CHAPTER ONE

Stars and constellations

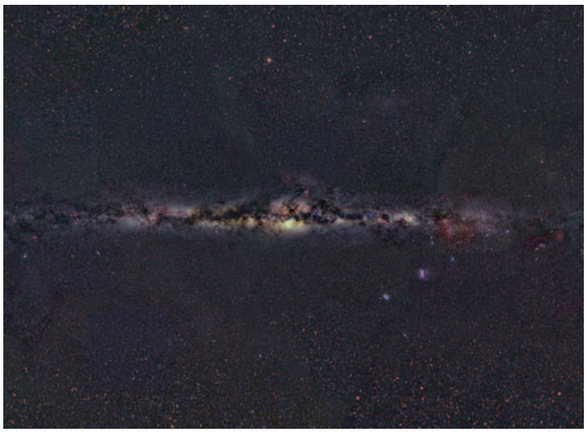

Fig. 1.1 **The Milky Way** A spectacular mosaic of the entire length of the Milky Way, focused on the center of the Galaxy in Sagittarius, reveals awesome complexity, all the constellations, millions of stars of all different kinds, and a great dark rift of interstellar dust in which stars are being born. In the middle is the Galactic bulge, while to the right are Orion and Canis Major, with Sirius, the brightest star of the sky. At center-left are Taurus and Auriga, where we find the Galaxy's anticenter [Appendix 5]. Ursa Major with its Big Dipper (or Plough) is above them. The two Magellanic Clouds, nearby irregular galaxies, are down from right center. See the frontispiece for an expanded view. (Courtesy of Axel Mellinger.)

Fig. 1.2 **The Pleiades** This most prominent of all open clusters has meant many things to many people, to some evoking sisters, to others brothers, a dipper, a basket, and much more. Note the dusty interstellar cloud lit by the hot blue stars. (Courtesy of Mark Killion.)

From the deep dark of the country, stars seem everywhere, bright ones set like colored jewels against a matrix of diamond dust. Learning them may seem a hopeless task. Closer examination, however, begins to show some order. The first sign of organization is their intense concentration toward the encircling band of the Milky Way, the visual manifestation of the disk of our Galaxy (Fig. 1.1). Superimposed upon this distribution are distinctive groupings (some physically real, others accidental) set into patterns that the human mind quickly recognizes and names, and in earlier times thought spiritually or otherwise significant. Thus were born the constellations. The moving Sun, Moon, and planets, embodying restless gods, resided within different starry "homes," and perhaps an understanding of where they seemed to be could tell something of human fate. If nothing else, the animals, heroes, and artifacts that in the ancient human mind populated the sky could be used to tell exciting stories as the stars wheeled overhead and the night played out its darkness.

In our own times, from the advent of our understanding of what the stars really are, the constellations have slowly lost their supernatural meanings (though not even now to those still enamored of astrology). Yet these figures retain their charm, their history, even considerable usefulness to modern astronomical nomenclature through their ability to parcel out the sky into manageable segments. The first step in our starry tale is therefore to explore what a newcomer to astronomy perhaps most wants to know: what does Orion look like, where can he be found, what is the name of that star over there, and why does it sound so strange to the ear, the subject inevitably leading back to physical reality and to the organization of the heavens.

All societies have to some degree explored the sky overhead. After all, it is half one's world. Though views overlap, every group has seen the sky through different eyes and has named different patterns of stars according to different rules. The ancient Greeks had 12 constellations in their zodiac, the Chinese, 30. The Greeks' Pleiades (Fig. 1.2) is the representation of the Seven Sisters, but to the Incas this lovely cluster was "cholca," a basket (which it indeed resembles). "Our" constellations, the ones that are used in "western" lore and are now adopted worldwide, are but one set; there are countless others. And they are neither ours nor western, as the oldest go back thousands of years to the lands of the middle east, with influences from the neighboring areas. Some figures actually look like something familiar. In most cases, however, the constellations' patterns were meant to represent, not portray, most looking little or nothing like the objects or people they were named after.

