

The Cambridge Double Star Atlas

The Cambridge Double Star Atlas is back! It is the first and only atlas of physical double stars that can be viewed with amateur astronomical instruments.

Completely rewritten, this new edition explains the latest research into double stars and the equipment, techniques, and opportunities for you to discover, observe, and measure them. The Target List has been completely revised and extended to 2,500 binary or multiple systems. Each system is described with the most recent and accurate data from the authoritative Washington Double Star Catalog, including the Henry Draper and Smithsonian numbers that are most useful in our digital age. Hundreds of remarks explain the attributes of local, rapidly changing, often measured or known orbital systems. The color atlas charts by Wil Tirion have been updated, to help you easily find and identify the target systems, as well as other deep-sky objects. This is an essential reference for double star observers.

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PROOF

THE CAMBRIDGE DOUBLE STAR ATLAS

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WIL TIRION

Based on the original concept by
James Mullaney



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PROOF

INTRODUCTION

This new edition of the *Cambridge Double Star Atlas* is designed to improve its utility for amateur astronomers of all skill levels.

For the first time in a publication of this type, the focus is squarely on double stars as *physical systems*, so far as these can be identified with existing data. Using the procedures described in Appendix A, the target list of double stars has been increased to 2,500 systems by adding 1100 “high probability” physical double and multiple stars and deleting more than 850 systems beyond the reach of amateur telescopes or lacking any evidence of a physical connection. Wil Tirion has completely relabeled the *Atlas* charts to reflect these changes, and left in place the previous edition’s double star icons as a basis for comparison. This new edition provides a selection based entirely on evidence rather than traditional opinion, so that the twenty-first century astronomer can explore with fresh eyes the astonishing actual variety in double stars.

Continuing the emphasis on physical systems, this *Atlas* explains the origin and dynamic properties of double stars and the role they have played in our understanding of star formation and stellar evolution. The dynamics of binary orbits, stellar spectral types, and methods of detecting and cataloging double stars, are explained to enrich the observer’s understanding of double star astronomy. There is also practical guidance for the visual astronomer – information on optics, equipment preparation, useful accessories, viewing techniques and opportunities for amateur research. The references suggest both print and online double star resources. Finally, over 330 systems in the target list are marked with a star (★) in the left margin. These indicate “showpiece” systems of intrinsic beauty or charm, “challenge” pairs of close separation or large brightness contrast and several systems that have been important in the history of astronomy. From most observing locations, at least three dozen of these targets will be in view at any time of night on any evening of the year.

Jim Mullaney’s choice of nineteenth century double star catalog labels has been retained as a tribute both to his original *Atlas* concept and to the bygone astral explorers who discovered over 90% of the systems in the target list (see Appendix D). These labels are also a convenient link to the legacy double star literature and a compact labeling style for the *Atlas* charts. However, as a convenience to the digital astronomer, the target list provides both the Henry Draper (HD) and Smithsonian (SAO) catalog numbers for each system. The first will identify each system in the research literature and online astronomical databases, the second is a compact targeting command or search keyword recognized by most GoTo telescope mounts and planetarium software.

What are double stars?

Let’s start by adapting the definition from double star astronomer Wulff Heintz:

A double star is two or more stars that are bound by mutual gravitational attraction into an enduring (usually lifelong) dynamic system.

The fundamental unit is two stars – usually termed a *binary star* – orbiting their mutual center of gravity. But a double star may also be triple, quadruple, quintuple and so on, under the umbrella category of *multiple star*. Using the singular *star* indicates that a double or multiple star is a single physical system, an astrophysical fact. By contrast, an *optical double star* is (as the name implies) only an optical illusion, two stars among millions that by chance are aligned along our line of sight. Although in most cases evidence for physicality is inconclusive or entirely lacking, especially in distant pairs, advances in astronomy in recent decades have given us a new capability to distinguish fact from illusion in double star astronomy.

Double stars display an enormous range of orbital dynamics and stellar types, and produce characteristic visual patterns that the astronomer will encounter

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often at the eyepiece. The most common of these patterns are illustrated on the back cover. The challenge for double star astronomers is to understand how these systems were formed and how they will change over time, then to apply this knowledge to answer basic questions about our Galaxy.

Remarkably, all evidence suggests that most if not all stars in the Galaxy were formed as members of double star systems. This means that nearly all the double stars we observe have been united from birth. And most double stars will eventually die together, one after the other, like Romeo and Juliet. We know this from the many binary systems that contain a dead or dying star, and the large number of binaries that are orbiting so closely they can never be torn apart.

The old view was that double stars formed by randomly falling into mutual orbits as they circled the Galaxy, or appeared when a single massive star rotated so rapidly that it split in two. The current view is that double stars are literally born together from a single *cloud core* of gas and dust collapsing into its own gravity. The collapsing core, stressed by external shock waves and internal turbulence, divides into two or more protostars (*prompt fragmentation*). Matter that continues to fall toward a protostar swirls into an enormous accretion disk that often develops spiral arms or irregular clumps (*disk fragmentation*). These also gather mass to become low mass companion stars or planetary systems.

These collapsing cloud cores rarely form in isolation: most are found inside a much larger concentration of gas and dust known as a *star forming region* (SFR). The number of stars that form within a single SFR depends on the mass, density and turbulence of the gas and dust it contains, but a typical SFR can span several parsecs and produce hundreds or thousands of new stars. Inside these murky clouds, usually found churning along the arc of a galaxy spiral arm, protostars attract matter and grow hotter and more compact with the increasing pressure of gravitational contraction. Within a few million years at most, the most massive of these young stars fire up their thermonuclear cores, push back the clouds with the force of their radiation, light up the dispersing gas as an emission nebula, and unveil a young star cluster to our view.



Introduction

The masses, rotational speeds and orbits of double protostars depend on the turbulence of the cloud core, the density of gas and dust in the SFR, the rate of their mass accretion and the angular momentum contained in their accretion disks. They also depend on interactions with other stars in their cloud core and natal star cluster. Binary protostars are slowed into smaller orbits by friction with their enveloping clouds; as they grow in mass, near encounters with other stars in the natal cluster can shear apart widely separated or “soft” companions, perturb stable orbits, and bind tighter already close orbiting or “hard” binaries. The often elliptical shape of double star orbits and the extreme variation in orbital periods are the result of these cumulative influences. Even stars too far apart to have formed in the same cloud core can display *common proper motion* – parallel motion across the sky – because they were born in the same SFR and escaped in the same direction as the natal cluster dissolved. For all these reasons, double stars have been called the “fossils of star formation.”

How stars form is only one of the many mysteries that double stars have illuminated in the history of astronomy. William Herschel discovered in 1802 that they moved in orbits, demonstrating that Isaac Newton’s gravitational attraction governed not just our solar system but the visible universe. In the nineteenth century, systematic discovery and observation of nearby binary systems led to refined methods of measurement and orbital calculation, which allowed astronomers to “weigh” double stars and discover the enormous range in stellar masses. With accurate estimates of stellar distance from the parallax surveys of the twentieth century, mass could be compared to intrinsic brightness (*absolute magnitude*). This confirmed that the brightest stars are also the most massive and pointed to nuclear fusion as the only possible source of starlight; theoretical physics could then deduce the paths of stellar evolution. Double stars have also been essential to our understanding of star clusters, many types of variable stars, supernovae, black holes and exotic high energy sources in deep space. They are the keystone species of the Galaxy.

What are double stars? The astronomer Simon Portegies Zwart answered the question this way:

Binaries are the basic building blocks of the Milky Way as galaxies are the building blocks of the universe. In the absence of binaries many astrophysical phenomena would not exist and the Galaxy would look completely different over the entire spectral range.

The binary orbit

The essence of double stars is found in the binary orbit, which is a stable dynamic balance between mutual gravitational attraction and centrifugal orbital energy.

Let’s start with the simplest example of two identical stars in a circular orbit. (Circular orbits are often found in close binaries that orbit in 10 days or less.) Each star attracts the other, so the total gravitational attraction between the two stars is proportional to their combined *system mass* ($M_1 + M_2$). But the strength of their mutual attraction varies as the *inverse square* of the distance between the stars. If the distance is multiplied by a number, the gravitational attraction is reduced by the reciprocal of the number squared. Increasing the distance by three times reduces the gravitational attraction to 1/9; reducing the distance by half increases the gravitational attraction four times.

However, in our circular binary the effective distance is not from one star to the other but the *orbital radius* (r) from each star to their common center of gravity or *barycenter*, at the center of their shared circular orbit. The two stars are always connected by a line through this fulcrum point, which means they have the same *orbital period* (P). As the stars revolve around the barycenter, their constant gravitational attraction is offset by a constant orbital velocity. A greater system mass or smaller orbital distance would require a greater orbital velocity to offset the greater gravitational attraction.

This simplest of all possible binary orbits can be imbalanced in two ways. First, the two stars are usually of unequal mass. In that case, balance is restored by making the distance of each star from the barycenter proportional to the *mass ratio* (q), the mass of the smaller star divided by the mass of the larger (M_2/M_1). Like unequal weights on a balance beam, balance requires the larger star to be closer to the center of gravity. As a result, the heavier star

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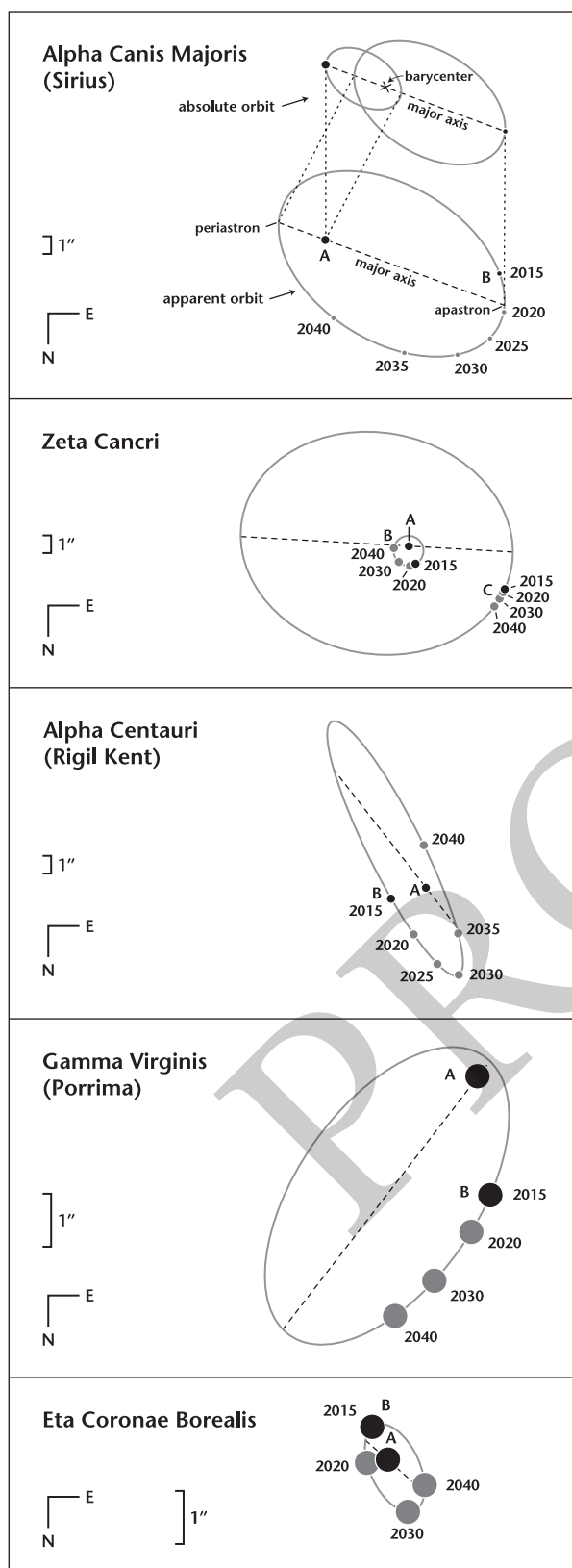


Figure 1 Five binary orbits
The absolute orbit of Sirius (top) shows the elliptical orbits of the two components around their mutual center of gravity.

moves in a separate circular orbit inside the orbit of the less massive star, and because its orbit is smaller, its orbital velocity is proportionally less.

Most binary orbits are also imbalanced a second way: the distance between the stars oscillates in synchrony with the orbital period, from a point of closest approach (*periastron*) to a point of farthest separation (*apastron*). This sends the stars into opposing elliptical orbits around the barycenter, now located at one focus of each ellipse (see Figure 1, top). The two stars are still connected by a line through the barycenter, the orbits have the same elliptical elongation or *eccentricity* (e) (see Appendix B) and the larger star still moves at a lower average velocity in a proportionately smaller orbit. Because the mutual gravitational attraction increases as the mutual distance from the barycenter decreases, the changing distance between the stars must be balanced by a changing orbital velocity, reaching peak velocity at periastron, lowest velocity at apastron. This elegant combination of system mass, mass ratio, orbital radius, eccentricity and orbital velocity around the barycenter is the *absolute orbit*, the actual physical motions of a binary star (see Figure 1, top).

Unfortunately, the barycenter of a binary system is invisible to an observer, so it cannot be used as a reference point to measure the orbital motion. Instead, the brighter and usually more massive *primary star* is made the anchor point, and the path of the fainter, less massive *secondary star* is measured in relation to it (see Figure 4). This is the *relative orbit*. It has the same period and eccentricity as the absolute orbit, but now the average orbital radius (r) is equal to the *semi-major axis* (a), half the longest dimension of the orbital ellipse. (Half the shortest dimension is the *semi-minor axis*, b .)

As a final wrinkle, the relative binary orbit is almost always tilted to our direction of view. This will make a circular orbit appear elliptical, like the rim of a cup viewed from one side, and the point of periastron in an elliptical orbit may not be the point of smallest

Figure 1 (cont.) The five apparent orbits shown are the orbits we actually measure. The dotted line indicates the major axis of the relative orbit with apastron and periastron at opposite ends. The current (2015) position of the components is shown with their predicted future positions out to 2040. The diagrammed star disks match the Airy disk diameter produced by a 250 mm aperture.

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visual separation between the two stars (see alpha Centauri in Figure 1). This *apparent orbit* is what we actually observe and measure on the celestial sphere. Complex mathematics, applied to painstaking observations of position and orbital velocity over decades or even centuries, are required to derive the dimensions of the relative orbit and the dynamics of the absolute orbit from the distorted path of the apparent orbit.

The balance in a binary orbitmultipl between gravitational attraction and orbital energy is summarized in a proportion known as Kepler's third law. This is easiest to calculate if we measure mass in units of *solar mass* ($1 M_{\odot}$ is the mass of the Sun), orbital radius in *astronomical units* (1 AU is the distance from the Earth to the Sun) and period in *Earth years*. Then Kepler's third law is simply:

$$(M_1 + M_2) = r^3 / P^2$$

The target list indicates both the period (P) and average orbital radius (r) for all systems with an orbital solution. For these, you can use Kepler's third law to calculate the system mass.

If we don't know the orbital radius, but know the distance (d) to the double star in parsecs (denoted pc; one parsec is equal to 206,265 AU or 3.26 light years) and have measured the angular separation (ρ or ρ) between the stars in arcseconds, then the *projected separation* (ps) between the stars, again in astronomical units, is:

$$\text{ps} = \rho \cdot d.$$

This is always a minimum separation, because a tilted (foreshortened) orbit will make the distance between stars appear smaller than it actually is.

Multiple star orbits

What happens in a system of three or more stars? Here a binary orbit still prevails, but in a remarkable way – it becomes enormously larger. This creates the defining feature of a stable multiple star: a *hierarchical orbit structure* (Figure 2).

A binary pair – the building block of every double star – is bound by mutual attraction to a common barycenter. If a third star approaches too close to this stable couple, the barycenter formed by all three stars

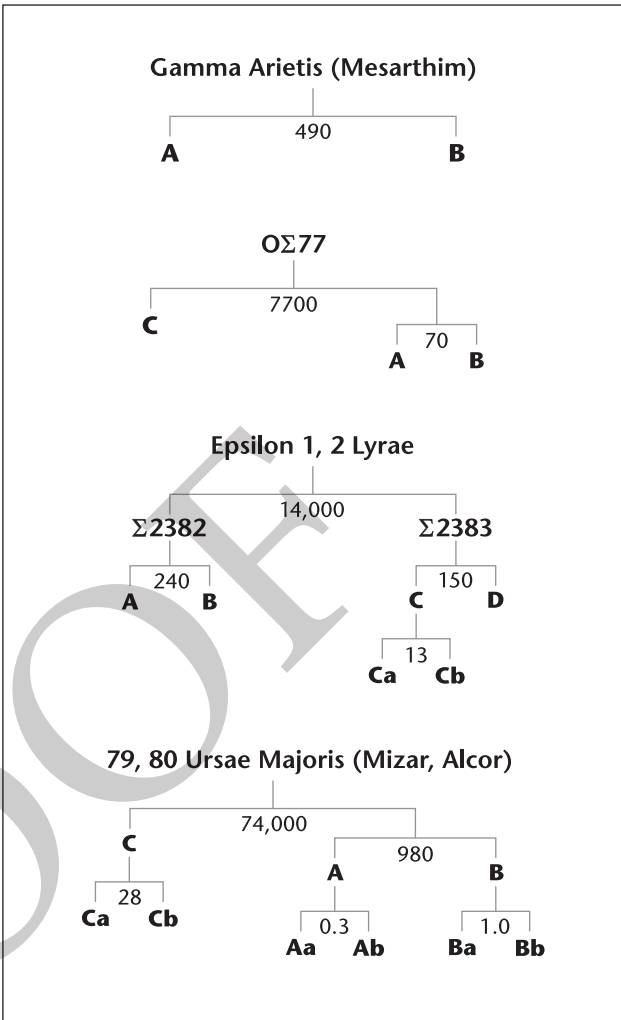


Figure 2 Hierarchical multiple star orbits
Multiple stars are composed of binaries and single stars arranged in a hierarchy of distances. The horizontal bars indicate the orbits, the number below each bar the orbital radius in astronomical units. Double stars of 2, 3, 5 and 6 components are drawn from the target list. The examples also show how multiple star components are labeled.

becomes unstable and their orbits unpredictable. But a binary can join with another binary or single star if they partner at a much greater orbital distance, often 100 to 1,000 times the orbital radius of the binary. At this remove a binary influences the distant barycenter as if it were a single large star, and can form one half of a stable "binary" unit. From the inverse square principle, we see this can reduce to 1/1,000,000th the gravitational disruption that the third component might exert on the binary orbit. Yet this bond can still be strong enough to resist the

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attraction from other stars in the Galaxy, making the triple star an enduring dynamic system.

This hierarchical segregation of orbits distinguishes a multiple star from its natal star cluster. In the cluster, all the star systems orbit the single barycenter formed by the entire cluster, stars are deflected into new orbits each time they pass through the cluster and “evaporation” (as dispersing gas and dust reduces the mass of the cluster, weakening the gravity that holds the cluster together) dissolves nearly all natal star clusters within a few 10 million years.

Multiple protostars seem to form within a single cloud core, so at birth they will have similar, dynamically unstable orbits. So how does a hierarchical structure develop? Through competition. As the protostars orbit their common center of gravity, by chance all three can approach periastron near the same time. When this happens the two most massive or closest stars can join forces with their greater mutual attraction and hurl the less massive or more distant third star into a larger, higher energy and higher velocity orbit; this transfer of orbital energy allows the dominant pair to settle into a tighter, lower energy orbit. This process can be repeated many times within a few million years, “hardening” the inner binary and eventually imparting an escape velocity to the third star, ejecting it from the system.

Although ejection is possible, it isn’t inevitable. There are over 160 examples of a binary plus third component or “2+1” systems in the target list that apparently have found a stable dynamic configuration. The less common “1+2” systems (a binary orbiting a more massive primary star) and the even rarer “double double” (2+2) systems can evolve in the same way, binding the binary units more tightly while increasing the orbital radius to other components. A nearby example is the wide naked eye pair Mizar and Alcor in Ursa Major. Mizar is also a close telescopic double, forming a 2+1 triple system. In fact all three components are very close binaries, forming a sextuple system of hierarchically segregated orbits (Figure 2).

Similar quintuple and sextuple systems are rare (only 40 are found in the target list), and hierarchical structure seems to reach its limit in systems of about seven stars. Beyond that, the competition among components dissolves large stellar groups before they

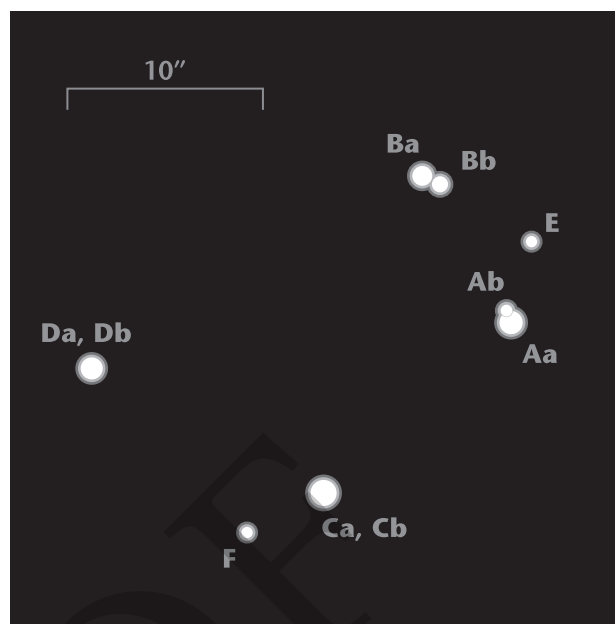


Figure 3 The Trapezium in Orion
An unstable group of at least a dozen stars emerging from its natal cloud of gas and dust. Because the four brightest stars are competing to dominate their shared barycenter, the group is unstable and will eventually break apart.

can competitively develop a stable hierarchical arrangement. The 400 parsec far Trapezium, emerging from the Great Orion Nebula, is a case in point (Figure 3). A visual quartet where each of the four massive stars is already a double or multiple system, there is no clear hierarchical ordering in their orbits or separations. Just a few million years old, this minicluster of a dozen or more stars already displays divergent motions, a sign that it is on the way to breaking apart.

Stellar mass and the binary life cycle

In stars, *mass is destiny*. The mass of a star determines how long it will live and how it will die. Because most binaries remain bound for the life of the component stars, this means mass determines the life cycle of the binary system as well.

A star is an enormous sphere of plasma, heated by the thermonuclear fusion of hydrogen or helium at its core. The fusion is ignited and contained by the enormous pressure of the star’s mass, as gravity strives to collapse the star to a single point. The energy released by this fusion pushes the collapsing mass

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outward in all directions, stabilizing the contraction into a spherical body with an incandescent skin or *photosphere*. This shines with a peak energy or *effective temperature* and a characteristic brightness or *absolute magnitude* (M). As stars increase in mass they become much hotter and brighter, and the color of their light, the clue to their temperature, shifts from red to blue wavelengths.

This relationship between mass, color and brightness is indicated by a star's *spectral type*. For normal or *main sequence* stars, it is simplest to think in terms of four contrasting categories of stellar mass. (1) The hottest, brightest (and rarest) *high mass* O and B type stars, such as Rigel or Achernar, have a mass from $120 M_{\odot}$ down to about $4 M_{\odot}$, and shine with a brilliant, bluish light that includes vast amounts of invisible high energy ultraviolet and X-ray radiation. (2) Less massive *A type* stars, such as Sirius, Formalhaut and Vega, are around 3 to $1.5 M_{\odot}$ and the benchmark for a bright, "pure white" star color. (3) The *solar type* stars – F, G and larger K types, like the Sun, Procyon or Rigel Kent – are about $1.5 M_{\odot}$ to $0.5 M_{\odot}$ and peak in the visible spectrum with a pale to distinctly yellow light. (4) The coolest, faintest (and most common) *low mass* stars – smaller K and M types, such as 61 Cygni or Kruger 60 – are $0.5 M_{\odot}$ or less and glow with a pronounced orange light that peaks in the invisible infrared (heat) and microwave wavelengths. Arranging these spectral letters in order of decreasing stellar mass and temperature yields the sequence O B A F G K M, traditionally memorized as *Oh Be A Fine Girl, Kiss Me*. Gradations within a type are indicated with a number from 0 to 9: for example, an A0 star has double the mass and triple the brightness of an A9.

All stars eventually consume the hydrogen available to their core, and once they do they leave the main sequence of normal stars. Solar and higher mass stars switch to burning the helium "ash" that accumulated from fusing hydrogen, and the resulting surge of new energy forces the surface of the star outward to 500 or more times its normal radius. This enormously expanded *giant* or *supergiant* surface area allows the photosphere to radiate vastly more light, making it perhaps 10,000 times brighter. The rarefied surface becomes cooler, shifting the peak wavelength into the

infrared and giving old solar and high mass stars a similar bloated, bright and ruddy appearance.

These developments are captured in the *luminosity type* of a star. A young or midlife, main sequence star is denoted with the Roman numeral V or IV; an expanding giant star by III; and a massive and massively expanded supergiant star – the most luminous star outside a nova or supernova – by Ia, Ib or II.

Due to the extreme heat in their massively compressed thermonuclear cores, high mass (O or B type) stars feverishly consume their reserves of fuel in a few tens of million years, while relatively cool, low mass (K or M type) stars can shine frugally for tens of billion years. In binaries of unequal mass ($q < 1.0$), the more massive component will enter the giant phase first, and this can create some spectacular stellar fireworks. In close binaries ($r < \sim 3$ AU), the dying star may expand so far that it forms a *semi-detached binary*, transferring its remaining hydrogen to the companion and giving it a life-shortening greater mass. The donor star then collapses into an incredibly compact and hot cinder called a *white dwarf*. When the companion also begins to die, expand and pour hydrogen onto its dead companion via an encircling accretion disk, the result can be a Type Ia supernova or X-ray binary and, eventually, the sepulchre of a matched white dwarf binary.

Most binary orbits are too large for mass transfer to occur and the giant or supergiant phase unfolds in isolation. These "giant type" binaries are not uncommon among visual double stars (the target list includes almost 130). This is because the giant and its companion are both intrinsically bright, their high system mass can sustain large orbits that can be resolved at great distances, and the giant phase can last for a billion years.

Examples of the next stage – a main sequence star with a white dwarf companion – are harder to find: white dwarfs are too faint to be visible outside the solar neighborhood. The three best known examples, Sirius B (Figure 1), Procyon B and 40 Eridani B, are all within 5 parsecs of the Sun, yet Procyon's 11th magnitude (m.11) white dwarf can only be glimpsed in large telescopes.

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The double star population

We now can address a basic question: what is the *multiplicity ratio*, the proportion of double stars among all star systems (whether single or double stars) in the Galaxy? In the solar neighborhood (within 25 parsecs of the Sun) and considering only average or *solar type stars* (F, G and more massive K types), recent research suggests the multiplicity ratio follows a “60%–60%” allocation: *Roughly 60% of individual stars are actually members of double or multiple star systems, but roughly 60% of star systems – those individual points of light in the sky – are single stars.* The corollary to this 60%–60% rule is: *About 70% of double stars are binary.* Among the roughly 40% of local, solar type star systems identified as double stars, 72% have only two components, 21% have three, 5% have four and only 2% contain five or more components.

This 60%–60% rule is not universal because mass strongly affects the multiplicity ratio. High mass (O and B type) stars have a multiplicity ratio of 80% up to perhaps 100%. In low mass stars – small K type, M type and even smaller brown dwarfs – the multiplicity ratio is apparently less than 30%. Equal mass binaries ($q = 1.0$) seem more common in closely orbiting pairs, as components in multiple systems, and in low mass systems; unequal mass ratios ($q < 1.0$) are about equally common down to mass ratios of 0.2. Delving the extreme mass ratios, the vast majority of solar type stars, single or double, appear to support planetary systems.

The size of binary orbits, like the mass of stars themselves, covers an enormous range (see Appendix C). The closest orbiting binaries have been studied as *eclipsing variable stars*, apparently single stars that display a periodic and revealing variation in brightness as one star passes in front of the other. Some of these are contact binaries (W Ursae Majoris type variable stars), solar mass stars that circle each other in less than a day and are enclosed in a single photosphere, with a shape resembling a peanut. Other solar mass stars, in nearly circular orbits with periods of a few days or weeks, perpetually turn the same face to each other and form dramatic tidal streams or enormous star spots within a shared and tangled magnetic field (RS Canis Venaticorum variable stars). Among

A type and high mass stars, systems have been found where the tidal attraction between the stars has distorted them into an ellipsoidal shape (ellipsoidal variable stars), sometimes causing a transfer of mass from the larger star to its companion (β Lyrae variables). And stars of any mass may be the Algol type variables, with orbits of months or years – too far apart to interact, but close enough to eclipse each other along our line of sight – that let us measure the diameter of each spectral type of star.

At the other extreme, one of the widest confirmed double stars (the A type system of Fomalhaut and TW Piscis Austrini) is separated by more than 50,000 AU with an age of more than 400 million years. Multiple systems may have the heft to bind even wider orbits: Mizar and Alcor, separated by 74,000 AU, have recently been shown to be bound. The outer limit of orbits that can endure for the life of the component stars is still believed to be around 1,000 to 5,000 AU, but orbits 10 times larger are now confirmed that have survived more than one revolution around the Galaxy.

Most double stars form orbits between these extremes. Among the local, solar type double stars, the median orbital radius is about 50 AU with a median period of 250 years and a wide range of eccentricities distributed around an average of $e = 0.5$ (the semi-major axis (a) is about 15% longer than the semi-minor axis (b); see Appendix B). But Kepler’s third law means the system mass will determine the orbital radius for the same 250 year orbital period: a high mass B5V binary must orbit at a radius of around 120 AU, while a low mass M5V type binary can orbit at only 30 AU, the distance of Neptune from the Sun.

Detecting double stars

By definition, a visual double star can be resolved into separate components with measurable relative positions. For more than two centuries, these measurements have been made with a filar micrometer: a device that lets the observer adjust the spacing between two parallel filaments in the eyepiece field of view to measure the separation between two stars, then rotate the filaments to align with and measure the position angle. Around 1975, the

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method of *speckle interferometry* used computers to transform atmospheric turbulence into greatly magnified star images. Two decades later, *long baseline interferometry* used computers to combine the images from widely separated telescopes to create a single high resolution aperture. Interferometry is considered a “visual” technique because it also provides measures of separation and position angle.

Many double stars in the target list were discovered by painstaking visual inspection of every star brighter than an arbitrary magnitude limit. But many double stars were detected by other methods, and it is customary to categorize these systems by the method used to discover and measure them.

Several hundred double stars have been discovered by analyzing the variable light from an apparently single star – those eclipsing variable stars, mentioned above. Since 1900, more than two thousand have been identified as *spectroscopic binaries*, because the two stars orbit at such high velocities that their mutual spectrum reveals Doppler shifts in the absorption lines of the much brighter star (a single line binary, denoted SB1) or of both similarly bright stars (a double line binary, SB2). Even when no Doppler shifts are apparent, *spectrum binaries* can be detected because the superimposed absorption lines of the two stars are recognizably different, and *photometric binaries* can be identified because the primary star is much brighter than its spectral type predicts. *X-ray binaries* – a white dwarf or neutron star receiving mass from a dying companion – have been identified with X-ray telescopes. Some binaries have even been discovered through a telltale stepwise (rather than instantaneous) extinction of the star’s light during *occultation* by the Moon.

A small number are *astrometric binaries*, detected even though the companion is too faint or too close to the glare of the primary star to be imaged. Instead, the small elliptical motion of the primary star can be observed as a sideways wobble in the path and periodic change in the pace of its proper motion across the sky. The companion to Sirius (Figure 1) was identified in this way in 1844, nearly two decades before it was visually detected in 1862.

Finally, several thousand have been identified as *common proper motion (CPM) binaries* because they

share the same speed and direction of motion across the sky. (Radial velocity toward or away from the Earth is more difficult to measure, but can be used to calculate the *true motion* in three dimensions.) These are identified by proper motion surveys that rapidly compare or “blink” matched sky photographs taken decades apart or by statistical analysis of the trajectories of stars measured by ground based telescopes and astrometric satellites. Research in the past few decades has found dozens of CPM binaries with an angular separation many times wider than the full Moon. In order to qualify as a double star, the separation of a CPM binary must be small enough to provide an enduring gravitational bond between the stars, but we’ve seen this limit is at least 50,000 AU in fact, and can be over 1 parsec in theory.

Stars beyond the largest binding distances can still show common proper motion: these *comoving groups*, gravitationally unbound stars with parallel orbits around the Galaxy, have emerged with similar trajectories from the same star forming region. These comoving groups can be huge. Most famous is the Ursa Major association: all but one of the stars in the “Big Dipper” asterism are at the head of an impressive stream of more than 50 stars scattered across 31 constellations.

Even with all the terrestrial and satellite instruments available to us today, visual double stars are local objects, astronomically speaking. Half the systems in the target list are within 120 parsecs of the Sun, and only high mass or high luminosity giant and supergiant systems are bright enough to be included beyond 350 parsecs. Slow positional change or highly inclined orbits prevents us from tracing long period orbits or detecting Doppler shifts; large distances can diminish even huge orbits; limited brightness obscures even neighboring low mass stars. Outside the solar neighborhood, we observe only an incomplete and biased sample of double stars and their components – low mass stars, in particular, are very difficult to detect without infrared telescopes.

As the astronomer Robert Grant Aitken complained over a century ago, a great number of optical pairs have made their way into double star catalogs. (These are retained, though recognized as optical, to prevent “rediscovery.”) A repertory of

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statistical tests has been developed to identify physical systems by appearance alone, and these converge on the visual profile *bright, tight, equal, similar* – the two stars should be little separated, equally bright, and have similar spectral types. The probability that an optical pair will match this profile is very small, but unfortunately this profile excludes the many unequal mass, “giant type” and visually wide CPM doubles we know exist. The real solution calls for data, and this means repeated measures of relative position made over decades or centuries of observation.

Double star catalogs

Double star observations have been painstakingly acquired and cataloged for more than two centuries by a brigade of double star astronomers, and their catalogs form a unique and irreplaceable historical record of celestial change. The target list is compiled from more than 80 of these double star catalogs dating from 1782 to the present (see Appendix D). All these catalogs (and many others) are now combined as the *Washington Double Star Catalog* (WDS), the authoritative and frequently updated database of visual double stars maintained since 1964 at the US Naval Observatory (USNO) in Washington, DC.

The attributes essential to include in any double star catalog (besides its celestial coordinates or location in the sky) are: (1) its catalog ID, (2) the component letter codes, (3) the position angle, (4) the separation, (5) the magnitudes of the components and (6) the epoch.

The WDS ID is currently a nine digit abbreviation of the target system’s celestial coordinates, with plans to expand to 13 digits. The shorter and more easily recognized Catalog ID, used in the *Atlas* charts and in many references, may not indicate the astronomer who discovered the pair: over 400 double stars credited to F. Wilhelm von Struve (Σ) were actually discovered by William Herschel (H).

The apparent orbit is measured with just two parameters (Figure 4). *Position angle* (θ) is the “clock face” orientation of a line joining the primary (usually brighter) star to the secondary (fainter) star, measured in degrees from the line to celestial north (0°), and increasing counterclockwise through east (90°), south

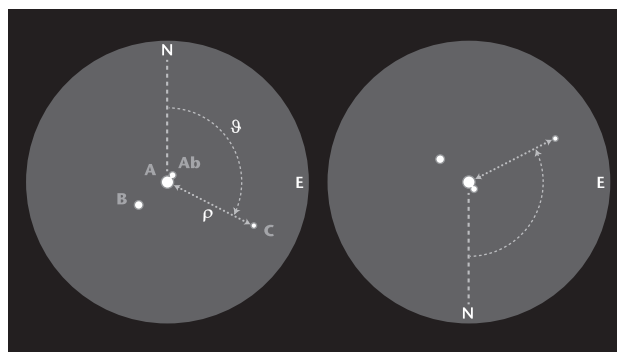


Figure 4 Double star measurement

A binary star is described by the position angle(θ), and the separation (ρ). The orientation of the field depends on the equipment: (right) an “inverting” astronomical telescope rotates the field by 180° and position angle increases in the counterclockwise direction; (left) a mirror diagonal reverses the field left to right and position angle increases clockwise.

(180°) and west (270°). Because stars appear to drift east to west in a fixed field of view, west is traditionally referred to as *preceding* (abbreviated p.) and east as *following* (f.). These abbreviations, used in combination with *north* (n.) and *south* (s.) in the target list remarks, can point to other objects in a field of view while signaling that the direction is only approximate.

Separation (ρ) is the angular distance between the two stars, measured in arcseconds (") or, in the target list, in arcminutes (') if larger than $120''$. How wide is a typical double star? The average separation of pairs in the target list is $26''$. In comparison, the disk of Jupiter is never smaller than $29''$.

Individual stars within multiple stars are identified by a letter *component code*, and measures of position are denoted by the component code combination. The primary star is labeled A, its companion or secondary star is labeled B, and measures of θ and ρ are listed for the pair AB; the third component is labeled C, its position relative to the primary as AC, and so on. Frequently a component thought to be a single star turns out to be a close binary, so the component symbol is split by appending lowercase letters and separating the pair with a comma (C becomes the binary Ca,Cb). If one of these is also found to be a binary, the code is split by appending numbers (Ca becomes Ca1,Ca2). New components are assigned the next available letter – D, E, F and so

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on. Figure 2 illustrates how this sequence of code revisions often signals the hierarchical structure of a multiple star.

In addition to positional measurements, the primary and secondary magnitudes (denoted m_1 and m_2) are important to calculate the system magnitude difference or *delta-m* (Δm). As the brightness contrast between the two stars, Δm can be used to estimate the mass ratio (q) of the stars when both are on the main sequence (see Appendix B).

All double stars are continually moving, in orbit around each other and in proper motion across the sky. This makes *epoch*, the year the system was measured, useful to decide if the parameters describe the current appearance of the system. In addition, the meaning of θ changes over time, because precession of the equinoxes changes the celestial direction of true north: epoch allows this to be corrected in historical measures. Although routinely omitted from most double star references, the proper motion of each component is invaluable to suggest whether two stars are moving independently or as a gravitationally bound pair. Finally, the *spectral type* and *luminosity type* are useful to understand the hierarchical structure and age of the system, estimate the system mass, and derive the absolute magnitude necessary to calculate the distance of the system from its apparent magnitude (the so-called *spectroscopic parallax*, see Appendix B).

Telescope optics

With this background understanding of physical double stars, it's time to explore the observing techniques of double star astronomy and the best use of your telescope.

The four basic optical attributes of a telescope are the *aperture* (D), the *objective focal length* (f_o), the objective focal ratio or *relative aperture* (N) of the primary mirror or objective lens and, for visual astronomy, the *eyepiece focal length* (f_e). These define the quantities of magnitude limit, resolution limit, magnification and exit pupil that determine the quality of your telescopic image. Appendix B lists the formulas used to calculate each of these quantities.

The *magnitude limit* (m_L) is an estimate of the faintest star you can detect with your telescope using

averted vision. This depends on faintest star you can detect with your naked eye, the *naked eye limit magnitude* (NELM), which is about 6.5 at a dark sky site but much less (~ 4.5) under light-polluted suburban skies. However, direct or foveal vision is necessary to see star colors and resolve close doubles, so these must be at least three magnitudes brighter than the magnitude limit of your telescope (wide, faint companions can still be detected with averted vision).

The λ/D or *Abbe Resolution limit* (R_o) is the smallest angular width that can be imaged with your telescope aperture. It is imposed by the wave nature of light, which diffracts a perfect image into alternating ripples of light and dark that, like pixels on a computer screen, limit the smallest resolvable detail. This limit R_o is calculated (in radians) as the average light wavelength (λ) divided by the aperture (D) in millimeters. Many double star astronomers rely instead on a *resolution criterion*, the minimum separation necessary to see two distinct star images, as proposed by Lord Rayleigh using optical theory, William Dawes using telescopic observations, or C. M. Sparrow using visual experiments (see Figure 5 and Appendix B). These are found by multiplying the optical limit R_o by a perceptual adjustment factor (k). But visual acuity is an individual attribute, part of your "personal equation". Many skilled observers can detect an equal magnitude binary as an elongated, "egg shaped" or "rod shaped" star at a separation that is nearly half the Abbe criterion. The optical quality and collimation of your telescope, the strength of your eyes, your viewing skill – as well as the atmospheric conditions and brightness contrast of the target system – determine your actual resolution limits.

Magnification (also denoted by M) is the visual width of the object as it appears in the image compared to its naked eye width in the sky. It is produced by the combined focal lengths of the objective (primary mirror or lens) and eyepiece. Magnification increases as the objective focal length gets longer, enlarging the image by projection distance like a film projector moved farther from a screen; and it increases as the eyepiece focal length gets shorter, enlarging the image by bringing it closer

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to the eye. Increased magnification has three effects: it reduces the angular width of your true field of view (TFOV), it makes the background sky darker, and it makes the effects of atmospheric turbulence more obvious.

Of course, to utilize fully the resolving power of your telescope, you must enlarge the resolution limit of the aperture to match the resolution limit of your eye. However, magnify as much as you like, you will never see an actual double star. Instead you see the image created as light waves from the star are disrupted by the physical limits of your telescope aperture. If the star is bright enough to be viewed directly, it will appear as a tiny drop of light called the *Airy disk*, and in brighter stars (under good seeing) this disk will be enclosed by one or more concentric ripples of light, the *diffraction rings*. Since you are not looking at an object outside the telescope but at a diffraction artifact inside the telescope, the visual size of the Airy disk must be estimated in a different way.

The *exit pupil* (d_e) of your telescope is inversely proportional to the apparent diameter of the Airy disk – as the exit pupil becomes smaller, the Airy disk will appear larger. To resolve the closest double stars or to evaluate the seeing (as explained below), you must magnify the Airy disk until it is distinctly visible. For most observers, this means an exit pupil less than 1.0 – in other words, an eyepiece focal length (f_e) that is less than the telescope's relative aperture (N) (see Appendix B). With the $N=10$ optics found in commercial Schmidt–Cassegrain telescopes, a 5 to 7mm eyepiece is often effective.

Preparing to observe

Astronomy requires good optics, but also careful adjustment and skillful use of your equipment. Assuming you already know how to set up and polar align your telescope, there are three preliminary steps to a night of observing: cool down, collimation and seeing evaluation.

Cool down allows the telescope to reach the same temperature as the surrounding air, which eliminates the thermal currents from the mirror and inside the telescope tube that will badly degrade the image. The routine solution is to store the telescope during the day where it can be protected from heat, set up

and uncover the telescope just before sunset, and start observing when twilight ends. Cool down of at least an hour is necessary for reflecting telescopes – Newtonians and all Cassegrain formats – and large apertures may require more time. As a rule, refracting telescopes equilibrate quickly.

Collimation is the centering and parallel alignment of the optical axis of all lenses and mirrors in the telescope – including the optical axis of the eye, which must be centered over the eye lens for best views. Miscollimation can seriously degrade the quality of the telescope image, but fortunately it is easy to correct. The manuals that ship with commercial reflecting telescopes will explain how to collimate the instrument. (Refracting telescopes are already collimated and most cannot be adjusted.)

Both collimation and cool down are evaluated by looking at a bright star image defocused in the extrafocal direction (toward the observer) to show about five diffraction rings around the faint central *Poisson spot*. A warm mirror will present an undulating circumference or a wedge-shaped plume rising from the middle of the defocused star image; a miscollimated mirror will show the Poisson spot out of center.

Once the thermal wedge has disappeared and collimation is confirmed, the same bright star in crisp focus can be used to evaluate the *seeing* – the rapid distortion of the telescope image cause by thermal turbulence in the atmosphere. Many astronomers use the ten-step *Standard Scale* devised by American astronomers A. E. Douglass and E. C. Pickering to rate the seeing, but the gist of the scale can be captured in five intervals, each linked to specific features of the star image (see Figure 5). The worst seeing (1) produces an enlarged and featureless ball of rapidly seething speckles of light. As seeing improves this becomes (2) a recognizable Airy disk inside a speckle cloud, (3) a distinct Airy disk surrounded by a continuous dark ring, and (4) the Airy disk with a first ring that is unbroken at least half the time. The best seeing provides (5) a completely formed and often motionless diffraction artifact. Although turbulence originates in the atmosphere, its effect depends on the size of your telescope: on the same night at the same location, the seeing will be superior

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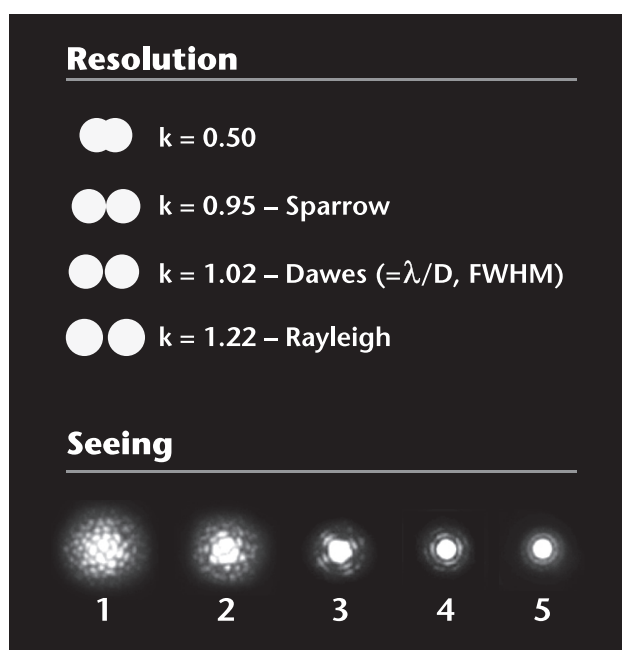


Figure 5 Resolution and seeing
(Top) The Dawes resolution criterion is essentially the same as the Abbe or λ/D resolution limit; the Rayleigh resolution criterion is 22% larger. (Bottom): Schematic of changes in Airy disk appearance under different levels of seeing.

in apertures below 200 mm. Many double star astronomers prefer even smaller apertures for their pretty and vividly colored images.

The appearance of the turbulence can indicate its source and persistence. *Low frequency* seeing seems to undulate like ripples in water, causes large jumps in the star image, and often shows an upward flow in a highly defocused star image. *High frequency* seeing churns rapidly, shows little or no jumping around, and often presents a sideways flow in the defocused image. Low frequency seeing is typically in the telescope or near the ground and often abates as the telescope, ground and air cool after sunset – provided you are not observing near heated buildings or paved surfaces. High frequency turbulence often originates in changing weather or the jet stream and is likely to persist all night.

