of the star on the plate; measurement of the size and shape of the pattern gives the correction to the clock time and the latitude of the observatory. A program employing automatic telescope operation is carried out from dusk to dawn throughout the year on a selected list of stars passing nearly overhead at Ottawa. This gives the time to an accuracy of a few thousandths of a second, and latitude to a few hundredths of a second of arc on any one night.

The time so determined is then disseminated throughout the country by wire and radio. Seconds' pulses with a bilingual voice announcement every minute are available continuously over the Dominion Observatory's short-wave station CHU. These meet the needs of aerial and marine navigation and surveying, and also of many scientific laboratories for whom the radio link is adequate. Direct wire provides accurate time and frequency to local government and private laboratories, to the railway telegraph offices, to the Parliament Buildings, and to the CBC for the control of the 1:00 P.M. signal.

Stellar Physics.—The Stellar Physics Division concentrates its research activities in three particular fields of astronomical research—solar physics, radio astronomy and meteor astronomy—each of which employs highly specialized instruments and techniques. Only the solar research program retains a close connection to the name of the Division, since the study of distant stars, once based on observations made with the 15-inch refractor in Ottawa, is now pursued at the Dominion Astrophysical Observatory using the much greater light-gathering power of its reflecting telescopes.

A large solar telescope is used in Ottawa to form an image of the sun about 10 inches in diameter. Any area on the visible hemisphere may then be selected for detailed study. The light is fed into a large grating spectrograph so that the solar spectrum may be recorded in any region from the ultraviolet through the visible and far into the infrared. Studies of the composition, temperature and atmospheric motions in the sun may be conducted in this manner. A smaller optical system is used with an interference filter to photograph the sun in the light emitted by hydrogen atoms. This technique is used to detect solar flares and other transient phenomena in the solar atmosphere. The flare patrol is operated each clear day, photographs of the sun being taken more frequently than once per minute. The importance of magnetic fields in controlling certain phenomena related to sunspots and flares has become more evident in recent years. An adaptation of the solar spectrograph to produce maps showing the strength of solar magnetic fields is nearing completion.

A total eclipse of the sun provides an opportunity to study the tenuous outer atmosphere or corona of the sun which cannot be observed from the earth at other times. In recent years high-flying aircraft have been employed for the study of such eclipses. Observations of the brightness and temperature of the corona were secured from a large RCAF aircraft flying over the Northwest Territories in July 1963.

The study of the emission of radio waves by astronomical sources, known as radio astronomy, has recently become a major branch of astronomical research. It provides valuable data of a kind not obtainable with optical telescopes. The Dominion Radio Astrophysical Observatory is located about 15 miles south of Penticton, B.C., and was opened in 1960 as a part of the Stellar Physics Division.

A parabolic reflector 84 feet in diameter is used primarily for studies of the structure of the Milky Way star system and particularly for detailed mapping of the neutral hydrogen gas which frequently is found in large clouds in interstellar space. In this program, high-frequency radiation near 1,400 megacycles per second is observed. To study the distribution of energy within the radio spectrum, observations at much lower frequencies are also required. For this work a different type of antenna system must be used and a large array of aerials has been constructed. The array is in the shape of a "T" in which the crossbar is four fifths of a mile in length. It operates at 22 megacycles per second while a second array, operating at 10 megacycles per second, will take advantage of the conditions of low radio interference expected near the time of minimum solar activity.