The constellations are commonly and neatly divided into "ancient" and "modern," as well as into informal "asterisms" and the mercifully "rejected." Such separation is rather artificial. One might rather think of constellation invention as a human desire that spans the ages and is chaotically continuous, each era providing its own richness to the mix. Still, the traditional groupings provide a good place to start.

1.1 Classical constellations

For a millennium, from Homer to Ptolemy, the astronomers and poets of the developing and mature Greek civilizations codified and expanded the myths of sky-figures that were handed down from forgotten times (Fig. 1.3). In his *Syntaxis*, the great work of mathematical astronomy known in Arabia as the *Almagest*, Ptolemy finally included 48 figures, the "ancient 48," which encompass the bright and obvious patterns (Table 1.1). The remainder of the starry heavens were referred to as "amorphous" (Greek, "amorphotoi") or "scattered," and presented a canvas left for others to paint on at later times. The old figures therefore have been termed the "ancient Greek constellations," though they long predate ancient Greece. The Romans, conquering Greece but also being conquered by its culture, gave to the figures the Latin names by which we know them today.

Fig. 1.3 **The northern ecliptic hemisphere** Constellation figures crowd the sky in an early eighteenth-century map. Centered on the north ecliptic pole, it features the ecliptic and the constellations of the Zodiac around the circular periphery. (Andraæ Cellarii, *Harmonia Cosmographia*, Amsterdam, edition 1708, courtesy of the Rare Book and Special Collections Library, University of Illinois.)

1.1.1 The Zodiac

Among the oldest and most revered figures were those that mark the apparent passages of the Sun, Moon, and planets, the street of the seven classical moving bodies of the sky, from which in part come our seven days of the week. The *Zodiac* (from Greek "zodia," for "animals") is filled with living fertility symbols that mark the time for planting, harvesting, and other human activities. In early classical times, the Sun passed through Aries – the Ram – on the first day of spring, through Virgo the Virgin and her golden sheaf of wheat as autumn approached, and into the "wet quarter" of Capricornus (the Water Goat), Aquarius (the Water Bearer), Pisces (the Fishes) as a prelude to spring. All these constellations are best seen six months opposite the time of solar passage.

From these dozen constellations are taken the occult astrological "signs" of the Zodiac. At the time of their invention, the signs (uniformly 30° wide in spite of the varying sizes of the astronomical constellations) overlapped the constellations and took their "magical" powers from them and their qualities. They no longer overlap because of precession [2.4], the 26 000-year wobble of the Earth's axis that carries the equinoxes and solstices [2.3.3], to which the signs are attached, westward through the constellations. Thus the sign of Libra sits on Virgo, the Virgin's sign on Leo, and so on. There are twelve because, to the nearest whole number, the Moon goes through its phases a dozen times per year. Therefore, every time the Moon passes a particular phase, the Sun is found in the next constellation (or, rather, sign) to the east. The constellation Ophiuchus (the Serpent Bearer) traditionally stands on, or crosses, the ecliptic, the Sun and its attendants actually passing through 13 constellations rather than 12. There is no "sign" for Ophiuchus, however, and he is a part of neither the astrological Zodiac nor of the classical astronomical Zodiac.

Today, the vernal equinox, the summer solstice, the autumnal equinox, and the winter solstice, are respectively held by Pisces, Gemini (technically, Taurus), Virgo, and Sagittarius. Two to three millennia ago, however, they were contained by Aries, Cancer, Capricornus, and Libra; hence the ram's horn ♈ as symbolic of the vernal equinox, the names of the northern and southern limits to the zenithal Sun (the Tropics of Cancer and Capricorn), and the non-animalistic invention of Libra, the Balance (which also marks the claws of Scorpius, making the two a double constellation). Quite by coincidence, the Milky Way cuts across the sky perpendicular to the ecliptic and almost along the solstitial colure (the great circle that runs through the celestial poles and the solstices), intersecting the Zodiac in Gemini and Sagittarius (Figs. 1.4 and 1.5).