Helpful accessories

By far the most important accessory for viewing double stars – assuming you already have your thermal clothes, red light flashlight, observing chair and thermos of warming beverage – is a *standard eyepiece*

that provides any combination of magnification and *apparent field of view* (AFOV) that you find routinely convenient with the telescope you are using.

Here preferences vary, depending on whether you think in terms of resolution or the field of view. I start with resolution, and prefer an eyepiece that gives an exit pupil of around 1.0: this lets me see the resolution limit of my telescope with a good sized field of view. Others prefer a magnification of 80 to 120 that presents a generous field, minimizes the effects of poor seeing in larger apertures and resolves all but the closest double stars. Try both approaches to see which one you prefer.

Eyepieces of the same focal length can have an AFOV between 40° and 100° or more, depending on optical design. I find an AFOV of 70° is optimal for the standard eyepiece: a smaller apparent field excludes too much of the surrounding skyscape, while a larger field makes it too difficult to estimate separation between wide double stars. This requires you to calculate the diameter of the *true field of view* (TFOV) of your eyepiece (see Appendix B), then use proportions of the field radius to judge angular distance. For example, if the calculated diameter of the true field is 20 arcminutes, then half the distance from the center to the edge of the field is 5 arcminutes.

Bracket this standard view with two eyepieces with half (or less) and double (or more) the standard eyepiece focal length. The lower power will deliver the most benefit with a superwide AFOV (80° or more). For the highest power eyepiece, a zoom lens across the short focal lengths is handy because you can nicely adjust the magnification to produce the best contrast and visual detail. Baader offers a very fine low power zoom; TeleVue has two excellent versions for high powers.

An *astrometric eyepiece* is available from Meade (the discontinued Celestron eyepiece can be purchased used). These show an illuminated linear scale across the field of view, used to estimate separation, and a circumference scale used to estimate position angle. The references include sources describing the use of these eyepieces. Although not as precise as a filar micrometer they are far less expensive and much easier to use.

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Finally, the modern, computer-controlled GoTo mount is enormously helpful in double star astronomy. Accurate GoTo pointing makes it easy to identify an 8th magnitude target system within a field of similar stars, and it eliminates the time-consuming (although often enjoyable) challenge of star hopping with star chart and finder scope. A laptop or desktop computer provides the highest level of control, but lacking that a handset with an installed star inventory is indispensable.

Many observers prepare and print out observing checklists, finder charts for faint systems, guidebook descriptions and other aids. I print out observing lists with room for making notes or ratings of visual quality, and use the pocket-sized paper notebooks by Fabiano for making notes and drawings at the eyepiece. A compact voice-activated recorder is also handy to capture observations for later transcription.

Observing techniques

All systems in the target list can be resolved by telescopes up to 300 mm aperture under good seeing. I have not stinted on challenge doubles that will test the limits of your observing skill and observing conditions, no matter what aperture you own.

The three challenge parameters of a double star are the primary magnitude, the magnitude difference and the separation. But a 2" separation can be easy or difficult depending on your telescope's aperture. To eliminate this complication, just divide the separation by your telescope's resolution limit (or resolution criterion): this is the *resolution ratio* (ρ/R_o) of the binary in your telescope. A resolution ratio of 2 means the binary separation is twice as large as your resolution limit or criterion and should be easy to resolve – with sufficient magnification.

Magnitude difference is equally important, however. Their combined effect can be evaluated with a *Treanor plot* (Figure 6). The gray dots in the figure plot the Δm for doubles in the target list using the resolution ratio for a 250 mm aperture. There is clearly an area in the lower left – the combination of small resolution ratio and large Δm – where double stars are too difficult to resolve: glare or diffraction rings around the primary obscure the fainter star. The

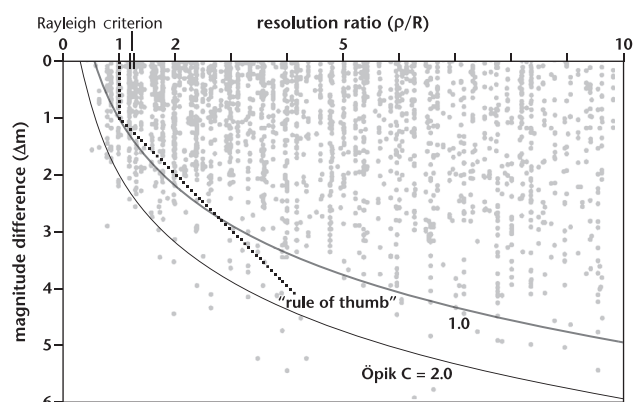


Figure 6 A Treanor plot

A Treanor plot locates individual double stars (gray dots) by the resolution ratio (ρ/R_o) and the magnitude difference (Δm). Resolution thresholds can be drawn into the plot to indicate whether a binary will be easy or difficult to resolve: two simple examples, the Öpik limit C and the "rule of thumb", are shown.

curve ($C = 1$) in the diagram represents a resolution boundary suggested by the Estonian astronomer Ernst Öpik: double stars plotted above this curve should be easy to resolve. The shape of the curve indicates that close doubles must be similar in magnitude to be detected easily, and that glare rapidly decreases with separation. A second curve, for $C = 2$, suggests how far your observing skill and favorable seeing can increase the systems you can observe.

Unfortunately, the Öpik and similar detection formulas require a calculator to implement. A simple "rule of thumb" approximation for $C = 1$ is: if Δm is less than 1 then the pair can be resolved down to the optical resolution limit ($\rho/R_o = 1$); otherwise Δm must be less than the resolution ratio ($\Delta m \leq \rho/R_o$). With experience and good equipment, you will routinely detect unequal doubles beyond this simple limit.

Small separation and large brightness contrast are not the only visual difficulties you will encounter. All close doubles are difficult in bad seeing. And difficulty increases at the magnitude extremes: a bright primary star will produce more diffraction rings and cast obscuring glare at a greater distance, especially on nights when there is diffusion from atmospheric humidity or dust. A reflecting telescope with a central obstruction that is more than 30% of the diameter of the aperture pushes excess obscuring light into the diffraction rings. If the stars are too faint

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for your aperture, they approach the foveal limit where your detail vision fails, and the lower resolution of your averted vision will be unable to resolve them. In all these situations, the stars must be farther apart in order to be seen. And there is occasional inaccuracy in the cataloged magnitudes or separation, making the star seem easy to resolve – on paper.

Patience is a critical ingredient in most visual astronomy. Unless the seeing is very good, you must wait for the “revelation peeps” (as astronomer Percival Lowell called them) when the air briefly steadies and you can glimpse close doubles without distortion. You must learn what a companion star looks like when it mingles with the diffraction rings of the brighter star – often appearing to be only a persistent speckle. And using sufficiently high magnification is often the key. With poor seeing, high magnification helps because the Airy disk of bright stars can be observed “through” the turbulence. (This runs counter to the practice of planetary and lunar astronomers who are taught to reduce magnification in bad seeing.) With good seeing, the right magnification can make faint components visible by suppressing the background sky brightness and make components hidden in the diffraction rings easier to detect.

How can you know if you have actually detected a close or difficult companion? The best case is that you *resolve* the binary and see two unmistakable Airy disks, separated by a sliver of darkness or barely touching at their edges. However you can *detect* a binary as a stubby rod produced by the overlap of two Airy disks, or you may see a fleeting or indistinct brightening of the diffraction rings, a fuzzy blob or persistent speckle that will not look at all like an isolated star. To test your observation, visually estimate the separation and position angle of the component, and compare your estimate to the target list values. This is easiest if you have a German equatorial mount (GEM). Align the drawtube of your focuser or star diagonal so that it is parallel to the declination axis, and the east/west (following/preceding, 90°/270°) position angles in the eyepiece field will be parallel to the optical axis of the telescope. (Note that field orientation rotates 180° when you turn your telescope across the meridian, switching west and east.) If your estimate

of position angle is reasonably close to the catalog value, then detection is confirmed.

From the eighteenth century to today, star color has been one of the most carefully described and widely enjoyed aspects of double star astronomy. However, color perception varies from one person to the next and the colors you see will differ from those seen by other observers. All star colors are quite unsaturated (diluted with “white” light), which can cause star color to change the longer you look at it, and your vision will alter the apparent color of stars with complementary color contrast, for example when a bright yellow or orange star makes a white companion star appear blue or green. As stars become fainter, the same orange or red hues appear more saturated, but yellow stars will fade quickly to an apparent gray, and otherwise colorless stars can appear pale blue. The telescope aperture, the brightness of the stars, the brightness contrast and angular separation between them will all noticeably affect star color. In double stars, color really is in the eye of the beholder, with the telescope an integral part of your eye.

To examine and describe star color, think in terms of the basic incandescent or “hot metal” hue categories – *red, orange, yellow, white, blue* (abbreviated R, O, Y, W, B) and adjacent blends such as *yellow orange* (YO) or *blue white* (BW). (*Blue green, green* and *violet* are always illusory.) In bright stars, color can be displayed more clearly if you slightly defocus the star in the extrafocal direction to present the color as a small disk. Notice also how much magnification affects star color: Rasalgethi, for example, will appear at low power as two yellow orange stars, but at an exit pupil of around 1.0, the beautiful yellow and blue (Y/B) contrast appears clearly. These complications limit the reliability of color as an indicator of a star’s spectral type: all the more reason to just enjoy the view.

Finally, change eyepieces often. The standard eyepiece, with the target system centered in the field of view, is always your basis to compare one system to another. Compare the magnitude of the components to the magnitude of the primary, and note whether the star is in a *rich field* or a *dark field*. (Optical pairs are much more likely in a crowded field of similar

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stars.) Use averted vision to search for faint components, and search the field of view for binaries, bright stars or groups of stars that may be associated with the target. Note the distance and quadrant direction of these features from the primary star.

For close pairs, use your high power eyepiece to resolve the target system. The Airy disk and the dark interval between the disk and first diffraction ring must be clearly visible. Conclude by switching to a low power eyepiece with a large TFOV. Near the galactic equator this can display splendid views in every part of the Milky Way and reveal nearby star clusters or nebulae. When you slew to the next target, this low power is ideal to locate the new system and center it in the field for viewing with the standard eyepiece.

Next steps

Double stars offer a great range of opportunities for the amateur astronomer. The best of these is simply keeping notes based on your observations. Separate from the value of a permanent record, notetaking encourages you look longer and both study and enjoy what you see. The remarks in the target list imply a routine format for observations, but what and how you record is a highly personal aspect of double star astronomy. Whatever your style, abbreviations are especially handy to record essential or routine features efficiently.

A fun way to start is the *Double Star Observing Program* moderated by The Astronomical League. You'll be asked to observe and draw 100 famous double stars, submit your work and receive a certificate, pin and the satisfaction of having met many double stars in person.

Sampling the systems in the target list may inspire you to view all the systems in one of the important historical catalogs – an *observing campaign* similar to the Messier challenge or Herschel challenge of deep sky astronomers. The catalogs by William Herschel, James Dunlop, Charles Rumker or James South are all attractive, if liberally mixed with pair asterisms. A favorite and ambitious challenge is the list of ~ 3,000 targets compiled in the early nineteenth century by F. Wilhelm von Struve (Σ). This catalog contains a great number of interesting and spectacular objects, and for that reason has formed the

backbone of nearly every double star observing list. (His supplement catalogs, denoted Σ I and Σ II, are limited to bright, wide pairs.)

Many amateurs enjoy measuring double stars, and this contributes directly to the project of confirming new physical systems and refining the orbits of those already known. This *Atlas* can be used to guide your choice of physical systems most fruitful to study, and the USNO will on request provide observers with a custom list of “neglected doubles” in dire need of attention. A micrometer eyepiece can be used to measure wide, fairly bright systems; filar and split prism micrometers are no longer manufactured commercially, and custom-made units can be very expensive. Many amateurs instead use charge-coupled device (CCD) imaging or drift timing; articles in the references describe these techniques and the software tools necessary to produce reliable measurements. Amateurs with very large telescopes can make productive contributions to the photometry and even the spectral analysis of double stars. (Note that you will be required to demonstrate the accuracy of your equipment and methods before your measurements will be added to the WDS.) Amateurs with access to computing resources and skill in working with data have made significant contributions, aided by the high quality of astronomical resources available online. Remarkably, many double stars have been “discovered” simply by reviewing archival astrometric data or research reports.

Double stars are a marvelous esthetic inspiration. Capturing the beauty of these dynamic beacons is a worthy artistic challenge, and many observers have developed methods to draw or paint eyepiece portraits of double stars. Others meet the challenge with color video astrophotography. Photographic equipment today, especially the combination of video and lucky imaging, is capable of capturing astonishingly delicate images of the brighter double stars that were inconceivable just a few decades ago.

The *Journal of Double Star Astronomy* (JDSO) maintains an online archive of hundreds of articles that explain the amateur use of measurement methods, software and equipment. This is a great resource for browsing just to see what others have done. Although more technical in nature, the

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Webb Deep-Sky Society *Double Star Circulars* also describing methods of discovery and measurement and are worth exploring. Both these electronic publications (see the references) show that double stars are still being discovered by amateurs working with amateur equipment.

But don't just read about it. The surest way to expand your knowledge of double stars is to collaborate – through your local astronomy club, star parties, astronomical conferences, and through classes by professors at your high school, city college or university. Astronomy is often a dark and solitary activity, and perhaps for that reason astronomers are often eager to share their experience and encouragement with newcomers and colleagues in this fascinating and rapidly evolving field.

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Magazines

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All these publications are targeted to amateur astronomers, provide reports on cutting edge astronomical research, hobbyist activities, amateur equipment reviews; all are available online. They also each publish a selection of books, atlases and digital or video materials, and participate in astronomical conferences and trade shows.

Articles available online

Note: Most of these articles, and hundreds more, can be downloaded in pdf format from the SAO/NASA Astrophysics Data System website (referenced

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below): simply search for the author last name(s) and date of publication. JDSO articles can be downloaded in PDF format from the JDSO website at <http://www.jdso.org/archives.xml>. Webb Deep-Sky Society Double Star Circulars can be downloaded at <http://www.webbdeepsky.com/double-stars/double-star-section-circulars>.

- R. G. Aitken, "The Definition of the Term Double Star" (1911). An early proposal to exclude optical pairs from double star catalogs, including an early description the "Aitken test" (as proposed by E. C. Pickering!).
- R. Anton, "On the Accuracy of Double Star Measurements from 'Lucky' Images, a Case Study of Zeta Aqr and Beta Phe" (JDSO, 2009). A useful introduction to the method of "lucky imaging" to improve CCD image clarity.
- R. Caballero, "Finding New Common Proper Motion Binaries by Data Mining" (JDSO, 2009). Describes how to use NOMAD data and Aladin sky survey imagery to identify CPM pairs.
- R. M. Caloi, "Estimation of Double Star Parameters by Speckle Observations Using a Webcam" (JDSO, 2008). Explains the methods of speckle interferometry, which exploits atmospheric turbulence to obtain high resolution images.
- J. Daley, "A Method of Measuring High Delta m Doubles" (JDSO, 2007). Describes construction and use of a stellar coronagraph in the CCD measurement of bright double stars with faint components.
- S. P. Goodwin, "Binaries in Star Clusters and the Origin of the Field Stellar Population" (2009). Recent, relatively non-technical summary of the way the "birth population" of double stars is transformed by the natal cluster.
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- C. Lada, "Star Formation in the Galaxy, An Observational Overview" (2005). An informative summary of star formation processes with emphasis on solar mass double stars.
- S. Larson "Binary Stars" (2010). A concise and lucid summary of the binary orbital dynamics. (http://sciencejedi.com/professional/classes/astrophysics/lectures/lec08_binaries.pdf)
- B. Mason, "Various Orbital Solutions and Double Star Statistics" (2011). Compact introduction to speckle interferometry and issues of orbital calculation.
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- D. Sinachopoulos and P. Mouzourakis, "A Statistical Approach for the Recognition of Physical Visual Double Stars" (1991). Calculates all sky 95% probability limits for the maximum angular separation by magnitude.
- M. Sterzik and R. Durisen, "Are Binary Separations Related to their System Mass?" (2004). A Monte Carlo study exploring the effect of system mass on the multiplicity fraction and binary orbital elements.
- P. J. Treanor, "On the Telescopic Resolution of Unequal Binaries" (1946). An early evaluation of the effect of unequal magnitude on double star detection.
- R. Wasson, "Measuring Double Stars with a Dobsonian Telescope by the Video Drift Method" (JDSO, 2014). A thorough explanation of this measurement method, here using a GoTo altazimuth telescope.
- B. Wilson and W. Hartkopf, "The US Naval Observatory Double Star Program: Frequently Asked Questions" (JDSO, 2011). Useful overview of the WDS database and the requirements for submitting measurements.

Websites

- Astronomical Files from Black Oak Observatory*: <http://www.handprint.com/ASTRO/> – Extensive information on double stars and visual double star astronomy.
- Astronomical League Observing Programs*: <https://www.astroleague.org/observing.html> – Observing campaigns suited to all levels of skill and supervised by the umbrella organization for USA amateur astronomy societies. A great way to start!
- Calibration Candidates*: <http://ad.usno.navy.mil/wds/orb6/orb6c.html> – A list of binaries that can be used for calibrating astrometric instruments.
- Henry Draper Catalogue at SkyMap.org*: <http://server6.sky-map.org/group?id=23> – Separate listings of information and related research for most HD objects. The index is a useless multipage shambles, so google the HD number to find a page directly.
- Multiple Star Catalog*: <http://www.ctio.noao.edu/~atokovin/stars/index.php> – Last update April 2010.
- A. Tokovinin's online database of multiple stars,

Introduction

showing hierarchical structure, spectral types and masses of all components.

SAO/NASA Astrophysics Data System: <http://adsabs.harvard.edu/> – Portal for a digital library of research papers in astronomy and physics, operated by the Smithsonian Astrophysical Observatory (SAO).

A national treasure.
SIMBAD Astronomical Database: <http://simbad.u-strasbg.fr/simbad/> – The comprehensive repository for all published astronomical data and survey photography maintained at the University of Strasbourg (FR).

Sixth Catalog of Orbits of Visual Binary Stars: <http://www.usno.navy.mil/USNO/astrometry/optical-IR-prod/wds/orb6> – A compilation of visual (including interferometric) binary star orbits, updated frequently.

Stelle Doppie: <http://stelledoppie.goaction.it/> – Gianluca Sordiglioni's comprehensive and easy to use database of double star data, compiled from many sources.

Washington Double Star Catalog (WDS): <http://www.usno.navy.mil/USNO/astrometry/optical-IR-prod/wds/> – The primary database of double and multiple star information, maintained at the US Naval Observatory; the "summary" version, separated into four 4Mb text files, can be downloaded for free.

Washington Double Star Catalog (WDS): <http://www.usno.navy.mil/USNO/astrometry/optical-IR-prod/wds/> – The primary database of double and multiple star information, maintained at the US Naval Observatory; the "summary" version, separated into four 4Mb text files, can be downloaded for free.

About the authors

Bruce MacEvoy is a Fellow of the Royal Astronomical Society and member of the Astronomical Society of the Pacific. He built his first telescope at age 11 and has studied double stars intensively since 2006. He has lectured on double star astronomy in California and Hawaii, developed database software to edit the Washington Double Star Catalog, and has observed over 5,300 double star systems from his observatory near Sebastopol, California. He was formerly a senior research psychologist with SRI International and director of research for *Yahoo!* He also curates one of the largest websites devoted to astronomical topics, www.handprint.com/ASTRO/.

Wil Tirion is a full-time uranographer. He is famous among the amateur astronomy community for the numerous atlases and star charts he has created. Among his other successful books for Cambridge University Press are *Sky Atlas 2000.0* (co-published with Sky Publishing), *The Cambridge Star Atlas*, *The Monthly Sky Guide*, and *A Walk Through the Heavens*.

For more publications see Wil Tirion's website: www.wil-tirion.com.

Acknowledgements

Although it is true that "this research has made use of the *Washington Double Star Catalog* maintained at the US Naval Observatory," that is meager recognition for the generous support and guidance provided to double star astronomers by William Hartkopf and Brian Mason of USNO. I also have relied on the research services of SIMBAD and VizieR with assistance from Gilles Landais and Cécile Loup (University of Strasbourg), and the online archives of physical science papers at SAO/NASA (Harvard University) and arXiv.org (Cornell University). Special tribute is due to Gianluca Sordiglioni, tireless curator of the *Stelle Doppie* website, for preparing the target list data, vetting the astronomical data sources and correcting many errors in the process. Dr. Hartkopf, James Barnett, Phil Sullivan, Ross Gould, Jan Randall and our copyeditor Zoë Lewin provided many useful comments on the text. Finally, a heartfelt thanks to Wil Tirion, my tireless and talented coauthor, and Vince Higgs, our patient and encouraging editor at Cambridge University Press, for agreeing to embark on a new edition. My gratitude for their collaboration must speak my regret for any unforced errors.

I dedicate this edition to my father John MacEvoy who helped me build my first telescope and taught me to appreciate the beauty of our world.

Bruce MacEvoy, FRAS

Sebastopol, California USA

Wil Tirion wants to thank James (Jim) Mullaney for his original idea to create a special atlas devoted to double stars. For this Second Edition, a lot of time went into updating the star maps and I want to express my thanks to Bruce MacEvoy for creating special lists to make this editing process as easy as possible. And, last but not least, my (our) thanks goes to our editor Vince Higgs, for his valuable guidance of the project.

Wil Tirion – Uranographer

Capelle aan den IJssel, The Netherlands

PROOF

STAR CHARTS

PROOF

CHART INDEX

Northern hemisphere

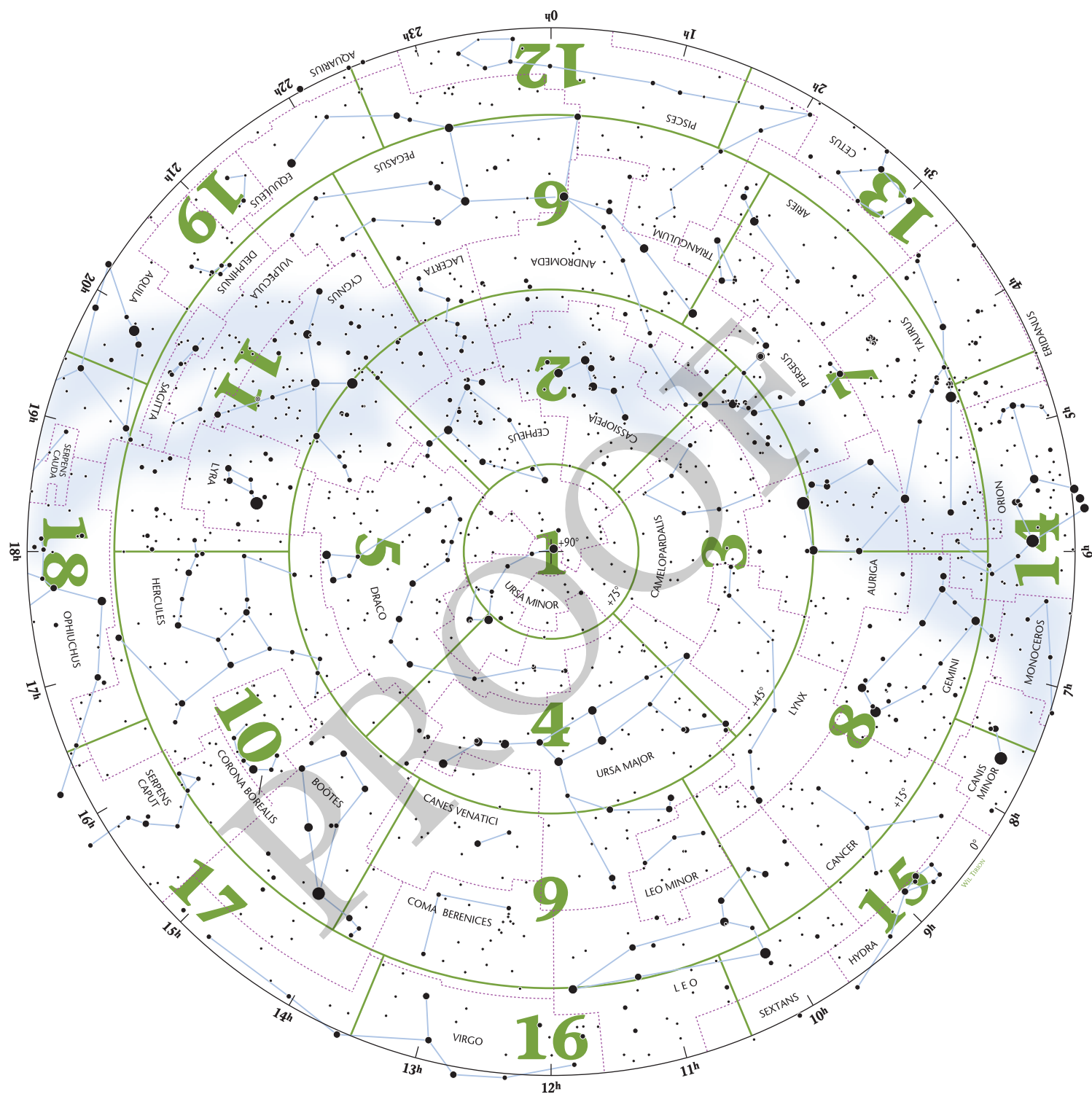
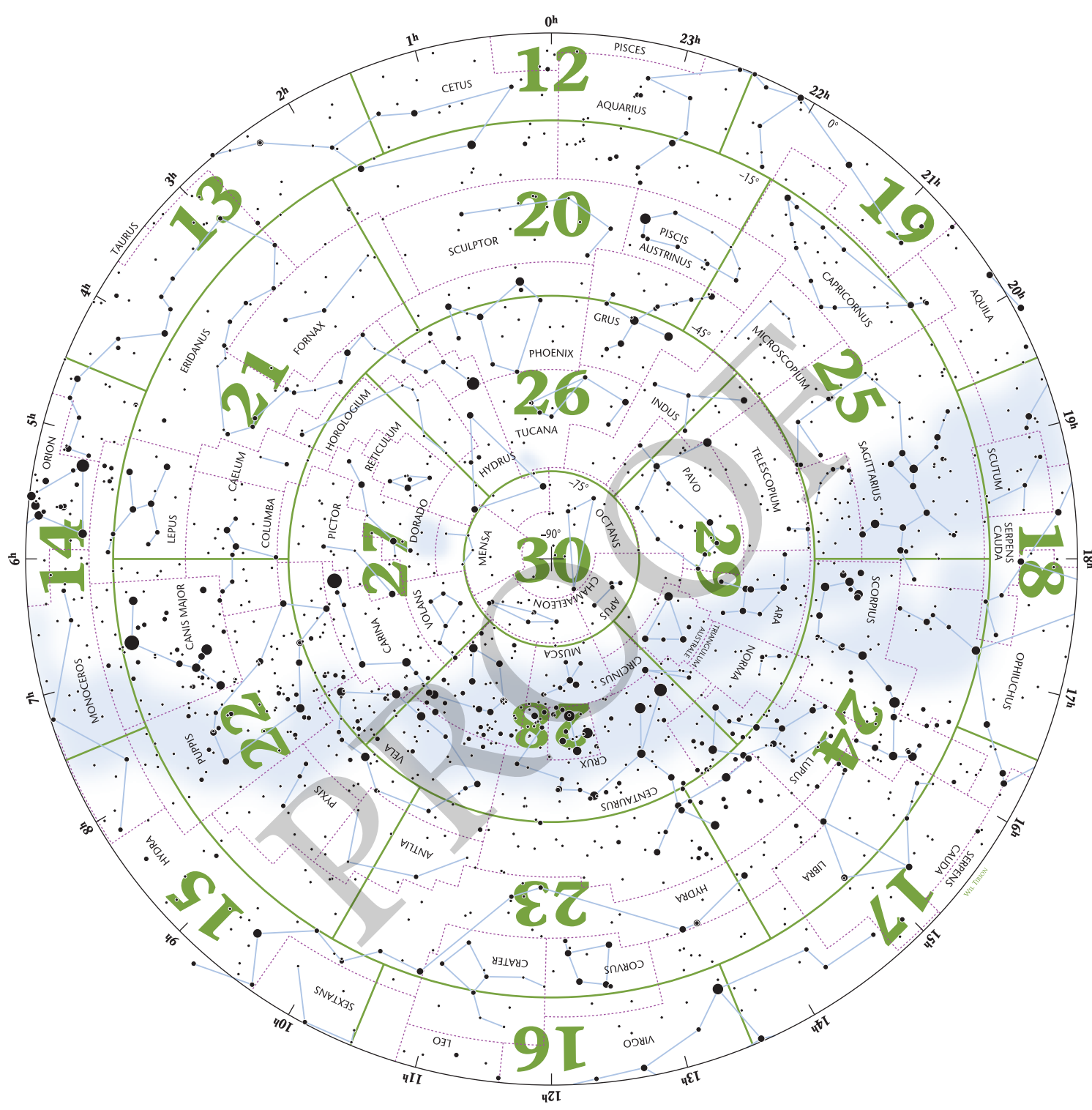


CHART INDEX

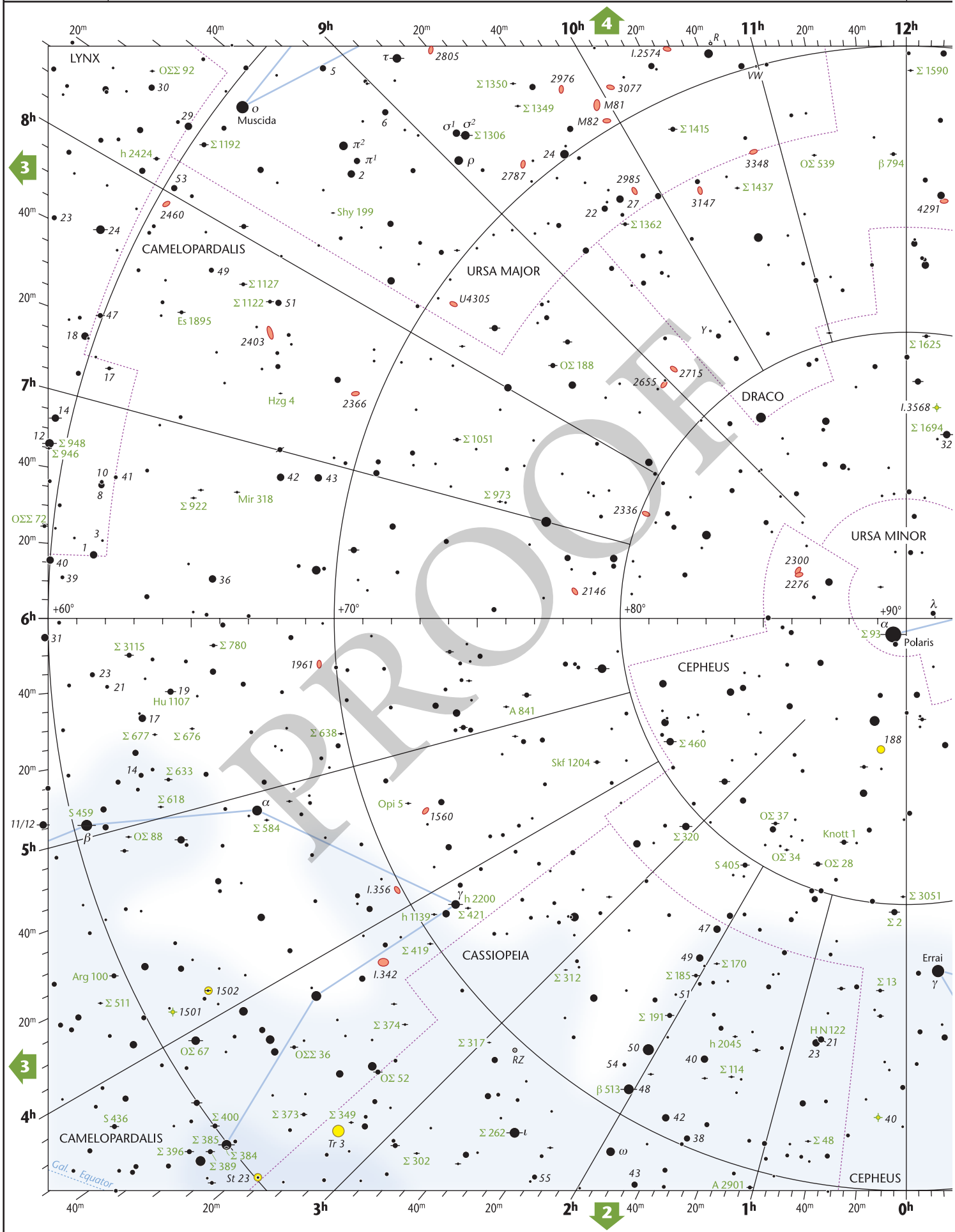
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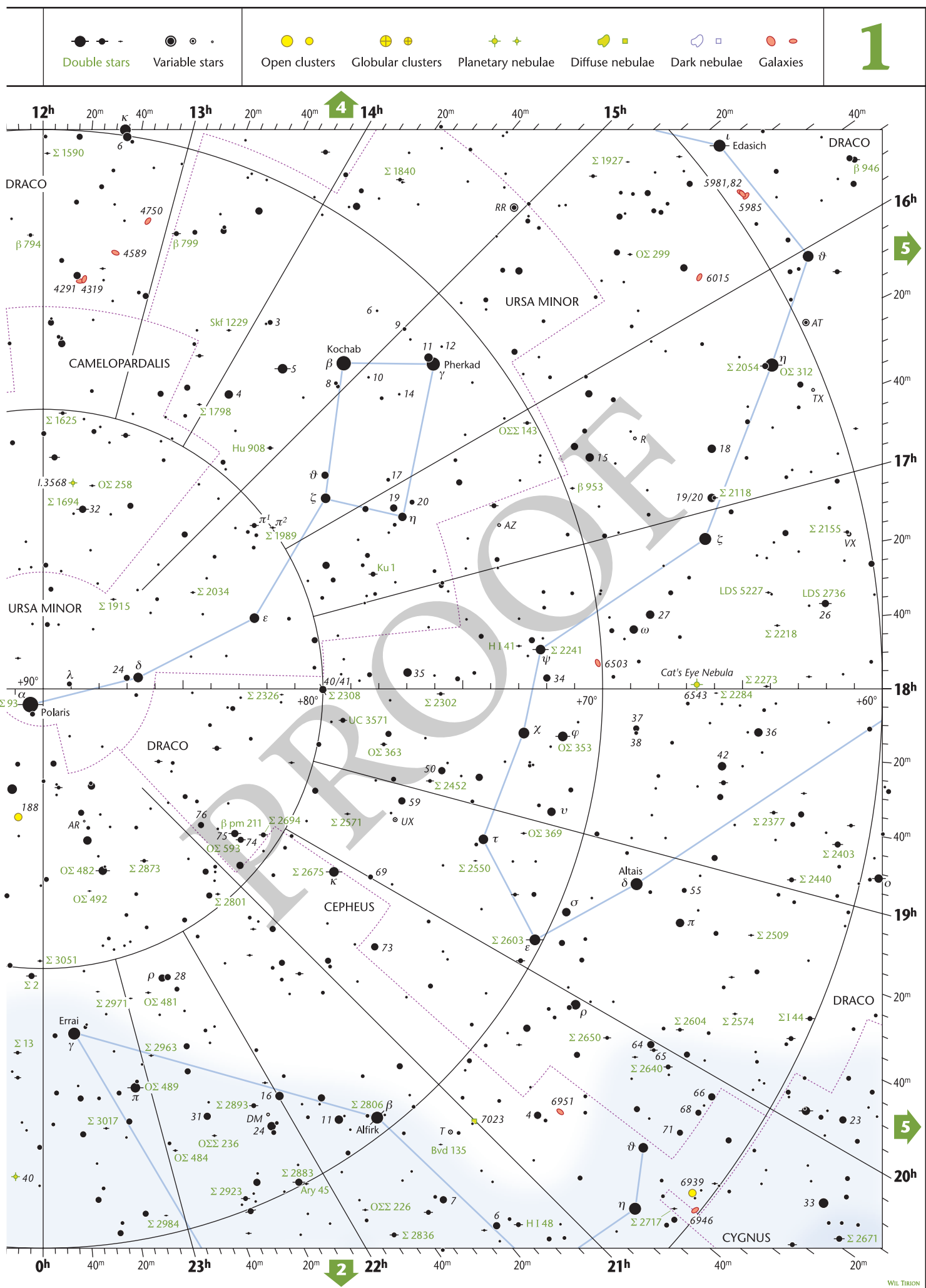


1

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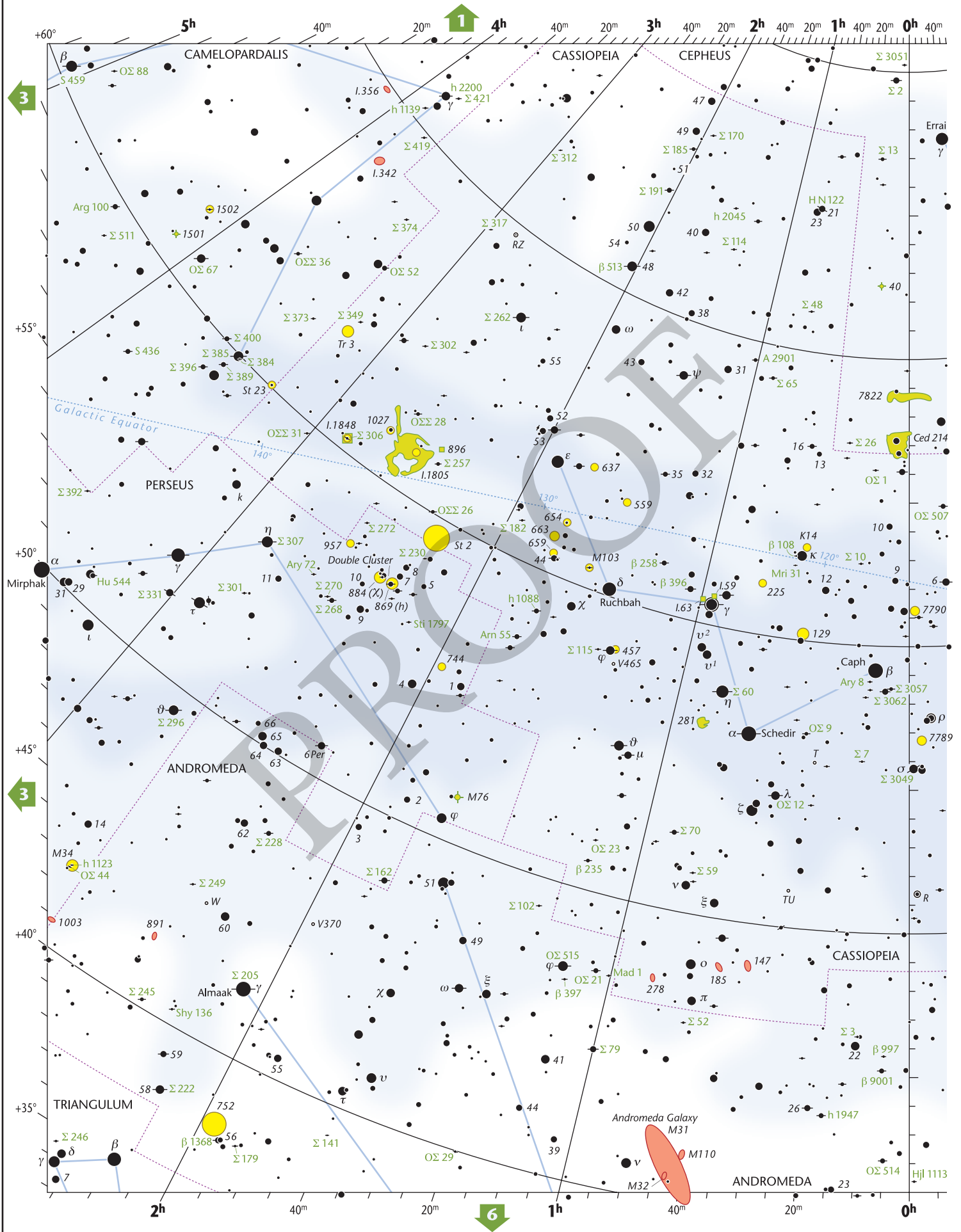




