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RESEARCH WITH A MODERATE APERTURE TELESCOPE

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In welcoming the addition of a new moderate aperture telescope to the fraternity of telescopes actively engaged in astronomical research, I would make a fervent plea, to those associated with it in its operation and use, to give much thought to the possibility of using the telescope with optimum efficiency by having associated accessories operative on it that would yield a maximum of information. Logically speaking, one would assume that this would be the natural course adopted by every telescope user. However, this is seldom done and I would, therefore, urge that as much or even greater attention be paid to the instrumentation attached to the focus of a telescope, than what has already gone into the telescope design and acquisition.

A moderate aperture telescope is the one that is hit most by lack of such a consideration. Financial resources form the principal limiting criterion and an observatory inevitably attempts to obtain the maximum light gathering facility within the specified cost ceiling. The follow-through with instrumentation and techniques, once the light is brought to a focus, is usually lacking, with the result that very often telescopes that are not within the largest dozen in the world, operate with lesser capability than what current technology permits consistent with their aperture. The danger is greater in a country like ours with a developing economy, and only a greater vigil, than what is necessary elsewhere, can steer it off.

The largest telescope we have in the world, the Hale telescope, has a diameter four times that of the one being dedicated today. In other words the Rangapur telescope should normally be able to perform similar to the 200-inch, but to a limiting magnitude three magnitudes brighter than that of the larger instrument. A substantial amount of astronomical endeavour is, therefore, within its grasp, if its users bestow the same care and attention on accessory instrumentation as has been done at Palomar. It is also possible that the smaller image scale can even be an advantage and decrease the three magnitude difference in favour of the smaller instrument.

A few instances that I give below will illustrate my point. In the field of photoelectric photometry, which I hope will be one of the profitable avenues of work you will adopt at this observatory, one finds almost all work in wide band photometry, fainter than the fifteenth magnitude, relegated to the large-aperture telescopes. If the faintest star that is measured photoelectrically at the 200-inch prime focus is 24.0, the Rangapur telescope equivalent performance should be 21.0. A fantastic amount of progress can be achieved in astronomy if we could foster more activity until the 21st magnitude with the aid of the smaller telescopes and leave the fainter domains to the aperture sizes really needed to tackle them. Harold Johnson, in an effort to reach the limit of possible performance of a 20-inch telescope, has measured the light of a 20th magnitude star with it. And when this is possible, one seldom notes in the literature instances of 20-inch telescopes used for magnitudes fainter than fourteen.

Let us examine the situation that prevails in spectroscopy. Coude high dispersion spectroscopy has been essentially the privilege of those having access to large size telescopes. The limiting performance at 9A/mm with the 12-inch aperture grating of the coude of the 200-inch telescope is magnitude 12.0 for an all night exposure. Hence, it should be possible to reach with an identical spectrograph, atleast magnitude 9.0 on the Rangapur instrument. If one takes into account the fact that with a 12-inch beam on the 48-inch instrument all the light will pass through the slit of the spectrograph, an additional gain is available which to retain the light gathering ratio, the 200-inch can perform only with a grating diameter four times its present facility. In fact the large camera of the 48-inch coude at the Dominion Astrophysical Observatory can equal the 200-inch in limiting magnitude at the high dispersion end and even possibly do better. I can find no better support for my argument than this actual attainment in practice of what seems a reasonable conjecture. It is no tribute to observatory planners of the past that when the moderate aperture telescope can really make most useful contributions in coude spectroscopy, and even has a distinct relative advantage over its larger counterpart, no efficient coude spectrograph exists on the smaller instruments, with the exception of the Victoria instrument. The detailed spectroscopic analysis of strars is a never ending source of basic information and constitutes a field where the moderate aperture instrument with efficient coude spectrograph can put in a fine performance.

Moderate to low dispersion spectroscopy with an efficient spectrograph and image tube is a very fascinating prospect for the user of a moderate aperture telescope. One of the most efficiently used spectrographs on a medium size telescope is the nebular spectrograph on the Crossley reflector at Lick. With the advent of the easily available blazed grating and Schmidt camera, Cassegrain

spectroscopy at low dispersion has gained much in efficiency in recent years. The use of an echelle at the Cassegrain and coude foci is a possibility packed with immense potential.

For the study of faint objects, there is much potential untapped in the technique of slitless spectroscopy. Its advantages in galactic structure studies, as in the study of spiral structure, is obvious. Much can be done with it in the study of emission line objects at the limit of detection, and in the measurement of red shifts of objects like the quasi-stellar sources.

One expects much that is new in the line of techniques and instrumentation, to originate from users of moderate aperture telescopes. The relatively low cost of operation of these telescopes makes them the most obvious ones to be used for trying out a new concept or method. In an experimental science where progress depends so much on the combination of brain and brawn, an alertness to harness the immediate assets of a progressive technology needs to be part of the repertoire of the user of a moderate instrument. The telescope only helps to bring light to a focus. The realization that what counts subsequently is the effective use of the scarce stream of photons thus made available, should be foremost in the mind of the user of any astronomical telescope.