As a set, the Zodiacal constellations are different from the other constellation groupings. Over the rest of the sky, the ancients generally singled out only the most visually prominent of patterns. Because of the great spiritual significance

Name	*Meaning*	*Genitive*	*Abbr.*	*Loc.*[a]	*Luminary*	*Remarks*
Andromeda	Chained Lady	Andromedae	And	EN–NP	Alpheratz=Alpha Mirach=Beta	Perseus myth
Antlia	Air Pump	Antliae	Ant	ES	Alpha	Modern
Apus	Bird of Paradise	Apodis	Aps	SP	Alpha	Modern
Aquarius	Water Bearer	Aquarii	Aqr	E–ES	Sadalsuud=Beta	Zodiac; Water Jar
Aquila	Eagle	Aquilae	Aql	E–EN	Altair=Alpha	Summer Triangle
Ara	Altar	Arae	Ara	SP	Beta	
Aries	Ram	Arietis	Ari	EN	Hamal=Alpha	Zodiac
Auriga	Charioteer	Aurigae	Aur	EN–NP	Capella=Alpha	
Boötes	Herdsman	Bootis	Boo	EN	Arcturus=Alpha	
Caelum	Engraving Tool	Caeli	Cae	ES	Alpha	Modern
Camelopardalis	Giraffe	Camelopardalis	Cam	NP	Beta	Modern
Cancer	Crab	Cancri	Cnc	EN	Al Tarf=Beta	Zodiac
Canes Venatici	Hunting Dogs	Canum Venaticorum	CVn	EN–NP	Cor Caroli=Alpha-2	Modern
Canis Major	Larger Dog	Canis Majoris	CMa	ES	Sirius=Alpha	Winter Triangle
Canis Minor	Smaller Dog	Canis Minoris	CMi	EN	Procyon=Alpha	Winter Triangle
Capricornus	Water Goat	Capricorni	Cap	ES	Deneb Algedi=Delta	Zodiac
Carina	Keel	Carinae	Car	SP	Canopus=Alpha	Argo
Cassiopeia	Queen	Cassiopeiae	Cas	NP	Shedar=Alpha	Perseus myth; Andromeda's mother
Centarus	Centaur	Centauri	Cen	ES–SP	Rigil Kentaurus=Alpha	Nearest star
Cepheus	King	Cephei	Cep	NP	Alderamin=Alpha	Perseus myth; Andromeda's father
Cetus	Whale, Sea Monster	Ceti	Cet	E	Deneb Kaitos=Beta	Perseus myth
Chamaeleon	Chameleon	Chamaeleontis	Cha	SP	Alpha	Modern
Circinus	Compasses	Circini	Cir	SP	Alpha	Modern

Table 1.1 **The constellations**

Name	Meaning	Genitive	Abbr.	Loc.[a]	Luminary	Remarks
Columba	Dove	Columbae	Col	ES	Phact=Alpha	Modern
Coma Berenices	Berenice's Hair	Comae Berenices	Com	EN	Beta	"Modern" but old; north Galactic pole
Corona Australis	Southern Crown	Coronae Australis	CrA	ES–SP	Alfecca Meridiana= Alpha, Beta equal	
Corona Borealis	Northern Crown	Coronae Borealis	CrB	EN	Alphecca=Alpha	
Corvus	Crow, Raven	Corvi	Crv	ES	Gienah=Gamma	
Crater	Cup	Crateris	Crt	ES	Delta	
Crux	Southern Cross	Crucis	Cru	SP	Acrux=Alpha	Modern
Cygnus	Swan	Cygni	Cyg	EN–NP	Deneb=Alpha	Northern Cross; Summer Triangle
Delphinus	Dolphin	Delphini	Del	EN	Rotanev=Beta	
Dorado	Swordfish	Doradus	Dor	SP	Alpha	Modern; south ecliptic pole
Draco	Dragon	Draconis	Dra	NP	Eltanin=Gamma	north ecliptic pole
Equuleus	Little Horse	Equulei	Eql	EN	Kitalpha=Alpha	
Eridanus	River	Eridani	Eri	ES–SP	Achernar=Alpha	
Fornax	Furnace	Fornacis	For	ES	Alpha	Modern
Gemini	Twins	Geminorum	Gem	EN	Pollux=Beta	Zodiac; Summer Solstice
Grus	Crane	Gruis	Gru	ES–SP	Al Nair=Alpha	Modern
Hercules	Hero, Hercules	Herculis	Her	EN	Kornephoros=Beta	"The Kneeler"
Horologium	Clock	Horologii	Hor	ES–SP	Alpha	Modern
Hydra	Water Serpent	Hydrae	Hya	E–ES	Alphard=Alpha	
Hydrus	Water Snake	Hydri	Hyi	SP	Beta	Modern
Indus	Indian	Indi	Ind	SP	The Persian=Alpha	Modern
Lacerta	Lizard	Lacertae	Lac	EN–NP	Alpha	Modern
Leo	Lion	Leonis	Leo	EN	Regulus=Alpha	Zodiac
Leo Minor	Smaller Lion	Leonis Minoris	LMi	EN	Praecipua=46	Modern

