The Large Magellanic Cloud. Note the strong bar structure and the slight suggestion of weak spiral arms.

S sequence, but of course without any spiral arms and containing much less gas. In addition, Sidney van den Bergh has described a sequence of gas-poor **anaemic spirals**, intermediate between S and S0, which are common in clusters of galaxies.

The original classes Sc and Irr I cover a wide range in appearance and each has been split into two, Sc and Sd, Sm and Im. Sm contains irregular galaxies with slight but definite traces of spiral structure: in this system, the Large Magellanic Cloud is SBm. Im contains irregular galaxies without such structure: the Small Magellanic Cloud is IBm. Both clouds have distinct bar structures.

Combination symbols, such as Sab, are used for intermediate types; (s) may be added if the spiral arms start in the nucleus and (r) if they start in a ring around the nucleus, as Sbc(s), SBa(r), with (rs) as intermediate type. De Vaucouleurs calls the ordinary spirals SA, to match the notation SB for barred spirals, with SAB intermediate between them. There is, thus, a continuous range covering three aspects, 0-a-b-c-d-m, A-B, (r)-(s). Further, spiral arms of similar structure can differ in strength; some galaxies have thick, massive arms while in others, of the same Hubble type, they are thin and filamentary. They are sometimes distinguished by a subscript m or f.

About 1958, William Morgan recognized a special class of giant ellipticals which he called cD galaxies. These are very large and bright elliptical galaxies with extended outer envelopes, and frequently the largest galaxy in a rich cluster is of class cD; most of them are also strong radio sources.

Luminosity classification

About 1960, van den Bergh found that the appearance of an Sb, Sc or Irr I galaxy is related to its luminosity; for example, the most luminous galaxies have the longest and most fully developed spiral arms. He, therefore, introduced luminosity classes numbered I to V in decreasing order of brightness; for Sb galaxies, however, only classes I, II and III are used, for it seems that all the intrinsically faint spiral galaxies are of class Sc. Also, there are no class I irregular galaxies.

Luminosity classification gives a simple method for obtaining the relative distances of large numbers of spiral galaxies.

Relative numbers of galaxies

Among the brightest galaxies observed, spirals amount to about 75 per cent, ellipticals and S0 20 per cent and irregulars 5 per cent. The relative numbers vary with limiting magnitude, however, for there are very many dwarf elliptical galaxies (sometimes counted as a distinct class dE) and also more irregular galaxies of low luminosity. For galaxies as a whole, therefore, the numbers of ellipticals probably exceeds 60 per cent and numbers of spirals and irregulars are approximately in the ratio 3 : 1.

The three groups, the ordinary spirals S (or SA), the barred spirals SB, and the intermediate group SAB, are present in about equal numbers.