

The Observatory's facilities at Richmond Hill are supplemented by laboratories and offices of the Department of Astronomy on the main campus of the University. Here also the astronomy staff and students are able to make considerable use of the up-to-date computing facilities of the University in analysing the data obtained at the Observatory.

Stellar Radial Velocities.—With regard to the real motions of the stars, which reveal the over-all dynamics of the stellar system, classical astronomy had to be content with that part of the motion which is directed across the line of sight and which is manifested by slight changes of position of the stars relative to one another. About eighty years ago it became possible by means of astronomical spectroscopy to measure also the radial or line-of-sight component of stellar motion. These stellar radial velocities, as they became available for statistically large numbers of stars in the early part of this century, revealed much new information concerning the structure of the galaxy. It was this field of radial velocity determination which was chosen for the major effort of the 74-inch telescope during the Observatory's early years. In thirty years about 3,000 stars have been measured for radial velocity out of a total of about 17,000 for which radial velocities are now known.

Stellar Photometry.—Another measurable attribute of stars which has always been of the greatest importance to the study of stars and star systems has been their apparent brightness. In particular this is true for stars of variable brightness. Some classes of these variables hold the clue for the determination of distances in the outer parts of the galaxy, particularly of the globular clusters. A thirty-year program of photographic photometry of faint variable stars in many of the globular clusters has added greatly to the knowledge of these clusters and of the stars which comprise them. A highlight of this program was the recent discovery of a nova or exploding star in one of these clusters. During the past decade photoelectric photometry both with the 74-inch telescope and with the 19-inch telescope has occupied an increasing proportion of the observing time. This kind of photometry is more time-consuming than photographic photometry but it is also more precise. In its simplest form the light of a single star is focused by the telescope onto the photosensitive surface of a photomultiplier tube, and by a suitable amplifying circuit a pen recorder gives a measure of the star's brightness. When various coloured filters are used in succession, the records provide an accurate measure of a star's colour as well as its brightness. In the photoelectric spectrophotometer the colour analysis is carried one step further by recording the brightness of the star at all colours as the star's spectrum is swept over the photosensitive surface. With these photometers many important studies have been made of the brightness and colour of stars and star clusters. Some of these studies have had a direct bearing on theories of the origin and evolution of stars; others have helped to establish the nature of the material in interstellar space and the size and structure of the Milky Way galaxy.

Stellar Luminosities.—Ranking in importance with measurement of apparent brightness of stars is the measurement of the luminosity or intrinsic brightness for, if both can be measured for the same star, then the star's distance may be calculated. Methods are available for gauging stellar luminosities from spectra of the stars and, in recent years, have been adapted to the collection of stellar spectra available at the Observatory from the radial velocity work. About 1,500 stars have now been measured for luminosity and new equipment and new methods are being developed to increase the precision of luminosity determination.

Radio Astronomy.—Astronomical bodies emit radio waves as well as light waves but only recently have radio telescopes been built to study the nature of these radio waves. The result has been a flood of new information about the sun, moon and planets, the interstellar hydrogen gas, and the Milky Way and other galaxies. Through co-operation between the Observatory and the Department of Electrical Engineering, a program of studies in radio astronomy is under way. Antenna and radiometer design, measurement of the radio emission from the sun and the solar corona, studies of ionized interstellar