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## GEOPHYSICS IN WAR AND PEACE

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### Abstract

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Geophysics is the science dealing with physical processes or facts related to the Earth, to its solid body as well as to the water and the atmosphere. It may be divided into general geophysics, the study of geophysical problems for reasons primarily scientific, and applied geophysics which is concerned with problems of economic or military importance [see "References" at end of abstract, GUTENBERG, 1937].

As geophysicists investigate problems covering the whole Earth, international cooperation is highly important. On the other hand, cooperation with other sciences, especially geology, geochemistry, and astronomy, is necessary. Geodesy is closely related to geophysics, and sometimes is considered a part of it or combined with it in "geonomy." Knowledge of the fundamental problems of physics is required of a geophysicist. Details depend on the particular problems; the theory of elastic waves plays an important role in many investigations; the theory of gravitation, electricity, magnetism, optics, and other studies in other fields. In applied geophysics, familiarity with fundamental problems of electrical engineering (electronic devices in instruments) is essential.

Geophysics started relatively late as a separate science; many of its fields were considered a part of other sciences, especially geology. However it is of little importance under which auspices geophysical research is being done, as long as results are obtained. In many instances, study of geophysical problems requires cooperation of various sciences. For example, in the investigation of an earthquake, the process itself and the propagation of the waves is a geophysical problem; the determination of the faults, their age, or the displacements during the past must be investigated by a geologist; displacements before, during, and after the earthquake have to be found by the geodesist; stress and strain in the various parts of a building should be studied by the engineer. Other examples could be cited.

It must always be considered that there is only one Earth; consequently in investigations concerning the Earth or parts of it, theories of geology, geophysics of the solid Earth, oceanography, physics of the atmosphere, or astronomy must not contradict each other or observations in those various fields. The close relationship between gravity anomalies, ocean deeps, volcanoes, earthquakes, and the location of the andesite line along the boundary of the Pacific Basin, is an example of the problems which require cooperation among various specialists. Another is furnished by the correlation between solar activity, auroras, changes in the magnetic field of the Earth, in radio-wave propagation, and in the ionosphere. A frequently overlooked field of necessitous cooperation is that dealing with the effect of geophysical processes on life. This not only includes bioclimatology and paleogeography, both important for the investigation of the climates of the past, but also problems such as daily, annual, and other cycles in life; the appearance of certain animals at the surface of the ocean during a given phase of the moon for mating; orientation during migration of birds.

In many instances, investigations in general geophysics have later found practical applications in peace and war, such as the study of microseisms, the propagation of elastic waves (sound waves) in the solid Earth as well as in the ocean and in the atmosphere. Practically all geophysical prospecting for water, oil, and minerals was originally based on existing methods and results of the corresponding fields in general geophysics.

As stated, geophysics requires international cooperation. This led to international organizations during the earliest history of geophysical science, earlier than in most other sciences and with excellent cooperation, strengthening the idea of "one world." However when a war was forced upon a country, geophysics always played an important role, not only in forecasting weather, river, and ocean conditions, but also in construction of devices in connection with transportation by air and water, and in various other fields, not always of a geophysical nature, but for which the specific

training of a geophysicist furnished the essential preparation. However geophysicists, probably more than people in general, are working for peaceful international cooperation, by exchange of publications as well as by international meetings. This results in a better understanding of the physical facts and processes concerning the Earth as a whole as well as parts of it, in the decrease of damage and loss of life, for example by floods, storms, earthquakes, and volcanoes, and in a better utilization of natural energies. .

Reference

GUTENBERG, B., Geophysics as a science, Geophys., v. 2, pp. 185-187, 1937.

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