

In the Division of Physics a new spectroscopy laboratory has been established under the direction of Dr. G. Herzberg who joined the staff of the Division during the year. Continuous recording of cosmic-ray intensities has been started to study the effects of geomagnetic and other geophysical phenomena on the intensity, in order to learn more about the nature of the primary rays. The study of cosmic rays by exposing nuclear photographic plates at high altitudes has yielded results showing the interaction of mesons, protons, neutrons, and nuclei that are of high scientific value.

A special Geiger-counter equipment developed during the year as an aid in prospecting for radioactive ores in diamond drill holes, was given field tests. An absolute magnetometer using the fluxgate principle has been almost completed. Interesting work has been done on measuring the efficiency of hydroelectric turbines by the temperature drop in the water as it passes through the turbine.

Results of some observations on the adsorption of water vapour by wheat have been published. This subject is important because of the effect of moisture on the quality of wheat during storage. Some preliminary experiments were made during the year to determine the usefulness of the velocity of sound as a control in oil refining. A high-speed motion-picture camera designed to take pictures at 200,000 frames per second was completed. It has been operated successfully at 120,000 frames per second. No difficulty is anticipated at higher taking rates when special electrical equipment required for this purpose becomes available.

There has been a continued demand for development of both civil and defence radar equipment, and during the past year the Division of Radio and Electrical Engineering has co-operated with Canadian industry to put into production a modern marine radar set, which promises to have wide application. During the same period the development of radar equipment to facilitate navigation in and out of harbours has been pursued actively, as well as a study of the most suitable type of navigational marker for use in conjunction with radar equipment. Gratifying progress has been made in the application of Shoran radar to both topographic and geodetic surveying procedure.

Considerable time has been devoted to more fundamental radar studies, particularly in connection with propagation and antenna design. Preparations have been completed for an exhaustive study of propagation in the microwave region over various types of snow surfaces. A continual demand exists for shorter and shorter wavelengths and the Division's tube laboratory is devoting its time to the development of tubes to operate at wavelengths shorter than one centimetre.

Radar equipment (32-5 megacycle) has been set up to study meteors in collaboration with the Dominion Observatory; the records obtained have led to very interesting speculations, and it is believed that these studies, co-ordinated with visual observations, will result in a much better understanding of meteor phenomena.

In the radio field, the ratio of signal-to-noise strength is a most important factor and depending upon the frequency of the equipment, the noise which becomes a predominant problem may originate within the equipment itself or externally. To study this latter source of noise a new station has been established near Ottawa to obtain further solar-