2

Magnitudes

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Double stars

Variable stars

Open clusters

Globular clusters

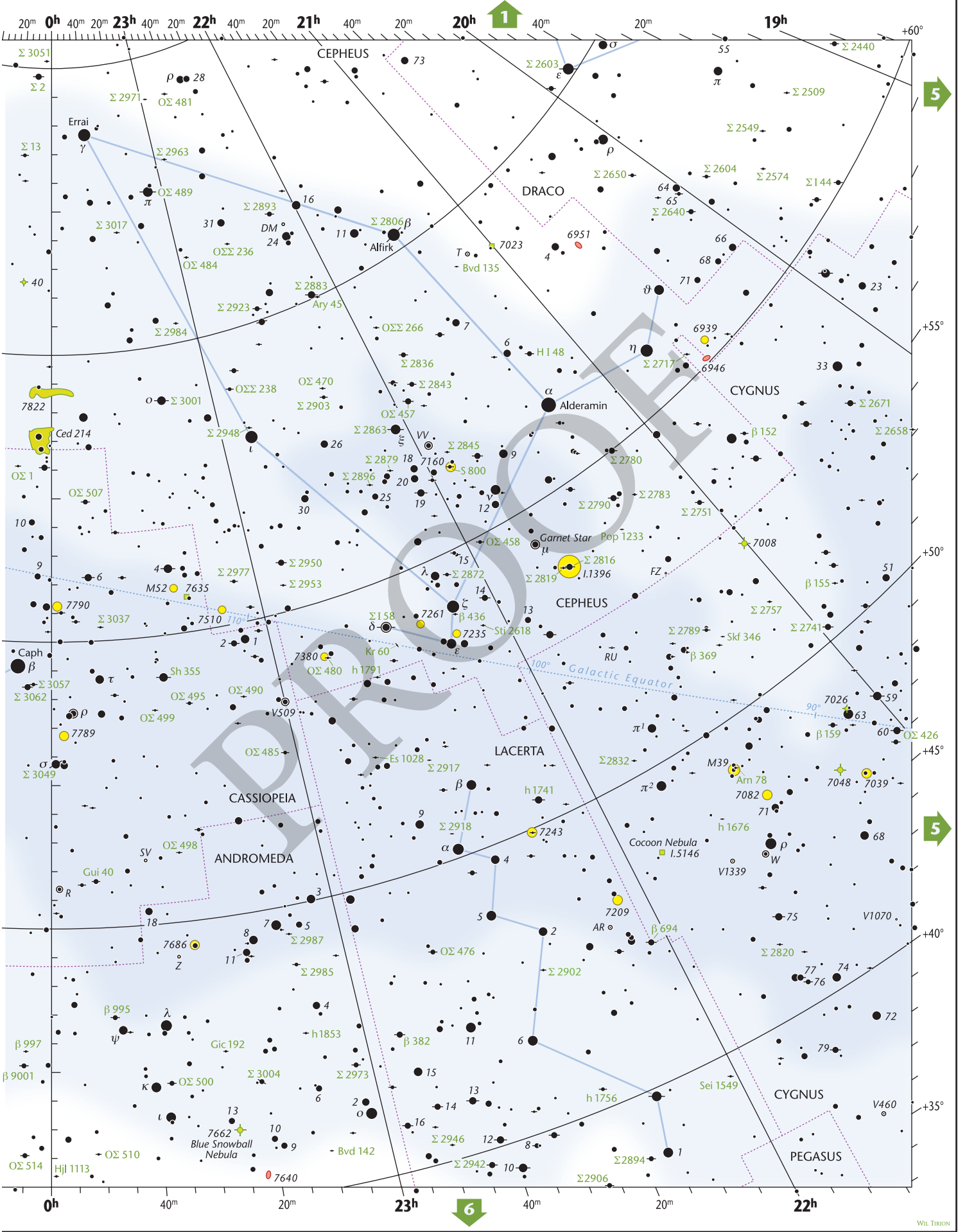
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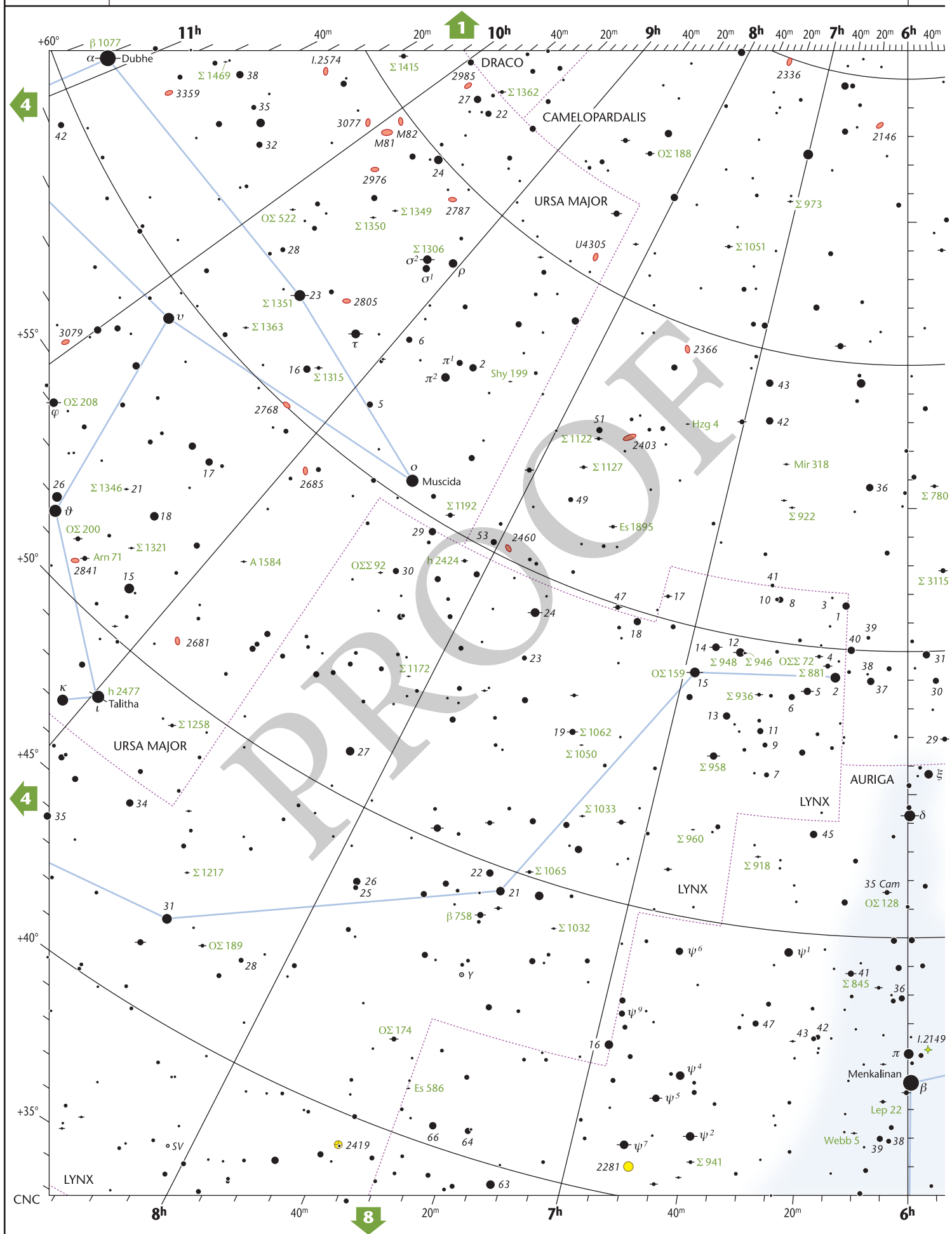
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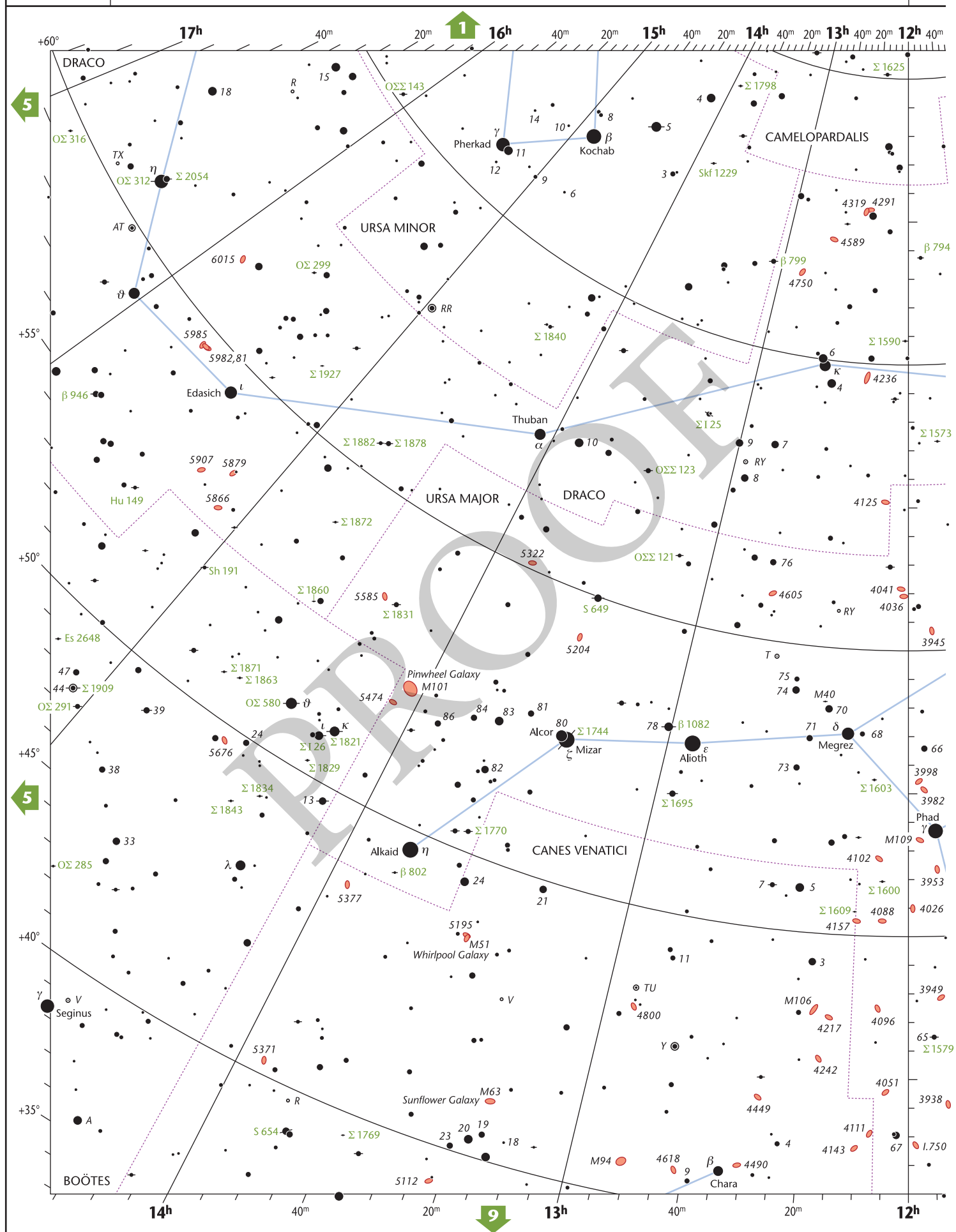
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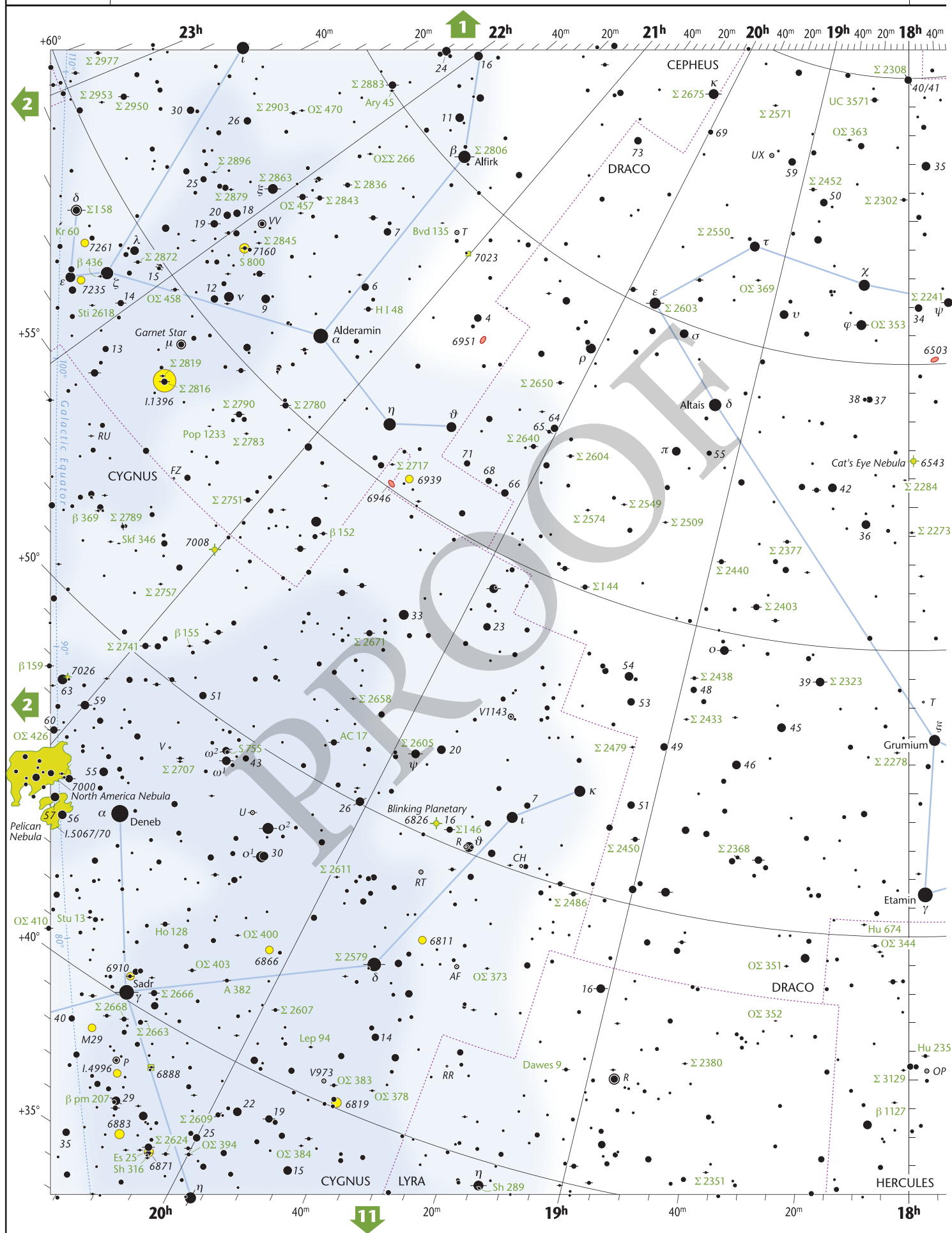
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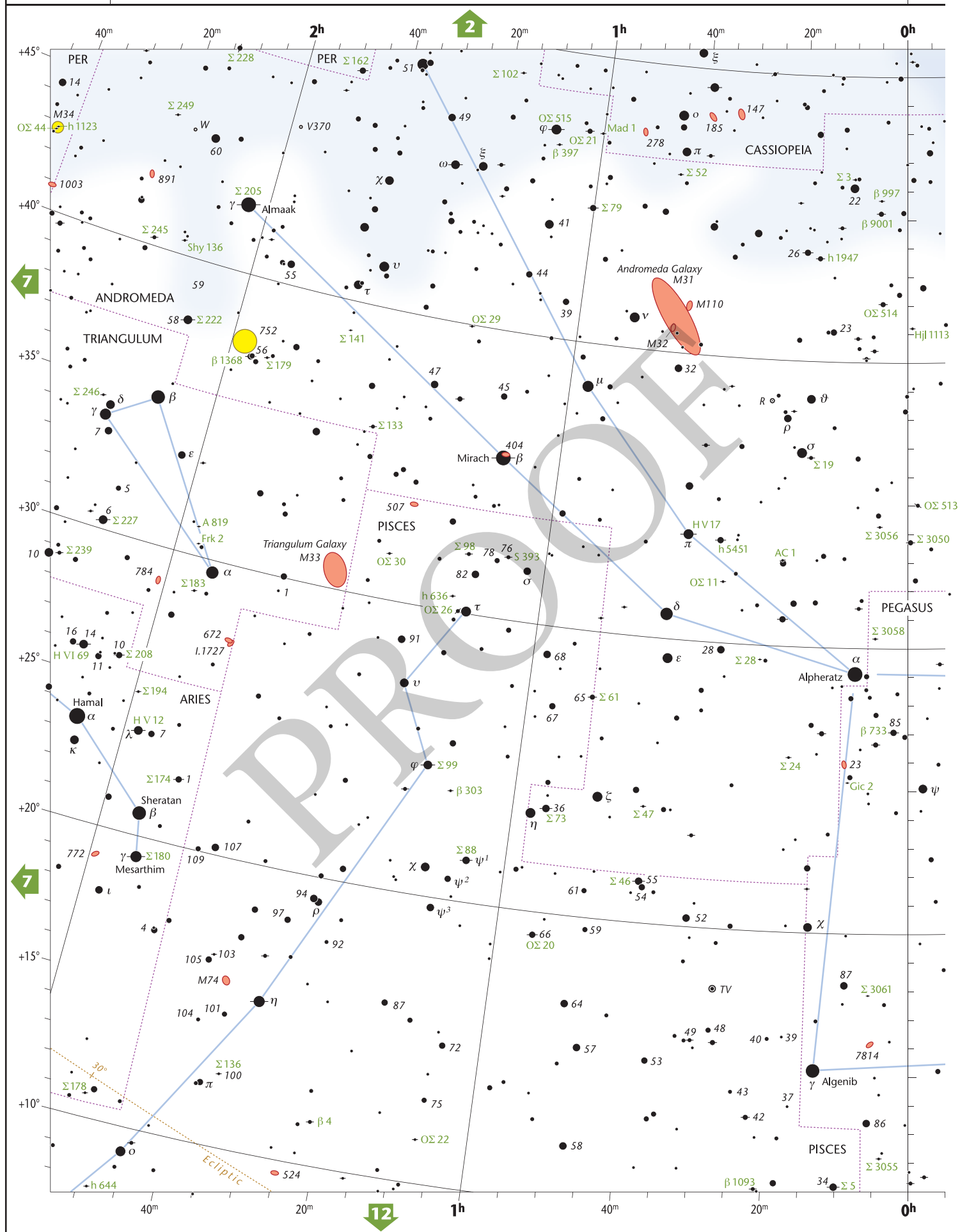


