

spectrum. Precise chemical analysis must take account of the differences of temperature and pressure in the atmospheres of different stars. The outer layers of the stars may appear to differ widely, but this is because of differences in their physical state. It is found that the majority of stars are of closely similar chemical composition. Studies of this nature depend on knowledge of the behaviour of matter in laboratories on earth. On the other hand, the stars themselves are a unique kind of laboratory where matter exists, and can be studied, under conditions that cannot be reproduced on earth. Thus some branches of astronomy, physics and chemistry complement each other.

Another important part of the Observatory's work is the study of close double stars. These are systems of two stars held together by their gravitational attraction. Under the influence of this attraction they revolve around their centre of gravity, completing a revolution in a very short time—usually a few days. The two stars are too close to each other to be seen separately with any telescope but they can be studied separately with the spectrograph. These objects are important because their motions are determined by the well-known law of gravitation, and can be made to yield much information about the component stars of each system. In favourable cases, the masses, sizes, densities, temperatures and luminosities of the two stars can be determined. Many of these stellar properties can be derived only from the study of such systems.

In addition to their research, the astronomers try to give a more direct service to the public. Telephone and mail inquiries are answered and many visitors come to the dome. Lectures are given to schools and other interested groups in the neighbourhood. On Saturday nights in the summer the 72-inch telescope is available for public observation during a two-hour period. Several hundred people take advantage of this opportunity whenever the sky is clear.

### **The David Dunlap Observatory of the University of Toronto**

The David Dunlap Observatory, located at Richmond Hill about ten miles north of Toronto, was built between 1932 and 1935. Its establishment resulted from a fortunate combination of interests centred in the tireless pioneering efforts of Professor C. A. Chant of the Department of Physics and (later) the Department of Astronomy at the University of Toronto in the training of professional astronomers, and in the generous offer of Mrs. Jessie Donalda Dunlap to donate an observatory to the University in memory of her deceased husband who had been interested in the efforts and aspirations of Professor Chant.

The David Dunlap Observatory was designed primarily for astrophysical research. The principal telescope, housed in a 61-foot dome, is a reflector of 74-inch aperture equipped with both Newtonian secondary for direct photography and Cassegrain secondary for use with several accessories for the analysis of starlight. One of these accessories is a prism spectrograph by means of which a star's light may be analysed to calculate its temperature, the content of its atmosphere, its velocity of approach or recession and sometimes its mass and diameter. A new spectrograph under construction in the observatory workshop will use reflection gratings and mirrors and so will extend the stellar spectra into the ultraviolet and will also permit work on fainter stars. Another accessory used at the Cassegrain focus is a photoelectric spectrophotometer which can record the light intensity of a single star in all colours of the spectrum in succession. Separate from the dome for the 74-inch telescope is the Administration Building which contains library, offices, laboratories and workshops. Atop this building there are now two telescopes, a 19-inch reflector which is used for photoelectric photometry of relatively bright stars, and a 6-inch refractor for student use. In the planning stage is a third telescope to be supported on the Administration Building—a reflector of intermediate size to relieve the pressure of student demand upon the other two research telescopes. Measuring instruments of various types for studying astronomical photographs are housed in the Administration Building.

A small separate building serves as the focal point of the Observatory's radio astronomy installation. A variety of antennas and radiometers are used in studying the radio radiation from astronomical objects.