Sharper Look at Southern Sky Pays Off

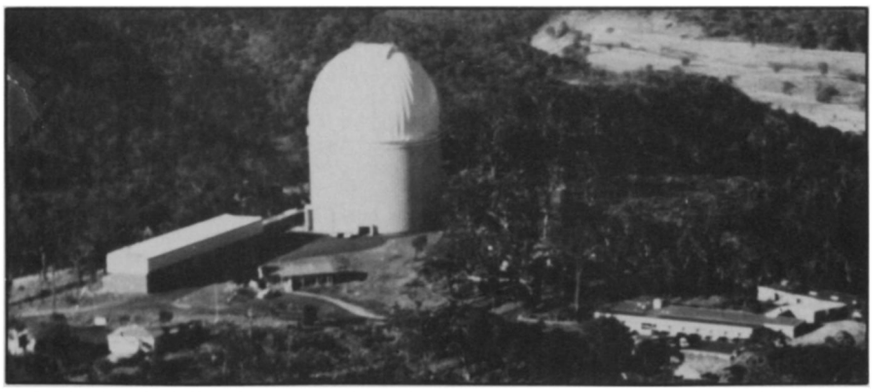
Siding Spring sounds like a place where trains would stop to take water. Perhaps in the Australian vernacular it means something entirely different, but it is the sort of isolated location familiar to viewers of films about Australia's pioneer days (one could call them antipodean westerns) that is ideal for astronomical observing. Being also not far from the metropolitan centers of Australia's east coast, it has become the home of a complex of astronomical equipment.

The latest and biggest piece is the recently dedicated Anglo-Australian Telescope, a 3.9-meter mirror, that is one of two simultaneously built large telescopes (the other is at Cerro Tololo in Chile) intended to give astronomers as sharp a view of the southern sky as they have long had of the northern half. The AAT has hardly been in operation long enough to get its screws, gears and dials adjusted, and already it has come up with two significant new findings about important southern-sky objects, a BL Lacertid and the Magellanic Clouds.

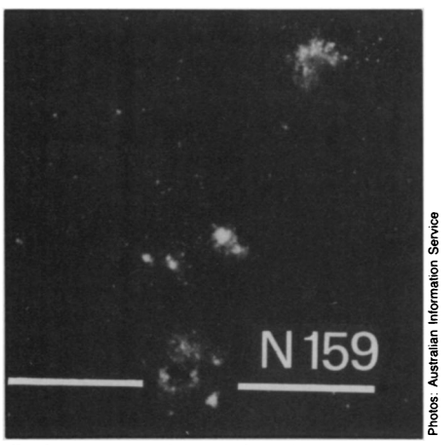
BL Lacertids are named for an object located in the constellation Lacerta (which is in the northern sky). As the BL designation indicates, the original object of the class was long regarded as a star. But closer observation showed that it looked something like a quasar, yet not quite enough to be called that, nor did it really look like a baby galaxy either.

Astronomers have been not quite sure what to do with BL Lacertids, although many would like to place them between quasars and compact galaxies in an evolutionary sequence running from quasars through Seyfert and other compact galaxies to the larger "normal" galaxies. One piece of information needed was a distance determination that, taken with the apparent brightness of the BL Lacertids, would enable calculation of their energy output.

But the BL Lacertids are dominated by bright nuclei that give off nonthermal radiation in which there is no hope of getting spectral lines that would determine a redshift and thereby the distance. A few, however, have haloes in which there is some hope of finding spectral lines, provided the emanations of the haloes can be distinguished against the overpowering brightness of the centers. One such haloed BL Lacertid is the southern object PKS 0548-322. Studying it, Australian astronomers have managed to detect absorption lines of calcium, sodium and other elements by using the Robertson-Wampler scanner, a photoelectronic device that enhances faint images. (The technique had been used before on other BL Lacertids, but had not yielded results as conclusive.)



In the lonely hills of New South Wales stands the Anglo-Australian telescope.



Photos: Australian Information Service

Carbon monoxide was found near N159.

A redshift of 0.07 has been calculated for PKS 0548-322, yielding a distance close to 350 megaparsecs. This would give it the luminosity roughly that of a bright elliptical galaxy. Such determinations may be of help in putting the BL Lacertids into an evolutionary scheme. Some controversy may arise because PKS 0548-322 appears to be part of a cluster of galaxies with only about half that much redshift, and astronomers on one side of the question will assume that it is part of the cluster and assign part of its redshift to causes other than distance. Others will allege that it is merely in the line of sight of the cluster, but really much farther away.

The two Magellanic Clouds, which lie near the southern pole of the sky, are the nearest galaxies to our own and appear to be satellites of it. Objects and processes within them can be distinguished, and studies in detail help to develop an astrophysics of the internal works of galaxies that can be reliably considered universal.

In one of the neatest observational tricks lately, Steve Knowles of the U.S. Naval Research Laboratory used the Australian telescope as a radio telescope to find carbon monoxide in the Large Magellanic Cloud. A radio receiver brought from Queen Mary College of the University of London by a group including Tom Phillips and Tony Gillespie was installed at the focus of the telescope. The telescope's aluminum surface was then used to gather and focus the extremely short radio waves (2.6 millimeters) emitted by the carbon monoxide.

Carbon monoxide is the most ubiquitous molecule in the interstellar gas clouds of our galaxy and is especially associated with regions of star formation. It has been discovered in a couple of other galaxies, but its presence in the Large Magellanic Cloud, which at 200,000 light years is the closest external galaxy, will allow its distribution and behavior to be studied in some detail. In the interstellar clouds of our own galaxy something like three dozen different molecular species have so far been found, and theorists postulate a complicated series of interstellar chemical reactions to account for them. If similar things can be discovered in the Magellanic Clouds, their study could give support to a universal theory of astrochemistry. Carbon monoxide, like most of the other species discovered in our galaxy, is an organic compound, and theorists are already proposing that these interstellar compounds are important to the origin of life. The presence of carbon monoxide in the Large Magellanic Cloud leads to speculation about the presence of life there. In fact, Bruce Peterson of the AAT Board's scientific staff seems almost sure of it. In his opinion, the discovery shows that the same type of physical processes that produce life occur in galaxies outside our own. "The carbon monoxide shows that there is some form of life in another system," he says. "Though it is too early to say what is going on out there, it is fairly safe to say that life does exist." □

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