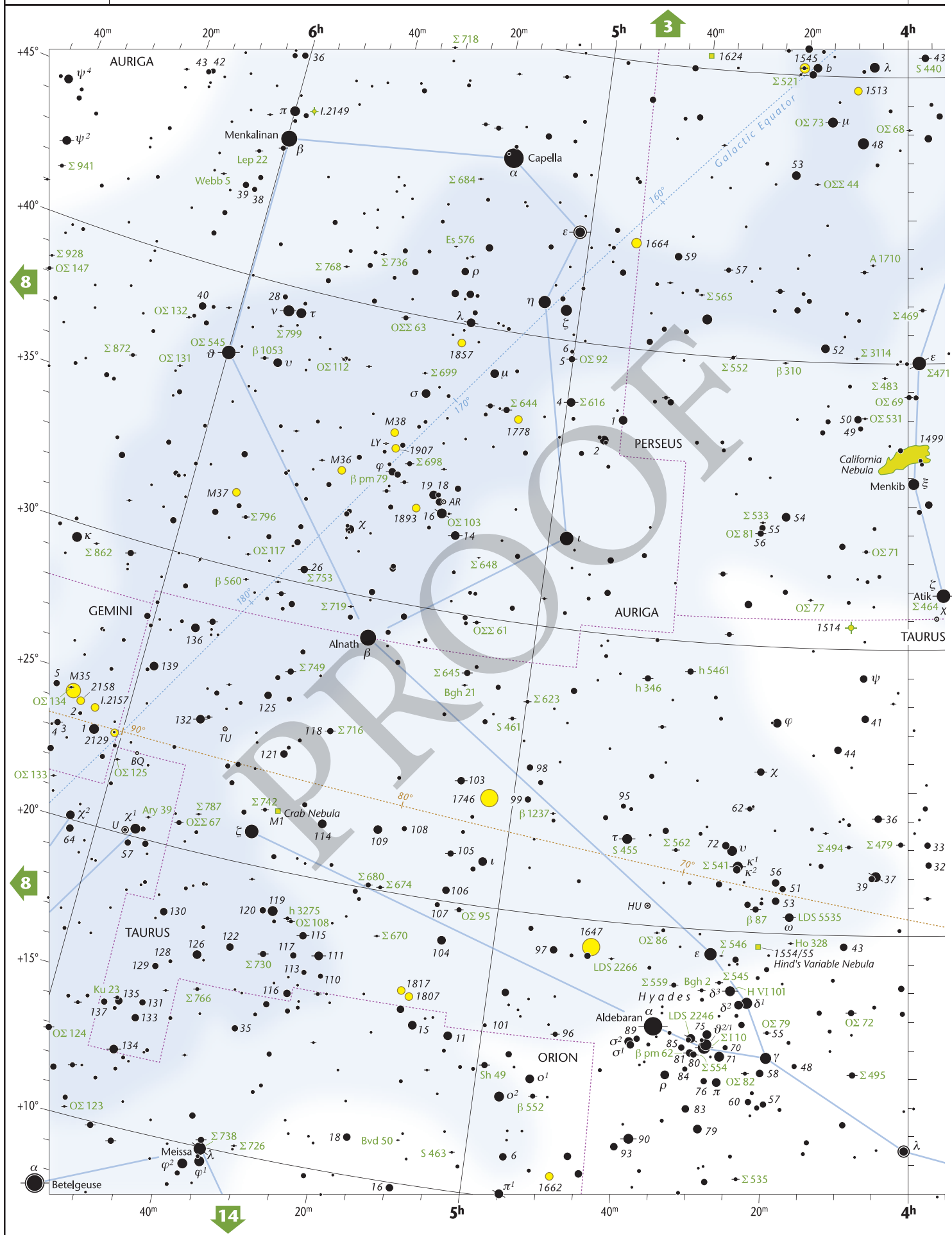


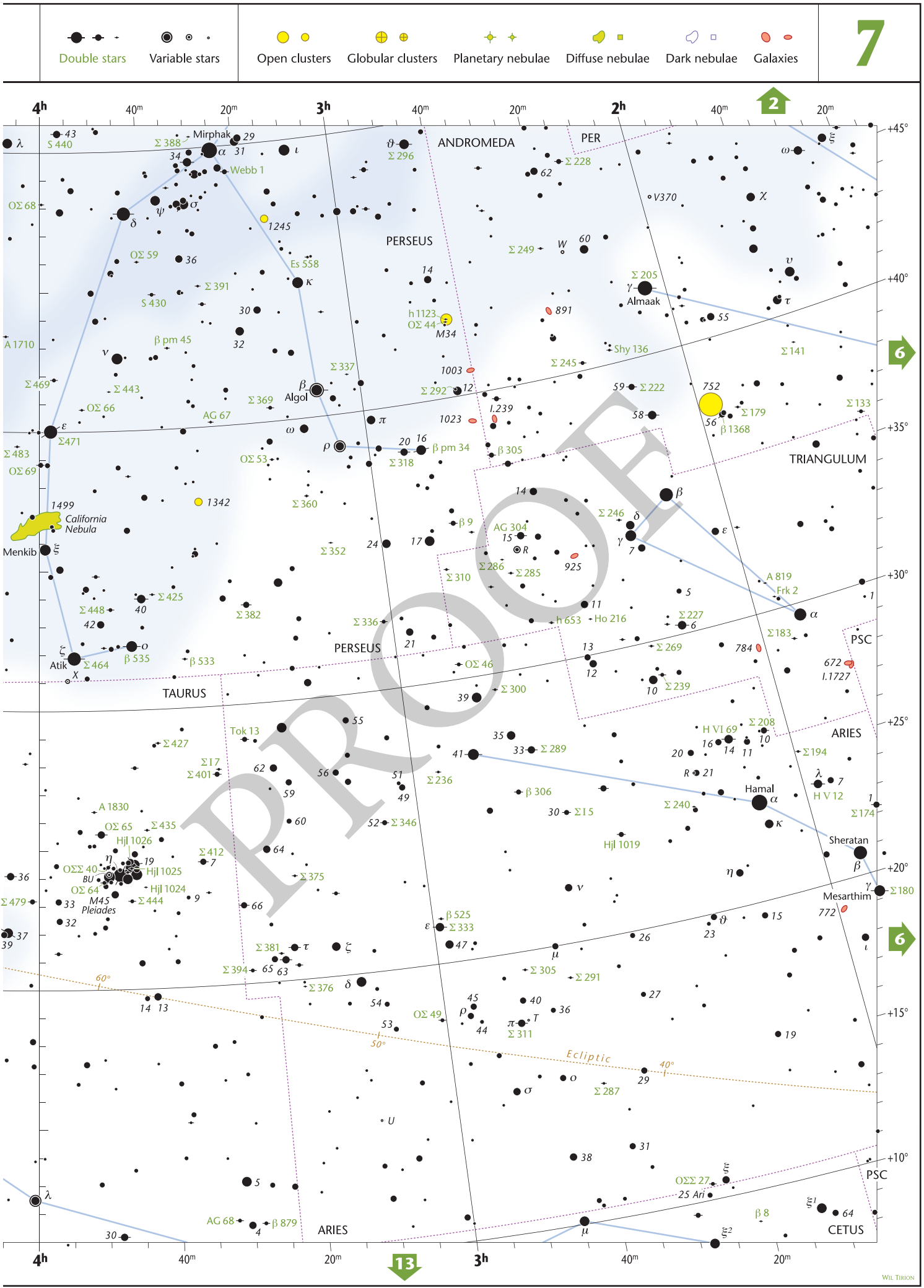


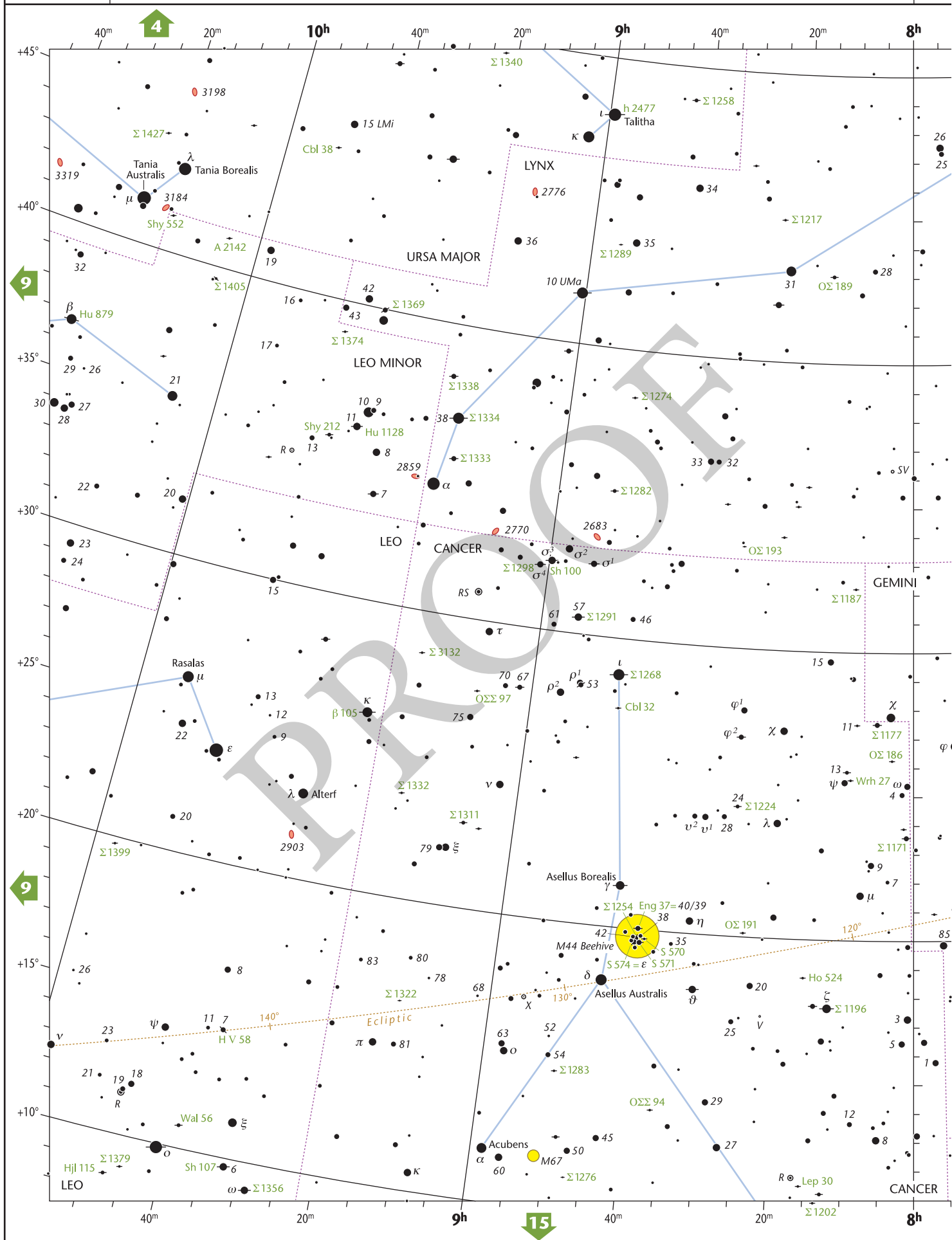


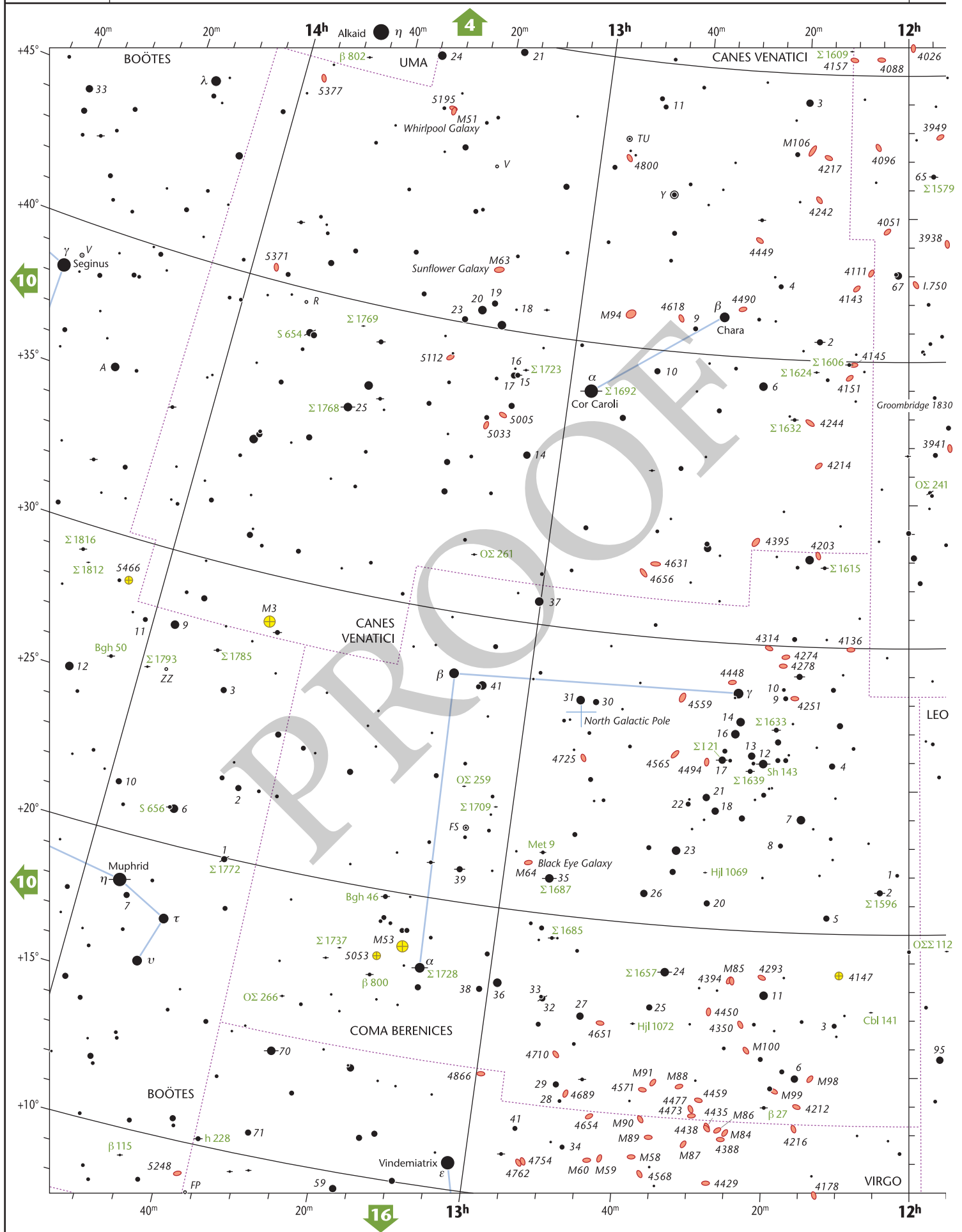


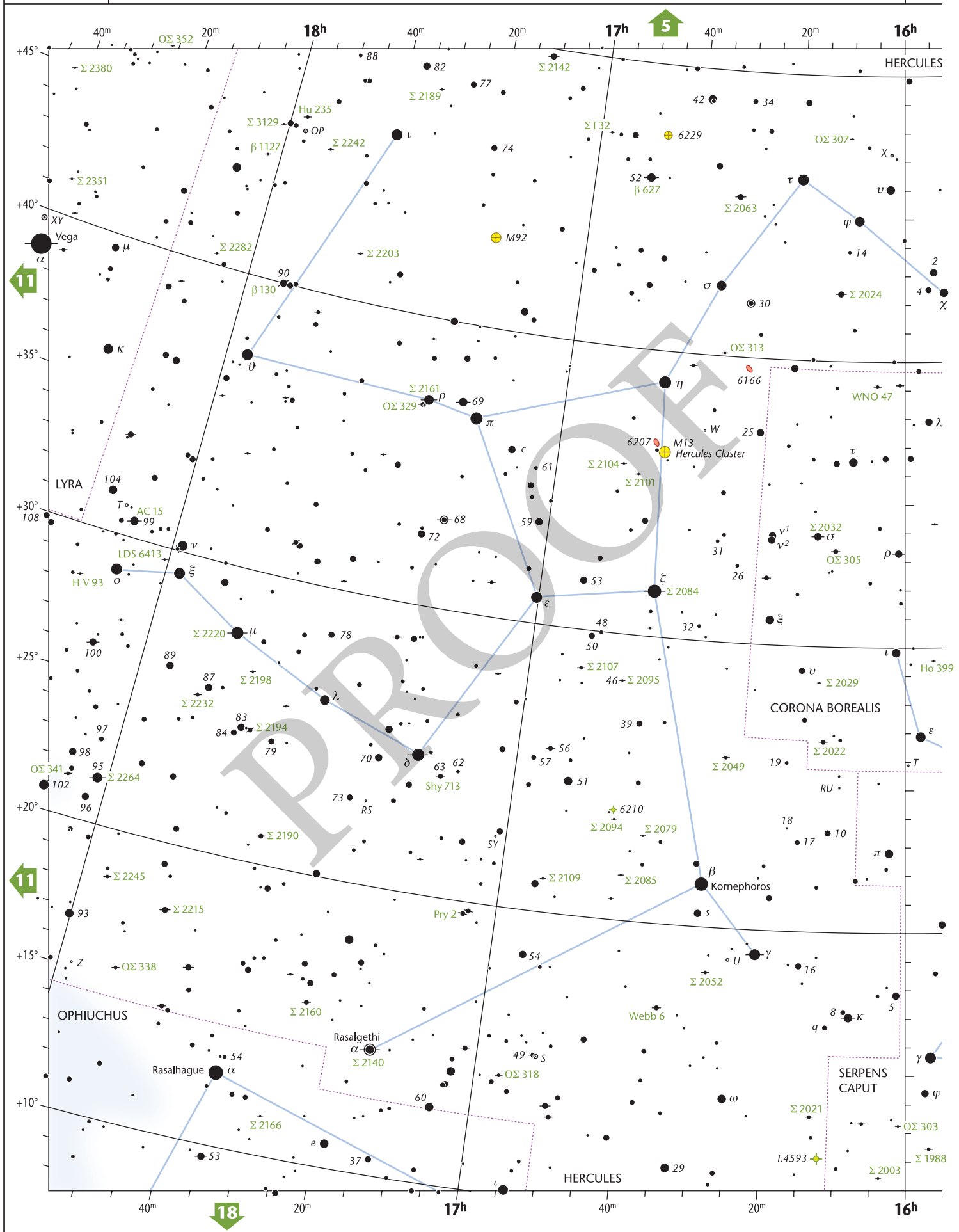




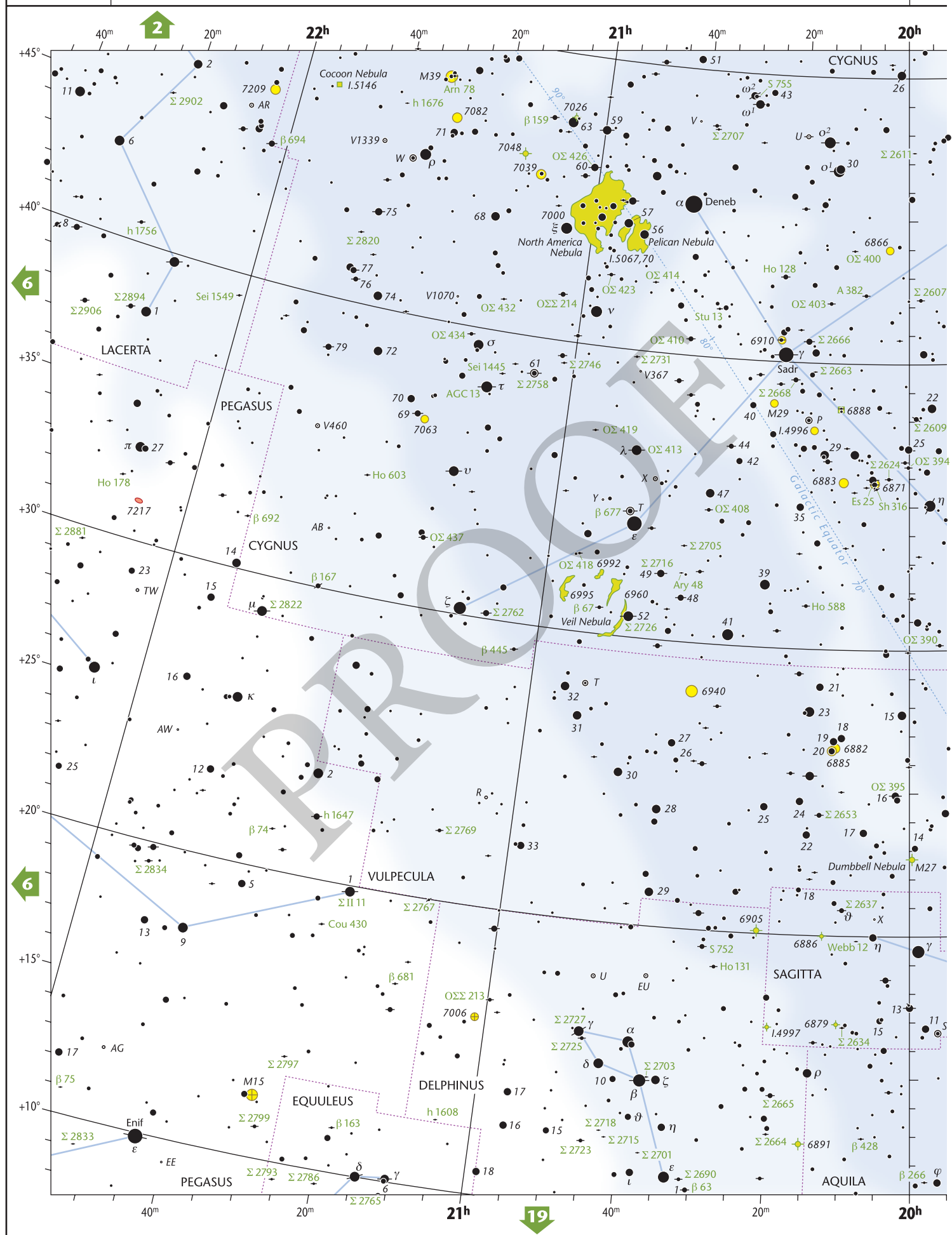


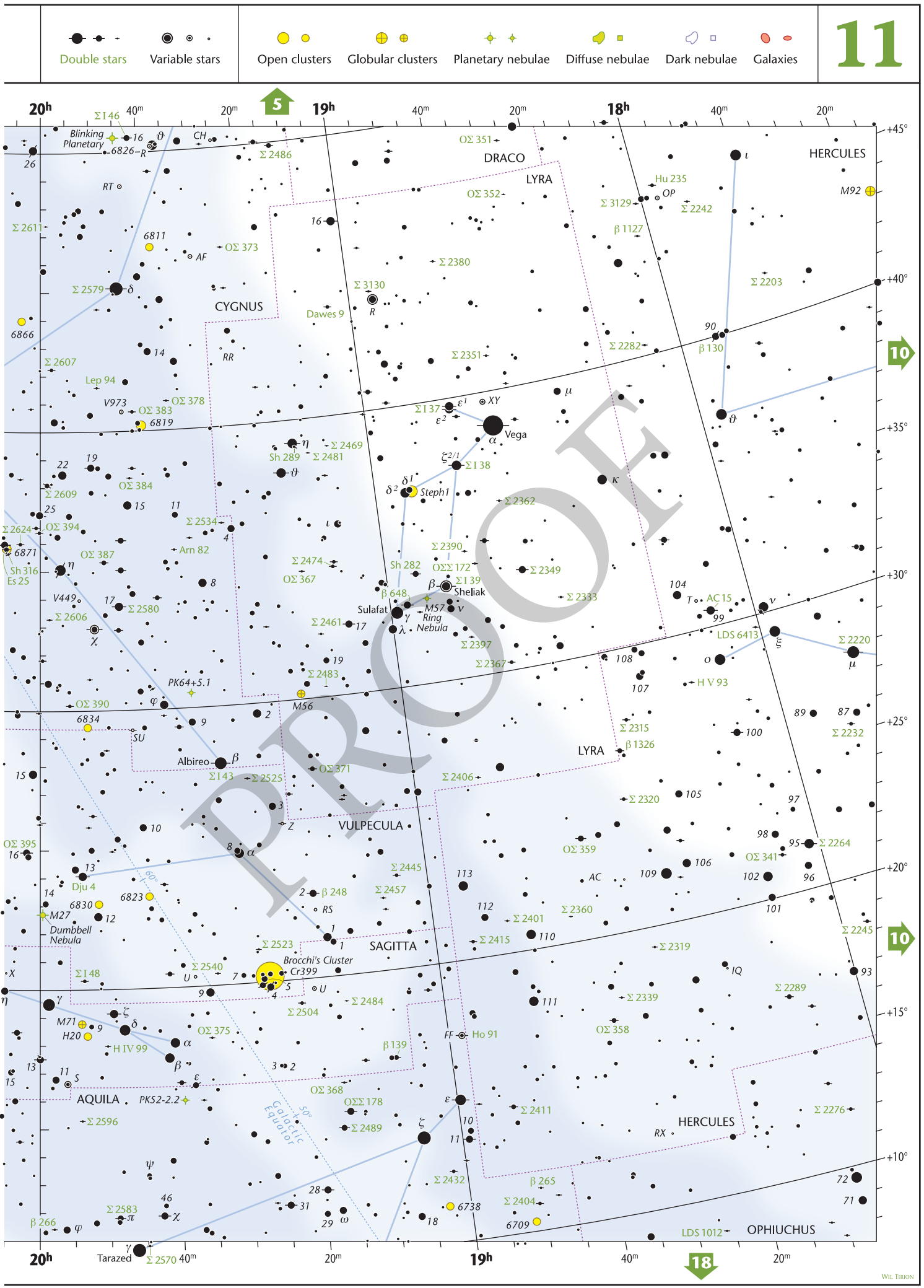


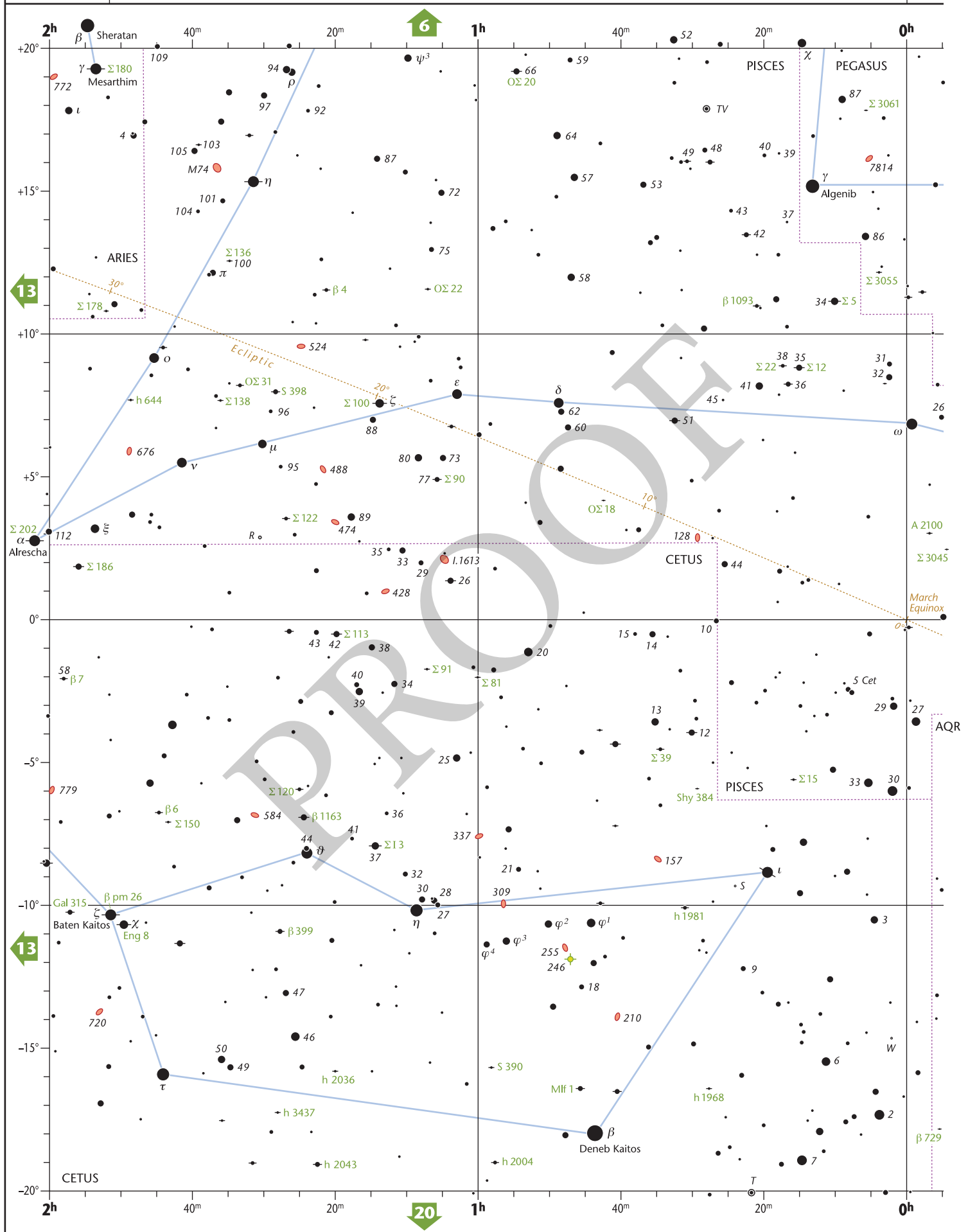


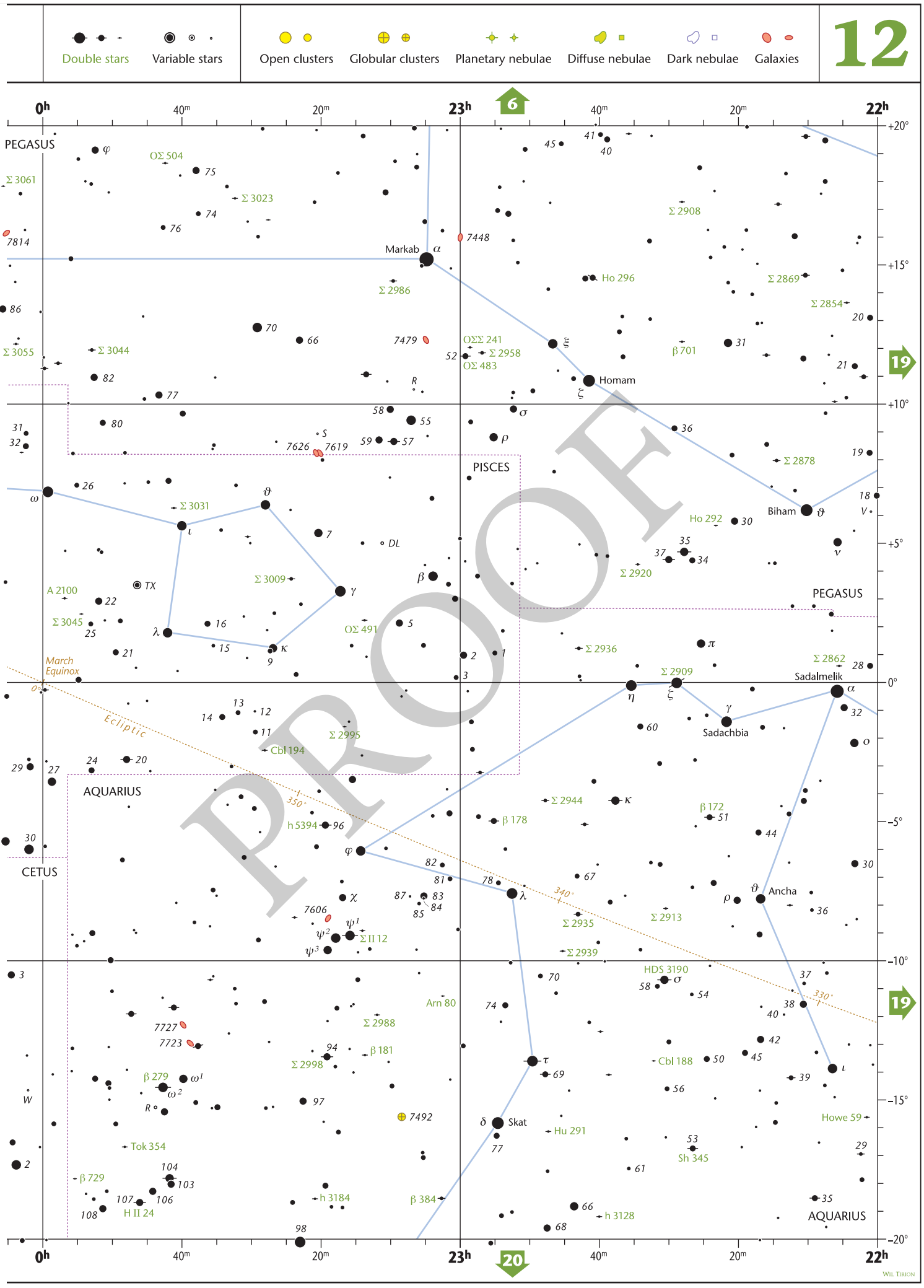


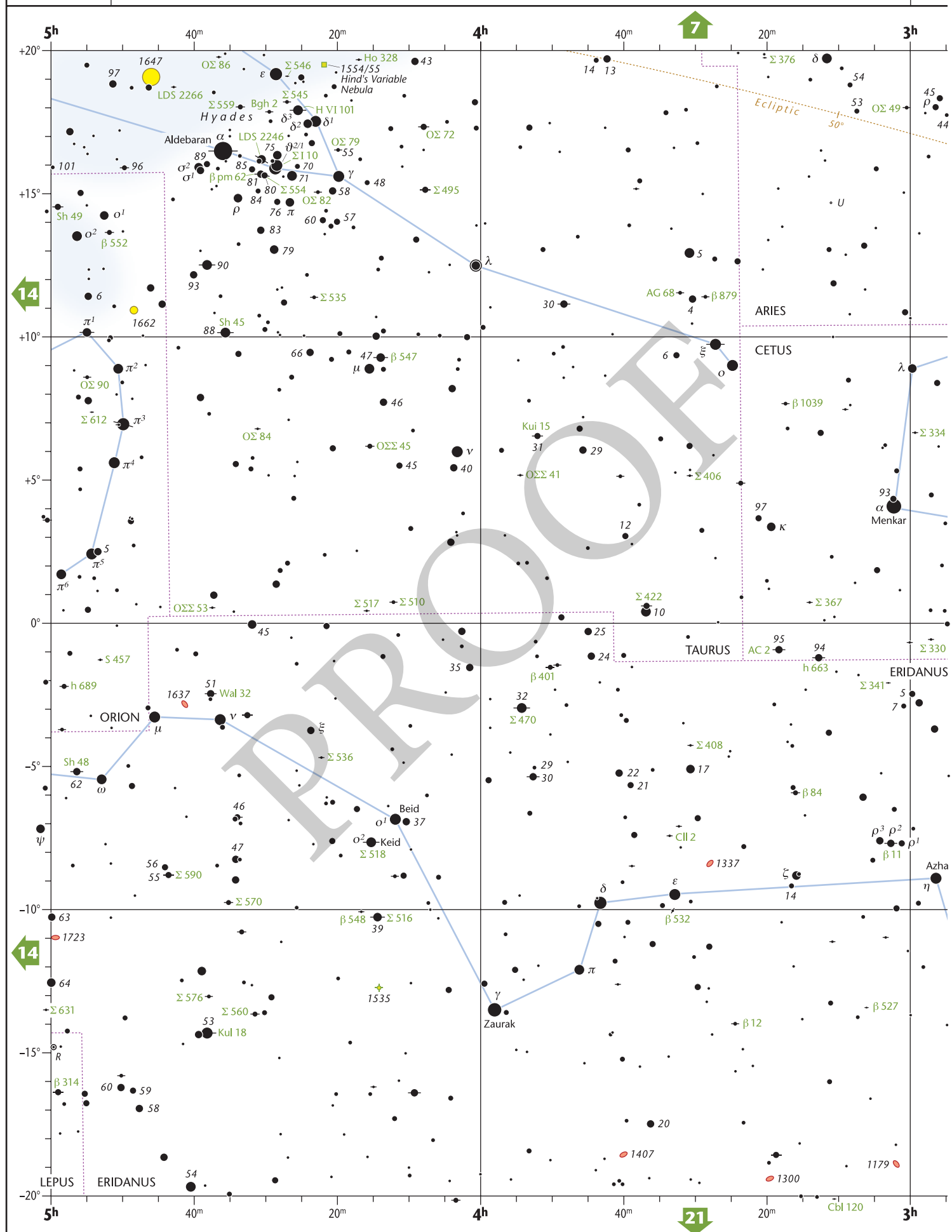


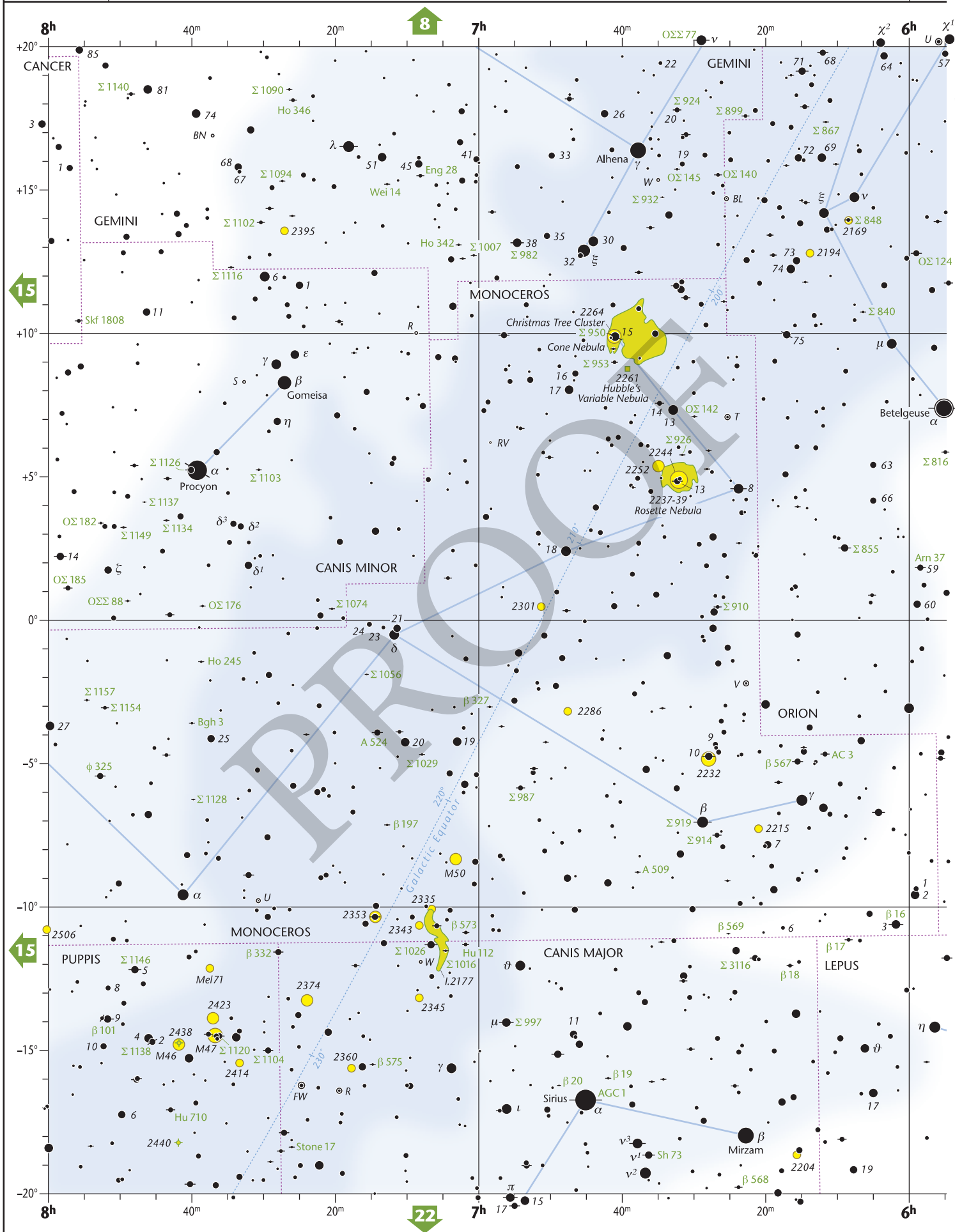


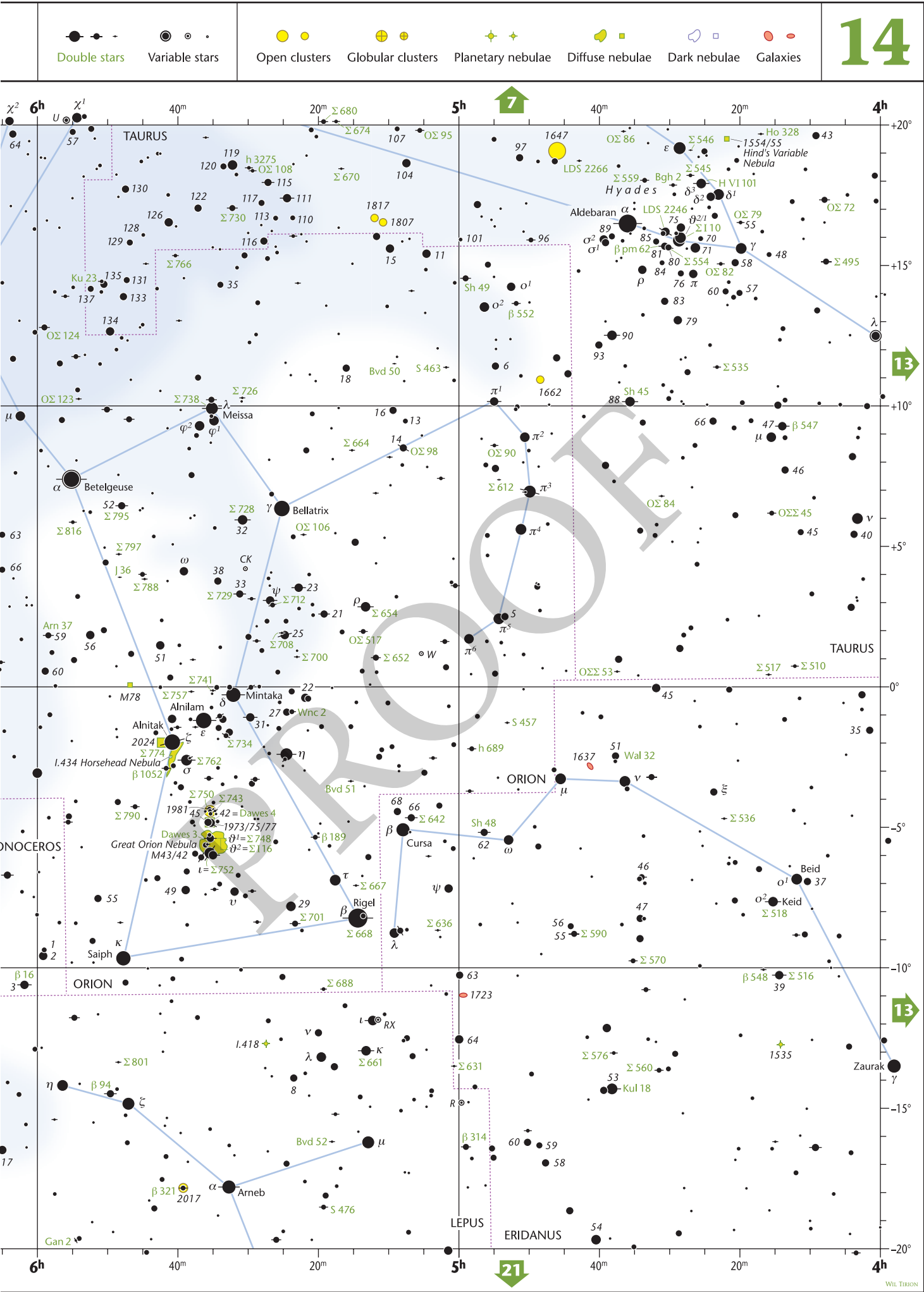


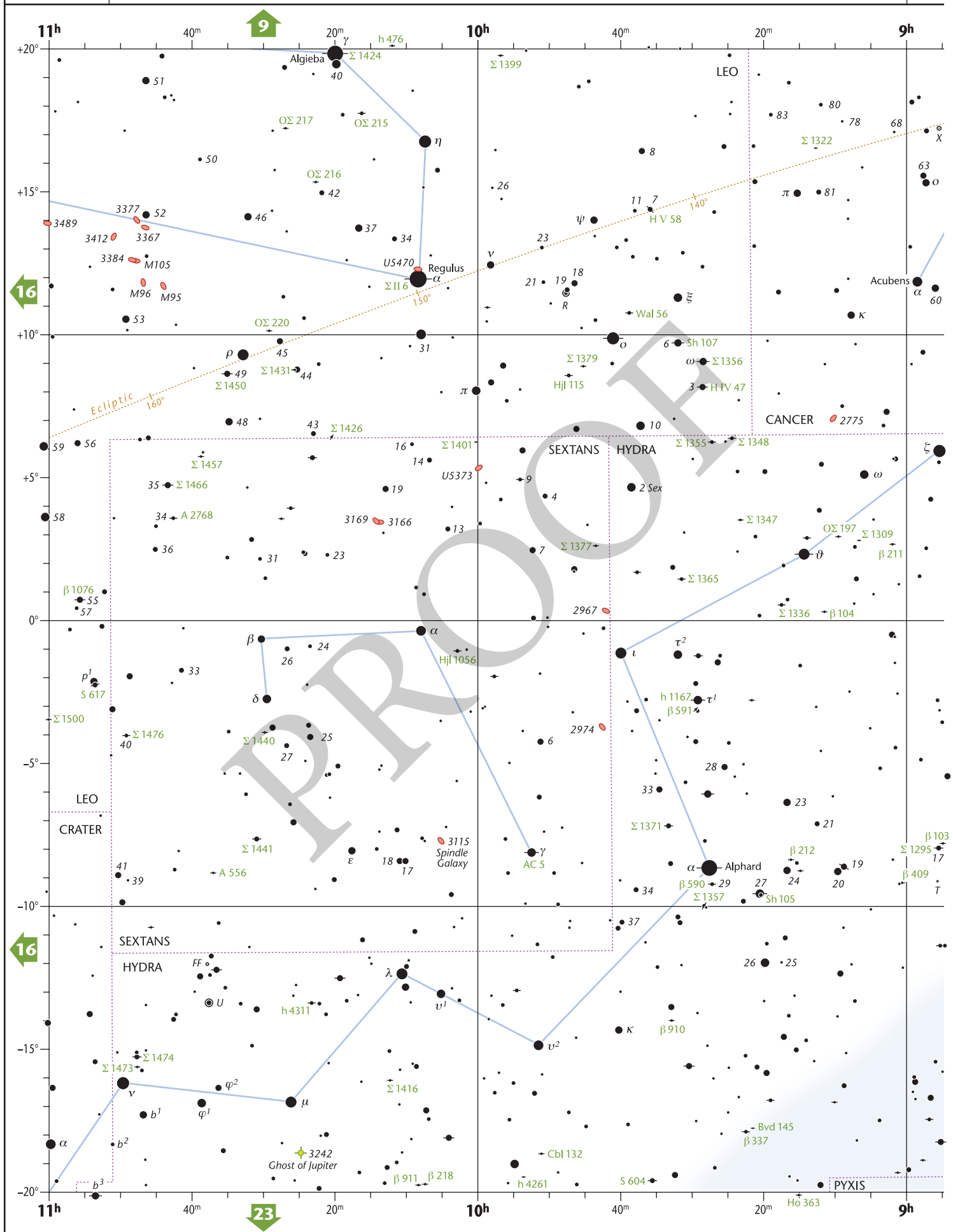


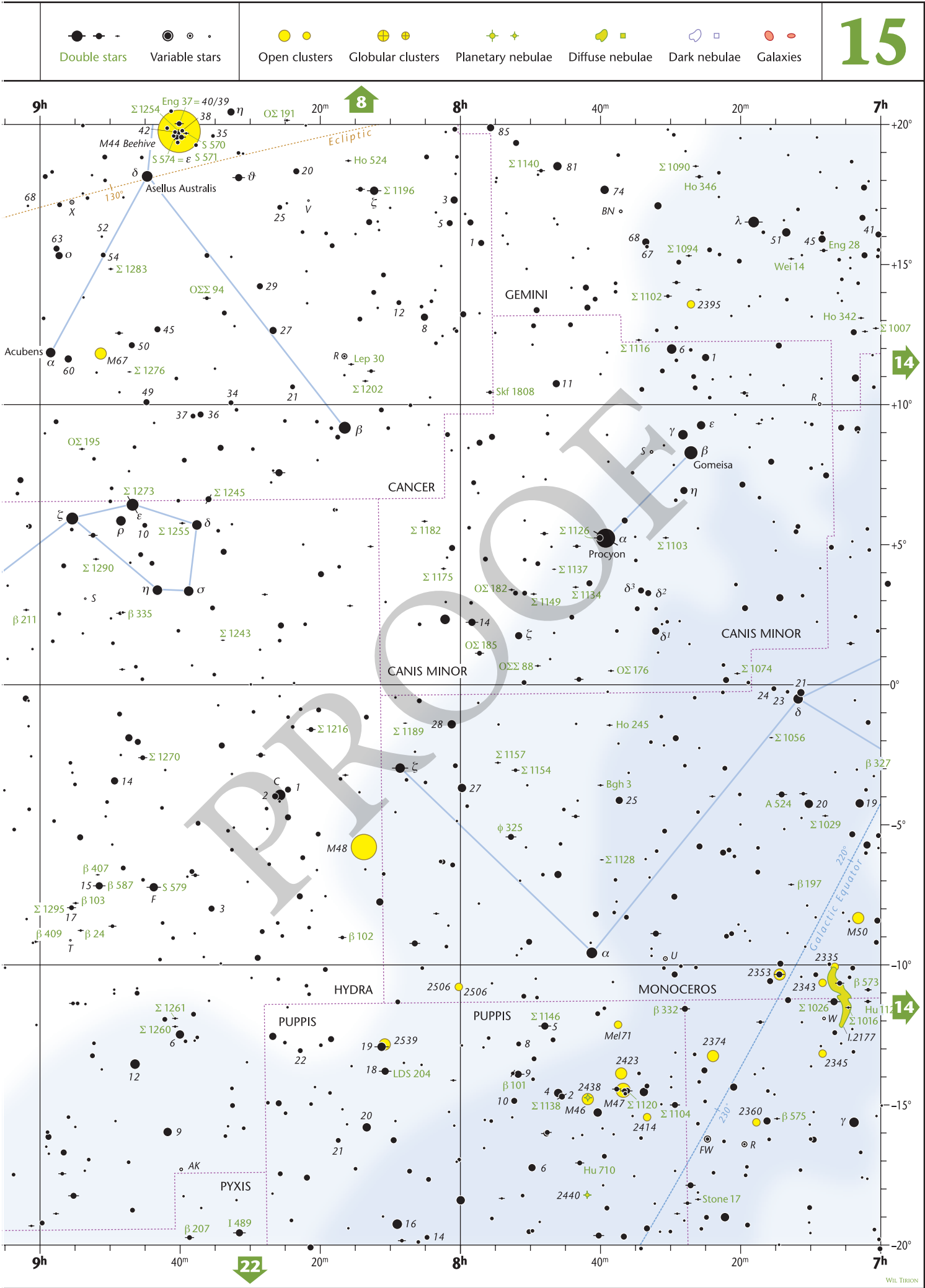


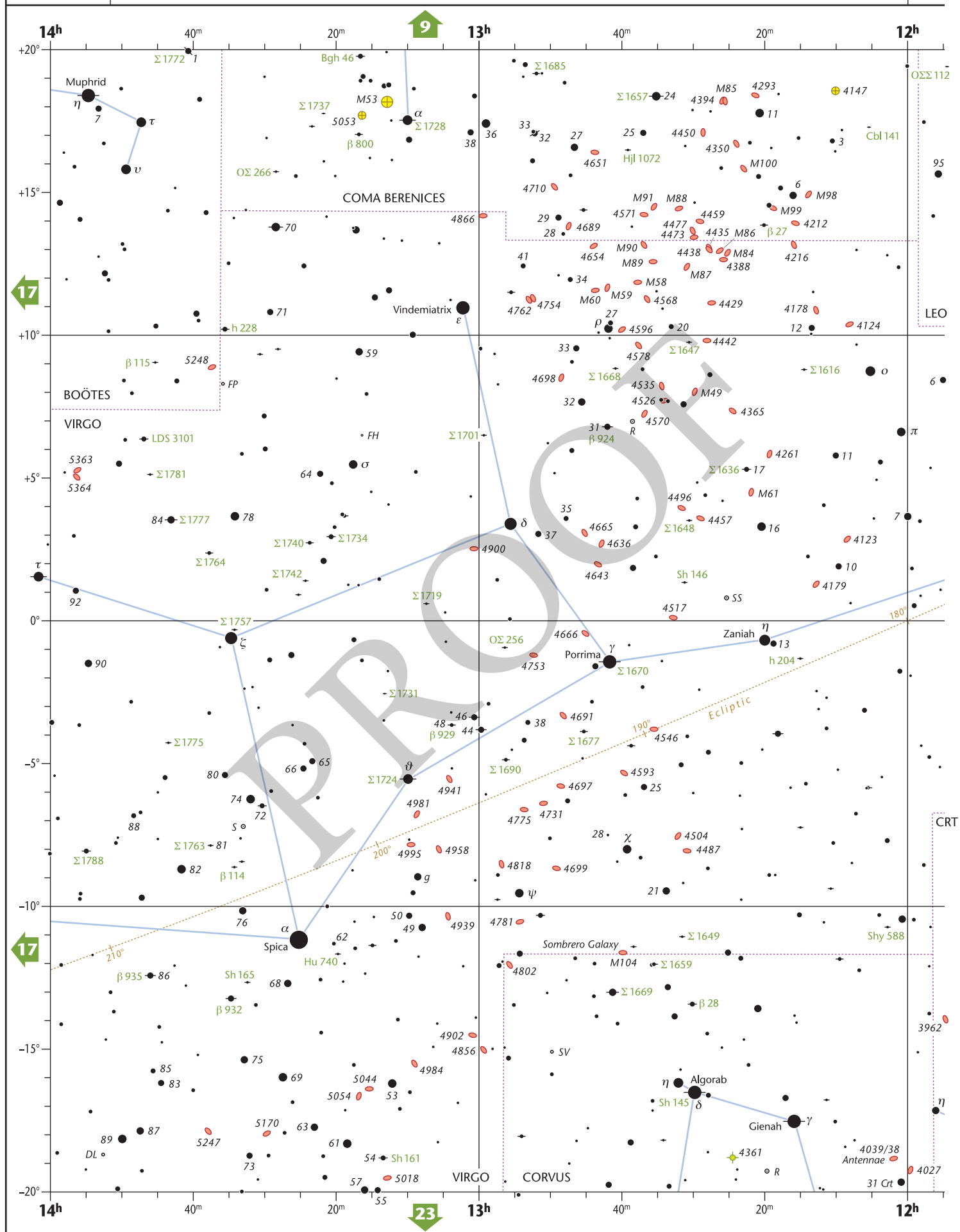












Double stars

Variable stars

Open clusters

Globular clusters

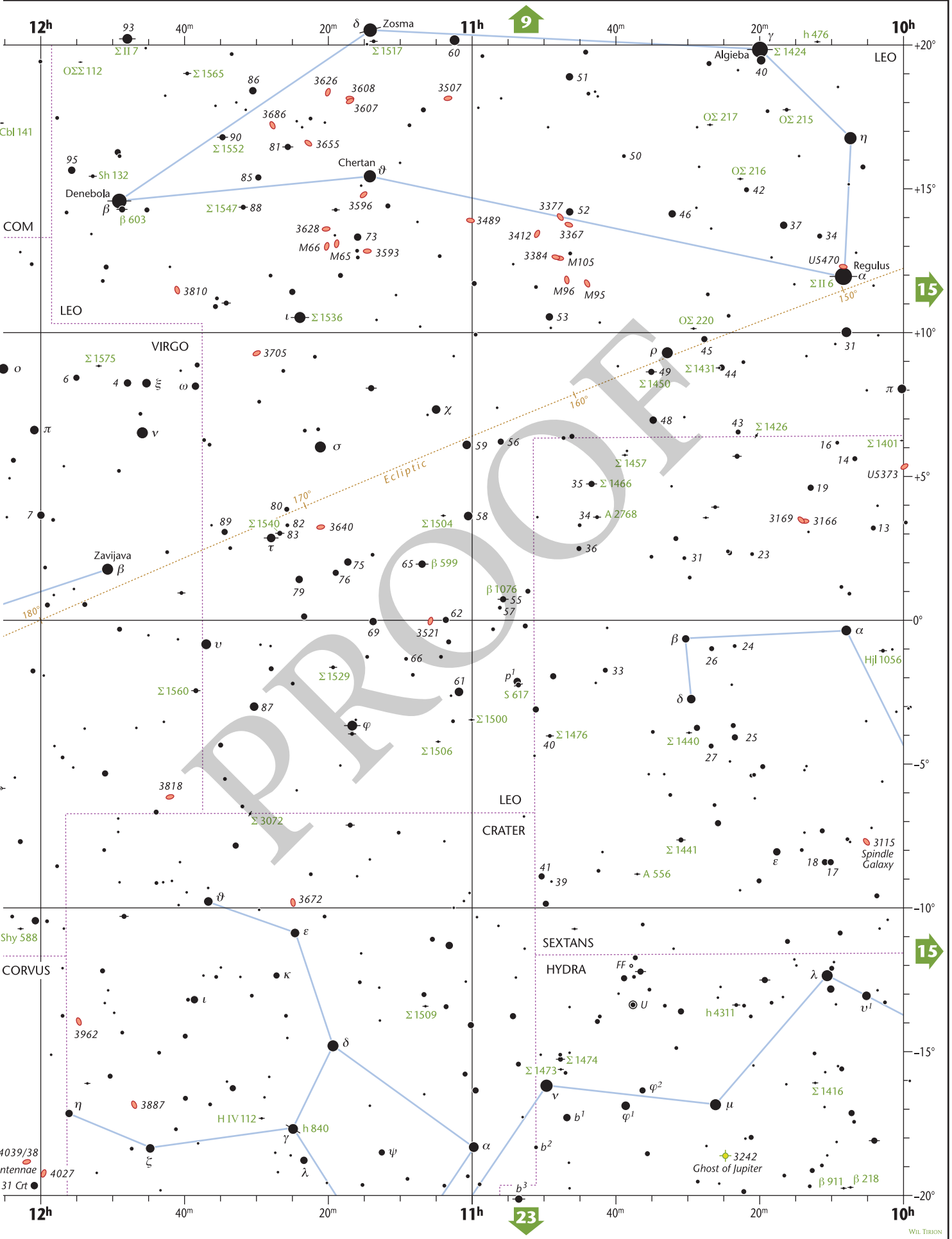
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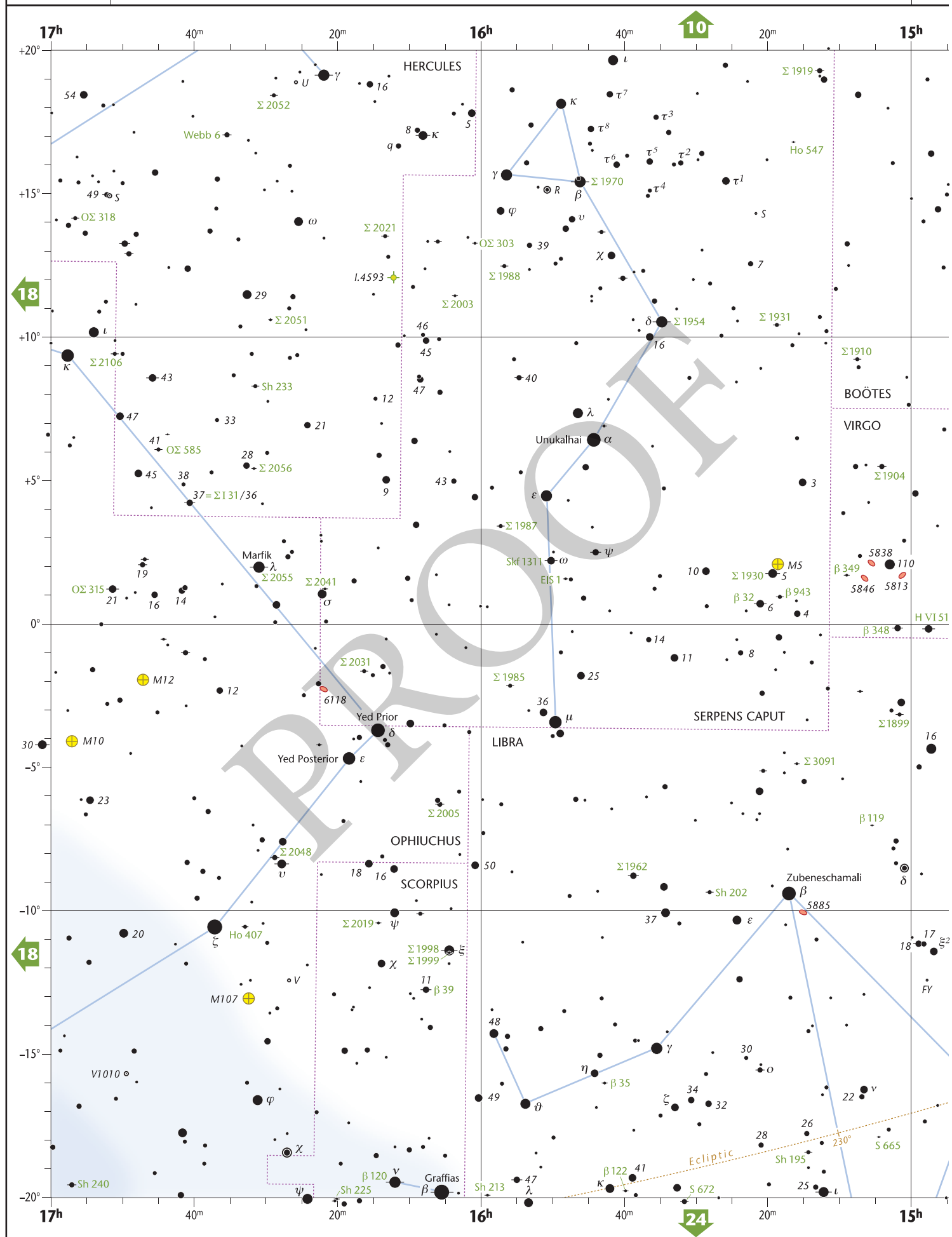
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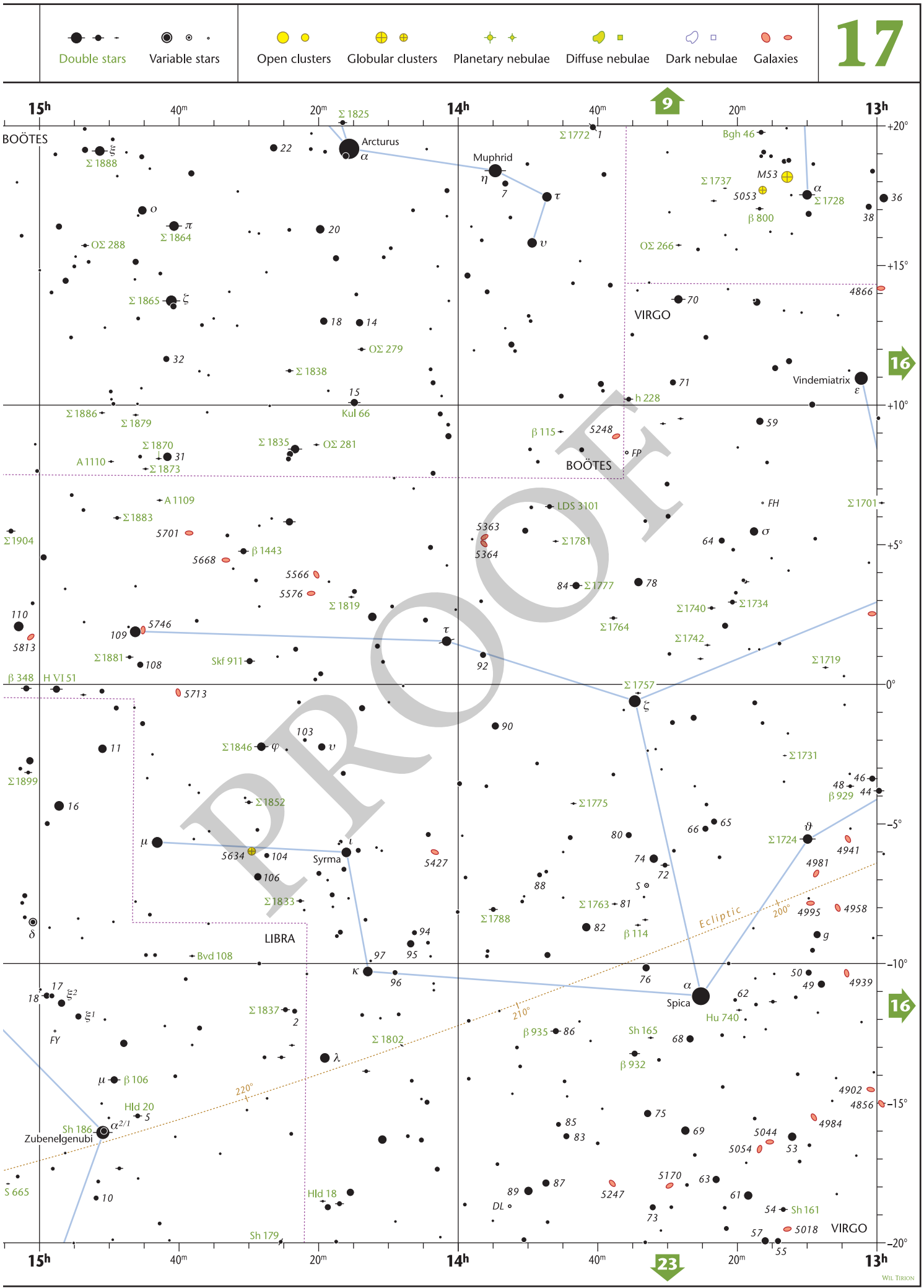
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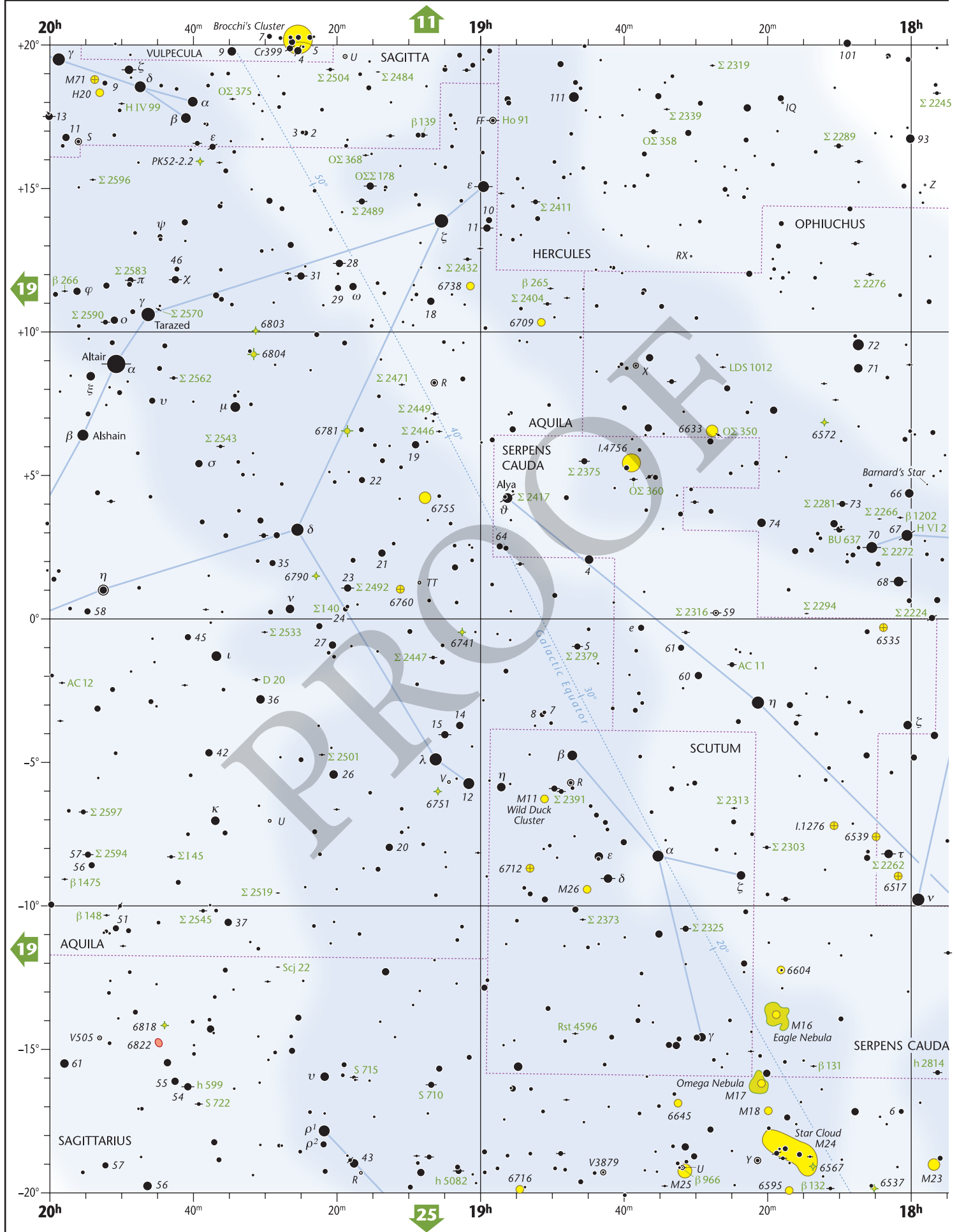
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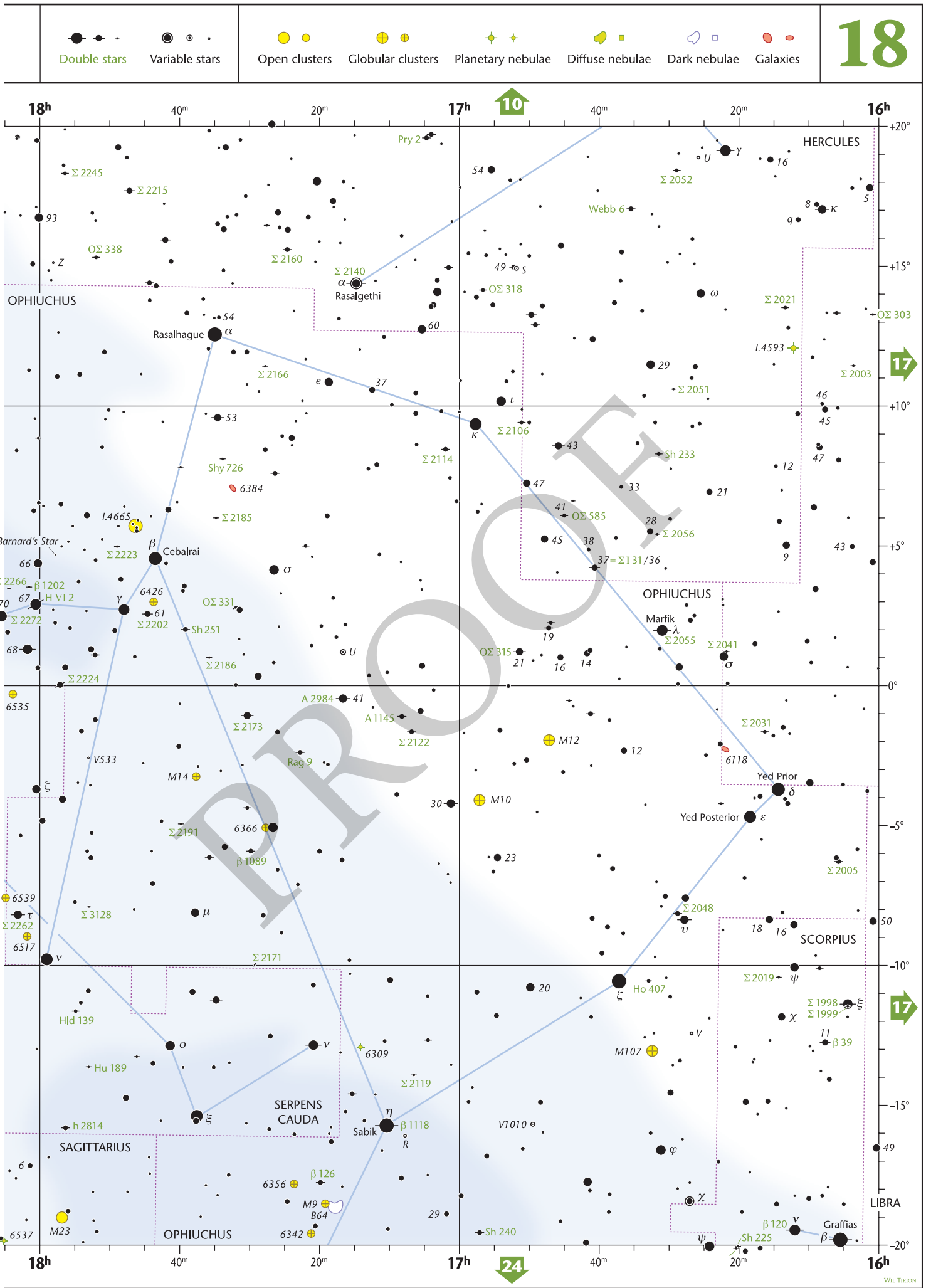
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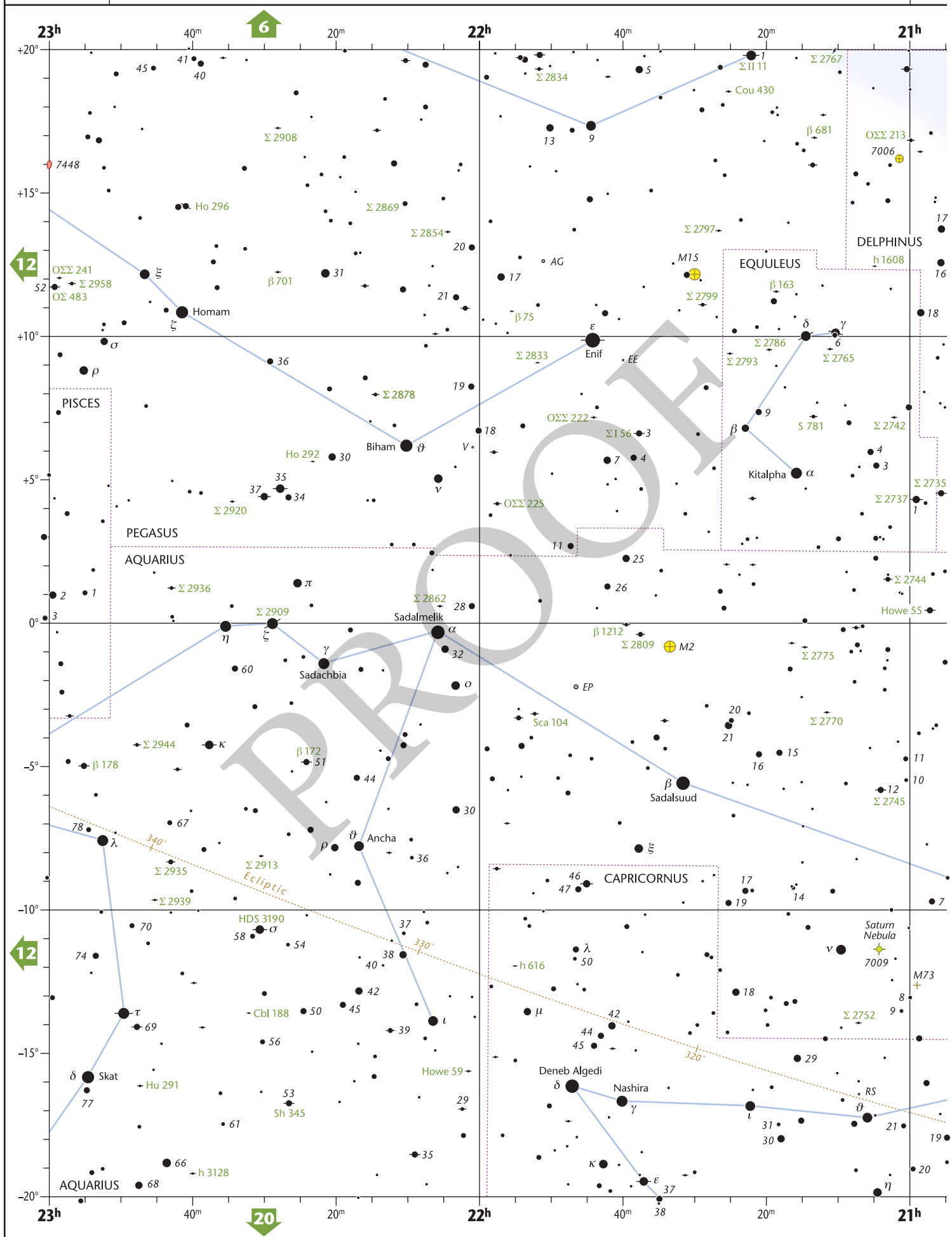


