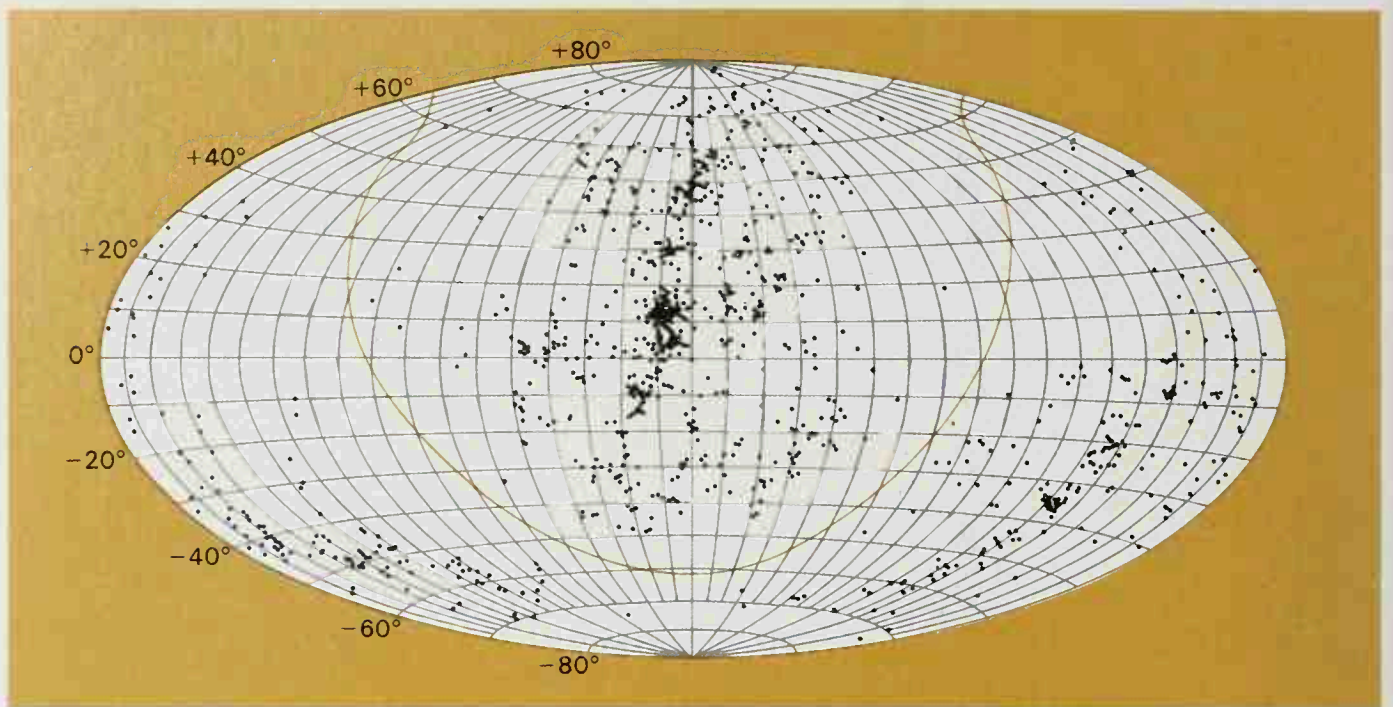
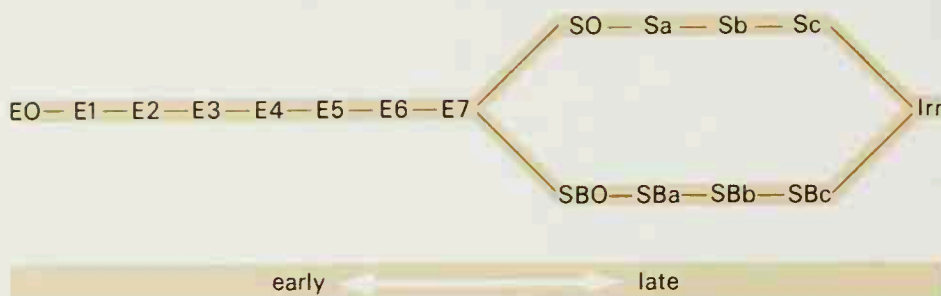


Fig. 7.1  
Positions in the sky of the thousand brightest galaxies, plotted using an equal-area projection of the entire sky using right ascension and declination as co-ordinates. The curved line represents the galactic equator. The distribution of galaxies avoids directions near the plane of the Galaxy, and also shows a strong tendency towards clustering (page 203).



The Hubble diagram of galaxy types.



E. Classes observed run from E0 to E7 only, systems flatter than E7 no longer being ellipses but displaying a central condensation and a disc instead. Next after E7 come the lens-shaped galaxies S0 and SB0, which have discs but no spiral arms. They lie in intermediate positions in the continuous Hubble sequence from E to S and SB types.

The classification Sa, Sb, Sc for spiral galaxies is related to the size of the central condensation and the tightness with which the spiral arms are wound; they vary together. For Sa, the arms are tightly wound and the central condensation is large; Sb have more open arms and a smaller central condensation; Sc have very open arms and a very small nucleus. The amounts of interstellar gas and dust increase in sequence from Sa to Sc. For barred spirals, SBa and so on, the structures are the same except that the arms emerge not from the nucleus but from the ends of a prominent bar passing through the nucleus. Unlike an elliptical, the classification of a spiral galaxy is absolute and does not depend on its orientation in the sky.

Two types of irregular galaxy are recognized. The more common type Irr I (or Ir I or Im), which includes both the Magellanic Clouds, clearly follows in sequence after Sc and SBc, with the break-up of arms into a confused structure and the presence of still more dust and gas. The second type Irr II (or Ir II or IO) is rarer; they are very different from Irr I galaxies, being peculiar, chaotic objects, highly obscured and reddened by internal dust. They lie outside the general sequence of galaxies, and often display strong activity.

### Significance of the classification

The Hubble sequence is based purely on appearance. There are, however, systematic physical variations – the relative number of bright blue stars and the content of gas and dust increase steadily from E and S0 galaxies through the sequence of S or SB to Irr I. So too does the galaxian angular momentum, except that it is small in irregular galaxies.