Table 1.1 ***(cont.)***

Name	*Meaning*	*Genitive*	*Abbr.*	*Loc.*[a]	*Luminary*	*Remarks*
Lepus	Hare	Leporis	Lep	ES	Arneb=Alpha	
Libra	Scales	Librae	Lib	ES	Zubeneschamali=Beta	Zodiac
Lupus	Wolf	Lupi	Lup	ES–SP	Alpha	
Lynx	Lynx	Lyncis	Lyn	EN–NP	Alpha	Modern
Lyra	Lyre	Lyrae	Lyr	EN	Vega=Alpha	Summer Triangle
Mensa	Table	Mensae	Men	SP	Alpha	Modern
Microscopium	Microscope	Microscopii	Mic	ES	Gamma	Modern
Monoceros	Unicorn	Monocerotis	Mon	E	Beta	Modern
Musca	Fly	Muscae	Mus	SP	Alpha	Modern
Norma	Square	Normae	Nor	ES–SP	Gamma-2	Modern
Octans	Octant	Octantis	Oct	SP	Nu	Modern; south celestial pole
Ophiuchus	Serpent Bearer	Ophiuchi	Oph	E	Rasalhague=Alpha	With Serpens
Orion	Hunter, Orion	Orionis	Ori	E	Rigel=Beta	Winter Triangle
Pavo	Peacock	Pavonis	Pav	SP	Peacock=Alpha	Modern
Pegasus	Winged Horse	Pegasi	Peg	EN	Enif=Epsilon	Perseus myth; Great Square
Perseus	Hero, Perseus	Persei	Per	EN–NP	Mirfak=Alpha	
Phoenix	Phoenix	Phoenicis	Phe	ES–SP	Ankaa=Alpha	Modern
Pictor	Easel	Pictoris	Pic	NP	Alpha	Modern
Pisces	Fishes	Piscium	Psc	E-EN	Kullat Nunu=Eta	Zodiac; Vernal Equinox; Circlet
Piscis Austrinus	Southern Fish	Piscis Austrini	PsA	ES	Fomalhaut=Alpha	
Puppis	Stern	Puppis	Pup	ES–SP	Naos=Zeta	Argo
Pyxis	Compass	Pyxidis	Pyx	ES	Alpha	Modern
Reticulum	Net	Reticulii	Ret	SP	Alpha	Modern
Sagitta	Arrow	Sagittae	Sge	NE	Gamma	