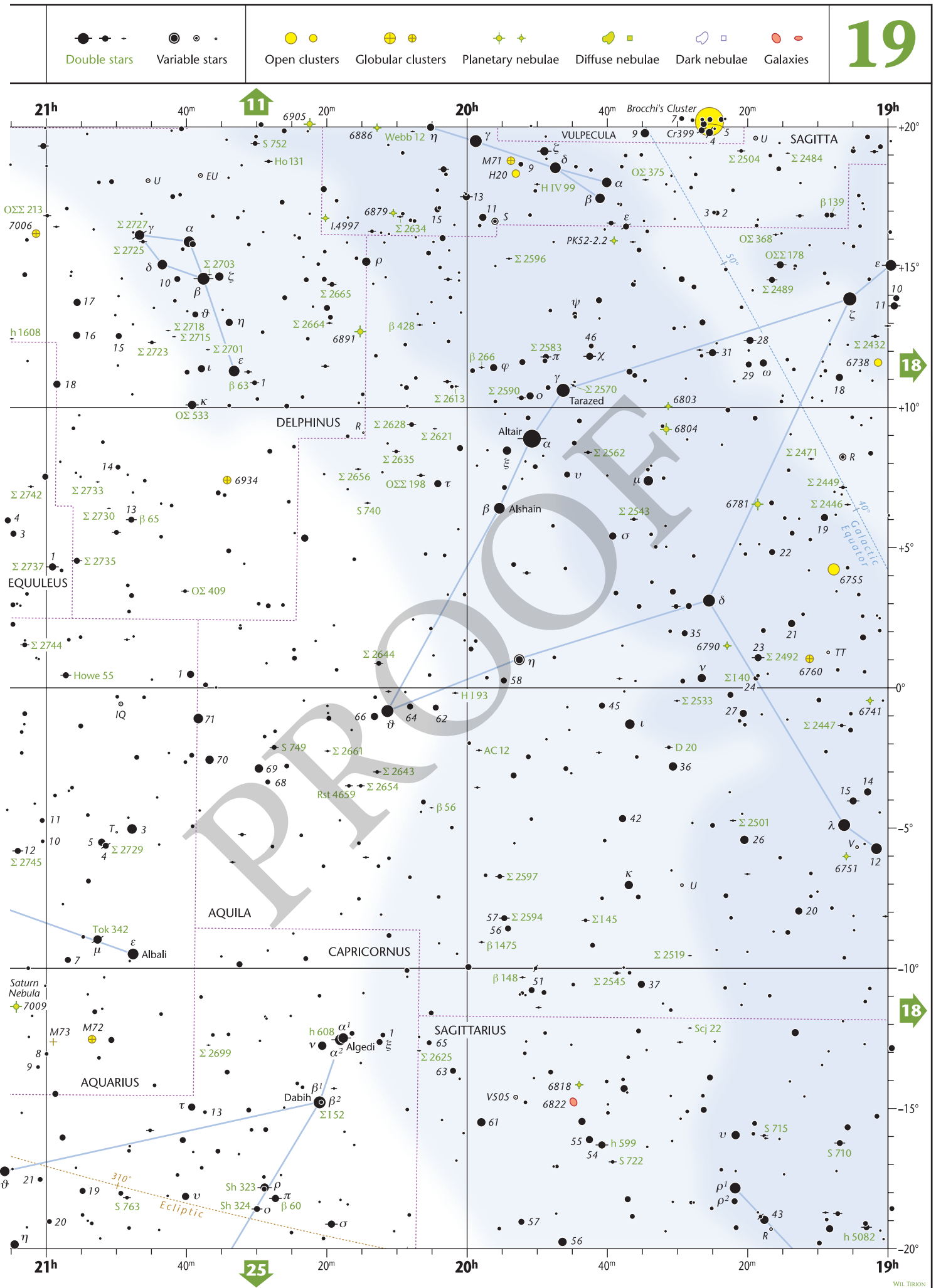


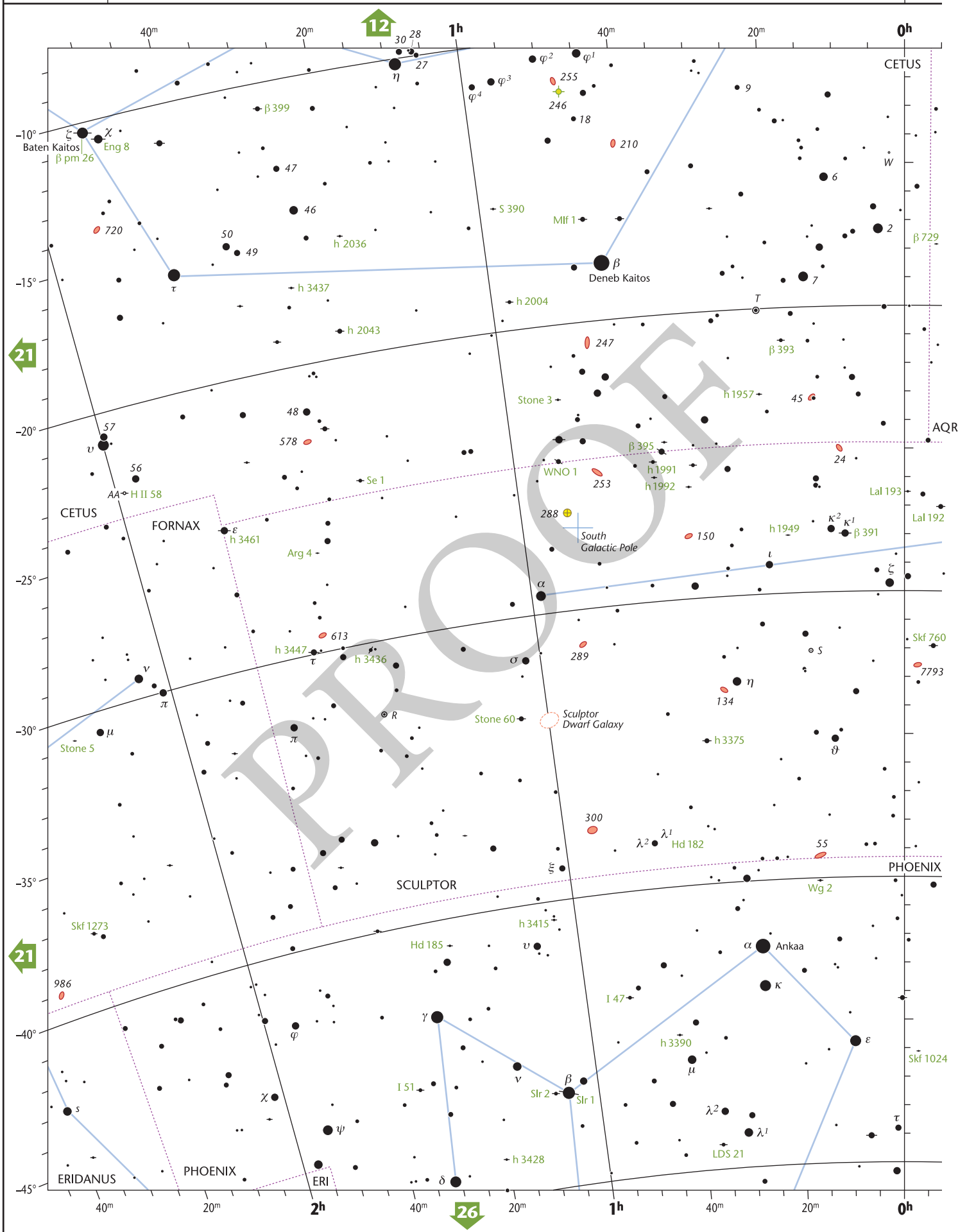












Double stars

Variable stars

Open clusters

Globular clusters

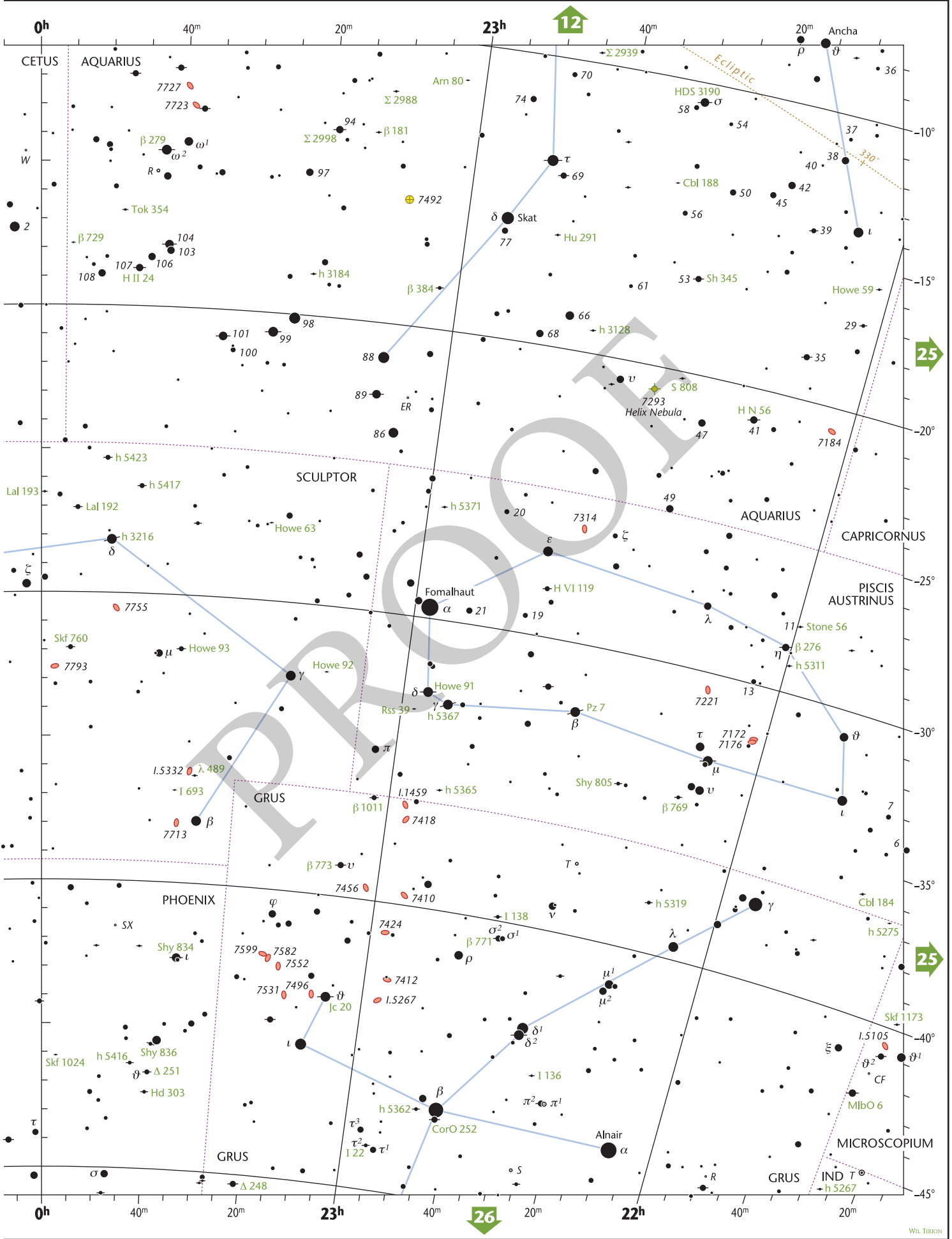
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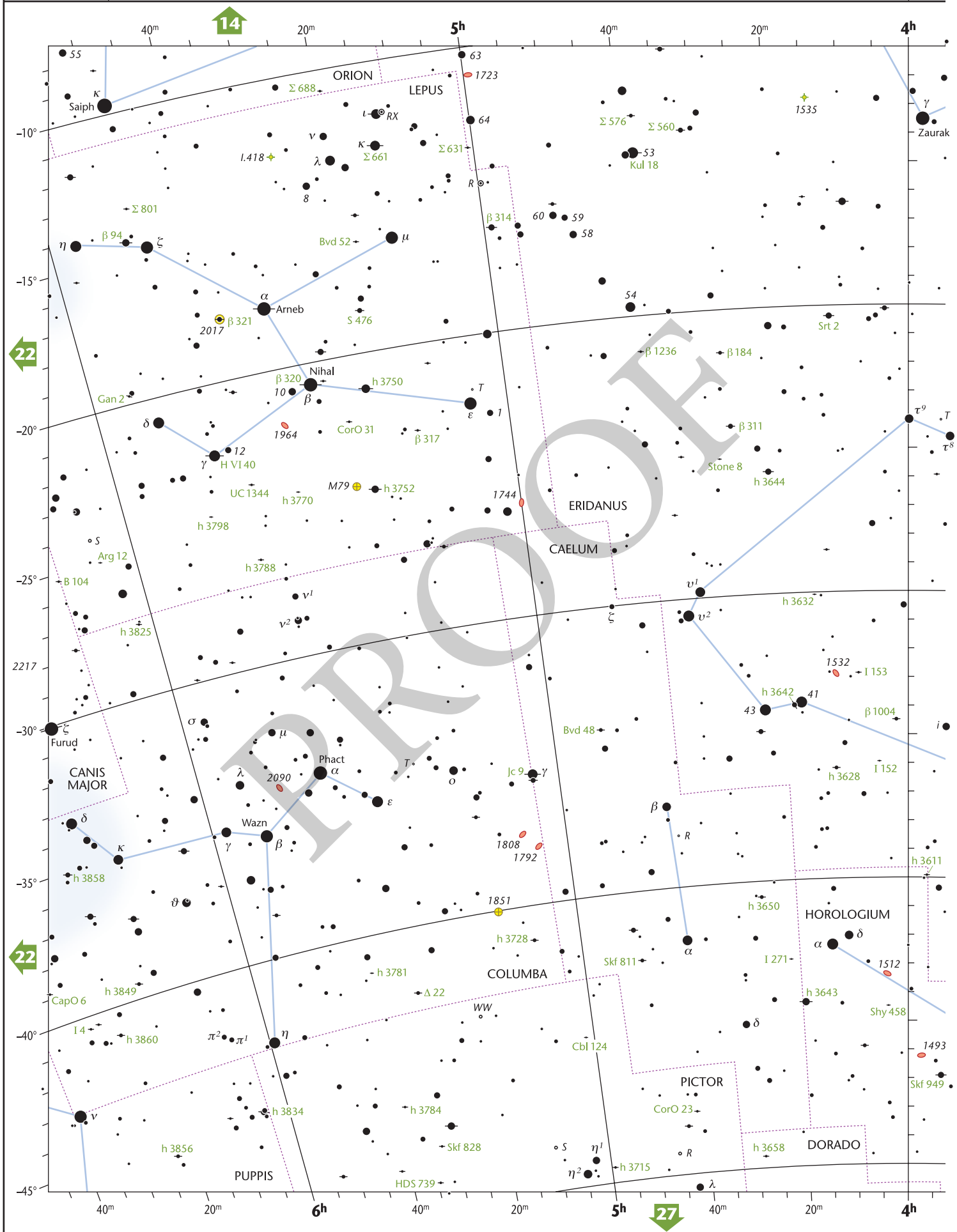
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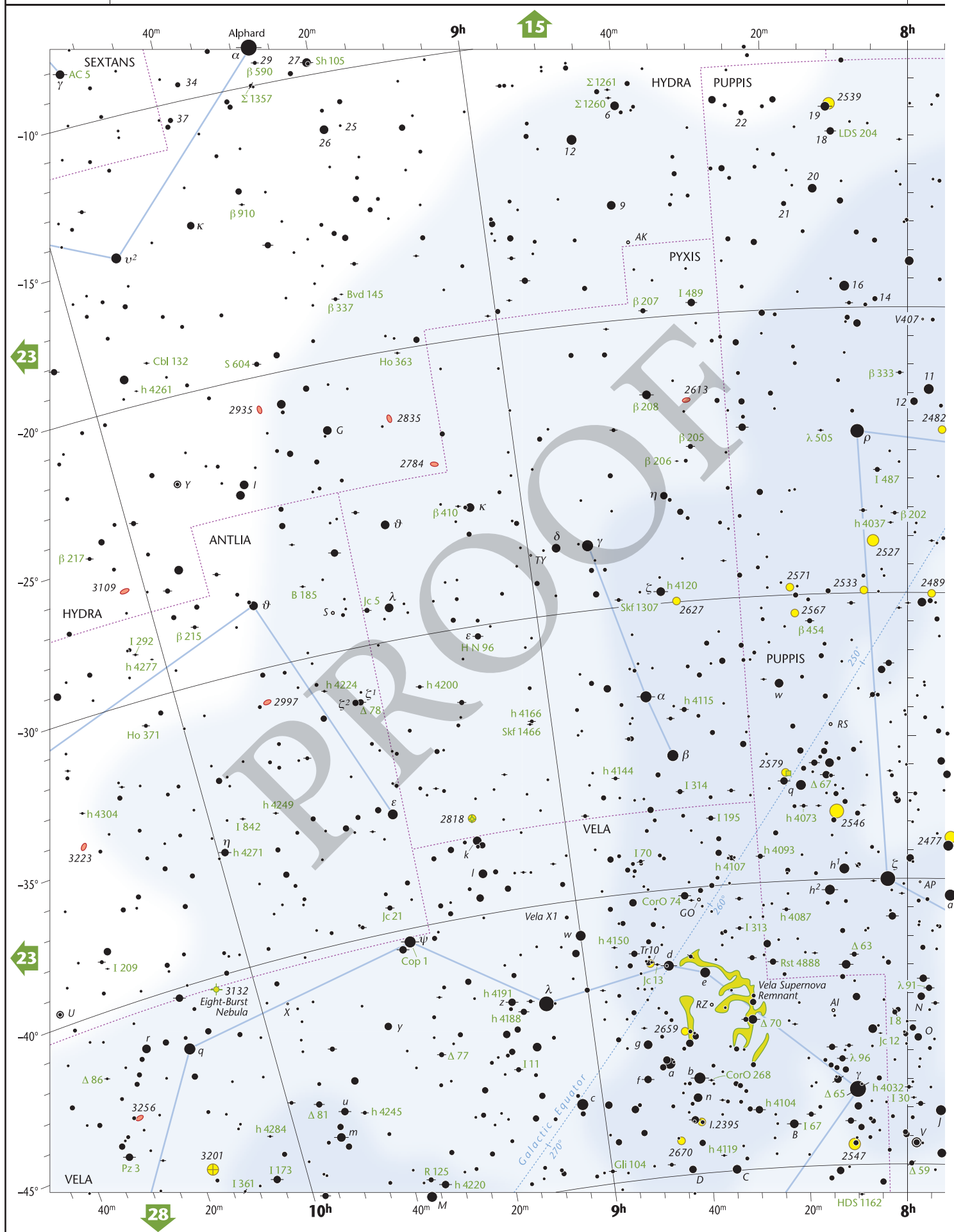
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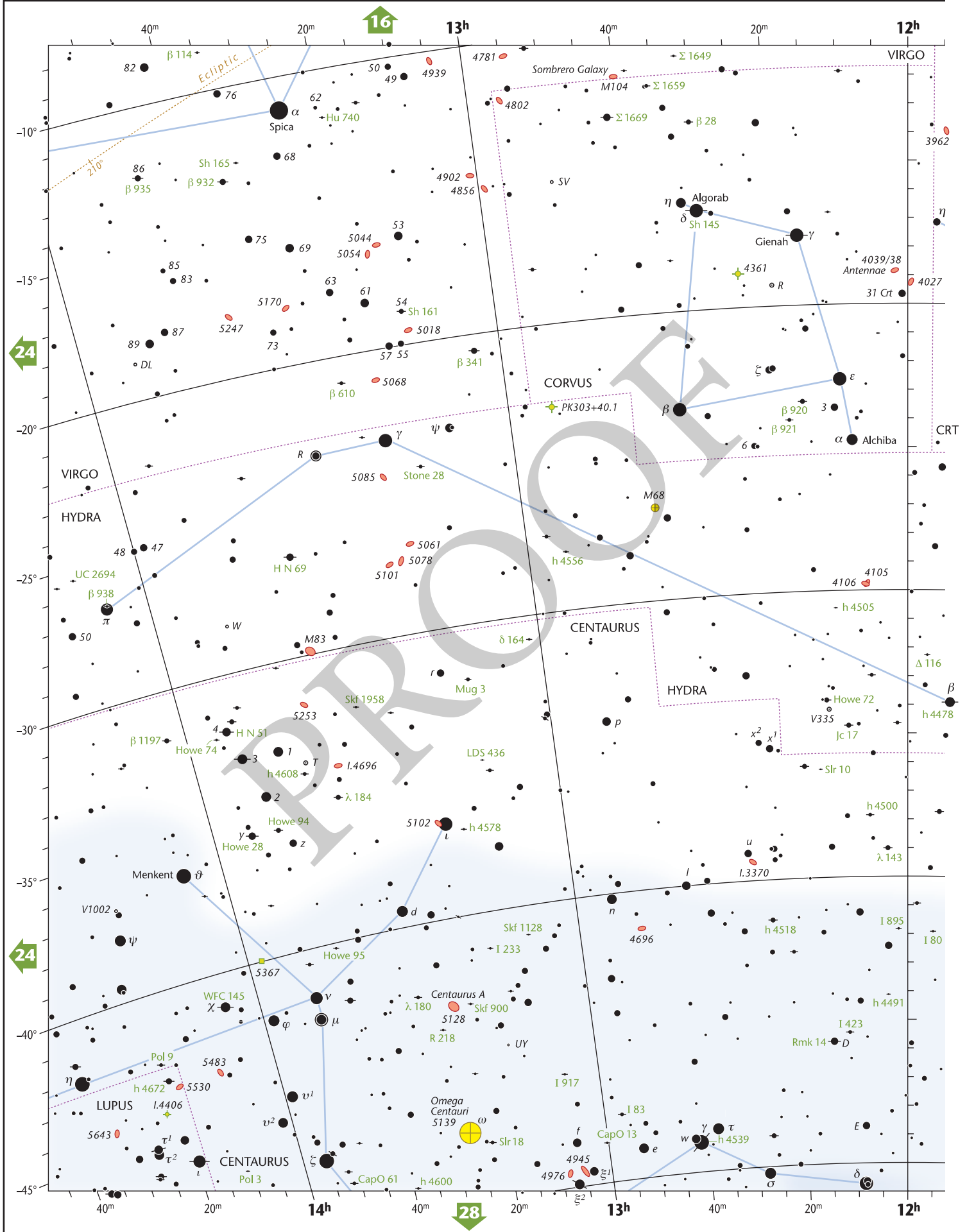
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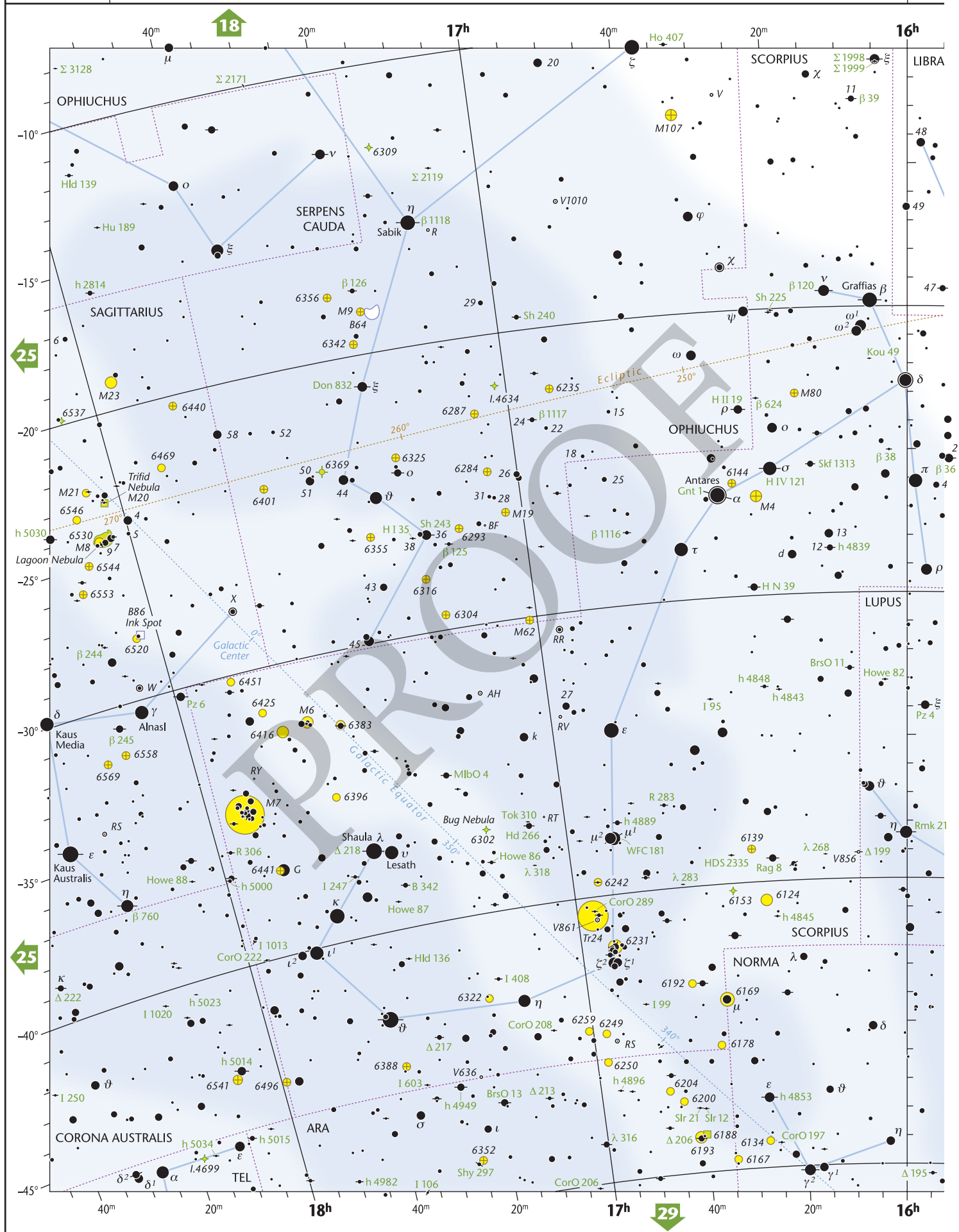












Double stars

Variable stars

Open clusters

Globular clusters

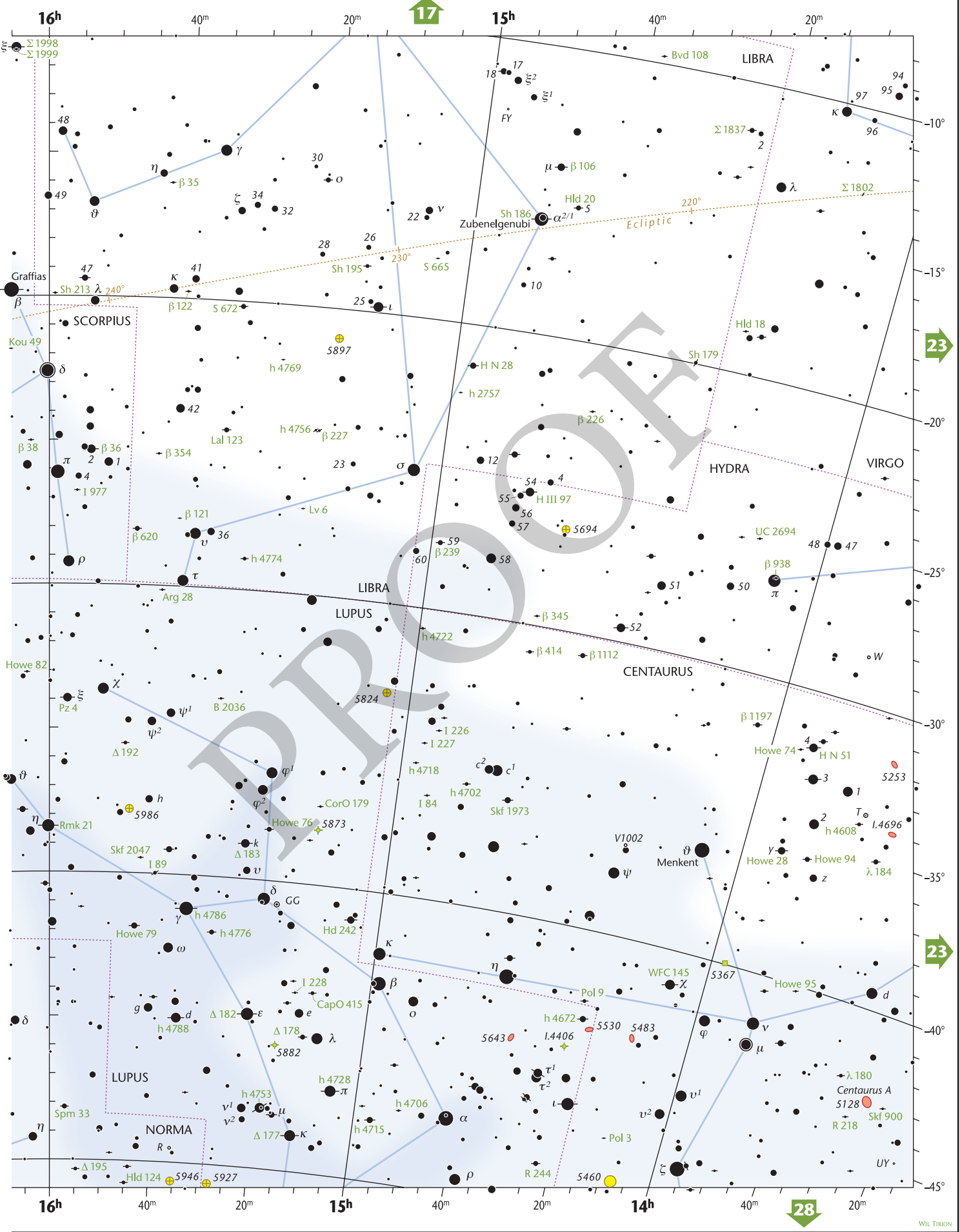
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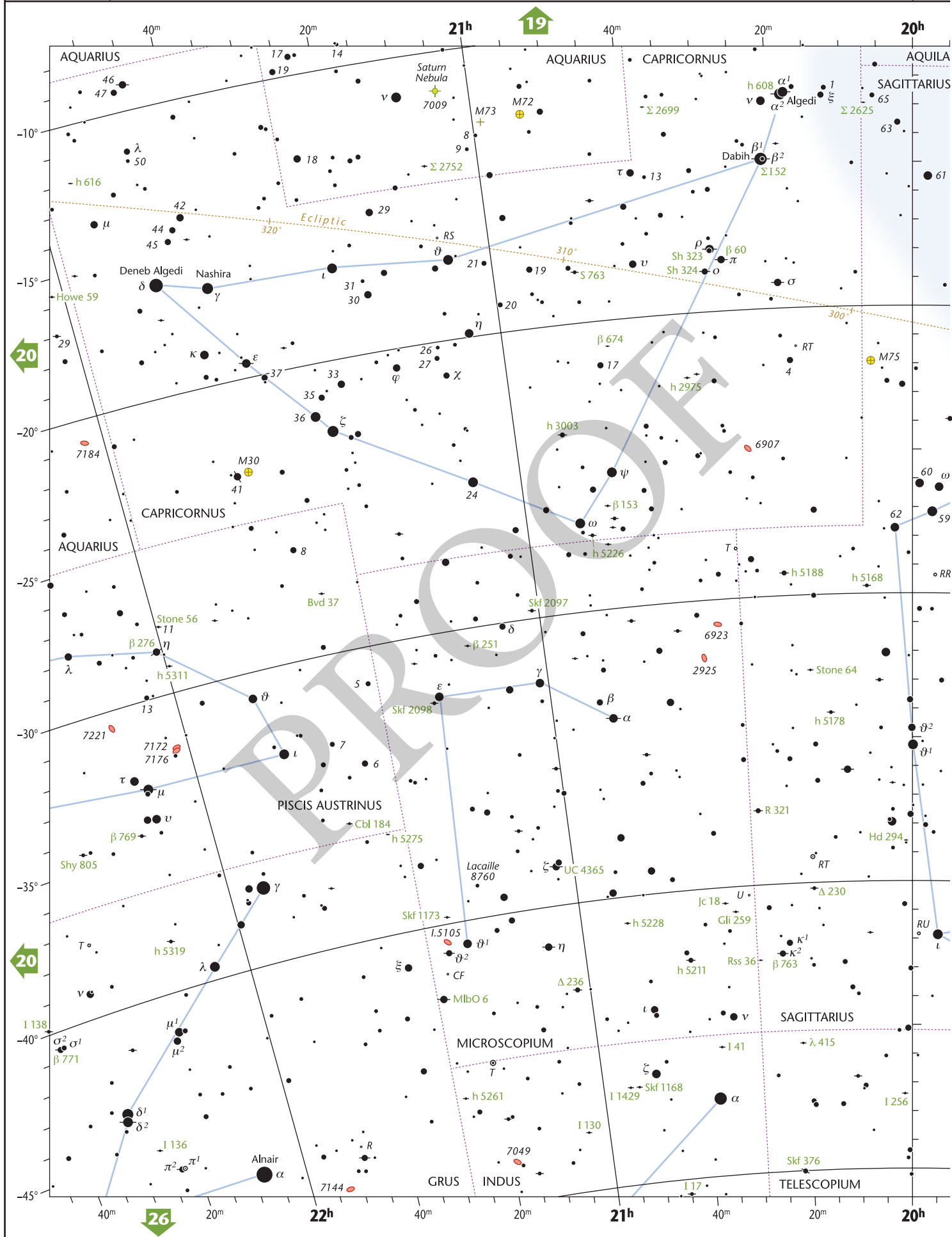
Diffuse nebulae

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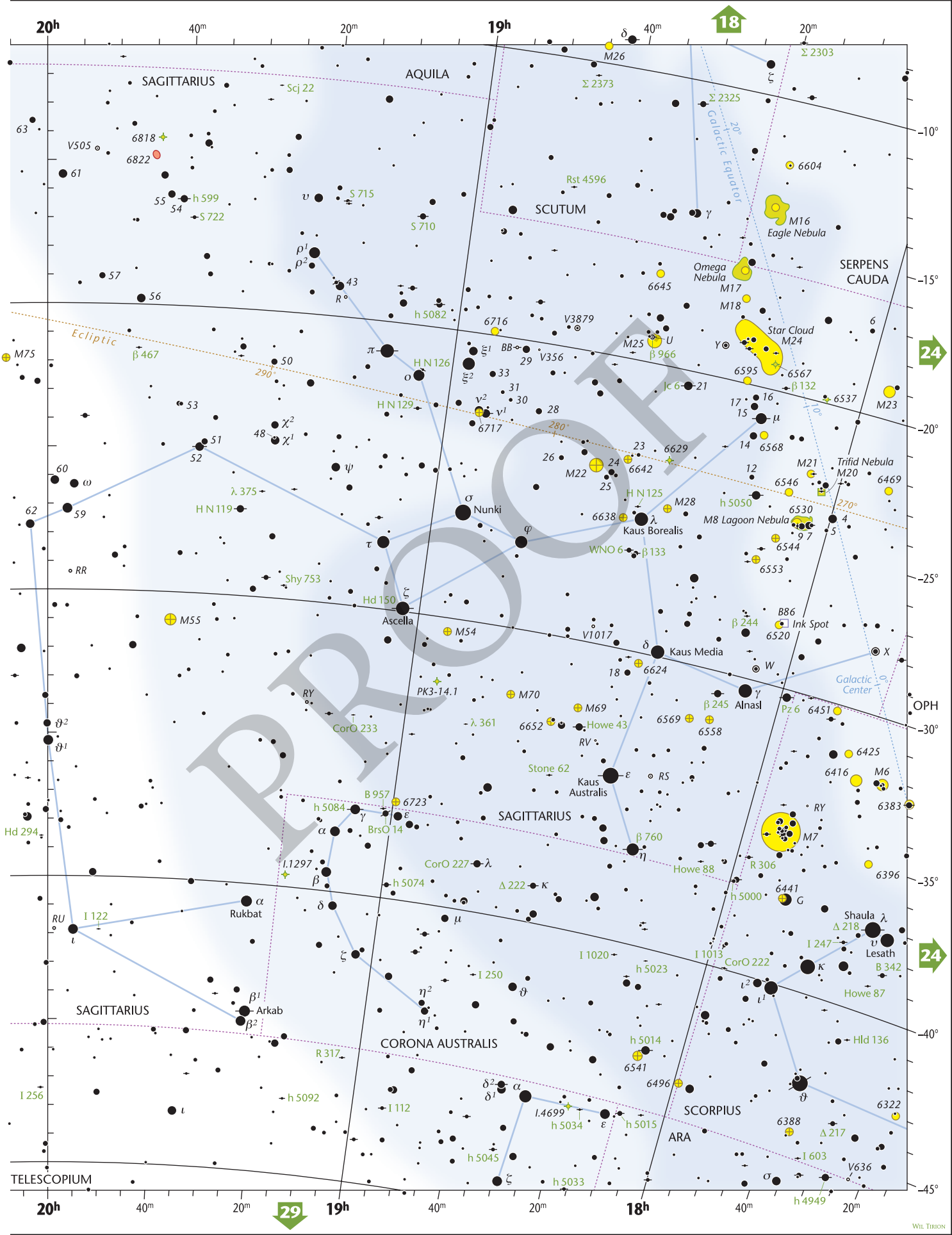
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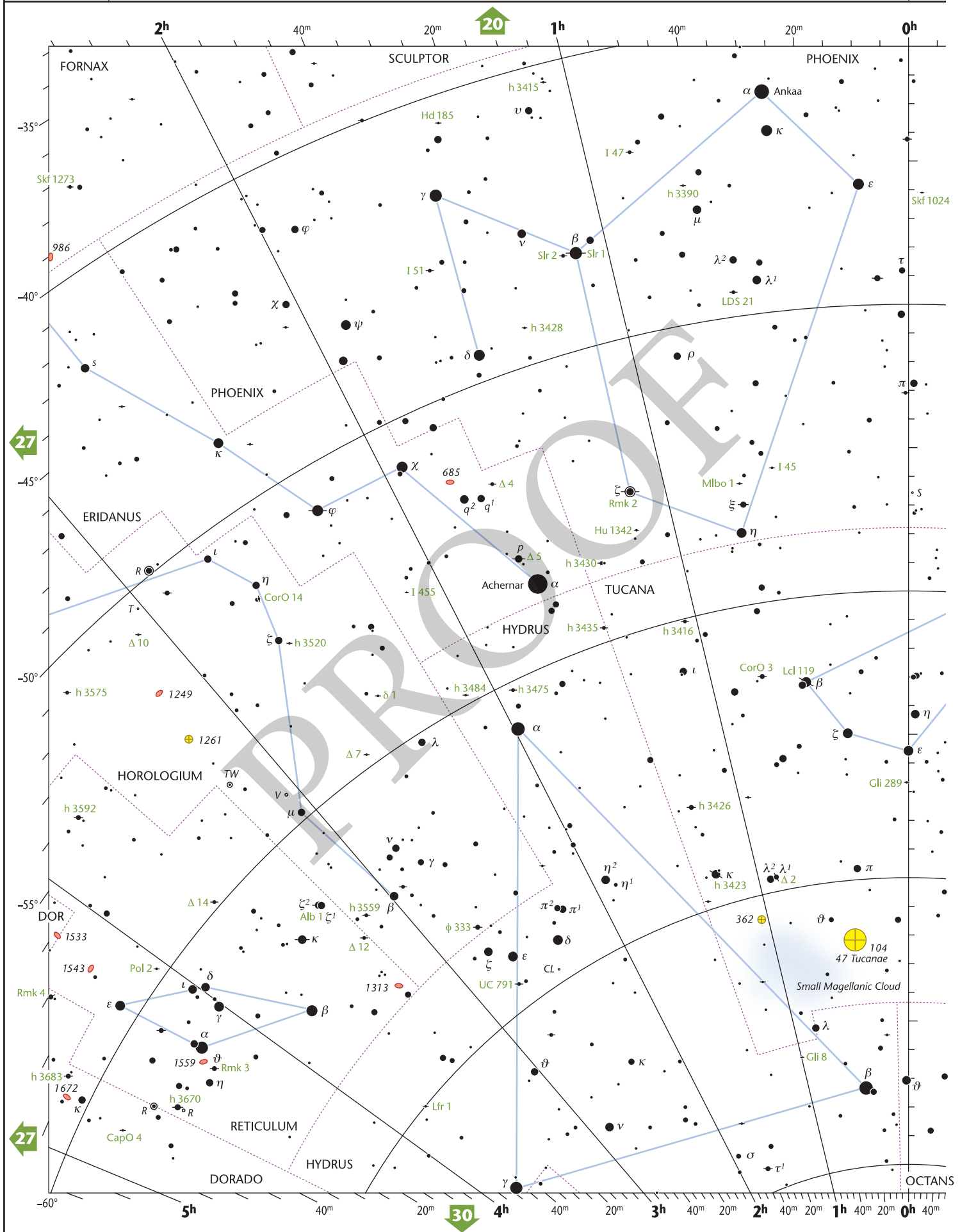
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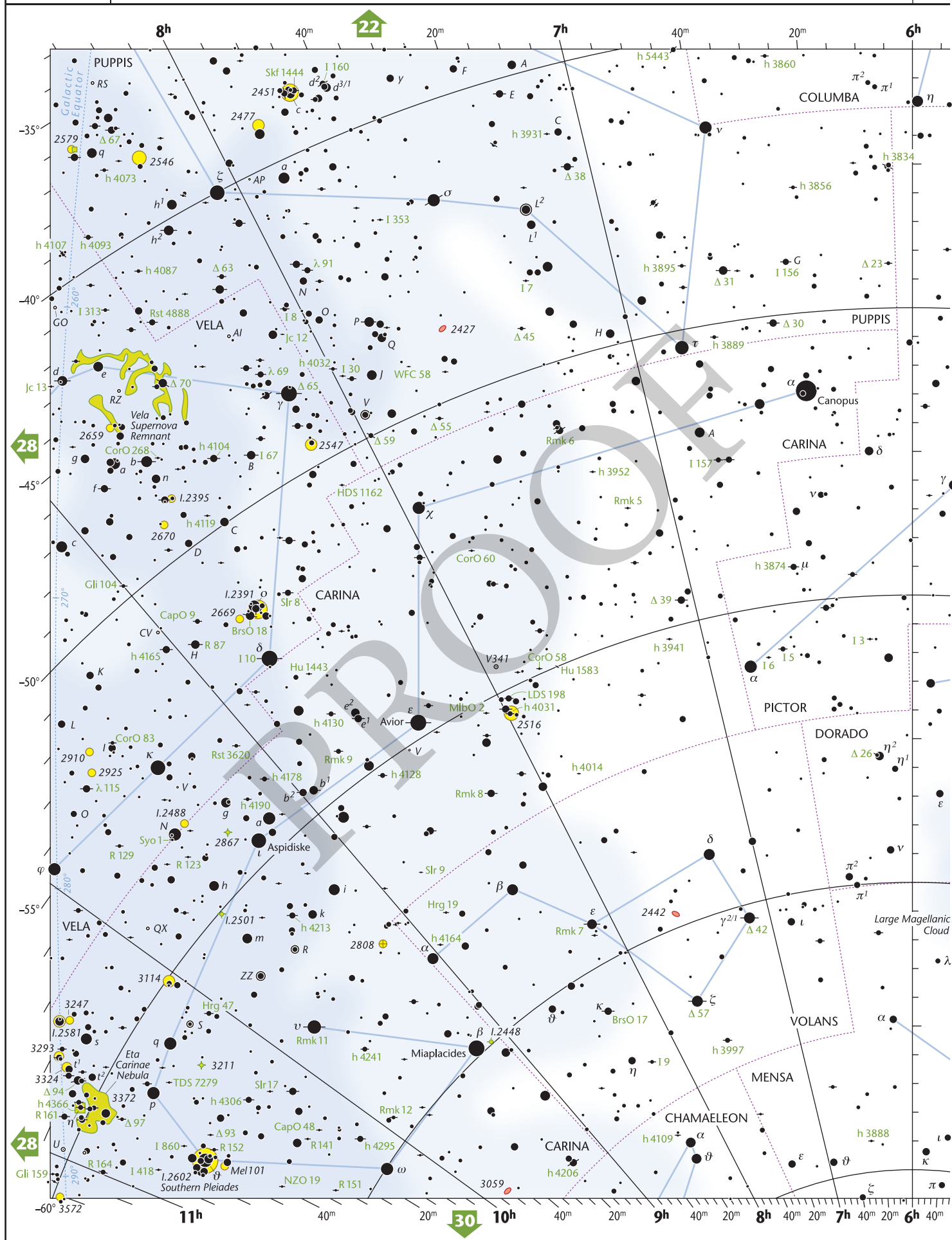
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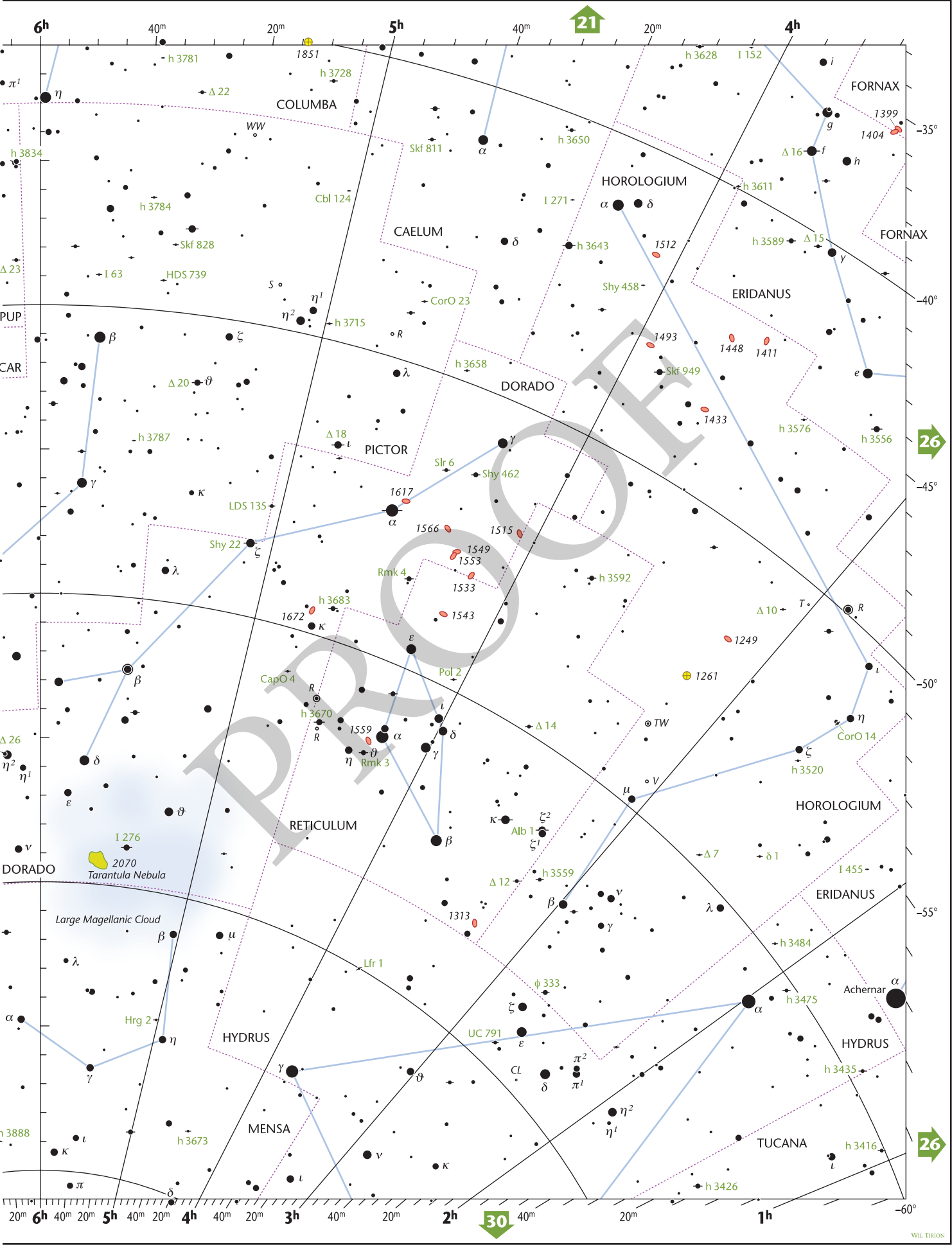
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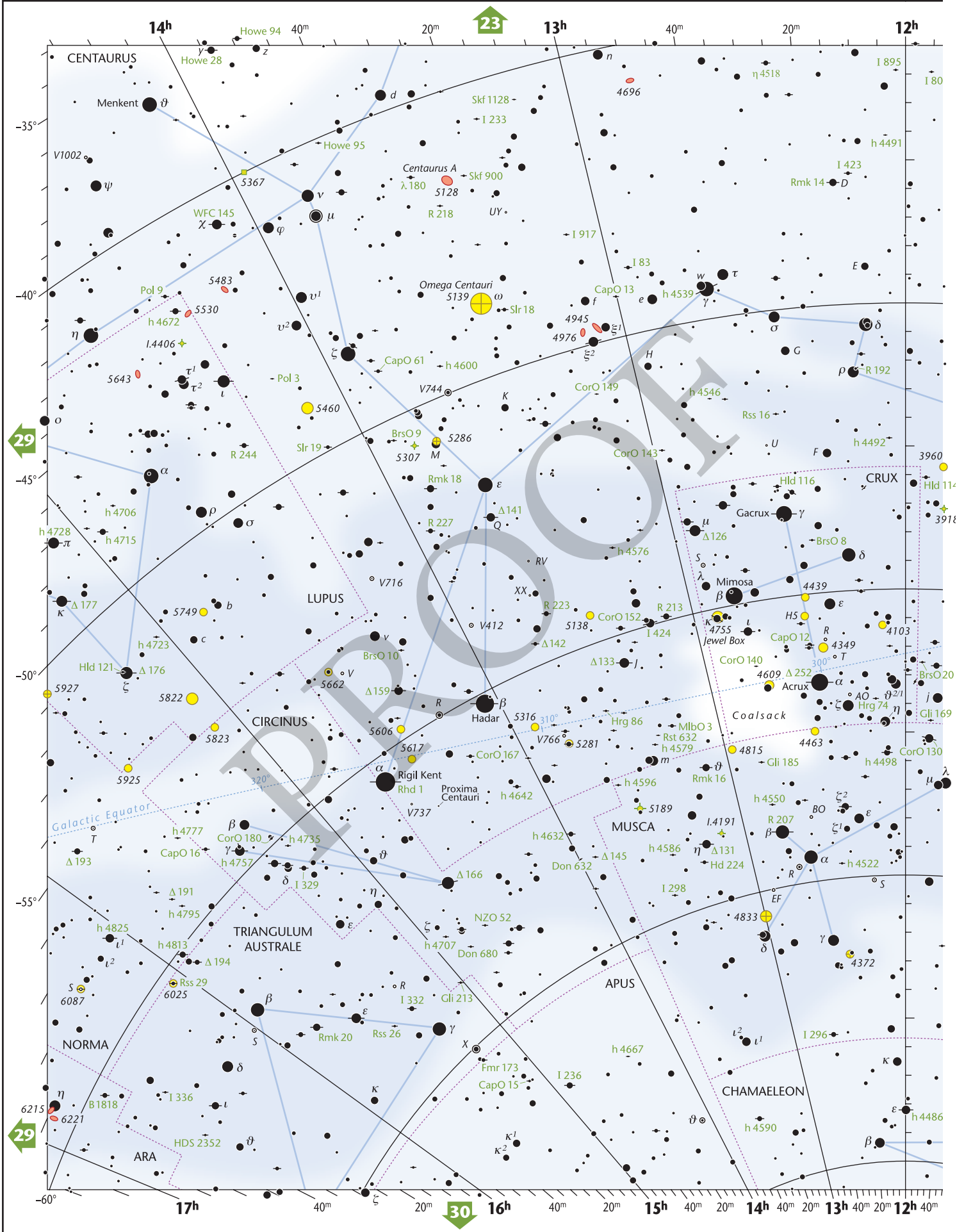
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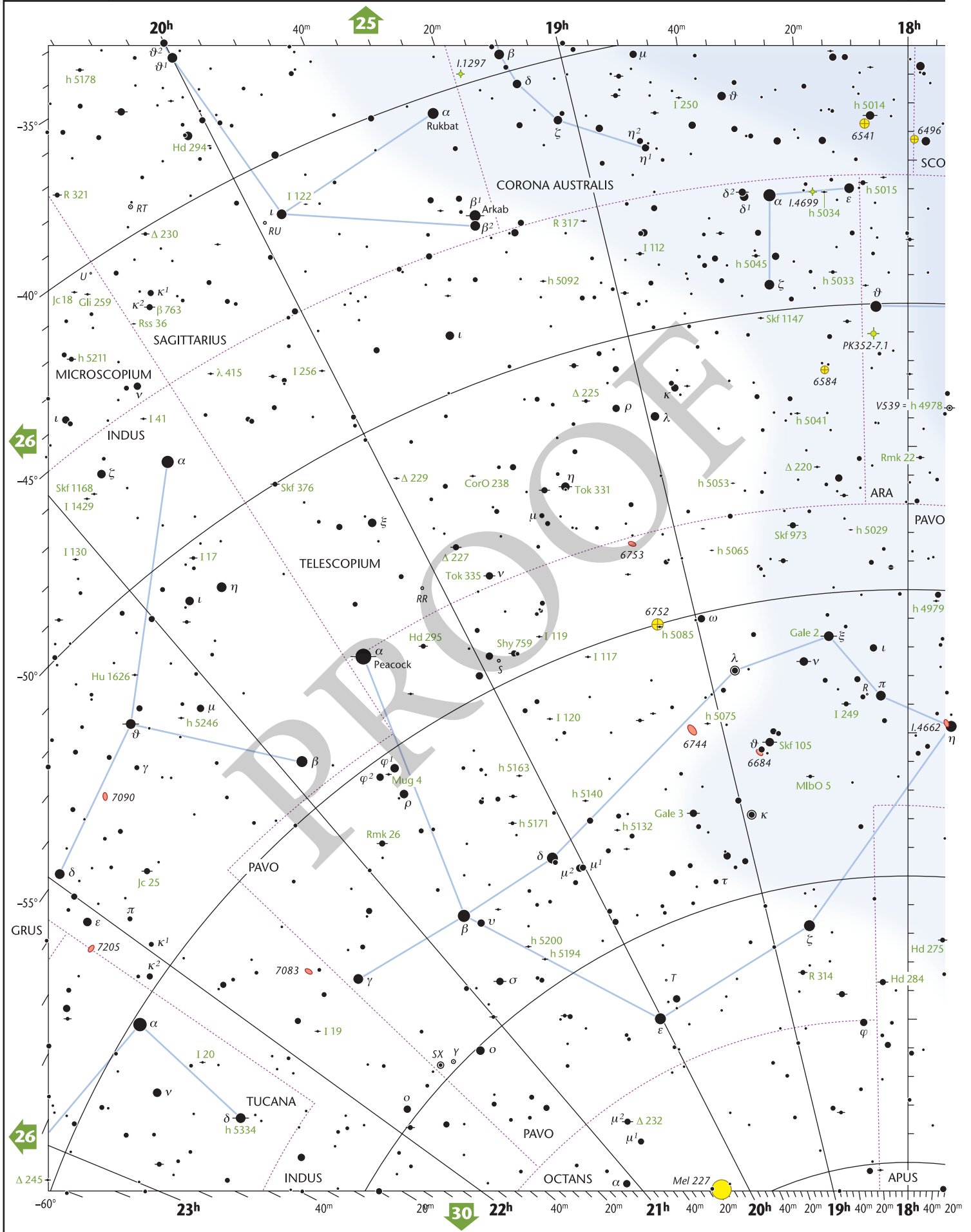
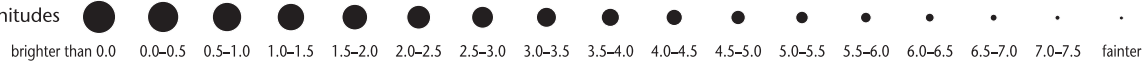


