geophysics as a science is its attack on these questions by means of the methods of physics and the use of precise quantitative data. Geophysics is a relatively young science, but has developed very rapidly in the last quarter century.

Distinguished but little in principles and methods but mainly in the kind of information sought, two commonly recognized divisions of this subject are General Geophysics and Applied Geophysics.

General geophysics deals with such fundamental problems as the nature of the materials in the interior of the earth, their composition, temperature, pressure, and physical state; also their arrangement, which is now known to be in concentric spherical shells. Direct, reflected, and refracted earthquake waves, originating at many different localities on the globe and registered by widely-scattered seismographs, are divulging a surprising wealth of information regarding both the outer and the deeper parts of the body of our planet. Other examples of fundamental problems are the structure

of the crust beneath mountain ranges and its bearing on the origin of mountains and the cause of volcanism. In the ocean Geophysics attacks such questions as the exact cause of the tides, of so-called tidal waves, and of the vast system of ocean currents. Regarding the atmosphere the geophysicist attempts to determine the constitution and temperature distribution at different levels, the velocity of sound waves, the nature of electrical phenomena, the thermodynamic relations of the different latitudinal zones of the air, and the laws that govern not only the daily vacillations responsible for our weather but the broader circulation over the globe.

Applied Geophysics is concerned with using the principles, knowledge, and techniques of the science in solving a great host of practical problems, many of which cannot be attacked effectively in any other way. Some of the most important of these relate to the finding of new resources for industry, such as oil, gas, and metals. Because of their success and the great value of the resources recovered, new methods have been devised rapidly.

The training in Geophysics at the Institute is almost entirely at the graduate level. The scheme of courses as laid out requires two academic years for its completion. About half of the time in each of six terms is devoted to geophysical courses; the remainder is used largely for additional training in appropriate branches of physics, mathematics and geology. The Institute awards the Masters degree in Geophysics, usually at the end of the first or second year, the degree of Geophysical Engineer, usually after two or three years, and the Ph.D. degree in Geophysics normally at the end of the fourth year.

It may be stated that at this early stage, when instruction in Geophysics is not yet extensively developed in many institutions in the country, the California Institute is already providing unusual opportunities in this field in terms of staff, physical facilities, and favorable geophysical environment.