Table 1.1 ***(cont.)***

Name	*Meaning*	*Genitive*	*Abbr.*	*Loc.*[a]	*Luminary*	*Remarks*
Sagittarius	Archer	Sagittarii	Sgr	ES	Kaus Australis=Epsilon	Zodiac; Winter Solstice; Little Milk Dipper; Teapot; Galactic center
Scorpius	Scorpion	Scorpii	Sco	ES	Antares=Alpha	Zodiac
Sculptor	Sculptor	Sculptoris	Scl	ES	Alpha	Modern; south Galactic pole
Scutum	Shield	Scuti	Sct	ES	Alpha	Modern
Serpens	Serpent	Serpentis	Ser	E	Unukalhai=Alpha	Two parts; with Ophiuchus
Sextans	Sextant	Sextantis	Sex	E	Alpha	Modern
Taurus	Bull	Tauri	Tau	EN	Alebaran=Alpha	Zodiac; Hyades; Pleiades Galactic anticenter
Telescopium	Telescope	Telescopii	Tel	ES–SP	Alpha	Modern
Triangulum	Triangle	Trianguli	Tri	EN	Beta	
Triangulum Australe	Southern Triangle	Trianguli Australis	TrA	SP	Alpha	Modern
Tucana	Toucan	Toucanae	Tuc	SP	Alpha	Modern
Ursa Major	Greater Bear	Ursae Majoris	UMa	NP	Alioth=Epsilon	Big Dipper/Plough; UMa cluster
Ursa Minor	Smaller Bear	Ursae Minoris	UMi	NP	Polaris=Alpha	Little Dipper; north celestial pole
Vela	Sails	Velorum	Vel	ES–SP	Regor=Gamma	Argo
Virgo	Maiden	Virginis	Vir	E	Spica=Alpha	Zodiac; Autumnal Equinox
Volans	Flying Fish	Volantis	Vol	SP	Gamma	Modern
Vulpecula	Fox	Vulpeculae	Vul	EN	Anser=Alpha	Modern

[a]Approximate location as follows:
E: Equatorial; lying on the celestial equator.
EN: Equatorial north; between the celestial equator and 45 degrees north declination.
NP: North polar; north of 45 degrees declination.
ES: Equatorial south; between the celestial equator and 45 degrees south declination.
SP: South polar; south of 45 degrees south declination.
Intermediate positions are indicated by combining location codes.

Fig. 1.4 **Gemini** The most northerly constellation of the Zodiac, lying in a faint part of the Milky Way, Gemini features two bright stars, Castor (the fainter) and Pollux. (Courtesy of Akira Fujii.)

of the Sun and planets, such was not true in the Zodiac. There had to be 12 constellations (or signs) whether the stars were bright or not. Thus we see quite a mixture, from brilliant Taurus [Fig. 4.7], Gemini, Scorpius [Fig. 9.9], and Leo (which really rather do look like what their names suggest) to dim figures like Cancer and Pisces that anywhere else in the heavens may well have been among the amorphotoi.

The Zodiac hosts a half-dozen prominent stars, the first magnitude [3.1] class K giants [6.2, 6.3] Aldebaran of Taurus and Pollux of Gemini (Fig. 1.4), the class B dwarfs Regulus of Leo and Spica of Virgo, the red supergiant [14.1] Antares of Scorpius, and second-magnitude sextuple class A star Castor (also of Gemini). The Zodiac's stars are also special because they are regularly occulted (or covered) by the Moon, which allows a measure of their angular diameters [7.2.2].

Several asterisms, or informal patterns, dot the Zodiac. Here we find the Pleiades and Hyades of Taurus, both of which are nearby open clusters [9.2], the latter making the Bull's thrusting head. Aldebaran, lying in the Hyades line of sight, burnishes the cluster, but is not a part of it. Within dim Cancer lies one of the few Christian allusions of the sky, the four-star "manger" that encloses the Praesepe (Beehive) open cluster, the two brightest stars "the asses." Leo is known for the "Sickle" that makes his head, Scorpius for its stellar "arteries" that flank Antares, Sagittarius for the southward-pouring "Little Milk Dipper" (which itself is part of the "Teapot," Fig. 1.5). Moving back northward, you can find Aquarius's prominent four-star "Water Jar" and Pisces' "Circlet."