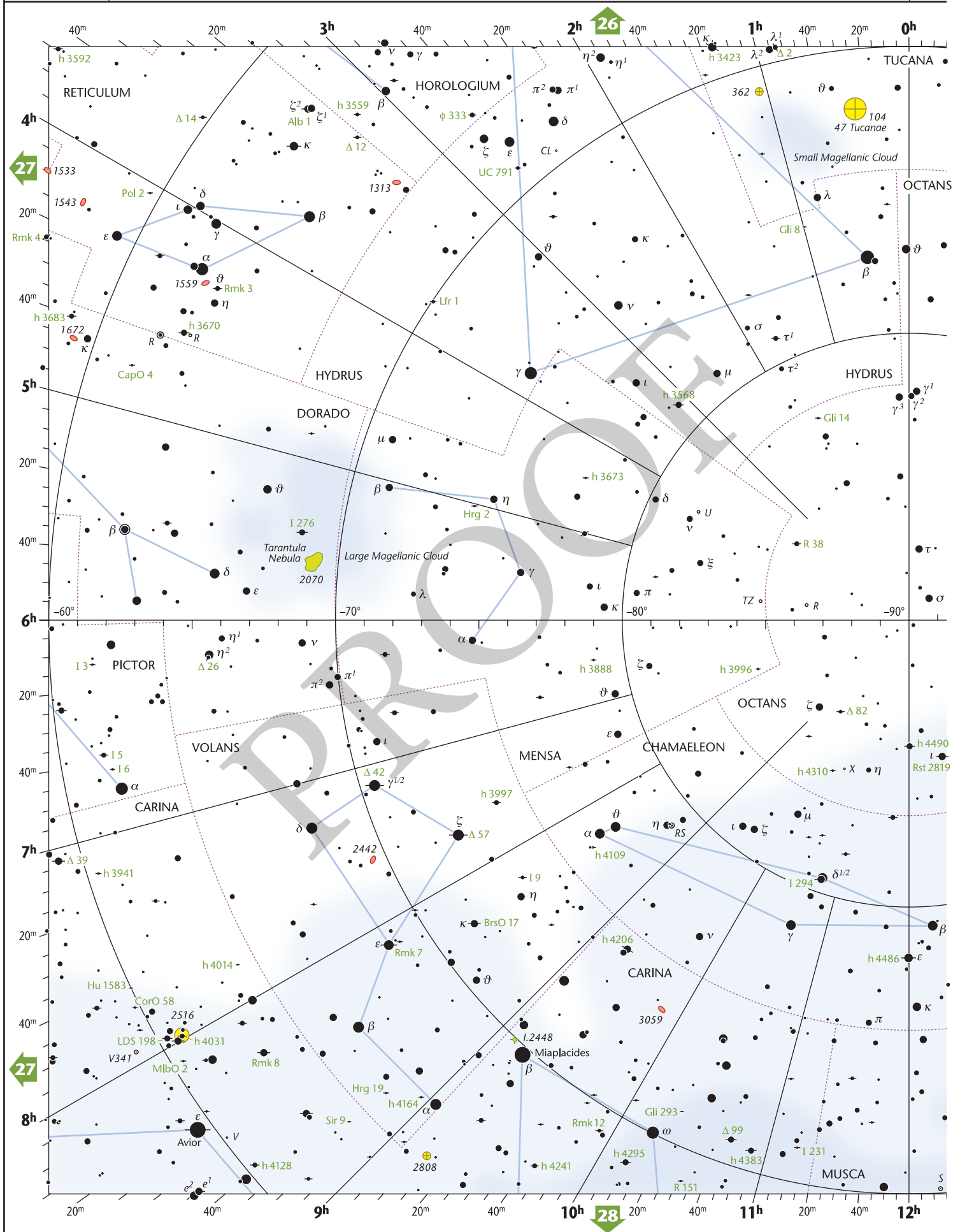














PROOF

Appendix A: The target list

Two criteria were used to select the following 2,500 “high probability” double stars from the 110,950 unique systems in the January, 2015 *Washington Double Star Catalog*.

The first is visual limits to magnitude and resolution. With few exceptions, targets are only included down to a combined visual magnitude 7.75 and secondary stars down to magnitude 13.5; separations are not less than the Abbe resolution limit of $R_0 = 0.5''$ feasible with a 250 mm or larger objective. Over 90% of the pairs can be resolved with a 150 mm aperture.

The second is evidence of a physical bond. This includes a projected separation less than 5,000 AU, a divergence between proper motion vectors less than 30% of the larger proper motion, a note in WDS that the system is physical based on CPM and/or parallax data, or an orbital solution (weighted by the quality rating assigned in the *6th Catalog of Orbits of Visual Binary Stars*). Negative indicators included a projected separation greater than 50,000 AU, a CPM deviation greater than 80%, a WDS flag indicating a “bogus binary” or optical pair, or a linear solution (a straight line path rather than curved orbital motion). Every record in WDS was evaluated against these criteria and the highest scoring systems and components (within the visual limits) were selected. These systems were further vetted using sky survey images at SIMBAD, observing notes and other references. Although this procedure cannot ensure every target is a physical system, it does reveal more accurately the true variety in physical double and multiple stars outside the traditional and ambiguous criterion of “looking like” a double star.

To conserve space, data are listed on a single line. This includes the Bayer, Flamsteed or Gould (southern hemisphere) designation, the catalog ID (as it appears in the charts); the component letter codes; the celestial coordinates for epoch J2000; magnitudes, position angle (θ) and separation (ρ) for the listed components; distance from the Sun (in parsecs);

spectral types (with alternate or dual types, most special codes and giant subtypes omitted for simplicity), and the Henry Draper (HD) and Smithsonian (SAO) catalog numbers. Distances estimated by spectroscopic parallax are flagged with an asterisk (*).

Again to conserve space, remarks are given primarily for “showpiece” (★) stars, systems frequently observed (200 or more positional measures) or “neglected” (not measured in this century), high CPM systems (annual proper motion of $0.5''$ or more), local systems (within 25 parsecs of the Sun), and systems with a calculated orbit. Period (P) and average orbit radius (r) are indicated for binaries in the *6th Orbits*, with eccentricity and year of next periastron or apastron given for high quality orbits. If the period is less than 300 years, the orbit diagram and ephemeris were examined to determine how the system will change visually. If there is no orbital solution, the projected separation with the Cousteau correction for foreshortening (see Appendix B) provides a visual scale. “MSC” system masses are from A. Tokovinin’s *Multiple Star Catalog*, other mass estimates are from WDS notes. The remark line ends with the epoch in parentheses.

The “Component” column enumerates the members of the system as these are described in WDS, MSC and SIMBAD, in the order the parameters are listed. Many lines have no component codes at all, which indicates the pair is listed as binary in WDS (“A B” is understood). The presence of binary component codes (“A B”, “A C”, etc.) indicates that the pair was extracted from a WDS multiple system comprising low probability or optical components. Pairs that cannot be resolved with a 300 mm aperture ($\rho < 0.4''$ or a large Δm) are grouped by parentheses with no space or comma between the component codes; the magnitude, θ and ρ describe the pair as a single component. To make plain the relative separations in “1+2” triples, brackets are used to indicate measures made within the binary: “A [B

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C]" with " ρ [ρ]" means the first separation is measured from A to B, but the second is from B to C. This system of formatting the component codes explicitly departs from the notation (described on p. XXX) used in WDS and other double star catalogs

and respected in the target list remarks. It is designed to indicate both the likely visual appearance and probable dynamic structure of the double star, so far as the most recent data describe it.

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Andromeda And												
LN	Σ 2973		23 02.8 +44 04	6.4, 10.1	39	7.4"	330	B2V	217811, 52626	1	1	And
KZ	Σ 2985	A (BaBb)	23 10.0 +47 58	7.2, 8.0	256	16"	25.0	G2IV	218739, 52754	0	2	And
		Local solar type 1+(2) spectroscopic triple; dominant in faint field; B is a BY Dra type variable (a low mass star with irregular surface brightness) and double line spectroscopic binary ($P = 3.0$ d). AB: $P = \sim 6,300$ y, ps = 540 AU. (2012)										
	Σ 2987		23 10.4 +49 01	7.4, 10.4	150	4.4"	45.4	G1V	218790, 52759	1	3	And
	Bvd 142	A [Ba Bb]	23 10.5 +41 19	7.8, [10.7, 11.4]	165, [89]	80", [0.6"]	63	F5V K0V	218805, 52762	0	4	And
	Σ 2992	A B	23 13.1 +40 00	7.7, 9.6	284	14"	230	A7III	219127, 73090	1	5	And
	Σ 3004		23 20.7 +44 07	6.3, 10.1	178	13"	75	A5Vn	220105, 52927	0	6	And
	Gic 192	(AaAb) C	23 26.7 +45 20	7.5, 10.9	354	57"	36.3	G0	220821, 53025	1	7	And
	O Σ 500	A B	23 37.5 +44 26	6.1, 7.4	12	0.5"	250	B8V	222109, 53202	0	8	And
		High mass binary; sparse field, faint double 5' s.p. AB: $P = 351$ y, orbit $r = 100$ AU, closing. (2012)										
	O Σ 501		23 40.0 +37 39	6.5, 10.6	162	15"	91	F2IV	222399, 73422	1	9	And
	β 995		23 47.6 +46 50	6.1, 8.7	250	0.8"	320	B3IV	223229, 53374	0	10	And
	O Σ 510	A B	23 51.6 +42 05	7.9, 8.4	119	0.6"	220	A6V	223672, 53427	1	11	And
		A type binary; dark field. AB: $P = 1,523$ y, orbit $r = 175$ AU, widening. (2012)										
	Σ 3042		23 51.9 +37 53	7.6, 7.8	86	5.7"	73	F5V	223718, 73565	0	12	And
	Ho 205	A B C	23 54.1 +39 17	6.7, 12.8, 11.7	181, 250	4.8", 93"	181	F8	223971, 73597	1	13	And
	O Σ 513		23 58.4 +35 01	6.8, 9.3	17	3.3"	125	A3	224492, 73640	0	14	And
	Hjl 1113	A B C	23 59.2 +41 12	7.8, 10.2, 8.2	188, 192	4.3", 115"	44.3	G0	224602, 53549	1	15	And
★	Σ 3050	A B	23 59.5 +33 43	6.5, 6.7	338	2.4"	28.9	F8V	224635, 73656	0	16	And
		Solar type binary; pretty YJ- color, dark field. AB: $P = 717$ y, orbit $r = 110$ AU, widening. (596 measures; 2013)										
	O Σ 514	(AaAb) B	00 04.6 +42 06	6.2, 9.7	170	5.2"	390	B9III	225218, 36037	1	17	And
		Distant (2)+1 triple, visual binary. MSC 8.1 M \odot . Aa,Ab: $P = 70$ y, widening; AB: ps = 2740 AU. (2002)										
	Σ 3056	A B D	00 04.7 +34 16	7.7, 8.1, 10.6	144, 238	0.7", 95"	177	G8III	225220, 53617	0	18	And
	β 997		00 05.0 +45 40	7.6, 9.4	337	3.9"	71	F8IV	225291, -	1	19	And
	β 9001	A C	00 05.2 +45 14	6.7, 10.6	236	22"	139	A2V	3, 36042	0	20	And
	Σ 3		00 10.1 +46 23	7.8, 9.1	80	5.1"	150	A4V	556, 36118	1	21	And
★	O Σ 2	A B (CaCb)	00 13.4 +26 59	6.8, 7.7, 10.4	159, 224	0.4", 18"	131	F8V	895, 73823	0	22	And
		Solar type 2+(2) quadruple, visual triple. MSC 5.8 M \odot . AB: $P = 422$ y, orbit $r = 85$ AU, $e = 0.72$, widening. (2012)										
	h 1947	A B	00 16.4 +43 36	6.2, 9.8	78	9.7"	107	A2V	1185, 36221	1	23	And
	Σ 19		00 16.7 +36 38	7.1, 9.5	141	2.4"	126	A2V	1223, 53772	0	24	And
	Σ 24		00 18.5 +26 08	7.8, 8.4	247	5.1"	155	A2	1429, 73883	1	25	And
	AC 1		00 20.9 +32 59	7.3, 8.3	287	1.9"	68	F5V	1641, 53827	0	26	And
	Σ 28	A B	00 23.9 +29 30	8.3, 8.6	224	33"	85	F7V F8V	1942, 73956	1	27	And
	O Σ 11		00 30.7 +32 08	7.6, 7.7	317	3.3"	159	F2	2688, 53947	0	28	And
	h 5451		00 31.4 +33 35	6.0, 9.3	86	55"	116	K1III	2767, 53956	1	29	And
29 pi	H V 17	(AaAbAc) B	00 36.9 +33 43	4.4, 7.1	174	38"	183	B5V	3369, 54033	0	30	And
		High mass (2+1)+1 spectroscopic quadruple, visual double. MSC gives 14.5 M \odot . Aa,Ab (Mkt 1): $P = 144$ d, $e = 0.54$; AB: ps = 9,400 AU. (2012)										
	Σ 47	A B	00 40.3 +24 03	7.3, 8.8	206	16"	132	A4III	3743, 74185	1	31	And

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
V355	Σ 52		00 44.2 +46 14	7.9, 9.0	3	1.4"	118	F6V	4134, 36611	0	32	And
★ 65 i	Σ 61		00 49.9 +27 43	6.3, 6.3	115	4.5"	89	F5III	4758, 74295	1	33	And
		Often measured CPM double with F giant, but no orbit yet. AB: ps = 540 AU. (250 measures; 2014)										
★ 36	Σ 73	A B	00 55.0 +23 38	6.1, 6.5	330	1.0"	38.0	G6IV K6IV	5286, 74359	0	34	And
		Solar type subgiant binary, dark field. AB: $P = 168$ y, orbit $r = 37$ AU, $e = 0.31$, closing. (706 measures; 2013)								0	34	And
	Σ 79		01 00.1 +44 43	6.0, 6.8	194	7.9"	119	B9.5V A2V	5789, 36833	1	35	And
Mad 1			01 00.6 +47 19	7.7, 9.1	2	0.8"	140*	A2	5842, 36840	0	36	And
	α 21		01 03.0 +47 23	6.8, 8.1	174	1.2"	96	A9IV	6114, 36875	1	37	And
β 397		A B	01 07.8 +46 51	7.5, 10.3	142	8.7"	173	K0II	6645, —	0	38	And
★ 42 phi	α 515	A B	01 09.5 +47 15	4.6, 5.6	118	0.5"	220	B6IV B9V	6811, 36972	1	39	And
		High mass binary; sparse field; system mass $6.5 M_{\odot}$. AB: $P = 554$ y, orbit $r = 125$ AU; decreasing θ . (226 measures; 2012)								1	39	And
	Σ 102	A B C	01 17.8 +49 01	7.3, 9.2, 8.8	274, 224	0.5", 10"	380	B9.5V	7710, 37087	0	40	And
α 29			01 18.9 +39 58	7.5, 11.7	266	20"	157	G5	7864, 54593	1	41	And
Σ 133		A B	01 32.8 +35 51	6.8, 9.4	192	3.0"	136	K3III	9370, 54771	0	42	And
		Solar type double with K giant; the pairs CD (m.10, 5") 20" s. and EF (m.10, 33") 3' n. are apparently unrelated. (2009)								0	42	And
Σ 141			01 40.1 +38 58	8.3, 8.6	304	1.7"	108	F5	10156, 54884	1	43	And
		Tiny solar type double; YO/Y color, dark field. Double h 1087 (m.10, 13") 9' p. (2012)								1	43	And
Σ 179			01 53.2 +37 19	7.6, 8.1	160	3.5"	79	F2V	11430, 55058	0	44	And
β 1368		A C	01 56.2 +37 15	5.8, 11.9	77	19"	97	K0III gM0	11749, 55107	1	45	And
★ 57 gam	Σ 205	A (BaBbC)	02 03.9 +42 20	2.3, 5.0	64	9.8"	120	K3II B8	12533, 37734	0	46	And
		Almach. High mass 1+(3) quadruple, visual double with K giant; striking Y/B color rivaling Albireo, typical of a K or M supergiant primary with OB or A component. MSC gives system mass $26.0 M_{\odot}$. AB discovered by C. Mayer (1777), first measured by Herschel (c. 1780). C discovered by F. W. von Struve (1834). AB: no orbit (353 measures), but MSC $P = 6600$ y. BC: $P = 64$ y, $e = 0.93$, reappears around 2025 toward apastron 2047 (381 measures). Ba,Bb: $P = 2.7$ d. (2012)								0	46	And
59	Σ 222		02 10.9 +39 02	6.1, 6.7	36	17"	140	B9V A1Vn	13294, 55330	1	47	And
		High mass, nearly matched double; rich field. h 1109 (m.10, 24") 10' n.p. with —five unidentified pairs. (2013)								1	47	And
Shy 136		(AaAb) B	02 13.2 +40 30	7.4, 7.3	340	10.3'	26.2	G0V GOV	13531, 37868	0	48	And
		V451+V450 And. Local, solar type (2)+1 triple, visual wide matched double; both BY Dra type variables in rich field, southern pair of three stars visible at low power. From the Shaya & Olling 2011 catalog that identifies fragile and comoving pairs by a statistical analysis of Hipparcos proper motion data. AB: ps = 16,500 AU. (2003)								0	48	And
Σ 228			02 14.0 +47 29	6.6, 7.2	294	0.8"	39.6	F2V F7V	13594, 37878	1	49	And
		Solar type binary; YW/— color, rich field. System mass $2.5 M_{\odot}$. AB: $P = 144$ y, orbit $r = 35$ AU, $e = 0.27$, periastron 2042. (331 measures; 2012)								1	49	And
Σ 245		(AaAb) B	02 18.6 +40 17	7.3, 8.0	293	11"	97	F3V F3V	14189, 37940	0	50	And
		Solar type (2)+1 triple; rich field. MSC gives $5.7 M_{\odot}$. Aa,Ab: $P = 110$ y, orbit $r = 33$ AU; AB: ps = 1440 AU. Neglected. (1999)								0	50	And
Σ 249			02 21.6 +44 36	7.2, 9.0	195	2.4"	168	A2	14477, 37971	1	51	And
β 305		A B C	02 38.3 +37 44	6.2, 11.3, 11.4	262, 206	8.5", 19"	82	F5IV	16327, 55729	0	52	And
Antlia		Ant							Charts 22, 23			
★ zet 1	Δ 78		09 30.8 –31 53	6.2, 6.8	212	8.1"	124	A1V A1V	82384, 200445	1	53	Ant
		Matched A type double; W or YW color, faint field with line of four stars 10' f. Neglected. (1999)								1	53	Ant
Jc 21			09 33.1 –39 08	6.5, 9.2	205	56"	75	F0IV	82785, 200492	0	54	Ant
B 185			09 36.0 –27 31	7.6, 9.7	201	3.2"	156	A4III	83196, 177722	1	55	Ant

h 4224	09 36.1 –31 14	7.8, 8.2	117	7.5"	370	A4V	83232, 200538	0	56	Ant
h 4249	09 48.8 –35 01	8.1, 8.1	122	4.2"	133	A9V	85100, 200758	1	57	Ant
β 215	09 54.1 –28 00	7.2, 9.3	346	1.8"	430	B4V	85860, 178157	0	58	Ant
ι 842	09 54.5 –34 54	7.3, 11.1	28	3.5"	120	A3V	85963, 200855	1	59	Ant
eta h 4271	09 58.9 –35 53	5.2, 11.3	318	31"	33.3	F1III	86629, 200926	0	60	Ant
h 4277	10 01.9 –28 41	8.1, 8.8	33	22"	118	A3IIIm	87088, 178319	1	61	Ant
ι 292	10 04.3 –28 23	8.4, 7.8	306	0.7"	82	F6V	87416, 178366	0	62	Ant
H _o 371	10 05.8 –30 54	6.7, 11.1	44	6.1"	158	G8III	87660, 201045	1	63	Ant
h 4304	10 20.2 –33 08	7.6, 9.8	286	9.5"	126	A3III	88672, 201293	0	64	Ant
ι 209	10 24.4 –38 35	8.4, 8.6	129	1.3"	147	F2IV	90256, 201362	1	65	Ant
Skf 1893	10 27.8 –34 24	7.5, 12.8	80	33"	39.4	G2V	90712, 201414	0	66	Ant
del H N 50	10 29.6 –30 36	5.6, 9.8	226	11"	133	B9.5V	90972, 201442	1	67	Ant
h 4381	10 54.6 –38 45	7.0, 8.5	42	26"	161	B8III	94565, 201886	0	68	Ant
Tok 278	10 55.9 –35 07	7.5, 11.5	352	61"	53	G5V	94771, 201911	1	69	Ant
Apus	Aps						Chart 30			
h 4667	14 22.6 –73 33	8.2, 8.6	138	2.3"	240	A0V	125292, 257145	0	70	Aps
h 4671	14 29.4 –80 06	8.1, 8.7	125	4.2"	76	F5V	125856, 257158	1	71	Aps
ι 236	14 53.2 –73 11	5.9, 7.6	123	2.2"	101	G5III	130458, 257206	0	72	Aps
★ CapO 15	15 06.4 –72 10	7.2, 8.5	42	1.4"	250	B8V	132874, 257237	1	73	Aps
Fmr 173	15 15.4 –70 32	6.9, 12.7	145	57"	188	G6IV+M3V	162157, 257754	0	74	Aps
ι 333	15 59.9 –78 02	6.9, 7.5	332	0.7"	88	F3IV	141846, 257341	1	75	Aps
★ del 1 BrsO 22	16 20.3 –78 42	4.9, 5.4	10	103"	230	M5III K3III	145366, 257380	0	76	Aps
h 4904	17 10.3 –75 23	7.6, 9.1	187	6.8"	81	F3V	153880, 257465	1	77	Aps
Hd 275	17 44.3 –72 13	6.9, 8.1	89	0.6"	43.4	F7IV F5V	159964, 257525	0	78	Aps
Hd 284	18 12.6 –73 40	6.0, 9.1	270	2.2"	42.1	F5V	165259, 257571	1	79	Aps
Aquarius	Aqr						Charts 12, 19, 20			
4 Σ 2729	A B	20 51.4 –05 38	29	0.8"	61	F5IV	198571, 144877	0	80	Aqr
6 mu Tok 342	(AaAb) B	20 52.7 –08 59	116	8.4"	48.2	K3III	198743, 144895	1	81	Aqr
Howe 55	A B	20 57.2 +00 28	71	27"	94	K2III	199442, 126396	0	82	Aqr
Σ 2744	A B	21 03.1 +01 32	112	1.3"	71	F7IV	200375, 126491	1	83	Aqr
12 Σ 2745	(AaAb) B	21 04.1 –05 49	196	2.5"	154	G4III	200497, 145065	0	84	Aqr
Σ 2752	A B	21 07.2 –13 55	178	4.4"	17.6	K2V+M0V	200968, 164147	1	85	Aqr
Σ 2770	Local, low mass double; sparse field, wide unidentified double 7' s.f. AB: ps = 100 AU. (2012)		247	7.5"	200	K0III	201719, 145185	0	86	Aqr
Σ 2775	(AB) C	21 14.7 –00 50	178	21"	310	A1V	202260, 145230	1	87	Aqr
	High mass, A type (2)+1 triple, visual binary; sparse field, small star group s.p. MSC system mass 7.3 M _⊙ . AB: P = 81 y, orbit r = 50 AU, e = 0.17, decreasing \dot{a} ; periastron 2027. AC: ps = 8,800 AU. (2008)							1	87	Aqr

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
24	Σ 2809	A B	21 37.6 –00 23	6.2, 9.4	162	31"	320	A2V	205765, 145533	0	88	Aqr
	β 1212	(AaAb) B	21 39.5 –00 03	6.9, 8.4	286	0.5"	44.0	F6V	206058, 145566	1	89	Aqr
		Solar type (2)+1 spectroscopic triple; sparse field. MSC 2.5 M \odot . AB: $P = 49$ y, orbit $r = 20$ AU, $e = 0.87$, periastron 2020. (238 measures; 2009)								1	89	Aqr
	Sca 104		21 52.4 –03 10	6.6, 11.0	117	63"	184	A0	207888, 145716	0	90	Aqr
	Howe 59	A B	22 01.5 –15 37	7.2, 10.3	270	8.9"	128	G8IV F0V	209154, 164819	1	91	Aqr
	Σ 2862		22 07.1 +00 34	8.0, 8.4	95	2.5"	79	G0	209965, 127306	0	92	Aqr
★ 41	H N 56	A B	22 14.3 –21 04	5.6, 6.7	112	5.2"	72	K0III+F2V	210960, 190986	1	93	Aqr
		Striking close double with K giant; sparse field, optical pair CD (m.9, 12") 3' n.f. is unrelated. From the 1821 W. Herschel N catalog, discoveries he made while searching for nebulae or new planets. (2009)								1	93	Aqr
★ 51	β 172	A B C	22 24.1 –04 50	6.5, 6.6, 12.2	38, 343	0.4", 53"	124	A0V	212404, 146067	0	94	Aqr
		A type 2+1 visual triple. AB: $P = 149$ y, orbit $r = 50$ AU, $e = 0.71$, apastron 2062. (238 measures; 2011)								0	94	Aqr
	S 808	A B	22 25.8 –20 14	7.1, 8.0	154	6.8"	600	G5III	212600, 191131	1	95	Aqr
★ 53	Sh 345	A B	22 26.6 –16 45	6.3, 6.4	59	1.3"	20.2	G0V G0V	212697, 165078	0	96	Aqr
		Local, solar type matched binary; dark field. AB: $P = 3,500$ y, orbit $r = 300$ AU, closing. (243 measures; 2013)								0	96	Aqr
★ 55 zet 1,2	Σ 2909	(AaAb) B	22 28.8 –00 01	4.3, 4.5	165	2.3"	28.2	F3IV	213051, 146107	1	97	Aqr
		Gorgeous solar type (2)+1 triple, visual double; W/W color, catalogued by W. Herschel (1779), MSC system mass 3.4 M \odot . Aa,Ab (Tok 201): $P = 26$ y, $e = 0.13$, apastron 2016; AB: $P = 487$ y, orbit $r = 95$ AU, $e = 0.34$. (1,155 measures; 2013)								1	97	Aqr
	Σ 2913		22 30.5 –08 07	7.8, 8.6	329	8.6"	200	F0V	213293, 146130	0	98	Aqr
	HDS 3190		22 30.6 –10 41	4.8, 8.5	10	3.7"	89	A0IV	213320, 165134	1	99	Aqr
	Cbl 188		22 32.2 –13 36	7.8, 9.8	94	42"	115	G0V	213510, 165149	0	100	Aqr
	h 3128		22 40.0 –19 12	7.3, 11.2	228	11"	61	F6V	214657, 165223	1	101	Aqr
	Σ 2936		22 43.0 +01 13	7.0, 9.6	52	4.2"	145	A6III	215129, 127707	0	102	Aqr
	Σ 2935	A B	22 43.1 –08 19	6.8, 7.9	306	2.4"	147	A5V	215114, 146271	1	103	Aqr
	Σ 2939		22 45.3 –09 39	7.4, 9.3	62	10"	84	A7III	215449, 146296	0	104	Aqr
	Hu 291		22 47.3 –16 09	7.6, 9.8	327	2.7"	34.0	G5V	215696, 165289	1	105	Aqr
★	Σ 2944	A B	22 47.8 –04 14	7.3, 7.7	302	1.9"	32.0	G2V G4	215812, 146315	0	106	Aqr
		High CPM, solar type binary, YO/- color. AB: $P = 1,160$ y, orbit $r = 130$ AU; slowly closing. (397 measures; 2012)								0	106	Aqr
	β 178		22 55.2 –04 59	6.0, 7.8	322	0.6"	83	G4III	216718, 146388	1	107	Aqr
		Binary with a red giant primary. AB: $P = 96$ y, orbit $r = 40$ AU; closing along edgewise orbit. (2009)								1	107	Aqr
	Arn 80		23 02.5 –11 16	7.9, 9.9	270	79"	109	K0	217681, 165454	0	108	Aqr
		CPM double with K giant, group n.p.: CPM double Σ 2970 (m.9, 8") 3' s.p. (2004)								0	108	Aqr
	β 384		23 02.6 –18 33	6.9, 9.2	59	1.1"	100	A2V	217684, 165456	1	109	Aqr
★	Σ 2988		23 12.0 –11 56	7.9, 8.0	98	3.5"	210	G8III	218928, 165551	0	110	Aqr
		Pretty matched double with G giant; easily found in dark field. AB: ps = 990 AU. (2012)								0	110	Aqr
	β 181	A B	23 13.8 –13 24	7.3, 9.3	306	1.5"	300	K4III	219151, 165571	1	111	Aqr
psi 1	Σ II 12	A [B C]	23 15.9 –09 05	4.4, [10.5, 10.7]	311, [104]	50", [0.6"]	45.9	K1III	219449, 146598	0	112	Aqr
		High CPM, solar type 1+-(2) triple with K giant; brilliant in field. MSC system mass 5.5 M \odot . BC (β 1220); $P = 84$ y, orbit $r = 22$ AU; closing along edgewise orbit. AB: ps = 2,300 AU. (2012)								0	112	Aqr
★ 94	Σ 2998	(AaAb) B	23 19.1 –13 28	5.3, 7.0	349	13"	21.1	G5IV	219834, 165625	1	113	Aqr

Local, solar type (2)+1 triple, visual double. MSC 2.3M☉. Aa,Ab: P = 6.3 y, orbit r = 4 AU, e = 0.19. (241 measures; 2012)											
96	h 5394	23 19.4 –05 07	5.6, 10.4	20	11"	34.2	F3V	219877, 146639	1	113	Aqr
	h 3184	23 20.9 –18 33	7.3, 8.4	283	5.6"	166	G8IV	220065, 165830	0	114	Aqr
105	ome 2	23 42.7 –14 33	4.5, 9.9	89	5.5"	45.5	B9.5V	222661, 165842	1	115	Aqr
	β 279	23 42.7 –14 33	4.5, 9.9	89	5.5"	45.5	B9.5V	222661, 165842	0	116	Aqr
★ 107	i 2	23 46.0 –18 41	5.7, 6.5	136	6.6"	73	A9IV F2V	223024, 165867	1	117	Aqr
Mixed A/solar type double; dark field. From the 1782 William Herschel catalog. AB: ps = 650 AU. (2012)											
	Tok 354	23 48.2 –16 42	7.6, 10.1	61	109"	57	F7V	223271, 165890	1	117	Aqr
	β 729	23 55.4 –17 50	7.7, 11.7	346	11"	56	F7V	224135, 165951	0	118	Aqr
									1	119	Aqr
Charts 18, 19											
Aquila											
Aql											
5	Σ 2379	(Aa1Aa2Ab) B	18 46.5 –00 58	5.9, 7.0	121	13"	A2V	173654, 142606	0	120	Aql
A type (2+1)+1 spectroscopic quadruple; rich field. MSC has 7.3 M☉. Aa,Ab: P = 34 y, e = 0.33, periastron 2023. AB: ps = 1,600 AU. (2012)											
	β 265	18 50.2 +11 31	7.4, 9.2	228	1.4"	520	A1V GIII	174485, 104570	1	121	Aql
	Σ 2404	18 50.8 +10 59	6.9, 7.8	182	3.5"	390	K5III+K3	174569, 104170	0	122	Aql
FF	Ho 91	18 58.2 +17 22	5.4, 10.1	144	6.8"	470	F8II	176155, 104296	1	123	Aql
	Σ 2432	19 01.8 +12 32	6.8, 10.4	87	15"	230	B8IV	176873, 104379	0	124	Aql
	Σ 2446	19 05.8 +06 33	7.0, 8.9, 11.2	153, 346	9.4", 36"	66	F5	177749, 124257	1	125	Aql
	Σ 2449	19 06.4 +07 09	7.2, 7.7	290	7.9"	106	F2V	177904, 124265	0	126	Aql
	Σ 2447	19 06.6 –01 21	6.8, 9.6	343	14"	135	B5V	177880, 143029	1	127	Aql
	Σ 2471	19 10.9 +08 07	7.5, 10.6	122	8.6"	94	A9V	179123, 124355	0	128	Aql
	OΣΣ 178	19 15.3 +15 05	5.7, 7.6	267	89"	210	G8II	180262, 104655	1	129	Aql
	OΣ 368	19 16.0 +16 10	7.5, 8.5	219	1.1"	240	A9IV	180451, 104666	0	130	Aql
	Σ 2489	19 16.4 +14 33	5.7, 9.3	347	8.3"	126	B9.5V	180555, 104668	1	131	Aql
23	Σ 2492	19 18.5 +01 05	5.3, 8.3, 13.5	2, 70	3.2", 10"	114	G9III	180972, 124487	0	132	Aql
24	Σ I 40	19 18.8 +00 20	6.5, 6.8	316	7.0"	127	K0III	181053, 124492	1	133	Aql
	Σ 2501	19 22.1 –04 44	7.8, 9.7	22	20"	98	F5	181806, 143315	0	134	Aql
	Σ 2519	19 28.2 –09 32	8.3, 8.5	125	12"	91	F0	183107, 143431	1	135	Aql
	Σ 2533	19 30.1 –00 27	7.4, 10.0	211	22"	72	A3V	183518, 143469	0	136	Aql
V822	D 20	19 31.3 –02 07	7.2, 9.6	65	1.3"	290*	B5V	183794, 143494	1	137	Aql
	Σ 2543	19 36.2 +06 00	6.8, 10.5	151	11"	200	G8III	184853, 124835	0	138	Aql
	Σ 2545	19 38.7 –10 09	6.8, 8.5	326	3.8"	86	A9III	185298, 162843	1	139	Aql
A type double; forms an optical "double double" with CPM pair Σ 2547 (m.8, 21") 13' s.f. AB: ps = 440 AU. (2012)											
	Σ 2562	19 42.8 +08 23	7.0, 8.7	251	28"	66	F8V G0V	186226, 124969	0	140	Aql
	Σ I 45	19 43.1 –08 18	7.1, 7.6	147	98"	72	F4V F5V	186158, 143722	1	141	Aql
	Σ 2570	19 44.9 +10 47	7.6, 9.8	280	4.5"	1400*	B3IV	186587, 105207	0	142	Aql
★ 52	pi	Σ 2583	19 48.7 +11 49	6.3, 6.8	103	1.3"	A3V F9III	187259, 105282	1	143	Aql
Mixed A/solar type double with F giant; subtle O/B color. AB: ps = 280 AU. (317 measures; 2013)											
	β 148	19 52.0 –10 21	7.7, 8.4	228	0.7"	87	F2	187774, 163059	1	143	Aql
Solar type binary. AB: P = 783 y, orbit r = 120 AU; slowly closing. (2009)											
	Σ 2590	19 52.3 +10 21	6.5, 10.3	310	14"	330	B7V	187961, 105355	1	144	Aql
	Σ 2596	19 54.0 +15 18	7.3, 8.7	298	2.0"	83	F8V	188328, 105396	0	145	Aql
★ 57	Σ 2594	(AaAb) (BaBb)	19 54.6 –08 14	5.7, 6.4	171	36"	B7Vn B8V	188293, 143898	1	146	Aql
High mass (2)+(2) spectroscopic quadruple, visual double; splendid in rich field, BW/BW color enhanced by magnification. AB: ps = 7,190 AU. (2013)											
	Σ 2597	A B	19 55.3 –06 44	6.9, 8.0	101	0.6"	F2V	188405, 143911	1	147	Aql
						82			0	148	Aql

