

UNIVERSITY OF TORONTO SOUTHERN OBSERVATORY

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Why are Canadian astronomers so keen on going to Chile to study the stars with a small telescope? First and foremost, the southern half of the celestial sphere contains scientifically exciting and unique objects which have long been neglected. Secondly the rapid growth of Canadian cities and the cloudy Canadian climate renders nearby telescopes less effective than they used to be for some (though not all) types of research.

It is on Las Campanas at the southern edge of the Atacama Desert that the U. of T. 60-cm telescope is located. Through the cooperation of the Carnegie Institution of Washington, the U. of T. was able to make arrangements to have a share in the site, which is at a latitude of 29 deg. south and a longitude of 71 deg. west. The altitude is over 2000 m.

The 60-cm telescope was purchased from Ealing in Montreal, but was built by Competition Associates in Cambridge, Mass. The f/15 Cassegrain is fitted with a camera for plates 10x13-cm in size. The scale, 22.54 arcsec/mm, is very close to that of the Newtonian focus of the 1.88-m reflector in Richmond Hill. An ITT magnetically-focussed image-tube camera, which has a useful field of about 12 arcmin, may also be used.

A grating spectrograph, designed by Garrison, may be employed with photographic plates or with a one-stage image tube at dispersions of 120 A/mm and 67 A/mm. Three photon-counting photoelectric photometers are also available. Photomultipliers on hand are of three types: S4 for UVB wavelengths, S25 extended red for RI, and an Indium-Antimonide for the infrared JHK.

There is an on-line reduction system complete with two Osborne-I microcomputers, with an HP-9815A and an HP-85 as backup. By the end of this year, an échelle spectrograph with a Reticon detector will be in use and two CCD detector systems have been applied for. The scale and availability of this small telescope make it ideal for survey programs, which are difficult, if not impossible for large telescopes.

Other auxiliary instrumentation is available to fit particular astronomical programs. A short-wave radio is available for twice-weekly (or more) communications with DDO. There is also a large tape collection to provide musical comfort for the observers.

Besides the dome, which houses the telescope, the University has built a small combination residence and operations centre, constructed of

local stone so as to blend into the mountain slope. The building provides comfortable accommodation for two observers, desk and work space, facilities for light meals, and a fully-equipped darkroom.

There are many special advantages to having such a telescope at a good location. One is that it allows us to carry out variable-star surveys, which are difficult with large telescopes or cloudy skies. Two large spectroscopic surveys, a large photographic survey, and several photoelectric surveys have been carried out. In addition, several new variables have been discovered serendipitously during surveys for other projects.

The most spectacular example of serendipity is that of CPD -48 1577, which is the brightest cataclysmic variable known. It was discovered during the MK spectral classification survey of southern OB stars carried out by Garrison, Hiltner and Schild (1977). Another unique discovery from that survey is that of the pure helium star CPD -31 1701; there is nothing in the spectrum other than helium. This has been confirmed with a fine analysis by the Kiel group, who found $Y = 1.0$.

Gauthier studied the spectra of 26 southern Cepheids around their cycles. His is the most comprehensive classification study ever carried out for these fascinating stars. His results are published in his 1983 thesis and in an article in the book "The MK Process and Stellar Classification", edited by Garrison.

Crowe extended the Mira-variable-star catalogue of Keenan, Garrison and Deutsch (1974) to include the southern Miras. Using direct and image-tube plates, he took 475 spectra of 72 variables around their cycles at a dispersion of 120 Å/mm. This work represents a very considerable effort over about 6 years. Many of the stars were quite faint at minimum for such a small telescope. His results are published in his 1983 thesis and the JRASC as well as the JAAVSO and "The MK Process and Stellar Classification", edited by Garrison. The complete version will be published as an Ap. J. Supplement.

A program currently underway is being carried out by the resident observer for Bill Herbst of Wesleyan University. It consists of photoelectric observations of H-alpha in southern T Tauri stars. These fascinating stars vary irregularly and the plan is to monitor them continuously for several days of each month over a period of years.

Programs such as these can only be done with a small telescope at a great site, because larger telescopes are too much in demand. In Chile, the excellent seeing, clear skies and freedom from city lights help to make observing with a small telescope very effective in producing good and useful scientific results. It makes it worth the long trip to Chile for Canadian astronomers. The telescope time is open to all astronomers on the basis of scientific merit of the application alone.