1.1.2 The rest

Away from the Zodiac, the constellations take on more of a story-telling, rather than mystical, role. A great many fall into mythological, or at least logical, groupings. Perhaps the greatest of them, since it is seen from nearly all latitudes of the Earth (winter in the far northern hemisphere, summer in the southern), is centered on Orion [Figs. 3.2, 3.4], the Hunter, in mythology lover of Diana, goddess of the Moon (and in one story accidentally killed by her). Few figures are as arresting. Like Scorpius (which was Orion's killer in another myth), Orion is composed of related stars, the former from the Scorpius–Centaurus OB association complex [9.3], Orion from the Orion OB1 association (which averages about 450 parsecs [4.2.1] away). As such, the figures are filled with brilliant, massive blue-white O and B stars, many multiple

Fig. 1.5 **Sagittarius** In mythology, an archer and centaur, Sagittarius is better known for its delightful informal figures, the obvious "Little Milk Dipper," its handle stuck in the Milky Way, and the "Teapot," of which the Milk Dipper is the left-hand side. The Milky Way shines at right. The bright red glow at right center is the Lagoon Nebula. (J.B. Kaler.)

Fig. 1.6 **The Big Dipper or Plough** The best-known of all asterisms, the Big Dipper (the Plough in Britain), glides across the open slit of the University of Arizona's 2.3-meter telescope atop Kitt Peak. Mizar and Alcor, a naked-eye double star, are toward the top right. (J.B. Kaler.)

[8.1]. Here in Orion we find two first magnitude supergiants, blue class B Rigel and the red class M variable Betelgeuse, which closely match each other in visual brightness.

Accompanying the Hunter are two faithful companions and a rather sad bit of prey. To the southeast, following Orion across the sky, is majestic Canis Major, the Larger Dog, with the sky's stellar luminary, white class A Sirius, the "Dog Star" that reaches almost to minus second magnitude. Few stars have been so important, as the "heliacal rising" of Sirius (its first visibility in the glow of morning twilight) once announced the rising of the Nile. Below Sirius is a bright triangle topped at the northern end by Adhara (Epsilon Canis Majoris), which is either the faintest first magnitude star or the brightest of second magnitude (just topping Gemini's Castor), depending on which list you use. To the northeast lies little Canis Minor (the Smaller Dog). Though it consists of but two stars, the brighter, class F Procyon, provides first magnitude luster. Beneath the Hunter is Lepus the Hare, whose brightest star ranks only third magnitude. Obviously named by northerners, Procyon, Betelgeuse, and Sirius make the "Winter Triangle," which is seen in the southern hemispheres' summer heat. Other obvious asterisms include Orion's jeweled three-star "Belt," whose western star closely marks the celestial equator, and the dangling "Sword," which encloses the glowing Orion Nebula [11.1.3].

Three other classical groupings rival Orion and his family for fame, two in the northern celestial hemisphere, one in the southern. Among the most beloved of figures is Ursa Major, the Great Bear, outlined primarily by the striking seven-star asterism known as either the "Big Dipper" or "Plough" (Fig. 1.6). All but one of its stars second magnitude, the middle five are related, and are actually the pinnacle of a cluster some 25 parsecs [4.2.1] away. The second star in from the end of the Dipper/Plough's handle and its naked-eye companion, Mizar and Alcor, the Arabs' "horse and rider," vie for notoriety with the "Pointers." These rather well point toward Polaris, the second magnitude (and Cepheid variable [10.3]) North Star, which lies within a degree of the north celestial pole [2.2]. In parallel with Ursa Major, Polaris stands at the end of the handle of the Little Dipper, which is the major asterism of Ursa Minor, the Smaller Bear [Fig. 10.4]. Following along behind the Great Bear as he rounds the pole is the Herdsman, Boötes, which is anchored by the orange class K giant star Arcturus, the luminary (though not by much) of the northern hemisphere.

Seen in the spring and summer polar skies of the northern hemisphere, the Great Bear treads opposite the large Perseus group, which is led in story by Cassiopeia [Fig. 14.5], the Queen, her "W" figure making most of her uncomfortable-looking "Chair." To the west lies her husband, dim Cepheus the King, notable more for Delta Cephei, the prototype of the Cepheid variables, than for any great kingly deed. They are parents to Andromeda, made of two graceful streams of stars that emanate from Pegasus, the Flying Horse (both south of Cassiopeia), upon which Perseus rode after slaying Cetus the Sea Monster [Fig. 10.1] before it devoured the maiden (Fig. 1.7). Pegasus is renowned for its Great Square, Perseus for Algol (Beta Persei), the paradigm of the eclipsing variable stars [8.4], and Cetus for Mira (Omicron Ceti), which heads the list of the long period variables [10.5.1].