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGCOLOR	ID	Constellation	
Solar type binary. AB: $P = 425$ y, orbit $r = 90$ AU; widening. (2010)													
	β 1475	A B	19 57.9−09 04	7.8, 9.5	112	10"	250	K2	188938, 143951	0	148	Aql	
	β 266		19 57.9 +11 25	7.4, 11.5	167	16"	198	A3	189093, 105474	0	150	Aql	
	AC 12		19 58.4−02 14	7.5, 8.3	299	1.5"	101	F5	189073, —	1	151	Aql	
	Σ 2613	(AaAb) B	20 01.4 +10 45	7.5, 8.0	354	3.6"	81	F5V F5V	189783, 105560	0	152	Aql	
	H I 93	A B	20 01.7−00 12	7.7, 8.4	297	1.8"	190	A0	189759, 144002	1	153	Aql	
	Σ 2621		20 04.6 +09 14	8.4, 8.6	224	5.5"	230	B8V A1V	190434, 125416	0	154	Aql	
	β 56		20 05.1−04 18	8.0, 9.1	187	1.3"	77	F5	190437, —	1	155	Aql	
	O $\Sigma\Sigma$ 198	A B	20 06.6 +07 35	7.1, 7.6	186	64"	121	A2V A3V	190849, 125456	0	156	Aql	
	β 428		20 06.7 +12 56	7.6, 9.1	356	0.8"	134	F4III	190887, 105700	1	157	Aql	
Solar type double with F giant; faint rich field. h 1476 4' s.p. (2008)													
	Σ 2628		20 07.8 +09 24	6.6, 8.7	340	2.8"	39.4	F3V	191104, 125478	0	158	Aql	
	Σ 2635	A B	20 10.1 +08 27	6.7, 10.2	80	7.8"	63	F7V	191533, 125517	1	159	Aql	
★	Σ 2644	20 12.6 +00 52 6.9, 7.1 181 B9 0										160	Aql
Nearly matched, high mass double. No orbit or linear solution. (211 measures; 2012)													
	Σ 2643		20 12.8−03 00	7.1, 9.4	79	3.1"	133	A0V	192007, 144173	1	161	Aql	
★	S 740		20 14.2 +06 35	7.8, 8.1	191	44"	61	G4IV	192344, 125597	0	162	Aql	
Solar type matched double; YO/W color. Near 100% probability the pair is physical. AB: ps = 3,620 AU. (2012)													
	Σ 2654		20 15.2−03 30	7.0, 8.1	232	15"	41.4	F2V F4V	192461, 144212	1	163	Aql	
	Σ 2656		20 15.6 +07 49	7.3, 11.3	234	9.7"	123	A7III	192622, 125620	0	164	Aql	
	Rst 4659	A B	20 16.8−03 30	7.2, 9.2	7	1.7"	65	F5	192791, 144237	1	165	Aql	
	Σ 2661		20 19.9−02 15	7.9, 9.2	341	24"	200	A0	193330, 144303	0	166	Aql	
★	S 749	A B	20 27.5−02 06	6.8, 7.5	188	60"	45.8	F7V+G2V	194765, 144450	1	167	Aql	
Solar type double; charming field. A characteristically wide system from the catalog of James South; near 100% probability the CPM pair is physical. AB: ps = 3,710 AU. (2012)													
Chart 29													
★ R	Ara	Ara	16 39.7−57 00	7.2, 7.8	120	3.3"	124	B9V	149730, 244037	0	168	Ara	
High mass double with Algol type variable; rich field, K type giant 4' n. AB: ps = 550 AU. Neglected. (1999)													
	HDS 2364		16 39.8−52 00	7.7, 9.0	163	22"	31.5	G4V+K2V	149813, 244042	1	169	Ara	
	Slr 12	A B C	16 39.9−47 47	8.0, 8.1, 10.8	159, 40	1.4", 36"	70	F5V	149901, 227020	0	170	Ara	
	B 1818		16 40.8−60 27	6.3, 9.1	36	1.6"	31.3	F2III	149837, 253651	1	171	Ara	
	Slr 21		16 41.1−47 45	7.4, 9.4	321	1.7"	250	B5III	150083, 227044	0	172	Ara	
	Δ 206	(Aa1Aa2Ab) B [(CaCb) G]	16 41.3−48 46	5.7, 8.4, [6.3, 9.6]	9, 263, [221]	1.7", 10', [4.3"]	1590*	O3V+O6V	150136, 227049	1	173	Ara	
High mass, spectroscopic multiple system within NGC 6193; listed as a single system in WDS but divergent CPM suggests the (2+1)+1 quadruple (Mlo 8) is unrelated to the (2)+1 triple (Sna 1). System mass of A triple $\sim 135 M_{\odot}$. Aa1,Aa2: $P = 2.7$ d. Aa,Ab: $P = 8.2$ y. (2012)													
	h 4896		16 56.2−46 51	7.8, 8.0	23	3.9"	330	B7V	152541, 227453	0	174	Ara	
	λ 316		17 00.4−48 39	6.3, 7.7	172	1.0"	107	G5IV	153221, 227542	1	175	Ara	
	HId 131		17 01.1−56 33	6.4, 9.9	131	2.3"	200	A	153201, 244356	0	176	Ara	

h 4901		17 01.1 –58 51	8.3, 8.5	130	2.8"	950	B3V	153123, 244353	1	177	Ara
CorO 206	A B	17 02.9 –50 10	7.3, 8.1	231	8.2"	150*	A0V	153579, 244386	0	178	Ara
Δ 213		17 10.3 –46 44	7.0, 8.3	168	8.2"	460	B1I B1.5V	154873, 227682	1	179	Ara
h 4920	(AaAb) B	17 13.0 –58 36	7.0, 9.2	323	3.0"	60	F4IV	155099, 244518	0	180	Ara
★ 41	BrSO 13	17 19.1 –46 38	5.6, 8.9	257	10"	8.80	G8V MOV	156274, 227816	1	181	Ara
	Local, very high CPM, solar type binary with faint M type companion; Y/O color, faint rich field. AB: ps = 120 AU. (2013)										
h 4931		17 20.6 –59 26	7.8, 7.8	256	0.9"	510	A0V	156335, 244638	0	182	Ara
CorO 213	A B	17 22.8 –58 28	6.9, 9.3	284	9.3"	62	A5V	156751, 244675	1	183	Ara
Shy 297		17 26.4 –48 37	7.1, 8.9	314	2.1"	47.3	F6V K1V	157555, 227954	0	184	Ara
★	h 4949	17 26.9 –45 51	5.6, 6.5, 7.1	252, 312	2.1", 103"	195	B7V B9.5V A0V	157661, 227972	1	185	Ara
	High mass 2+1 triple; exemplary specimen in a rich field. MSC system mass 12.2 M _☉ . A.C: ps = 27,100 AU. (2007)										
I 106		17 37.3 –49 15	7.3, 8.3	35	1.0"	310	B8III	159439, 228194	0	186	Ara
R 303		17 45.1 –54 08	7.9, 9.0	101	2.7"	390	A1V A1V	160818, 245592	1	187	Ara
CapO 17		17 45.6 –50 47	8.1, 8.1	182	1.1"	97	F7V	160996, 245004	0	188	Ara
h 4982		17 50.5 –48 17	7.0, 9.3	58	41"	270*	K3III	161880, 228465	1	189	Ara
★ V539	h 4978	17 50.5 –53 37	5.7, 9.2	268	12"	300	B2V B3V	161783, 245065	0	190	Ara
	High mass (2)+1 triple with Algol type eclipsing variable; sparse field. MSC has 27.2 M _☉ . AB: ps = 4,860 AU. (2000)										
Rmk 22		17 57.2 –55 23	7.0, 7.9	95	2.4"	210	K0III A2	163028, 245131	1	191	Ara
h 5015		18 08.5 –45 46	6.2, 9.6	259	3.5"	270	B8II	165493, 228734	0	192	Ara
Chart 7											
1	Σ 174	01 50.1 +22 16	6.3, 7.2	165	2.9"	180	G3III	11154, 74966	1	193	Ari
Σ 178		01 52.0 +10 49	8.2, 8.2	204	3.0"	137	F1V	11386, 92669	0	194	Ari
★ 5 gam	Σ 180	01 53.5 +19 18	4.5, 4.6	2	7.5"	50	A1 B9V	11503, 92681	1	195	Ari
	Mesarthim; Brilliant, high mass matched pair with alp2 CVn type variable. First noticed as double by Robert Hooke (1664). AB: ps = 505 AU; pair CD (β 512, m.14, 3.6' 1 following) is unrelated. (374 measures; 2014)										
★ 9 lam	H V 12	01 57.9 +23 36	4.8, 6.7	48	37"	39.5	F0IV F7V	11973, 75051	0	196	Ari
	Solar type (2)+1 spectroscopic triple, visual double with bet Lyr type eclipsing variable; striking in a featureless field, stars f. unrelated. AB: ps = 1,970 AU. (2013)										
Σ 194		01 59.3 +24 50	7.6, 9.5	278	1.3"	193	A3	12101, 75071	1	197	Ari
10	Σ 208	02 03.7 +25 56	5.8, 7.9	343	1.4"	48.7	F8IV	12558, 75114	0	198	Ari
	Solar type binary; dark field, m.10 G giant 9' f. System mass 2.6 M _☉ . AB: P = 325 y, orbit r = 70 AU, e = 0.59, apastron 2094. (224 measures; 2012)										
14	H VI 69	02 09.4 +25 56	5.0, 8.0, 8.0	34, 279	93", 105"	89	F2III	13174, 75171	1	199	Ari
Σ 240		02 17.3 +23 52	8.3, 8.6	53	4.8"	112	F0	14066, 75263	0	200	Ari
VW	OΣΣ 27	02 26.8 +10 34	6.7, 8.3, 11.8	31, 155	74", 60"	128	A3	15165, 92952	1	201	Ari
Hji 1019	A [Ba Bb]	02 29.2 +23 28	8.0, [10.2, 10.5]	323, [49]	3.6', [0.4"]	95	A5m	15385, 75398	0	202	Ari
30	Σ I 5	02 37.0 +24 39	6.5, 7.0	275	38"	41.8	F5V F7V	16246, 75471	1	203	Ari
Σ 287		02 39.0 +14 52	7.4, 9.6	73	6.8"	270	G5	16480, –	0	204	Ari
33	Σ 289	02 40.7 +27 04	5.3, 9.6	0	28"	71	A3V	16828, 75510	1	205	Ari
Σ 291	A B C	02 41.1 +18 48	7.7, 7.5, 9.5	117, 242	3.3", 65"	740	B9.5V	16694, 93052	0	206	Ari
β 306	A B	02 43.9 +25 38	6.4, 10.4	19	3.0"	104	A3V	16955, 75539	1	207	Ari
Σ 300		02 44.6 +29 28	7.9, 8.1	314	3.1"	92	F0IV	17007, 75544	0	208	Ari
Σ 305	A B	02 47.5 +19 22	7.5, 8.3	307	3.6"	33.6	G0V	17332, 93105	1	209	Ari
	Solar type binary; sparse field. Low quality orbit AB: P = 720 y, orbit r = 100 AU, slowly decreasing θ . (320 measures; 2012)										
★ 42 pi	Σ 311	02 49.3 +17 28	5.3, 8.0, 10.7	119, 112	3.2", 24"	240	B6V	17543, 93127	0	210	Ari

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
High mass (2)+1+1 spectroscopic and occultation quadruple; dark field. MSC system mass 8.7 M \odot . AC: ps = 7,770 AU. (2012)												
O Σ 46	A B C	02 50.0 +30 32	6.8, 10.8, 12.7	75, 169	4.5'', 20'	62	F0	17572, 55920	1	210	Ari	
Σ 326	A B	02 55.6 +26 52	7.7, 10.0	220	4.8''	23.5	G5	18143, 75644	0	212	Ari	
Local, high CPM solar type double; Y/O color, sparse or dark field, s.f. of 2 stars. There is both an orbit and linear solution, although AB: ps = 150 AU and CPM divergence is only 7% of 0.3''/y. (2012)												
β 525		02 58.9 +21 37	7.5, 7.5	272	0.6''	152	A3	18484, 75671	1	213	Ari	
\star eps	Σ 333	02 59.2 +21 20	5.2, 5.6, 12.7	209, 192	1.4'', 2.4'	102	A2V A2V	18519, 75673	0	214	Ari	
Matched A type 2+1 triple. AB: $P = 1,216$ y; orbit $r = 220$ AU, closing. (447 obs.) AC: ps = 14,700 AU. (2014)												
\star 52	O Σ 49	A B	03 00.5 +18 00	6.8, 9.9	50	2.3''	122	A0	18854, 93229	1	215	Ari
\star 52	Σ 346	A B C	03 05.4 +25 15	6.2, 6.2, 10.8	254, 358	0.4'', 5.1''	165	B7V	19134, 75723	0	216	Ari
High mass, visually tiny 2+1 triple. System mass 8.0 M \odot . AB: $P = 227$ y, orbit $r = 80$ AU, $e = 0.73$, widening to apastron 2052. (2009)												
Σ 376	Σ 375	A B	03 20.3 +19 44	8.3, 8.4	250	7.1''	123	A2V	20682, 93392	1	217	Ari
Σ 381	Tok 13	(Aa1Aa2Ab) B	03 20.4 +23 41	7.6, 9.9	316	2.7''	105	A7IV	20655, 75873	0	218	Ari
\star 52	Σ 381	A B	03 23.3 +20 58	7.6, 8.8	107	1.1''	30*	G5	20947, 75906	1	219	Ari
UX	Tok 13	(Aa1Aa2Ab) B	03 26.6 +28 43	6.6, 10.0	129	96''	52	G5IV	21242, 75927	0	220	Ari
Solar type (2+1)+1 quadruple, visual binary with RS CVn type variable (see Introduction). MSC gives 3.0 M \odot . Aa,Ab: $P = 12.4$ y, $e = 0.77$. AB: ps = 6,700 AU. (2001)												
\star 52	Σ 394	(AaAb) B	03 28.0 +20 28	7.1, 8.2	163	6.8''	140*	A3 G5	21437, 75940	1	221	Ari
A type (2)+1 triple, visual double; dark field. MSC system mass 6.6 M \odot . AB: ps = 1,280 AU. (2011)												
Auriga												
\star 4 ome	Σ 616	A B	04 59.3 +37 53	5.0, 8.2	4	4.7''	52	A1V	31647, 57548	0	222	Aur
A type double; the s.p. of two stars in very dark field. AB: ps = 330 AU. (2013)												
5	O Σ 92	(AaAb) B	05 00.3 +39 24	6.0, 9.5	284	4.1''	60	F5V	31761, 57559	1	223	Aur
9	H VI 35	(AaAb) B C	05 06.7 +51 36	5.0, 12.2, 10.0	82, 61	5.2'', 91''	26.3	F0V	32537, 25019	0	224	Aur
\star 52	O $\Sigma\Sigma$ 61	A B	05 09.7 +29 48	6.7, 8.5	245	68''	53	F8V	33185, 76989	1	225	Aur
\star 52	Σ 644	(AaAb) B	05 10.3 +37 18	7.0, 6.8	221	1.7''	490	B2II K3	33203, 57704	0	226	Aur
Distant, high mass (2)+1 spectroscopic triple; B supergiant with K companion; mixed, rich field. AB: ps = 1,120 AU. (2012)												
16	Σ 648	A B D	05 11.0 +32 02	8.1, 8.9, 13.4	59, 73	4.4'', 46''	42.4	G5	33334, 57719	1	227	Aur
16	O Σ 103	(AaAb) B	05 18.2 +33 22	4.8, 10.6	55	4.1''	71	K3.5III	34334, 57853	0	228	Aur
Solar type (2)+1 spectroscopic triple, visual binary with K giant. MSC gives 7.0 M \odot . Aa,Ab: $P = 1.2$ y, $e = 0.10$; AB: ps = 390 AU. (2002)												
Σ 684	Es 576	A [C D]	05 22.2 +45 05	7.7, 9.3	141	1.5''	670*	B8III	34788, 40280	1	229	Aur
Σ 698	A B	05 24.4 +42 37	8.1, [8.9, 9.8]	237, [89]	43'', [0.8'']	170*	A2	35101, 40311	0	230	Aur	
Σ 699	A B	05 25.2 +34 51	6.7, 8.3	350	31''	125	K2III	35295, 57999	1	231	Aur	
24 phi	β pm 79	A B	05 25.6 +38 03	7.9, 8.6	345	8.9''	310	A1V	35313, 58006	0	232	Aur
Σ 719	A B C	05 27.6 +34 29	5.2, 10.9	72	62''	139	K3III	35620, 58051	1	233	Aur	
O $\Sigma\Sigma$ 63	Σ 719	A B C	05 30.1 +29 33	7.5, 8.8, 9.4	335, 354	170	G5	36044, 77210	0	234	Aur	
Σ 711	A B	05 30.8 +39 50	6.5, 7.7	277	76''	175	G9III	36041, 58129	1	235	Aur	
High CPM, solar type double; Y/− color. The pair Ca,Cb (m.12) 3' s.p. and m.12 double 3' p. are unrelated. AB: ps = 420 AU. (2007)												
Σ 718	A B	05 32.3 +49 24	7.5, 7.5	73	7.7''	83	F5	36146, 40400	1	237	Aur	
Σ 736		05 37.1 +41 50	7.5, 8.6	0	2.6''	44.2	F8	36929, 40485	0	238	Aur	

Charts 3, 7, 8

★ 26	Σ 753	(AB) C	05 38.6+30 30	5.5, 8.4	269	12"	174	G8III A1V	37269, 58280	1	239	Aur	
OΣ 112		A type (2)+1 triple with G giant; sparse field. MSC gives 7.4 M☉. AB: P = 53 y, e = 0.65. AC: P = ~46,000 y, ps = 2,820 AU. (2010)											
		05 39.9+37 57	7.9, 8.2	47	0.9"	280*	B9	37384, 58301	0	240	Aur		
High mass double; O/- color. Spectroscopic parallax suggests ps = 340 AU. Tiny SEI 367 (m.11, 12") 5' f. (2012)													
Eng 22		A B	05 41.3+53 29	6.3, 9.8	69	100"	12.3	K1V M0.5V	37394, 25319	1	241	Aur	
★ 37 the	Σ 768	Local, high CPM, low mass double; YO/- primary, wide m.11 pair 9' f. in dark field. AB: ps = 1,660 AU, near 100% probability pair is physical. (2011)											
	β 560		05 43.3+41 07	7.5, 10.3	221	19"	230	B8	37841, 40560	0	242	Aur	
	Σ 117		05 47.4+29 39	7.8, 8.2	125	1.7"	80	F8	38491, 77555	1	243	Aur	
	Σ 796		05 48.2+30 32	7.1, 10.0	32	11"	280	K5	38583, 58451	0	244	Aur	
	Σ 799		05 49.9+31 47	7.2, 8.2	62	3.7"	168	A3	38819, 58484	1	245	Aur	
	β 1053		05 52.2+38 34	7.3, 8.3	162	0.8"	210	B8	39114, 58520	0	246	Aur	
	Σ 545		05 53.5+37 20	6.9, 8.8	359	1.9"	69	F5	39315, 58535	1	247	Aur	
	Σ 545		05 59.7+37 13	2.6, 7.2	306	4.1"	51	A0	40312, 58636	0	248	Aur	
	Lep 22		Mahasim. A type double with alp2 CVn type variable; faint rich field. AB: ps = 280 AU. (2013)										
	OΣ 128		A [B C]	06 04.5+44 16	6.7, [9.1, 12.0]	290, [38]	3.2', [3.9"]	33.1	F8+K5	40979, 40830	1	249	Aur
★ 41	Σ 131		A [B C]	06 04.5+51 34	6.4, [9.6, 10.6]	14, [309]	40", [0.6"]	135	A7III	40873, 25548	0	250	Aur
	Σ 132		06 07.4+36 16	7.0, 9.5	277	1.5"	300	B9II	41523, 58762	1	251	Aur	
	Webb 5		06 08.2+37 59	7.2, 9.6	332	1.8"	185	A2V	41637, 58776	0	252	Aur	
	Σ 845		06 09.7+43 08	7.1, 9.2	216	44"	260	A0	41847, 40898	1	253	Aur	
	Σ 862		06 11.6+48 43	6.2, 6.9	359	7.5"	102	A1V A6V	42127, 40925	0	254	Aur	
	Σ 872		Splendid A type matched double; W/W color, rich field. System mass ~4.9 M☉. AB: ps = 1,030 AU. (2012)										
	Σ 888		06 12.1+29 30	7.6, 10.8	339	6.6"	560	G2Ib	42454, 78095	1	255	Aur	
	Σ 918		06 15.7+36 09	6.9, 7.4	216	11"	54	F4IV	43017, 58906	0	256	Aur	
	OΣ 147		(AB) C	06 20.0+28 26	7.5, 9.6	263	2.9'	133	A6V	43885, 78233	1	257	Aur
	Σ 928		A type (2)+1 triple, visual binary. MSC system mass 6.1 M☉. AB: P = 104 y, e = 0.05; apastron 2061. AC: ps = 520 AU. (2008)										
54	Σ 929		A B	06 34.0+52 28	7.3, 8.2	334	4.8"	A3	46048, 25811	0	258	Aur	
	Σ 941		A B [C D]	06 34.3+38 05	6.8, 8.7, [10.6, 11.0]	75, 120, [109]	43", 46", [0.5"]	290	K0	46296, 59230	1	259	Aur
	OΣ 152		A B	06 34.7+38 32	7.9, 8.6	131	3.5"	189	F5	46359, 59239	0	260	Aur
	Es 586		A B	06 35.4+37 43	7.4, 8.4	24	5.9"	184	G5	46482, 59259	1	261	Aur
	Boötes		A B	06 38.7+41 35	7.3, 8.2	82	1.9"	340	B9	47046, 41232	0	262	Aur
	Σ 1772		Distant, high mass double; CPM pair Σ 933 (m.8, 26') 30" s. AB: ps = 870 AU. (2012)										
	Σ 1785		A B	06 39.6+28 16	6.2, 7.9	36	0.9"	260	B7III	47395, 78593	1	263	Aur
	S 656		07 30.3+41 36	7.8, 11.2	22	14"	24*	K0	59083, 41819	0	264	Aur	
	Σ 1793		Boötes										
	Σ 1793		A B D	13 40.7+19 57	5.8, 9.6, 7.4	133, 1	4.5', 3.5'	101	A1V	119055, 82942	1	265	Boo
Σ 1793	β 115		A B	13 45.3+09 03	7.5, 10.4	257	1.6"	55	G5	119825, 120096	0	266	Boo
	Σ 1785		13 49.1+26 59	7.4, 8.2	183	3.0'	13.4	K4V K6V	120476, 83011	1	267	Boo	
	S 656		13 50.4+21 17	6.9, 7.4	208	87"	106	G0	120651, 83022	0	268	Boo	
Σ 1793		13 59.1+25 49	7.5, 8.4	243	4.7"	154	A5V	122080, 83108	1	269	Boo		

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★ 17 kap 1,2	Bgh 50		14 04.8 +25 49	7.0, 8.9	32	99"	44.0	F5 K0	123033, 83152	0	270	Boo
	Σ 1812	(AB) C D	14 12.4 +28 43	7.9, 9.5, 12.1	108, 154	14", 72"	130*	F2V	124346, 83219	1	271	Boo
	Σ 1821	A (BaBb)	14 13.5 +51 47	4.5, 6.6	234	14"	50	A8IV F1V	124675, 29046	0	272	Boo
★ 21 iot	Asellus Tertius. Radiant A/solar type 1+(2) binary with del Sct type variable (A/F type, imperceptibly and rapidly pulsating star); sparse field. AB: $P = 6,100$ y, orbit $r = 565$ AU; at cusp of edgewise orbit. Long period spectroscopic binary Ba,Bb; $P = 4.9$ y. (2014)											
	OS 279		14 13.8 +12 00	6.8, 9.1	255	2.2"	171	K2III	124517, 100922	1	273	Boo
	Σ 1816		14 13.9 +29 06	7.4, 7.8	96	0.4"	113	F0 A2	124587, 83235	0	274	Boo
15	Mixed A/solar type binary; brighter of two stars in dark field. AB: $P = 1,340$ y (?), orbit $r = 185$ AU, closing. (222 measures; 2011)											
	Kui 66		14 14.8 +10 06	5.4, 8.4	108	1.0"	81	K1III	124679, 100934	1	275	Boo
	Σ 1829		14 15.5 +50 26	8.1, 8.6	151	5.6"	161	F5	125020, 29061	0	276	Boo
★ 21 iot	Σ I 26	(AaAb) B	14 16.2 +51 22	4.8, 7.4	32	39"	29.1	A7IV K0V	125161, 29071	1	277	Boo
Σ 1825	Asellus Secundus. A type (2)+1 spectroscopic triple with del Sct type variable; kap 1,2 Boo 30' n.p. Aa,Ab: $P = 0.6$ d. AB: ps = 1,530 AU. (2014)											
			14 16.5 +20 07	6.5, 8.4	154	4.3"	32.6	F6V	125040, 83259	0	278	Boo
	OS 281		14 20.3 +08 35	7.7, 9.7	166	1.5"	51	G5	125608, 120406	1	279	Boo
Σ 1834	Matched solar type binary, sparse field. AB: $P = 376$ y, orbit $r = 75$ AU, $e = 0.89$, apastron 2091. (240 measures; 2012)											
			14 20.3 +48 30	8.1, 8.3	109	1.8"	75	F9V	125796, 45000	0	280	Boo
	★ Σ 1835	A (BC)	14 23.4 +08 27	5.0, 6.8	195	6.1"	66	A0V F2V	126129, 120426	1	281	Boo
Σ 1838	Mixed A/solar type 1+(2) triple, visual binary; system mass $\sim 2.7 M_{\odot}$. BC (β 1111): $P = 40$ y, $e = 0.25$, apastron 2018; AC: ps = 540 AU. (2013)											
			14 24.1 +11 15	7.5, 7.7	334	9.4"	37.1	F8V G1V	126246, 101009	0	282	Boo
	Σ 1843	A B	14 24.6 +47 50	7.7, 9.2	186	20"	92	F4V	126531, 45045	1	283	Boo
23 the	OS 580		14 25.2 +51 51	4.1, 11.5	182	70"	14.5	F7V	126860, 29137	0	284	Boo
		Asellus Primus. Local, high CPM, solar type double with unequal ($q \sim 0.2$) del Sct type variable; dark field. AB: ps = 1,370 AU. (2003)								0	284	Boo
	Σ 1850		14 28.6 +28 17	7.1, 7.6	260	26"	350	A1V A1V	127067, 83374	1	285	Boo
★	Σ 1854	A B	14 29.8 +31 47	6.1, 10.6	256	26"	110	A0V	127304, 64178	0	286	Boo
	Σ 1858	A B	14 33.6 +35 35	8.1, 9.0	38	3.0"	36.8	G5	128041, 64213	1	287	Boo
	Σ 1863		14 38.0 +51 35	7.7, 7.8	62	0.7"	82	F4V	128941, 29224	0	288	Boo
★ 29 pi 1	Matched solar type binary; galaxy NGC 5707 5' p. AB: $P = 538$ y, orbit $r = 90$ AU, widening. (202 measures; 2013)											
	Σ 1864	(AaAb) (BaBb)	14 40.7 +16 25	4.9, 5.8	111	5.5"	94	B9V A6V	129174, 101138	1	289	Boo
	High mass (2)+(2) spectroscopic quadruple, visual double; W/W color, pretty brightness contrast, discovered by C. Mayer (1777) and first measured by W. Herschel (1779). AB: ps = 700 AU. (372 measures; 2013)											
★ 30 zet	Σ 1865	A B	14 41.1 +13 44	4.5, 4.6	297	0.5"	54	A0V A0V	129246, 101145	0	290	Boo
		Matched A type binary; splendid W/W color, subarcsecond resolution test. System mass $\sim 5.6 M_{\odot}$. AB: $P = 124$ y, orbit $r = 32$ AU, $e = 0.998$ (highest known eccentricity), closing to less than 0.4" by 2017. (743 measures; 2012)								0	290	Boo
	Σ 1871		14 41.6 +51 24	8.0, 8.1	310	1.8"	99	F3V	129600, 29246	1	291	Boo
★ 36 eps	Σ 1870		14 42.9 +08 05	7.5, 10.0	231	4.8"	198	F2	129538, 120618	0	292	Boo
	Σ 1873		14 44.8 +07 42	8.0, 8.4	93	6.4"	230	G5III	129868, 120635	1	293	Boo
	Σ 1877	A (BaBb)	14 45.0 +27 04	2.6, 4.8	343	2.9"	62	K0II	129989, 83500	0	294	Boo
OS 285	Izar. F.W. von Struve's Pulcherrima ("most beautiful"), discovered by W. Herschel (1779) and admired for its O/B color. A "giant type" 1+(2) triple with K supergiant primary and spectroscopic binary component; despite AB: ps = 240 AU and a noticeable arc in the measures, there is no orbit. (455 measures; 2012)											
		A B C	14 45.5 +42 23	7.8, 8.7, 12.4	86, 288	0.5", 55"	84	F6V	130188, 45208	1	295	Boo
	Solar type 2+1 triple; MSC gives 3.1 M_{\odot} . AB: $P = 88$ y, orbit $r = 27$ AU, apastron 2016 (273 measures); AC: ps = 6,230 AU. (2011)											
Σ 1879	A B C		14 46.3 +09 39	7.8, 8.5, 12.1	82, 233	1.8", 38"	43.2	G2V	130145, 120651	0	296	Boo

Solar type 2+1 triple; sparse field. AB: $P = 226$ y, orbit $r = 43$ AU, $e = 0.70$, periastron 2119, (308 measures; 2013)											
Σ 1884		14 48.4 +24 22	6.6, 7.5	54	2.0"	85	F8IV	130603, 83535	1	296	Boo
A 1110	A B C	14 49.7 +07 59	7.7, 7.9, 12.0	244, 201	0.7'', 20''	132	F5 F8III	130726, 120683	0	298	Boo
Σ 1886	A B	14 51.0 +09 43	7.6, 9.7	225	7.4''	29.4	K0	131023, 120697	1	299	Boo
A B	A B	14 51.4 +19 06	4.8, 7.0	306	5.7''	6.71	G8V K5V	131156, 101250	0	300	Boo
Local, solar type binary with BY Dra type variable; Y/O color. AB: $P = 152$ y, orbit $r = 33$ AU, periastron 2061. (1414 measures; 2013)											
Σ 288		14 53.4 +15 42	6.9, 7.6	160	1.0''	47.6	F9V	131473, 101273	1	301	Boo
Solar type binary; dark field. AB: $P = 313$ y, orbit $r = 65$ AU, closing. (399 measures; 2013)											
Σ 289		14 56.0 +32 18	6.2, 10.2	110	4.6''	96	A2V	132029, 64408	0	302	Boo
Sh 191		14 59.6 +53 52	6.9, 7.6	342	40''	118	F1V F1V	132909, 29372	1	303	Boo
BX Σ 291		15 00.6 +47 17	6.3, 9.6	156	35''	170	B9	133029, 45326	0	304	Boo
★ 44 i Σ 1909	A (BaBb)	15 03.8 +47 39	5.2, 6.1	63	1.2''	12.5	F7V K4V	133640, 45357	1	305	Boo
Local, high CPM, solar type 1+(2) spectroscopic triple; B is a W UMa type eclipsing variable (see Introduction). AB: $P = 225$ y, orbit $r = 46$ AU, $e = 0.51$ (805 measures). Ba,Bb: $P = 0.27$ d. (2013)											
Σ 1910		15 07.5 +09 14	7.4, 7.5	211	3.9''	31.6	G2V G3V	134066, —	0	306	Boo
Es 2648	A C B	15 12.7 +48 35	7.3, 10.8, 11.3	310, 341	0.7'', 27''	154	K0	135364, 45436	1	307	Boo
49 del Σ 127	A B	15 15.5 +33 19	3.6, 7.9	79	105''	37.3	G8IIICN	135722, 64589	0	308	Boo
★ 51 mu Σ 128	(AaAb) [Ba Bb]	15 24.5 +37 23	4.3, [7.1, 7.6]	171, [5]	109'', [2.3'']	34.7	F2IVa G0V	137391, 64686	1	309	Boo
Alkalurrops. Splendid, bright (2)+2 quadruple; visual triple. MSC system mass 5.2 M_{\odot} . Aa,Ab: $P = 0.82$ y, $e = 0.27$; Ba,Bb: $P = 257$ y, orbit $r = 50$ AU, $e = 0.58$, periastron 2120. (2013)											
Σ 296	A B	15 26.4 +44 00	7.8, 9.1	274	2.1''	88	G5	137805, 45541	0	310	Boo
Ku 108	A [B C]	15 27.7 +42 53	7.6, [9.7, 11.0]	319, [100]	41'', [0.4'']	32.1	G5	138004, 45551	1	311	Boo
★ Σ 298	A B C	15 36.0 +39 48	7.2, 8.4, 7.8	183, 328	1.2'', 2.0''	22.3	K1V K3V	139341, 64800	0	312	Boo
Local, high CPM, solar type 2+1 triple; mass 2.3 M_{\odot} . AB: $P = 56$ y, orbit $r = 18$ AU, $e = 0.59$, apastron 2021. (532 measures; 2013)											
Σ 301		15 46.2 +42 28	7.5, 10.4	29	3.7''	220	K0	141204, 45718	1	313	Boo
Caelum											
I 271		04 21.8 –42 47	7.8, 10.4	143	2.5''	250	K1III	27843, 216764	0	314	Cae
h 3650		04 26.6 –40 32	7.0, 8.2	184	3.0''	127	A1V	28358, 216803	1	315	Cae
★ Skf 811	A (BC)	04 49.2 –42 23	7.3, 7.3	134	2.5''	166	A3V+A2F2	30848, 217012	0	316	Cae
High mass, wide 1+2 triple or visual double; sparse field, unrelated m.9 star 1' n. AB: ps = 22,900 AU. (2010)											
Bvd 48	A B C	04 51.9 –34 14	6.8, 8.7, 8.9	160, 309	52'', 100''	59	F6IV+G5	31142, 195364	1	317	Cae
Jc 9		05 04.4 –35 29	4.7, 8.2	305	3.2''	56	K3III	32831, 195532	0	318	Cae
Double with K type giant; pretty color contrast with giant FIII gam 2 Cae 15' s. AB: ps = 240 AU. (2001)											
Camelopardalis											
Σ 52	A B	03 17.5 +65 40	7.1, 7.4	58	0.5''	169	A2V	20104, 12686	1	319	Cam
A type binary, subarcsecond resolution test. Low quality orbit, AB: $P = 350$ y, orbit $r = 80$ AU, decreasing i . (2010)											
Σ 373	A B C	03 22.1 +62 44	7.7, 10.0, 7.8	118, 112	20'', 116''	123	F8	20588, 12721	0	320	Cam
Σ 374		03 24.2 +67 27	7.8, 9.0	297	11''	178	F8	20711, 12738	1	321	Cam
Σ 384	A B C	03 28.5 +59 54	8.1, 8.9, 10.6	272, 342	1.9'', 117''	760	F8	21224, —	0	322	Cam
Distant, solar type 2+1 triple; O/B color. Rich field with HLM 2 (m.9, 5'') and CS Cam (Σ 385, m.4, 2'') 5' n.f. (2007)											
Σ 385		03 29.1 +59 56	4.2, 7.8	162	2.3''	600	B9Ia	21291, 24054	1	323	Cam

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation	
Σ 389	Σ 396	Σ 400	(AaAb) B	03 30.2 +59 22	6.4, 7.9	71	2.7"	95	A2V	21427, 24062	0	324	Cam
			A B	03 33.5 +58 46	6.4, 7.7	245	20"	155	A4III	21769, 24093	1	325	Cam
			A B	03 35.0 +60 02	6.8, 8.0	267	1.6"	53	F3V	21903, 24111	0	326	Cam
Solar type "diamond ring" binary; Y/− color. System mass 3.0 M \odot . AB: $P = 288$ y, orbit $r = 65$ AU, $e = 0.67$, apastron 2061. (2012)													
$O\Sigma$ 36	A (BC)	03 40.0 +63 52	6.9, 8.3	71	46"	42.5	F5V G8V	22399, 12854	1	327	Cam		
Σ 419	A [B C]	03 42.8 +69 51	7.8, [7.8, 9.4]	72, [112]	3.0", [0.4"]	310	A5IV	22553, 12873	0	328	Cam		
Σ 421	03 46.2 +71 37	7.1, 10.7	237	12"	183	G9III	22912, 4984	1	329	Cam			
S 436	03 49.3 +57 07	6.5, 7.2	76	58"	149	A0Vn	23594, 24244	0	330	Cam			
gam	h 2200	h 1139	A C	03 50.4 +71 20	4.6, 9.1	86	107"	110	A2IVn	23401, 5006	1	331	Cam
			03 51.7 +70 30	7.5, 9.6	177	48"	148	A3	23602, 5015	0	332	Cam	
			03 57.1 +61 07	5.3, 8.1	49	1.7"	450	K3I	24480, 12968	1	333	Cam	
$O\Sigma$ 67	03 57.1 +61 07	5.3, 8.1	49	1.7"	450	K3I	24480, 12968	1	333	Cam			
Σ 511	04 17.9 +58 47	7.4, 8.7	77	0.5"	126	A2V	26839, 24521	0	334	Cam			
A type binary; pretty field. System mass 3.0 M \odot . AB: $P = 343$ y, orbit $r = 70$ AU, $e = 0.31$, slowly widening. (2010)													
Skf 1204	04 20.0 +78 05	7.1, 10.0	100	80"	250	K0+F	26415, 5153	1	335	Cam			
Arg 100	(AB) C	04 23.0 +59 37	6.2, 9.3	58	33"	142	A4V	27402, 24577	0	336	Cam		
Σ 531	04 26.8 +55 39	7.7, 8.8	324	1.0"	159	F4IV	27856, 24614	1	337	Cam			
\star 1	Σ 550	04 32.0 +53 55	5.8, 6.8	308	11"	1430*	B0III+B0IV	28446, 24672	0	338	Cam		
	DL Cam. Distant, high mass double with bet Cep type variable; notable color, rich field. AB: ps = 15,700 AU. (2012)												
Opi 5	A C	04 38.1 +71 28	7.7, 8.5	279	112"	185	A2	28760, 5263	1	339	Cam		
\star 2	Σ 566	(AB) C D	04 40.0 +53 28	5.6, 7.5, 13.2	174, 224	0.8", 21"	44.5	A8V	29316, 24744	0	340	Cam	
	A type (2)+2 quadruple, visual triple. AB: $P = 27$ y, $e = 0.86$, periastron 2015; AB,C: $P = 480$ y, orbit $r = 65$ AU. (2009)												
Hu 612	04 47.8 +53 18	7.1, 8.5	359	0.7"	127	F2	30136, 24830	1	341	Cam			
Solar type binary; sparse field. AB: $P = 310$ y, orbit $r = 64$ AU, widening to apastron. (2007)													
Σ 584	04 50.1 +66 32	7.6, 9.4	122	12"	250	K0	30164, 13278	0	342	Cam			
7	Σ 610	(AaAb) B C	04 57.3 +53 45	4.5, 7.9, 11.3	202, 242	0.6", 26"	114	A1V	31278, 24929	1	343	Cam	
$O\Sigma$ 88	04 57.3 +61 45	7.2, 8.3	307	0.8"	240	G0	31151, 13317	0	344	Cam			
Σ 618	A B	05 03.6 +63 05	7.7, 8.0	211	33"	32.2	G0	31865, 13348	1	345	Cam		
High CPM solar type double; AB: ps = 1,430 AU. CPM double Σ 617 (DE, m.9, 13") 5' south is unrelated. (2003)													
β 749	05 07.5 +55 32	7.5, 9.2	241	1.3"	142	F8	32606, 25029	0	346	Cam			
\star	A 841	A [B C]	05 10.0 +75 41	7.3, [10.1, 10.9]	343, [228]	48", [0.6"]	149	A2III	32230, 5442	1	347	Cam	
	1+2 triple with A type giant; sparse field, large aperture needed to resolve BC. AB: ps = 9,650 AU. (2004)												
Σ 633	05 10.7 +63 36	6.8, 10.6	342	12"	86	F0	32893, 13394	0	348	Cam			
Σ 638	05 14.3 +69 49	7.5, 9.1	222	5.1"	103	K1IV	33164, 13412	1	349	Cam			
Σ 677	A B C	05 24.7 +63 23	7.9, 8.5, 13.0	118, 227	1.1", 6.8"	47.2	G0	34839, 13482	0	350	Cam		
Solar type 2+1 triple; YO/− color. AB: $P = 362$ y, orbit $r = 70$ AU, decreasing θ . (2012)													
Σ 676	05 24.8 +64 44	8.1, 8.9	268	1.3"	200	F8	34804, 13481	1	351	Cam			
19	Hu 1107	05 37.3 +64 09	6.2, 9.8	56	1.5"	111	A0V	36570, 13550	0	352	Cam		
Σ 3115	05 49.1 +62 48	6.6, 7.5	338	0.8"	123	A4V	38284, 13618	1	353	Cam			
A type binary; small star group δ' s. and s.p. AB: $P = 977$ y, orbit $r = 165$ AU; decreasing θ . (2008)													
Σ 780	A B C	05 51.0 +65 45	7.0, 8.2, 10.2	104, 148	3.8", 12"	980	F8	38475, 13627	0	354	Cam		

Σ 922	A B	06 38.3 +64 44	7.7, 10.8	137	11"	78	F4V	46463, 13901	1	355	Cam
Mlr 318		06 42.5 +66 12	7.3, 9.3	308	1.7"	70	F8	47215, 13929	0	356	Cam
Σ 973	A B	07 04.1 +75 14	7.2, 8.2	32	13"	35.7	G0	51067, 6050	1	357	Cam
Hrg 4		07 19.1 +66 44	7.8, 11.8	35	8.5"	53	F8	55745, 14145	0	358	Cam
Σ 1051	A B C	07 26.6 +73 05	7.6, 9.1, 7.8	297, 84	1.1", 32"	146	F2IV F0IV	57044, 6187	1	359	Cam
Es 1895		07 31.6 +62 30	7.0, 10.7	289	9.9"	159	A0	58917, 14221	0	360	Cam
Σ 1122		07 45.9 +65 09	7.8, 7.8	186	15"	70	F2	61907, 14311	1	361	Cam
Σ 1127	A B C	07 47.0 +64 03	7.0, 8.5, 9.7	341, 176	5.3", 13"	182	A2	62195, 14326	0	362	Cam
OΣ 188		08 22.2 +74 49	6.5, 10.5	195	10"	143	G8III G0V	69054, 6511	1	363	Cam
Σ 1625	A B	12 16.2 +80 08	7.2, 7.8	219	15"	500	F1V F3V	106799, 2009	0	364	Cam
★ Σ 1694	A (BaBb)	12 49.2 +83 25	5.3, 5.7	324	21"	179	A1IIIh A0V+A2V	112028, 2102	1	365	Cam
Radiant, nearly matched 1+(2) spectroscopic triple, visual double with A type giant; dark field. AB: ps = 5,070 AU. (2011)											
OΣ 258		12 54.2 +82 31	7.3, 10.6	71	10"	167	K0	112651, 2112	0	366	Cam
Cancer	Cnc	Charts 8, 15									
Skf 1808		07 55.8 +10 27	7.0, 8.9	273	76"	300	B9+F2	64745, 97378	1	367	Cnc
Σ 1171		08 01.0 +23 35	6.5, 10.0	326	2.1"	88	K1III	65757, 79864	0	368	Cnc
OΣ 186		08 03.3 +26 16	7.7, 7.9	74	1.0"	188	A4V	66176, 79893	1	369	Cnc
Σ 1177		08 05.6 +27 32	6.7, 7.4	350	3.5"	290	B9V	66684, 79928	0	370	Cnc
Σ 1187	(AaAb) B	08 09.5 +32 13	7.2, 8.0	21	3.0"	65	F2	67501, 60604	1	371	Cnc
Solar type (2)+1 triple; visual double. MSC system mass 2.9 M _☉ . AB: ps = 260 AU. (203 measures; 2012)											
Wrh 27	(AaAb) B	08 09.7 +25 34	7.6, 10.7	97	29"	650		67613, 79987	0	372	Cnc
★ 16 zet 1,2 Σ 1196	A B (CDaDb)	08 12.2 +17 39	5.3, 6.3, 5.9	28, 64	1.1", 6.6"	25.1	F8V	68255, 97645	1	373	Cnc
Tegmine. Local, high mass 2+(1+2) quintuple, visual triple. One of the finest visual triple stars in the sky, compact and nearly matched. AC first noted by Flamsteed (1680), AB by W. Herschel (1781); D detected astrometrically by O. Struve (1874); Da, Db reported as an M dwarf binary by Hutchings <i>et al.</i> (2000). MSC system mass 11.7 M _☉ . Orbits retrograde, viewed nearly face on, but inclinations differ by 28°. AB: P = 60 y, orbit r = 22 AU, e = 0.32, apastron 2018; AC: P = 1,115 y, orbit r = 190 AU, CD: P = 17.3 y, orbit r = 4.6 AU, e = 0.08, periastron 2018. (1155 measures; 2013) See Figure 1.											
Σ 1202		08 13.6 +10 51	7.4, 9.6	306	2.7"	77	F7V	68615, 97662	0	374	Cnc
Lep 30		08 15.6 +11 26	7.7, 9.8	238	32"	38.6	G5	69056, 97681	1	375	Cnc
High CPM, solar type double; star n.f. unrelated. AB: ps = 1,670 AU. (2009)											
Ho 524	Aa Ab B	08 16.0 +18 42	7.5, 7.5, 10.5	34, 343	0.4", 4.4"	185	K0	69072, 97684	0	376	Cnc
OΣ 191		08 24.8 +20 09	7.4, 8.6	192	38"	188	A5	70826, 80164	1	377	Cnc
24 ups Σ 1224	A (BC)	08 26.7 +24 32	6.9, 7.5	47	6.1"	80	F0V F7V	71153, 80184	0	378	Cnc
Solar type 1+(2) triple, visual binary. AB: ps = 660 AU; BC: P = 22 y, orbit r = 12 AU, e = 0.08, periastron 2020. (253 measures; 2013)											
Σ 1245	(AaAb) (BaBb)	08 35.9 +06 37	6.0, 7.2	25	9.8"	25.1	F8V G5V	72945, 116929	1	379	Cnc
Local, solar type (2)+(2) quadruple, visual double; sparse field. MSC system mass 3.2 M _☉ . AB: ps = 330 AU. (2013)											
OΣΣ 94		08 36.2 +13 47	7.4, 8.1	133	43"	300	A0	72965, 97952	0	380	Cnc
S 570	A B C	08 39.1 +19 41	7.5, 9.6, 9.4	84, 345	58", 3.0"	100*	A8V	73449, 97999	1	381	Cnc
S 571	(AB) (CaCb) (DaDb) E	08 39.9 +19 33	7.3, 7.5, 6.7, 11.8	157, 242, 3	45", 93", 35"	180*	Am K0III	73618, 98013	0	382	Cnc
Striking, A type (2)+(2)+(2)+1 CPM and spectroscopic septuple system, visual quadruple; in NGC 2632 (Praesepe), Σ 1254 9' n.f. Neglected. (1999)											
39 Eng 37	A (BaBb) D (CaCb)	08 40.1 +20 00	6.5, 6.6, 8.8, 9.0	152, 111, 309	2.5", 2.3', 2.2'	187	K0III	73665, 80333	1	383	Cnc
Fragile, possibly unstable 1+(2)+(1+2) CPM sextuple with K giant, in NGC 2632 (Praesepe). AC: ps = 37,600 AU. (2013)											
									1	383	Cnc

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★	★ 1254	(AaAb) (BaBb) C D E	08 40.4 +19 40	6.5, 10.4, 7.6, 9.2, 12.5	54, 343, 44, 154	21", 63", 83", 16.2"	220	K0III G9III	73710, 98021	0	384	Cnc
		Another fragile CPM septuple with K giant Algol type variable, at north edge of NGC 2632 (Praesepe). AD: ps = 24,600 AU. (2012)								0	384	Cnc
41 eps	S 574		08 40.5 +19 33	6.3, 7.5	250	2.2'	180	A5m	73731, 98024	1	385	Cnc
	Cbl 32		08 46.2 +27 36	7.4, 10.7	174	41"	99	K1IV	74669, 80409	0	386	Cnc
★ 48 iot	Σ 1288		08 46.7 +28 46	4.1, 6.0	305	31"	102	G7.5III A3V	74739, 80416	1	387	Cnc
	Σ 1276	Wide CPM double with late G type giant; YO/B color, discovered by C. Mayer (1779). AB: ps = 4,270 AU. (2013)				12"	980	A0	74926, 98120	0	388	Cnc
	Σ 1283	A B	08 47.2 +11 10	8.3, 8.6	354							
	Σ 1283		08 49.9 +14 50	7.7, 8.5	123	17"	440	F0	75355, 98148	1	389	Cnc
OΣ 195			08 54.0 +08 25	7.7, 8.3	139	9.8"	56*	F8	76037, 117244	0	390	Cnc
Σ 1291		A B C	08 54.2 +30 35	6.1, 6.4, 9.2	311, 202	1.5", 55"	141	G7III	75959, 61125	1	391	Cnc
		Probable solar type double with G giant; AC: ps = 10,460 AU. (274 measures; 2013)								1	391	Cnc
64 sig 3	Sh 100	A B C	08 59.5 +32 25	5.3, 9.0, 10.1	294, 217	90', 2.6'	91	G8III	76813, 61177	0	392	Cnc
66	Σ 1298	A B	09 01.4 +32 15	6.0, 8.6	139	4.1"	143	A2V	77104, 61202	1	393	Cnc
	Σ 1311	A B	09 07.5 +22 59	6.9, 7.1	198	7.9"	58	F4V+F5V	78175, 80643	0	394	Cnc
OΣΣ 97			09 08.5 +27 33	8.3, 8.3	238	52"	42.6	G0V	—, 80055	1	395	Cnc
Σ 1322			09 12.7 +16 32	8.3, 8.7	53	1.7"	300*	A4IV	79127, 98430	0	396	Cnc
Σ 1332			09 17.3 +23 39	7.9, 8.1	29	5.8"	71	F6V F7V	79872, 80738	1	397	Cnc
IP	Σ 3121	A B	09 17.9 +28 34	7.9, 8.0	219	0.4"	17.3	K0	79969, 80745	0	398	Cnc
		Local, high CPM, low mass binary; AB: P = 34 y, orbit r = 12 AU, e = 0.32; less than 0.2" at periastron (2015), but widening to 0.5" by 2018. (403 measures; 2010)								0	398	Cnc

