Table 6·1 **Bright globular clusters**

cluster	NGC	right ascension h m	declination ° ′	apparent magnitude	distance (kpc)	mass (× 10^4 $M_\odot$)	spectral type	number of variables
47 Tucanae	104	00 21·9	−72 21	4·0	5·0		G3	11
ω Centauri	5 139	13 23·8	−47 03	3·6	5·2		F7	165
M 3	5 272	13 39·9	28 38	6·4	10·6	21	F7	189
M 5	5 904	15 16·0	02 16	5·9	8·1	6	F6	97
M 4	6 121	16 20·6	−26 24	5·9	4·3	6	G0	43
M 13	6 205	16 39·9	36 33	5·9	6·3	30	F6	10
M 92	6 341	17 15·6	43 12	6·1	7·9		F1	16
M 22	6 656	18 33·3	−23 58	5·1	3·0	700	F7	24
Δ 295	6 752	19 06·4	−60 04	6·2	5·3		F6	1
M 15	7 078	21 27·6	11 57	6·4	10·5	600	F2	103
M 2	7 089	21 30·9	−1 03	6·3	12·3		F4	17

Table 6·2 **Bright galactic clusters**

cluster	NGC	right ascension h m	declination ° ′	apparent magnitude	distance (pc)	spectral type	estimated age (× 10^6 yr)
h & χ Persei	869,884	02 15·5	56 55	4·2	2 360	B0·5	12
M 34	1039	02 38·8	42 34	5·6	440	B8	160
Pleiades (M 45)	—	03 44·1	23 57	1·3	126	B7	63
Hyades	—	04 17	15 30	0·6	45	A2	400
M 38	1 912	05 25·3	35 48	7·0	1 320	B8	50
M 36	1 960	05 32·8	34 06	6·3	1 260	—	32
M 37	2 099	05 49·1	32 32	6·1	1 280	B8	200
M 35	2 168	06 05·8	24 21	5·3	870	B5	—
Praesepe (M 44)	2 632	08 37·2	20 10	3·7	158	A5	252
M 67	2 682	08 47·8	12 00	6·5	830	F2	4 000
κ Crucis (Jewelbox)	4 755	12 50·7	−60 04	5·0	830	B3	16
M 21	6 531	18 01·6	−22 30	6·8	1 250	O9·5	6·3
M 16	6 611	18 16·0	−13 48	6·6	2 500	O5	1·3
M 11	6 705	18 48·4	−06 20	6·3	1 740	B8	160
M 39	7 092	21 30·4	48 13	5·1	250	B9	252

discoveries of new molecules in the late 1960s took place at the same time as dramatic improvements in microwave receiver design. However, the range of molecular species found in the cloud complexes was a great surprise. A few of these molecules were inorganic (lacking carbon); but the vast majority were organic compounds, ranging from simple diatomic varieties such as methylidyne (CH), cyanogen (CN), and carbon monoxide (CO), up to nine-atom molecules like ethyl alcohol – ethanol – (C_2H_5OH). Quantities of the latter in the huge cloud complex Sgr B2 have been estimated as sufficient to make up more than 10^{27} litres of whisky! Even larger molecules have now been detected including cyanooctatetrayne (HC_9N) and the 13-atom cyanopentaacetylene ($HC_{11}N$), although the latter is probably only associated with a circumstellar shell, rather than a true interstellar molecular cloud.

A number of molecules, which we would expect to be relatively common in space, such as oxygen (O_2), nitrogen (N_2), carbon dioxide (CO_2) and, most especially, hydrogen (H_2) are not detectable by their rotational transitions on account of their symmetry. Although we do not observe them directly, we can infer their presence. Hydrogen is the most common molecule in space, followed by carbon monoxide (with 10^{-4} of the hydrogen abundance), and then by hydroxyl (OH) and ammonia (NH_3) (with only 1 per cent of the CO abundance). Most of the 50 or so molecular varieties so far discovered have been found in fewer than a dozen locations in the Galaxy, where the density is greater than 10^{10} atoms per m^3 and where there is enough dust to shield the molecules from the dissociating effects of ultraviolet radiation from young stars.

The fourth molecule to be discovered, hydroxyl, still poses problems for astronomers. Although it is usually seen as a single, broad line at 18-cm wavelength, there are regions of the sky where the OH line is observed to be split into several bright, narrow emission lines with strengths a million times greater than normal. These OH sources are very tiny: condensations in them are less than 10 au across, whereas a normal molecular cloud is several pc in

The 'Snake' Nebula, Barnard 68 and 72. It is easy to see on this photograph why such patches of obscuring material were once regarded as being starless voids in space.