Extragalactic Astronomy for Amateurs

It is the undoubted fascination of identifying extragalactic objects which drives many amateurs to spend long hours searching for them and looking at them through their telescopes. Although no one could ever expect to see them as they are shown in the photographs obtained with some of the world's largest telescopes, there still remains the pleasure in comparing one's own impression or drawing with those photographs, and in being able to identify certain features, even if they are only faintly visible. There are also people who like making comparisons between their own drawings and those of some of the famous earlier observers. In particular, they wish to identify with their own eyes all the objects in Messier's catalogue, and as many of the NGC and IC nebulae and galaxies as possible. Some observers even limit themselves to equipment similar to that used by Messier himself – for most objects roughly the equivalent of a modern 90mm refractor. However, rather larger equipment is needed for most of the galaxies to be visible in detail.

Three extragalactic systems (the Large and Small Magellanic Clouds and the Andromeda Galaxy, M31) are certainly visible to the naked eye, and one other spiral galaxy (M33) is reputedly so. Of the fainter objects on Messier's list, some are naturally of very considerable astronomical and cosmological interest in their own right, e.g. M77, one of the Seyfert galaxies (page 207), M82, a galaxy apparently showing violent activity, and M87, the very active galaxy in Virgo (page 210).

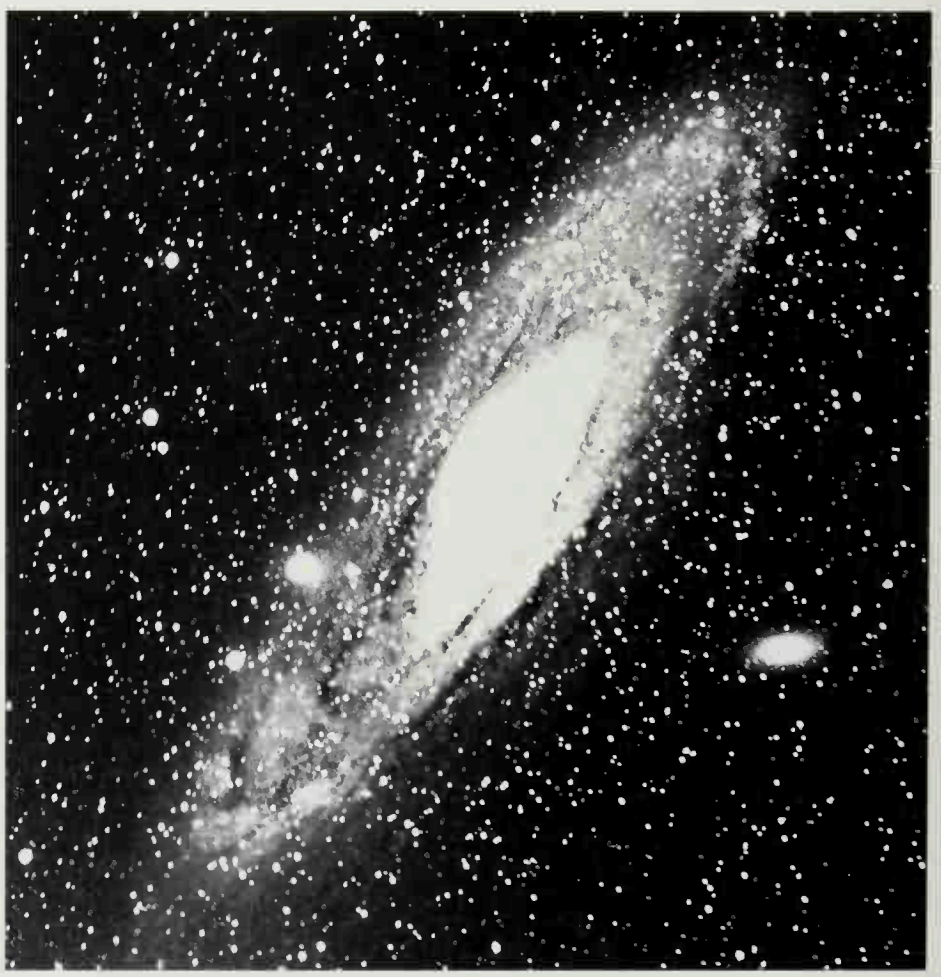
Both of the Magellanic Clouds are so close to our own galaxy that they can be partially resolved into individual stars with only moderate optical aid. They are both well worth examining with binoculars, particularly the Large Cloud, as this contains the vast region of nebulosity known as 30 Doradus (or the Tarantula Nebula) which is also visible to the naked eye alone. Close to the Small Magellanic Cloud is the large bright globular cluster NGC 104, 47 Tucanae, which belongs to our own Milky Way system. The Andromeda Galaxy (M31) is not particularly striking in binoculars, but becomes worthy of close examination with larger instruments. It would be pointless to attempt here to deal in any detail with all the other galaxies which become visible with even a moderate telescope.

For anyone with rather larger equipment – e.g. a reflector of 200mm aperture or more – some even more exotic objects are available for study. These include BL Lacertae itself (page 209) and the quasar 3C-273 (page 208), which has a nominal magnitude of 12.3 but is, of course, variable. Some amateurs follow the brightness changes of these, and a few other similar objects, using the methods of variable star observing described on pages 56–57.

It is perhaps necessary to offer a word of warning about the magnitudes of many extragalactic objects given in catalogues. Very frequently a magnitude is actually an integrated magnitude for the whole of an extended object, including the faint outlying regions, and it may well have been derived from a photograph. In most cases the observer's eye will not perceive these faint outer regions and the apparent magnitude will be considerably less than the catalogue value. A failure to realize this has caused observers to spend a lot of time fruitlessly searching for objects which they believed to be above the limit of their telescopes, but which in actual fact become visible only in much larger instruments.

As previously noted, it is essential that the 'unexpected' eruptive variables, such as the novae and supernovae, be discovered as early as possible. Searching for novae has already been discussed (page 56), but the methods employed in attempting to catch supernovae are rather different. There are one or two professional patrols, but most discoveries come from workers in other fields who happen to obtain a photograph which shows a supernova. However, more amateurs are now turning their attention to this subject, and are beginning to achieve some success in discoveries of supernovae.

As with the novae, searching may be carried out either visually or photographically. Each method has its advantages – speed and low cost in the case of the visual search, permanence of records and generally fainter limiting magnitudes in the photographic method. In both cases suitable charts of candidate galaxies are needed. These must not only identify suitable comparison stars for use if a supernova outburst occurs, but must also plot any foreground stars, condensations or H II regions (page 178) in the galaxy which might be confused with a true supernova. Obviously discoveries can and do take place in galaxies for which no charts are available, and at present this occurs in the majority of cases. In these instances checking has to be even more thorough, as there may be considerable



The Andromeda Galaxy, photographed with a 350mm × 500 mm Schmidt telescope on N2/H2 baked, hypersensitized Technical Pan film, with high-contrast copying.