To the southern hemisphere belongs the great ship Argo, which sails on northern winter – southern summer – seas to the south and east of Canis Major, forever carrying Jason on his quest of the Golden Fleece. Almost unmanageably huge as a sector of the sky, Argo was separated in the nineteenth century into three portions that are now formal constellations in their

Fig. 1.7 **Pegasus, Andromeda, and Cassiopeia** Three of the constellations of the Perseus myth rise above the eastern horizon, the "Great Square" of Pegasus at right, Andromeda at lower center, the "W" of Cassiopeia at left. The Andromeda Galaxy, M31, is just below the center. (J.B. Kaler.)

own right: Puppis (the Stern), Carina (the Keel), and Vela (the Sails), giving us a modern count of ancient constellations of 50. Set into a stunning portion of the Milky Way, Carina contains the second brightest star, Canopus (Alpha Carinae), the extensive Carina Nebula, and one of the best of all supernova candidates [14.2], Eta Carinae.

Loosely associated with Argo are Centaurus the Centaur (Chiron, Jason's mentor, to the east of Argo), Hydra (the Water Serpent, and the longest constellation in the sky, seen to the north of Argo), and even mighty Hercules. Centaurus is at the heart of its own group, the Centaur seen strangling Lupus the Wolf upon Ara the Altar. This large constellation holds the closest and third brightest star (Alpha Centauri), as well as another of first magnitude (the B dwarf Hadar, Beta Centauri), and the grandest of all globular clusters [9.4], Omega Centauri. Hercules, which lies far to the north and contains the major northern globular cluster M13, is – in addition to belonging loosely to the Argo group – also a distinctly singular constellation, the descendent of the mysterious "Kneeler," the hero usually depicted upside down.

And again Ophiuchus rises both as himself and with further Argonian connection. Set north of Scorpius, the sprawling figure represents Asclepias, the physician aboard the Argo and the healer of the Trojan Wars, whose snake-wrapped body descended to us to become the physician's symbol. The Serpent is the only constellation entirely divided into two parts: Serpens Caput (the Serpent's Head, to the west of Ophiuchus) and Serpens Cauda (the Tail, to the east). It is nevertheless still treated as a single constellation, the two parts making individual asterisms.

Single constellations are scattered across the sky, some bearing loose relation to each other or to larger groups. Among them we watch three birds. Cygnus (the Swan) [Fig. 4.3] and Aquila (the Eagle) fly the northern Milky Way with the first magnitude A supergiant Deneb and the A dwarf Altair in tow, while Corvus the Crow boldly inspects the terrain to the west of Virgo. Tip Cygnus upside down and you find the informal Northern Cross. Each hemisphere also contains a crown – Corona Borealis (the Northern Crown, worn by Ariadne) and Corona Australis (the Southern Crown, perhaps belonging to Sagittarius). Between the two Bears winds long Draco the Dragon, and to the west of Orion runs even longer Eridanus, the River, which ends in the blue B dwarf Achernar. Within the set there is yet another wet-quarter fish (Piscis Austrinus, the Southern Fish, with the first magnitude A dwarf Fomalhaut), Orpheus's harp (Lyra, with the luminous A dwarf Vega), an arrow (Sagitta), a dolphin (Delphinus), a triangle (Triangulum, near Aries), a little horse (Equuleus, nicely near Pegasus), an amazingly dim cup (Crater, to the west of Corvus and on top of Hydra), and quite wonderful Auriga, the Charioteer, who rides to the north of Orion holding the double G giant Capella, the "she-goat," under his powerful arm. Arcturus, Vega, and Capella, of nearly equal brightness, somewhat tripartite the northern sky, while Vega, Deneb, and Altair make the northern "Summer Triangle," within which begins the Great Rift of the Milky Way, the two white celestial rivers flowing south to Scorpius and Sagittarius and beyond to the wonders of the deep southern sky.