

## THE INDIAN INSTITUTE OF ASTROPHYSICS

The Indian Institute of Astrophysics has been functioning as an autonomous Institute since 1971. It has excellent facilities for research in Solar Physics at Kodaikanal where it has been active for several decades. It has new facilities, that have been in operation since 1972 at Kavalur Observatory located in the Javadi hills, for observations of stars and galaxies. Here a very modern telescope of 102cm aperture complete with spectrographs, photometers and automated spectrum scanners functions as one of the most sophisticated instruments in its aperture class anywhere in the world. Much of the accessories of this instrument have been developed principally in the laboratories of the Institute.

Less than a month after the telescope was commissioned Dr.J.C.Bhattacharyya made with it the discovery of an atmosphere on Ganymede which is a satellite of Jupiter. A rare occultation of a star by this satellite was utilised for the observation which indicated the presence of a modest atmosphere. Only one other satellite of a planet in our solar system had been known earlier to possess an atmosphere.

A very major development with the 102cm telescope has been the development by M.K.V.Bappu and M.Parthasarathy of a technique that enables the rapid identification of quasistellar objects. These objects are of considerable interest in cosmology by virtue of several characteristics yet unexplained and which can only be solved by extended observations of a large sample. Earlier studies of the quasars could be done only after an optical identification of the radio object was made and a redshift determined. Subsequent studies showed that there were several of these objects in the sky in large numbers which were relatively radio-quiet and hence not easily picked up by even the most powerful radio telescopes available today. These objects can only be detected by optical methods from the large numbers that constitute the star background. Work with the 102cm Kavalur telescope has enabled this possibility and the new technique permits the rapid identification of such objects. Once the identifications are established, telescopes with light gathering power larger than the Kavalur one can measure the redshifts and assign a distance.

The study of the spiral structure of the galaxy we live in is one of the important projects handled by the 102cm telescope. It carries out this task by searching for blue objects that are young and which trace out the spiral arms. To be able to study those regions of the galaxy where dust in the interstellar medium will obscure and make optical studies impossible, the new metre wavelength radio telescope

being built at Gauri Bidanur by Dr.Ch.V.Sastry of the Institute will detect the extended regions around hot stars and provide the necessary information.

At Kodaikanal the emphasis has been on solar research and the study of solar terrestrial relationships. The Kodaikanal Observatory has long been known throughout the world as one of the major observatories engaged in studies of the physics of the solar atmosphere. In the sixties new equipment had been commissioned which provide the valuable facility of high spatial and spectrographic resolution. In recent years these have been used extensively for several major studies of short time-scale phenomena in the solar atmosphere. The most important of these has been the finding by Drs.Bappu and Sivaraman of the agency in the solar atmosphere that gives rise to the phenomenon well known in the stars as the Wilson-Bappu effect. This effect relates to the case of star chromospheres wherein the calcium emission line, which is a chromospheric characteristic, exhibits a unique dependence on visual luminosity of the star. All stars that exhibit chromospheres show this feature over a million fold range in intensity. Not only has it been shown that this aspect of chromospheric emission is confined to bright regions on the sun about two thousand kilometres across but it was also discovered that there were downflowing clouds of calcium that significantly affected the profiles of these lines as seen in the stars.

During the last few years the Institute has been able to have most of its instrumentation accessories built in the optical and mechanical shops attached to it. Telescope optics are now built at the Institute's new optical shop at Bangalore by A.P.Jayarajan. For instance, the new coude spectrograph of the 102cm telescope at Kavalur had all its imaging optics made in this optical laboratory. With this background of a capability of fabrication of large aperture optics, the Institute is currently engaged on making entirely in India a telescope of 90-inches aperture. The optical surfaces will be figured at the Institute. The precise mechanical and electronic components will, according to designs worked out by its personnel and consulting agencies, be fabricated elsewhere in India. This major enterprise, which calls for standards in engineering of high precision, is expected to be completed by the end of the Fifth Plan and will not only provide astronomers at the Institute and the rest of the country a major optical facility, but also be a great stimulus to the precision scientific instrumentation industry in India. For, optical telescopes of any aperture are products of precision engineering, and few countries in the world have produced their own.

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