Chart 9

Canes Venatici CVn

Σ 1606	(AaAb) B	12 10.8 +39 53	7.4, 7.9	151	0.5"	120	A8III	105824, 44064	1	399	CVn
A type (2)+1 triple with rare A giant, visual binary; galaxy NGC 4145 9' p. MSC system mass 4.5 M \odot . Aa,Ab: P = 75y, e = 0.37, periastron 2030; AB: P = 1,431 y, orbit r = 240 AU, e = 0.78, widening. (258 measures; 2012)											
Σ 1609	A B	12 11.7 +50 50	8.0, 9.6	204	11"	185	F2	105980, 28290	0	400	CVn
Σ 1624	A B	12 16.7 +39 36	7.3, 10.2	153	5.9"	109	A2.5V	106784, 62930	1	401	CVn
Σ 1632		12 20.2 +37 54	6.8, 10.0	193	11"	165	K0III F9V	107341, 62953	0	402	CVn
★ 12 alp 1,2	(AaAb) (BaBb)	12 56.0 +38 19	2.9, 5.5	228	19"	35.2	F2V A0pec	112413, 63257	1	403	CVn
Cor Caroli. Fine solar/A type (2)+(2) spectroscopic quadruple, visual double; resolved in all apertures with a subtle color contrast that varies with observer. Parallax equal within errors and CPM unite the pair. B is prototype of alpha2 CVn variables: mostly A type stars with silicon and rare earth absorption lines, strong magnetic fields and surface light fluctuations. AB: ps = 900 AU. (2014)											
Σ 1723		13 08.2 +38 44	8.7, 10.1	11	6.4"	73	G2IV	114146, 63362	0	404	CVn
0Σ 261		13 12.0 +32 05	7.4, 7.6	339	2.6"	73	F6V	114723, 63396	1	405	CVn
Solar type matched binary; snug in small apertures, dark field. AB: P = 861 y, orbit r = 130 AU. (249 measures; 2013)											
★ 25	Σ 1768	13 37.5 +36 18	5.0, 7.0	96	1.7"	61	A7IV	118623, 63648	0	406	CVn
A type binary; YWJ/- color. System mass 4.6 M \odot . AB: P = 228 y, orbit r = 60 AU, e = 0.80, periastron 2092. (486 measures; 2013)											
Σ 1769	(AaAb) B C	13 38.0 +39 11	7.9, 10.4, 9.3	45, 259	1.6", 56"	46.0	G5	118742, 63656	1	407	CVn
Solar type (2)+1+1 quadruple; linear solution for AB but no CPM discrepancy. Aa,Ab: P = 11.6 d. AC: ps = 3,480 AU. (2013)											
S 654	A B	13 47.0 +38 33	5.6, 8.9	239	72"	97	K0III F8V	120164, 63739	0	408	CVn

Canis Major		CMa	Chart 22									
B 104			06 12.3 –25 15	8.0, 8.8	184	1.1"	113	F0	42899, 171379	1	409	CMa
Skf 58		A (BaBb) C Local, solar type 1+(2)+1 quadruple with BY Dra type variable; pretty field. A(B): ps = 560 AU. AC: ps = 3650 AU. (2010)	06 13.8 –23 52	6.5, 12.5, 13.0	177, 171	25", 2.7"	16.7	G6.5V	43162, 171428	0	410	CMa
			06 16.7 –12 03	7.1, 8.4	285	1.8"	162	F2V	43628, 151303	1	411	CMa
B 110			06 17.6 –24 27	7.6, 11.5	48	6.8"	64	F3V	43879, 171521	0	412	CMa
FR Σ 3116		A B	06 21.4 –11 46	5.6, 9.7	23	3.9"	340	B1Ve B9V	44458, 151401	1	413	CMa
β 568			06 23.8 –19 47	6.9, 8.2	153	0.8"	410	B8III	44953, 151453	0	414	CMa
β 753			06 28.7 –32 22	5.9, 7.6	43	1.2"	260	B4Vne	45871, 196861	1	415	CMa
h 3863			06 29.4 –22 35	7.0, 8.7	126	3.0"	185	A1V	45941, 171831	0	416	CMa
h 3871			06 34.1 –29 38	7.1, 8.2	354	7.7"	133	A1V	46813, 171964	1	417	CMa
6 nu 1 Sh 73			06 36.4 –19 40	5.8, 7.4	264	18"	108	G5III	47138, 151694	0	418	CMa
★ H II 60		(AaAb) B Distant, high mass (2)+1 triple with Algol type eclipsing variable; Y/B color with pretty brightness contrast. AB: ps = 3,760 AU. Neglected. (1999)	06 36.7 –22 37	6.4, 9.3	335	8.7"	320	B5V	47247, 172021	1	419	CMa
β 19			06 42.0 –16 00	7.1, 9.0	169	3.9"	530	B8III	48287, 151807	0	420	CMa
β 195		A B	06 42.5 –23 14	7.1, 9.6	215	5.9"	640	B3V	48425, 172196	1	421	CMa
S 534			06 42.8 –22 27	6.3, 8.3	144	18"	54	F2V	48501, 172204	0	422	CMa
★ 9 alp AGC 1		A B	06 45.1 –16 43	-1.5, 8.5	83	9.6"	2.64	A1Vm	48915, 151881	1	423	CMa
		Sirius. Local, very high CPM. A type spectroscopic binary with white dwarf in close orbit; infamously difficult brightness contrast, good seeing and observing in twilight are helpful. From variations in proper motion, Bessel (1844) identified Sirius and Procyon as "genuine binary systems, each consisting of a visible and an invisible star." Sirius B ("the Pup") was detected by Alvan G. Clark (1862) as it neared apastron; at 0.98 M _☉ , it is the most massive white dwarf known. AB: P = 50y, orbit r = 20 AU, e = 0.59, apastron 2019. (642 measures; 2013) See Figure 1.										
HP h 3891			06 45.5 –30 57	5.7, 8.2	220	5.4"	580	B2III	49131, 197177	0	424	CMa
β 20			06 48.8 –16 13	7.8, 9.9	28	3.3"	240	K1III	49649, 151957	1	425	CMa
S 538			06 49.6 –24 09	7.2, 8.2	4	27"	250	A2	49868, 172383	0	426	CMa
★ β 324		A B C	06 49.7 –24 05	6.6, 7.9, 8.3	211, 282	1.8", 30"	250	A1V	49891, 172389	1	427	CMa
HZ H V 108		A type 2+1 triple; comoving "double double" with S 538 (above) 5' s. in rich field. AC: ps = 7,500 AU. (2008)								1	427	CMa
		A (BC)	06 50.4 –31 42	5.8, 7.7	66	43"	199	B6Vne	50123, 197263	0	428	CMa
β 325			06 51.8 –26 35	7.9, 9.1	38	1.7"	1180*	B2V	50379, 172461	1	429	CMa
18 mu Σ 997		A C	06 56.1 –14 03	5.3, 10.3	289	87"	380	G5III A2	51250, 152123	0	430	CMa
S 541			06 56.6 –22 39	7.5, 8.5	45	23"	290	K1III	51457, 172606	1	431	CMa
★ 21 eps CapO 7		Adhara. High mass double with B giant; visually resembles Sirius, but component is probably A type star. (2008)	06 58.6 –28 58	1.5, 7.5	162	7.9"	124	B2II	52089, 172676	0	432	CMa
										0	432	CMa
I 183			07 00.8 –25 39	7.4, 9.9	139	3.9"	520	B2IV	52596, 172750	1	433	CMa
GU Hu 112			07 01.8 –11 18	7.0, 7.7	198	0.6"	440	B2Vne	52721, 152255	0	434	CMa
h 3914			07 02.1 –23 30	7.5, 11.0	314	11"	280*	G8III	52925, 172808	1	435	CMa
Σ 1016			07 04.6 –11 31	7.4, 9.5	149	5.4"	1960*	B0V	53456, 152324	0	436	CMa
FN Σ 1026		A B C	07 06.7 –11 18	5.7, 6.9, 9.0	111, 350	0.6", 18"	930	B0.5IV	53974, 152394	1	437	CMa
β 575		A B C	07 14.8 –15 29	8.3, 7.9, 9.9	297, 1	0.5", 16"	93	F5V	56012, 152609	0	438	CMa
BrSO 2			07 17.0 –30 54	6.3, 7.8	183	38"	132	A9II	56731, 197789	1	439	CMa
h 3949			07 18.6 –30 48	7.7, 7.9	77	3.0"	610	B2V	57120, 197827	0	440	CMa
★ Lal 53		Pretty matched pair adrift in Milky Way streams, s.p. NGC 2367. HDS 1026 (m.9, 17") 3' n.f. AB: ps = 450 AU. (2000)	07 19.3 –22 03	7.6, 7.7	166	3.8"	119	A4V	57190, 173466	1	441	CMa
										1	441	CMa

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
δ 129			07 24.7 –31.49	5.4, 9.7	311	2.1"	200	G8II	58535, 197964	0	442	CMa
		Solar type double, probably unrelated to CD (B 1540, m.8, 0.9"), 98" n.p. Neglected. (1991)								0	442	CMa
β 199		A B	07 25.1 –21 10	7.2, 8.1	24	1.7"	—	B1Ib	58510, 173684	1	443	CMa
Stone 17			07 26.1 –18 22	7.6, 9.6	76	5.0"	220	A0V	58698, —	0	444	CMa
β 332		A B	07 27.9 –11 33	6.2, 7.4	173	0.7"	490	G8Ib	59067, 152909	1	445	CMa
Canis Minor									Chart 15			
Σ 1074		A B	07 20.5 +00 24	7.4, 7.8	172	0.7"	230	B9.5V	57275, 115294	0	446	CMi
Σ 1103			07 30.6 +05 15	7.1, 8.6	244	4.2"	188	B9	59538, 115532	1	447	CMi
$\text{O}\Sigma$ 176		A B	07 38.5 +00 30	7.2, 9.2	221	1.6"	490	B9	61275, 115733	0	448	CMi
Σ 1126		(AaAb) B	07 40.1 +05 14	6.6, 7.0	174	1.0"	300*	A0III	61563, 115773	1	449	CMi
		Local A type (2)+1 spectroscopic triple, 15' following Procyon (alp CMi). AB frequently measured, but no orbit (281 measures; 2012)								1	449	CMi
Σ 1134		(AaAb) B	07 43.5 +03 29	7.1, 10.4	146	9.4"	51	F8	62323, 115851	0	450	CMi
Σ 1137			07 46.6 +04 08	8.0, 9.1	133	2.9"	440	F5	62968, 115910	1	451	CMi
$\text{O}\Sigma\Sigma$ 88		A B	07 49.0 +00 40	7.5, 8.9	5	58"	70	F2	63436, 115967	0	452	CMi
Σ 1149			07 49.5 +03 13	7.8, 9.2	41	22"	130	G0	63536, 115981	1	453	CMi
$\text{O}\Sigma$ 182			07 52.7 +03 23	7.8, 7.9	12	1.0"	210	A2	64165, 116064	0	454	CMi
$\text{O}\Sigma$ 185			07 57.3 +01 08	7.1, 7.3	17	0.4"	62	F7V	65123, 116165	1	455	CMi
		Matched solar type binary; drifting in a stream of stars. AB: $P = 58$ y, orbit $r = 21$ AU, $e = 0.67$, apastron 2031. (2013)								1	455	CMi
Σ 1175			08 02.4 +04 09	7.9, 9.1	285	1.4"	40.6	G5	66177, 116263	0	456	CMi
Σ 1182			08 05.4 +05 50	7.5, 8.8	74	4.7"	330	B9	66801, 116324	1	457	CMi
Capricornus									Chart 25			
6 alp 2		A [B C]	20 18.1 –12 33	3.7, [11.2, 11.5]	196, [245]	6.6", [1.2"]	32.4	G9III	192947, 163427	0	458	Cap
★ 9 bet 1,2		(AaAb) (BaBb) C	20 21.0 –14 47	3.2, 6.1, 8.8	267, 133	3.4", 4.4'	100	F8V A0	193495, 163481	1	459	Cap
		Dabih. High mass (2)+(2)+1 spectroscopic quintuple, wide visual triple. MSC 18.1 M \odot . Aa,Ab (Bla 7); $P = 3.8$ y, $e = 0.43$. AB (Bar 12): $p_s = 27,500$ AU. (2012)								1	459	Cap
10 pi		(AaAb) B	20 27.3 –18 13	5.1, 8.5	146	3.2"	167	B8II	194636, 163592	0	460	Cap
11 rho		A B	20 28.9 –17 49	5.0, 6.9	191	1.6"	30.3	F3V	194943, 163614	1	461	Cap
12 omi			20 29.9 –18 35	5.9, 6.7	238	22"	66	A3Vn A7V	195094, 163626	0	462	Cap
			20 33.5 –22 14	7.5, 11.6	22	9.9"	47.0	F8	195680, 189425	1	463	Cap
Σ 2699		A B	20 36.9 –12 44	8.0, 9.2	197	9.4"	91	F2V	196310, 163730	0	464	Cap
β 674		A B	20 44.8 –20 54	8.0, 9.6	99	1.7"	250	K1III	197523, 189638	1	465	Cap
β 153			20 47.3 –26 25	7.4, 9.0	254	1.8"	123	A1m F0	197889, 189697	0	466	Cap
S 763		A B	20 48.4 –18 12	7.2, 7.8	293	16"	104	G8III	198063, 163895	1	467	Cap
h 5226			20 50.1 –27 22	7.3, 8.8	67	19"	139	K0III	198278, 189747	0	468	Cap
h 3003			20 53.0 –23 47	6.6, 8.6	194	1.5"	108	K0III	198732, 189801	1	469	Cap
h 616			21 55.0 –11 58	8.1, 10.5	275	31"	137	A2m	208208, 164738	0	470	Cap
Carina									Charts 27, 28			
l 157			06 46.7 –54 42	6.6, 9.3	349	1.9"	127	G6III	49705, 234704	1	471	Car
Δ 39			07 03.3 –59 11	5.8, 6.8	86	1.4"	151	B9IV	53921, 234890	0	472	Car
h 3941			07 09.4 –60 23	7.3, 8.3	273	0.5"	220	G5III	55527, 249754	1	473	Car

h 3952	07 16.2 –54.03	7.4, 10.6	278	16"	163	K1III	56960, 235059	0	474	Car
Rmk 6	07 20.4 –52 19	6.0, 6.5	26	9.2"	31.7	F2IV	57852, 235110	1	475	Car
Hu 1583	07 41.3 –60 00	8.4, 8.7	241	1.1"	290	B9IV	62597, 235419	0	476	Car
CorO 58	07 46.2 –59 49	8.2, 8.3	45	23"	38.9	G8V G8V	63581, 235503	1	477	Car
	Solar type pair, bound or comoving with m.8 C (Shy 194, HD 62850) 47' n.p., all three are pre main sequence (very young) stars. AC: ps = 81,000 AU. Neglected. (1999)									
h 4014	07 48.6 –63 41	7.9, 9.1	156	11"	280	B9V	64186, 249972	0	478	Car
CorO 60	07 49.6 –55 05	7.5, 9.1	55	3.9"	280	A1V	64162, 235543	1	479	Car
LDS 198	07 57.8 –60 18	5.6, 9.9	78	60"	16.2	G0V	65907, 250035	0	480	Car
	Local, high CPM, solar type (2)+1 spectroscopic triple, visual double. AB: ps = 970 AU. (2000)									
h 4031	07 58.4 –60 51	7.1, 7.7	357	5.5"	290	B6 + B8	66066, 250047	1	481	Car
MlbO 2	08 05.0 –60 23	7.7, 8.6	353	1.6"	330	A0	67515, 250102	0	482	Car
★ Rmk 8	08 15.3 –62 55	5.3, 7.6	69	4.1"	78	A2V	69863, 250164	1	483	Car
	Beautiful A type double; rich field, optical pair h 4077 (m.9, 19") 5' n.f. AB: ps = 430 AU. (2010)									
Hu 1443	08 39.1 –55 57	7.8, 8.9	19	0.9"	186	F3V	74045, 236148	0	484	Car
h 4128	08 39.2 –60 19	6.8, 7.5	203	1.1"	137	A0V	74148, 250291	1	485	Car
h 4130	08 40.7 –57 33	6.5, 8.3	240	4.0"	67	A3V	74341, 236179	0	486	Car
★ Rmk 9	08 45.1 –58 43	6.9, 6.9	292	4.2"	260	B7III	75086, 236241	1	487	Car
	Sparkling high mass double with B type giant; with possible small stellar group in rich field. AB: ps = 1,470 AU. (2010)									
Sir 9	08 47.2 –63 49	8.0, 8.9	358	1.3"	220	A0V	75541, 250328	0	488	Car
h 4178	09 04.8 –57 51	6.5, 9.6	161	3.4"	310	A8III	78293, 236578	1	489	Car
h 4190	09 11.5 –57 58	6.6, 10.1	23	8.2"	300	B3IV	79421, 236707	0	490	Car
h 4206	09 17.4 –74 54	5.3, 9.6	345	7.0"	108	A1V	80951, 256599	1	491	Car
h 4213	09 25.5 –61 57	5.8, 9.6	330	8.8"	77	A4V	81830, 250575	0	492	Car
Syo 1	09 32.8 –57 06	7.1, 11.1	19	11"	2800	B6II	82919, 237090	1	493	Car
R 123	09 33.3 –57 58	7.5, 7.6	34	1.9"	670	B8III	82988, 237097	0	494	Car
Rss 208	09 36.1 –64 57	8.0, 11.7, 6.6	204, 68	12", 7.9"	81	F5V	83359, 250629	1	495	Car
	Solar type 2+1 triple; part of a comoving group of six stars (Shy 543, 546 & 548) within 3.5 pc. AC: ps = 51,500 AU. (2000)									
h 4241	09 42.2 –66 55	6.3, 10.3	305	34"	160	A0V	84416, 250672	0	496	Car
★ ups	09 47.1 –65 04	3.0, 6.0	126	5.0"	440	A8Ib	85123, 250695	1	497	Car
Rmk 11	09 47.1 –65 04	3.0, 6.0	126	5.0"	440	A8Ib	85123, 250695	1	497	Car
	Distant double with A type supergiant; CPM double h 4252 (m.8, 12") 5' s.f. in faint rich field. AB: ps = 2,970 AU. (2010)									
Rmk 12	09 55.1 –69 11	6.9, 8.9	213	9.2"	180	B9V	86388, 250750	0	498	Car
Hrg 47	10 03.6 –61 53	6.3, 7.9	352	1.2"	500	B7IVne	87543, 250795	1	499	Car
★ h 4295	10 09.5 –68 41	6.6, 6.5, 11.5	104, 40	0.7", 26"	210	A0IV	88473, 250844	0	500	Car
	Matched A type 2+1 triple; pretty field. AC: ps = 7,370 AU. (2000)									
Sir 17	10 13.0 –65 10	7.0, 9.9	343	3.4"	310	B5V	88894, 250872	1	501	Car
CapO 48	10 15.1 –67 17	7.7, 9.1	341	1.9"	128	K1III	89205, 250894	0	502	Car
h 4306	10 19.1 –64 41	6.3, 6.5	313	2.6"	80	A1V	89715, 250917	1	503	Car
R 141	10 20.1 –67 10	7.5, 8.3	44	1.8"	380	B6V	89891, 250923	0	504	Car
Gli 293	10 20.7 –71 09	8.1, 8.6	208	28"	270	A0V	90037, 256702	1	505	Car
TDS 7279	10 27.1 –62 00	9.1, 7.6	316	64"	71	G5	307693, 250959	0	506	Car
R 151	10 31.1 –68 54	7.6, 9.7	190	2.9"	196	A0V	91423, 250999	1	507	Car
Δ 83	10 34.9 –64 08	7.5, 8.4	39	24"	220	A0V	91906, 251022	0	508	Car
Δ 94	10 38.8 –59 11	4.9, 7.5	20	15"	720	K5III	92398, 238295	1	509	Car

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★	R 152		10 38.9 –64 30	7.2, 8.9	20	2.1"	153	B9Vn	92467, 251043	0	510	Car
	NZO 19		10 39.4 –67 10	7.7, 9.8	345	5.4"	240	G8III	92571, —	1	511	Car
	I 860	A B C	10 42.0 –63 30	8.0, 8.1, 11.5	73, 73	0.5", 10"	123	A3IV	92886, 251075	0	512	Car
		Exquisite, miniature, matched A type 2+1 triple, unresolved in small apertures. AB: ps = 83 AU, AC: ps = 1,660 AU. (2000)										
Δ 97	A B C E		10 43.2 –61 10	6.6, 7.9, 8.1, 10.0	175, 17, 83	13", 83", 81"	570	B3III	93010, 251085	1	513	Car
	Distant comoving or unstable bound group of massive B giant and A type stars. AC: ps = 47,300 AU. Neglected. (1998)											
★ eta	Δ 99	A [Ba Bb]	10 44.3 –70 52	6.3, [6.4, 9.0]	75, [48]	63", [0.6"]	103	A5IV	93344, 256750	0	514	Car
	h 4366	(AaAb ...) B ... G	10 45.1 –59 41	6.5, 11.1, 10.0	317, 67	1.6", 38"	2300*	pec (–O3I)	93308, 238429	1	515	Car
		Distant, high mass and unstable luminous blue variable (LBV) star associated with the eta Carinae star forming region and young star cluster of high mass stars (Trumpler 16), surrounded by ejecta from a nova eruption in 1837–1853 – “an old nova in a nebula with nuclei” (WDS notes) – with 12 or more possible components (not listed here)										
		within a 5" radius. A singular object. (2000)										
R 161			10 49.4 –59 19	6.1, 7.4	292	1.0"	230	B9.5IV	93943, 238514	0	516	Car
	I 418		10 53.0 –63 05	8.0, 8.2	203	2.2"	350	A8IV	94466, 251162	1	517	Car
	h 4383		10 53.7 –70 43	6.4, 7.1	288	1.5"	230	B6V B6V	94650, 256770	0	518	Car
	h 4393		10 57.3 –69 02	6.6, 8.7	132	8.7"	270	B7V	95122, 251195	1	519	Car
R 164	A B		10 59.2 –61 19	6.5, 10.0	76	3.9"	118	B8IV	95324, 251205	0	520	Car
Gli 159			11 05.1 –59 43	7.7, 9.2	275	18"	980	B1Ib	96261, 238749	1	521	Car
Brso 19	A [B C]		11 11.7 –60 27	7.8, [9.0, 9.4]	13, [27]	53", [0.4"]	550*	B1	97400, 251307	0	522	Car
I 231			11 12.1 –71 13	7.1, 9.6	2	2.6"	240	B7Vn	97535, 256809	1	523	Car
R 163	A (BC)		11 17.5 –59 06	7.2, 7.6	58	1.6"	240	B9.5III	98278, 238939	0	524	Car
Cassiopeia Cas												
OΣ 485	(AaAb) C		23 02.7 +55 14	6.5, 10.5	80	56"	260	B9III	217833, 35092	1	525	Cas
OΣ 490	A B		23 10.2 +57 27	7.2, 9.2	297	1.2"	240	G3III	218803, 35193	0	526	Cas
OΣ 495			23 24.1 +57 32	7.5, 7.8	123	0.4"	300	B2V	220562, 35386	1	527	Cas
★ AR	Sh 355	(AB) (Iab) F [C D]	23 30.0 +58 33	4.9, 9.9, 10.6, [7.2, 9.1]	207, 338, 269, [215]	3.9", 67", 76", [1.4"]	190	B3IV	221253, 35478	0	528	Cas
		High mass comoving (2)+ (2)+1+2 group of three binaries with Algol type variable as primary star, and Σ 3022 (m.8, 21") 10' s.f. AC: ps = 14,400 AU; MSC system mass >21.5 M☉, probable cluster remnant. (In WDS, compare with β 442 in Cygnus.) A unique and remarkable system. (2002)										
	OΣ 498	A B	23 31.3 +52 25	7.6, 10.9	244	17"	76	F6V	221377, 35501	1	529	Cas
	OΣ 499	A (BC)	23 33.2 +57 24	7.6, 9.5	75	9.9"	107	G5	221625, 35873	0	530	Cas
V650	Σ 3037	A B E	23 46.1 +60 28	7.4, 9.2, 9.7	211, 63	2.8", 110"	360	K0	223070, 20832	1	531	Cas
	OΣ 507	A B	23 48.7 +64 53	6.8, 7.8	319	0.7"	169	A0	223358, 20866	0	532	Cas
		A type binary with alp2 CVn type variable; faint field. AB: P = 566 y, orbit r = 170 AU. (2011)										
	Gui 40	A B	23 50.4 +51 37	6.5, 12.1	164	21"	40.6	F3V	223552, 35823	1	533	Cas
8 sig	Σ 3049	A B	23 59.0 +55 45	5.0, 7.2	326	3.1"	1340	B1V	224572, 35947	0	534	Cas
V640	Σ 3057	(AaAb) B	00 04.9 +58 32	6.7, 9.3	297	3.8"	840	B3V	225257, 21062	1	535	Cas
	Σ 3062		00 06.3 +58 26	6.4, 7.3	352	1.5"	21.5	G3V	123, 21085	0	536	Cas
		Local solar type (2)+1 spectroscopic triple with eclipsing binary (P = 1.1 d); small group s.f. AB: P = 107 y, orbit r = 31 AU, e = 0.45, periastron 2049. (595 measures; 2013)										
	Ary 8	A B (CaCb)	00 10.6 +58 45	8.1, 8.6, 7.5	100, 43	39", 105"	590*	B3IV	594, 21166	1	537	Cas
Σ 7			00 11.6 +55 58	8.0, 8.5	211	1.3"	600	B8V	709, 21191	0	538	Cas
OΣ 1			00 11.8 +66 08	7.5, 9.5	212	1.6"	260	A0	724, 11030	1	539	Cas

	Σ 10	A B	00 14.8 +62 50	8.0, 8.6	176	18"	170*	A2V	1026, 11062	0	540	Cas
	OS 9	A B C	00 26.2 +56 47	6.9, 9.7, 9.9	51, 3	2.1", 22"	180	G3III	2170, 21395	1	541	Cas
14 lam	OS 12		00 31.8 +54 31	5.3, 5.6	210	0.2"	116	B8V B9V	2772, 21489	0	542	Cas
		Matched high mass binary. AB: $P = 246$ y, orbit $r = 31$ AU, $e = 0.69$; now $< 0.2''$, B reappears in 2025. (270 measures; 2010)										
	Mri 31		00 34.6 +62 35	8.1, 9.0	9	117"	63		3068, 11270	1	543	Cas
	β 108	A B	00 34.6 +62 54	7.8, 10.6	6	4.5"	54	F5	3067, 11269	0	544	Cas
	Σ 48	A B	00 42.7 +71 22	7.8, 8.1	334	5.4"	280	A	3891, 4191	1	545	Cas
21 YZ	H N 122	(AaAb) B	00 45.7 +74 59	5.7, 10.6	160	36"	93	A2IV	4161, 4216	0	546	Cas
	Σ 59	A B	00 48.0 +51 27	7.2, 8.1	148	2.2"	210	B9.5IV	4536, 21716	1	547	Cas
		High mass double; shares rich field with optical pair H 5 82 (m.7, 56"), 20' s. (2012)										
★ 24 eta	Σ 60	A B	00 49.1 +57 49	3.5, 7.4	324	13"	5.95	G1V+M	4614, 21732	0	548	Cas
		Achird. Local, very high CPM, solar type binary with RS CVn type variable; YW/O color, rich field. AB: $P = 480$ y, orbit $r = 70$ AU, $e = 0.50$. (1,056 measures; 2013)										
	Σ 65		00 52.8 +68 52	8.0, 8.0	220	3.3"	280	A2	4947, 11440	1	549	Cas
	Σ 70	A B	00 53.8 +52 41	6.3, 9.5	248	8.0"	88	A0	5128, 21814	0	550	Cas
		A type double; CD (m.11, 1.5") 1' s. appears unrelated. (2011)										
	A 2901		01 01.5 +69 22	7.1, 7.8	60	0.4"	270	B9	5839, 11526	1	551	Cas
		High mass binary. AB: $P = 1,517$ y, orbit $r = 270$ AU, increasing α . (2006)										
	β 396		01 03.6 +61 04	6.1, 8.6	67	1.3"	610	F0II	6130, 11551	0	552	Cas
	OS 23	A B	01 10.1 +51 45	8.1, 8.6	191	14"	79	F8	6872, 22050	1	553	Cas
	β 235	Aa Ab	01 10.6 +51 01	7.5, 7.8	138	0.8"	105	F5V	6918, 22060	0	554	Cas
		Solar type binary; doubles p. (β 235 BC) and f. (OS 24) in rich field. Aa,Ab: $P = 278$ y, orbit $r = 80$ AU, closing. (2011)										
V761	β 258	A B	01 13.2 +61 42	6.5, 8.8	282	1.5"	200	B9V	7157, 11637	1	555	Cas
	Σ 115	A B	01 23.4 +58 09	7.1, 7.3	160	0.4"	59	F5V	8272, 22230	0	556	Cas
		Solar type binary; bright field. System mass $2.4 M_{\odot}$. AB: $P = 222$ y, orbit $r = 49$ AU, $e = 0.93$, apastron 2096. (2012)										
	Σ 114		01 24.1 +72 51	7.2, 9.7	358	3.7"	570	A0	8226, 4393	1	557	Cas
	h 2045		01 29.0 +74 12	7.3, 12.6	83	27"	56	G5	8730, 4407	0	558	Cas
	h 1088	A B	01 42.3 +58 38	6.3, 9.8	169	20"	600	B7III Am	10293, 22520	1	559	Cas
V773	Arn 55	(AaAb) B D	01 44.3 +57 32	6.3, 8.7, 9.9	332, 45	0.6", 2.7"	85	A3V	10543, 22566	0	560	Cas
		A type (2)+1+1 quadruple, visual triple; splendid field. MSC gives $6.1 M_{\odot}$. (AB): $P = 193$ y; AD: $ps = 18,600$ AU. (2010)										
	Σ 170		01 55.5 +76 13	7.5, 8.2	243	3.1"	158	A5	11316, 4512	1	561	Cas
	Σ 182	A B	01 56.4 +61 17	8.3, 8.4	124	3.6"	550*	B7V	11669, 12046	0	562	Cas
48	β 513	A B C	02 02.0 +70 54	4.7, 6.7, 13.2	308, 52	0.6", 23"	35.3	A3V	12111, 4554	1	563	Cas
		A type 2+1 spectroscopic triple; MSC system mass $4.6 M_{\odot}$. AB: $P = 61$ y, orbit $r = 22$ AU, $e = 0.36$, periastron 2025. (215 measures; 2011)										
V779	Σ 185	A B	02 02.2 +75 30	6.8, 8.6	9	1.1"	192	A0	12013, 4550	0	564	Cas
	Σ 191		02 03.2 +73 51	6.2, 9.1	195	5.1"	119	A5III	12173, 4559	1	565	Cas
		Double with rare A giant; Y/B color, delicate brightness contrast, rich field. Σ 184 (m.9, 17") 11' n.p. (2006)										
	OSΣ 26	A B	02 19.7 +60 02	7.0, 7.3	202	63"	240	A2V	14172, 23194	0	566	Cas
		HIP 10855/56. Prominent CPM arcminute pair; in rich field n. of Double Cluster (χ/h Per). AB: $ps = 15,100$ AU. (2012)										
V559	Σ 257	(AaAb) B	02 25.7 +61 33	7.5, 8.2	71	0.4"	210	B8IV	14817, 12277	1	567	Cas
		High mass (2)+1 triple with Agol type eclipsing binary. MSC has $9.5 M_{\odot}$. Aa,Ab: $P = 1.6$ d. AB: $P = 836$ y, orbit $r = 170$ AU. (2007)										
★ lot	Σ 262	(AaAb) B (CaCb)	02 29.1 +67 24	4.6, 6.9, 9.1	230, 115	2.9", 7.1"	40.7	A5p F5V	15089, 12298	0	568	Cas

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
		Pretty, compact (2)+1+(2) quintuple, visual triple with alp2 CVn type variable; subtle color contrast among components. Connection to C components uncertain. MSC gives a system mass of 4.9 M \odot . AaAb: P = 47 y. AB: P = 620 y, orbit r = 120 AU. (255 measures; 2013)								0	568	Cas
	0232 28		02 39.0 +62 35	6.7, 7.6	148	68"	125	B9	16218, 12369	1	569	Cas
	Σ 302		02 50.0 +64 38	7.5, 10.3	170	5.1"	610*	B8II	17327, 12455	0	570	Cas
	Σ 306	A B	02 51.1 +60 25	7.4, 9.1	93	2.2"	880	O5Ve O7.5V	17505, 12470	1	571	Cas
		Distant, high mass binary; O/B color, rich field with cluster IC 1848. AB: ps = 2,600 AU. (2008)								1	571	Cas
	Σ 312	A B C	02 56.2 +72 53	8.2, 8.9, 10.1	45, 131	1.8", 43"	66	G0	17785, 4776	0	572	Cas
	Σ 317		02 58.1 +69 12	7.9, 9.8	84	4.1"	80	F2	18056, 12530	1	573	Cas
	0232 31		03 00.9 +59 40	7.3, 8.0	230	74"	240	B9	18473, 23761	0	574	Cas
	Σ 349		03 10.8 +63 47	7.9, 8.6	323	5.9"	84	F5V	19440, 12635	1	575	Cas
	Centaurus	Cen							Charts 23, 28			
V815	h 4409		11 07.3 -42 38	5.2, 7.7	252	1.3"	84	A	96616, 222581	0	576	Cen
★	R 165		11 13.1 -47 03	7.5, 7.5	253	2.8"	89	G0IV	97547, 222645	1	577	Cen
	h 4423	Solar type matched double; s.f. of 2 m8 stars in mixed field, from the H.C. Russell catalog. AB: ps = 335 AU. (2000)	11 16.5 -45 53	7.0, 7.3	278	2.6"	52	F3V	98096, 222687	0	578	Cen
	h 4426	Solar type matched double; YW/YW color, ethereal faint field, m.7 star 8' n.p. AB: ps = 180 AU. (2000)	11 21.6 -43 33	7.2, 10.3	173	13"	430	K0III	98779, 222738	1	579	Cen
	Skf 2009		11 22.3 -58 23	6.7, 9.6	328	54"	152	G8III+F8	98897, 239003	0	580	Cen
★	Br5O 5		11 24.7 -61 39	7.7, 8.8	242	4.4"	13.7	K5V+MOV	99279, 251393	1	581	Cen
	Skf 1217	Local, high CPM, rare low mass binary, rich field. AB: P = 399 y, orbit r = 80 AU, e = 0.67, widening. Neglected. (1996)	11 25.0 -35 55	8.1, 9.0	346	51"	380	K0II+K0	99241, 202424	0	582	Cen
	h 4438		11 27.5 -39 53	7.3, 10.7	197	23"	137	A0V	99627, 202462	1	583	Cen
★	I 78	A type matched double; pretty field, K giant HR 4447 14' n.p. AB: ps = 110 AU. Neglected. (1998)	11 33.6 -40 35	6.1, 6.2	99	0.7"	118	A2IV	100493, 222863	0	584	Cen
	Rss 267		11 36.5 -61 40	7.1, 9.0	315	73"	4970*	B1Ib	100943, 251480	1	585	Cen
	Gli 165		11 36.6 -60 54	8.1, 9.1	4	1.9"	260	B8V	100942, 251482	0	586	Cen
V871	I 422	A B C	11 38.3 -63 22	7.1, 7.4, 9.9	116, 6	0.4", 1.7"	1850*	OTN	101205, 251511	1	587	Cen
	h 4460		11 39.2 -57 44	7.2, 8.2	176	8.6"	510	A0V	101312, 239261	0	588	Cen
	Howe 70		11 39.5 -37 26	8.2, 8.4	107	3.4"	104	F5V	101327, 202675	1	589	Cen
	CapO 11	(AaAb) B	11 40.6 -62 34	6.9, 7.4	219	2.6"	—	O9.5	101545, 251533	0	590	Cen
	Hd 212		11 41.2 -61 08	7.5, 7.9	322	1.0"	200	K1III	101629, 251540	1	591	Cen
	Gli 169		11 51.8 -64 36	7.5, 9.0	226	4.3"	800	B4V	103066, 251616	0	592	Cen
★	HId 114		11 55.0 -56 06	7.4, 7.8	172	3.3"	30.2	G3V	103493, 239487	1	593	Cen
	Br5O 20	Solar type double; splendid rich field. AB: ps = 135 AU. (2000)	11 55.0 -62 35	7.7, 8.9	266	19"	640*	M3III	103515, 251641	0	594	Cen
	I 80		11 55.4 -41 54	8.0, 8.2	94	1.3"	116	A5V	103567, 223115	1	595	Cen
	I 895		12 01.7 -41 50	8.1, 8.2	318	0.8"	134	A3III	104472, 223175	0	596	Cen
89	λ 143		12 03.6 -39 01	7.1, 7.7	28	0.5"	46.0	F7V	104747, 203084	1	597	Cen
		Solar type high CPM binary. System mass 2.4 M \odot . AB: P = 111 y, orbit r = 31 AU, e = 0.58, periastron 2024. (2013)		8.1, 8.8	42	23"	55	G2III	104760, 223195	0	598	Cen
	h 4491		12 03.8 -44 07									

h 4492	12 03.8 –54 43	7.5, 11.2	273	16"	81	F3V	104764, 239624	1	599	Cen
h 4500	12 06.6 –37 52	6.7, 9.1	31	50"	151	K1III	105173, 203137	0	600	Cen
I 423	12 11.0 –45 25	6.8, 10.6	166	2.7"	400	K0III	105852, 223266	1	601	Cen
R 192	12 11.2 –52 13	7.9, 9.7	100	3.2"	124	A6V	105874, 239730	0	602	Cen
★ D Rmk 14	12 14.0 –45 43	5.8, 7.0	243	2.8"	175	K3III	106321, 223297	1	603	Cen
	Solar type (2)+1 spectroscopic triple, visual double with K giant; O/Y color, faint field. AB: ps = 660 AU. Neglected. (1995)									
Slr 10	12 15.0 –36 13	7.8, 9.8	244	2.0"	150	A3IV	106488, 203275	0	604	Cen
h 4518	12 24.7 –41 23	6.5, 8.4	208	10"	190	K3III	107998, 223417	1	605	Cen
Rss 16	12 30.2 –53 36	8.1, 8.6	152	50"	370*	A0IV	108771, 240002	0	606	Cen
gam h 4539	12 41.5 –48 58	(2.4, 2.9), 14.4, 3.9	114, 304	58", 45'	39.9	A1IV	110304, 223603	1	607	Cen
	Muhlifain. A type (2)+1+1 quadruple, visual triple. System mass 7.3 M _☉ . AB: P = 83 y, orbit r = 34 AU, e = 0.81, apastron 2056; B reappears in 2021. AD (tau Cen): ps = 108,500 AU. (2013)									
h 4546	12 44.9 –52 45	7.9, 9.5	222	15"	88	F0V	110770, 240206	0	608	Cen
I 83	12 56.7 –47 41	7.4, 7.7	234	0.8"	81	F5V	112361, 223774	1	609	Cen
★ CorO 143	12 58.2 –54 11	7.4, 8.7	112	17"	560	A0V	112532, 240424	0	610	Cen
	Solar type binary, sparse field, from the R.T.A. Innes 1927 catalog. AB: P = 191 y, orbit r = 42 AU, near apastron. (2010)									
	Distant A type double; field of faint doubles and tiny stellar groups. AB: ps = 9,520 AU. Neglected. (1999)									
CapO 13	13 00.3 –48 36	7.2, 9.2	68	5.1"	150	G8IV	112851, 223827	1	611	Cen
δ 164	13 01.8 –30 50	7.6, 11.4	291	6.1"	320	K4III	113129, 204050	0	612	Cen
I 917	13 06.6 –46 02	8.1, 8.4	281	1.3"	123	F3V	113766, 223904	1	613	Cen
R 213	13 07.4 –59 52	6.6, 7.0	21	0.7"	170	G2	113823, 240566	0	614	Cen
Skf 1128	13 09.3 –41 01	7.7, 10.8	312	55"	170	K0III	114164, 223935	1	615	Cen
CorO 149	13 09.3 –51 41	7.7, 10.3	257	13"	110	A0V	114139, 240601	0	616	Cen
V831 I 424	13 12.3 –59 55	4.6, 8.4	7	1.9"	116	B8V	114529, 240645	1	617	Cen
	High mass (2)+1+1 quadruple with bet Lyr type variable; faint field, CorO 152 8' n.f. MSC system mass 12.1 M _☉ . (AB): P = 27 y, closing. (2013)									
LDS 436	13 12.5 –34 45	7.8, 9.9	221	31"	77	F5V	114692, 204235	0	618	Cen
Mug 3	13 12.7 –31 52	5.6, 10.1	331	8.5"	36.1	G0V	114729, 204237	1	619	Cen
CorO 152	13 12.9 –59 49	6.3, 9.4	146	25"	42.2	G0V	114630, 240653	0	620	Cen
	Local, solar type (2+1)+1 spectroscopic quadruple, visual double; stars n.f. unrelated. MSC 3.3 M _☉ . Aa1,Aa2: P = 0.6 d. Aa,Ab: P = 32 y, orbit r = 13 AU, widening. AB: ps = 1,420 AU. (2000)									
MlbO 3	13 14.7 –63 35	7.0, 9.1	39	1.7"	470	O9II	114886, 252220	1	621	Cen
	Distant, high mass (2)+(2) spectroscopic quadruple, visual binary with O supergiant (C, E, F below limit magnitude); rich field. MSC system mass 40.1 M _☉ . AB: ps = 1,080 AU. (2014)									
h 4576	13 16.1 –57 04	7.1, 10.0	127	5.6"	140	F2IV	115113, 240693	0	622	Cen
I 233	13 16.8 –41 17	7.3, 9.7	109	3.5"	189	K0II	115279, 224025	1	623	Cen
h 4578	13 17.6 –37 01	7.6, 10.8	148	9.3"	169	A3IV	115431, 204325	0	624	Cen
Rst 632	13 19.6 –63 45	7.7, 10.6	302	4.9"	64	F5V	115602, 252261	1	625	Cen
h 4579	13 21.4 –64 03	7.9, 8.6	98	5.1"	56	G0	115863, 252277	0	626	Cen
Skf 900	13 22.0 –43 03	7.2, 10.0	108	46"	151	A3IV F8	116081, 224089	1	627	Cen
	A type CPM double; ps = 9,400 AU. Tiny, m.11 trapezium 6' f. (2000)									
★ J Δ 133	13 22.6 –60 59	4.5, 6.2	345	61"	109	B2.5Vn	116087, 252284	0	628	Cen
	High mass (2)+1 triple, visual double; faint rich field. B is V790 Cen, a Cepheid variable. (2010)									
Slr 18	13 22.9 –47 57	6.7, 7.2, 10.8	243, 62	0.7", 37"	300	A4V	116197, 224095	1	629	Cen

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
	R 218		13 28.1 –43 46	7.5, 9.7	169	2.4"	260	K1III	116991, 224157	0	630	Cen
	λ 180	A B	13 31.4 –42 28	6.8, 9.2	234	3.6"	145	K0III	117483, 224214	1	631	Cen
	Skf 1958		13 31.6 –32 08	7.5, 10.5	165	113"	162	F2V	117548, 204552	0	632	Cen
	Hrg 86		13 32.5 –62 21	8.1, 8.6	239	1.5"	310	B9IV	117540, 252356	1	633	Cen
	λ 184		13 37.8 –35 04	7.5, 9.6	302	2.8"	34.0	G3V	118465, 204673	0	634	Cen
★	R 223		13 38.1 –58 25	6.6, 9.9	13	2.6"	158	K1III	118384, 241013	1	635	Cen
		Double with K type giant; rich field, s. of 3 m.7 stars, small group n. AB: ps = 550 AU. Neglected. (1991)								1	635	Cen
	h 4600		13 39.2 –49 00	7.8, 9.3	117	16"	200	K2III	118651, 224311	0	636	Cen
★	Q Δ 141		13 41.7 –54 34	5.2, 6.5	163	5.4"	83	B8Vn	118991, 241076	1	637	Cen
		High mass double; faint rich field, double HDS 1926 (m.9, 11") 3' s.f. AB: ps = 610 AU. (2010)								1	637	Cen
	h 4608		13 42.3 –33 59	7.4, 7.5	9	4.3"	76	F5	119191, 204749	0	638	Cen
	Howe 95	A B	13 43.8 –40 11	7.5, 7.9	185	1.0"	152	F2V	119415, 204777	1	639	Cen
	Δ 142		13 44.0 –59 14	6.5, 7.6	90	33"	260	B8V	119283, 241114	0	640	Cen
	Howe 94		13 48.9 –35 42	6.6, 10.2	359	11"	29.5	G3IV	120237, 204867	1	641	Cen
		High CPM, solar type double; mixed field. AB: ps = 440 AU. (2013)								1	641	Cen
	CapO 61	A B	13 51.5 –48 18	7.4, 7.4	130	30"	75	G6III	120592, 224485	0	642	Cen
N	Rmk 18		13 52.1 –52 49	5.2, 7.5	288	18"	80	B8V	120642, 241239	1	643	Cen
★	4 h H N 51	(AaAb) (BaBb)	13 53.2 –31 56	4.7, 8.5	185	15"	195	B4IV	120955, 204944	0	644	Cen
		High mass, spectroscopic (2)+(2) quadruple; sparse bright field. MSC system mass 12.3 M \odot . AB: ps = 3,950 AU. (2013)								0	644	Cen
y	Howe 28	A B	13 53.5 –35 40	6.3, 6.4	313	1.0"	52	F4V	120987, 204955	1	645	Cen
		Solar type binary. AB: P = 292 y, orbit r = 70 AU; slowly increasing θ . A "Dawes" (equal 6th magnitude) resolution test. (2011)								1	645	Cen
	BrO 9		13 54.6 –50 42	8.1, 8.3	76	18"	450	F2V F4V	121092, 241280	0	646	Cen
	Howe 74		13 55.3 –32 06	7.2, 9.8	117	5.8"	175	G5	121287, 204988	1	647	Cen
	R 227	A B	13 56.3 –54 08	6.5, 7.5	10	1.9"	140	A1V	121336, 241309	0	648	Cen
	β 1197		14 03.0 –31 41	6.5, 7.8	221	2.4"	38.2	F8V	122510, 205123	1	649	Cen
	WFC 145		14 06.0 –41 11	4.3, 8.5	78	85"	156	B2V	122980, 224673	0	650	Cen
	h 4642	A B [D E]	14 07.1 –63 27	6.9, 12.6, [10.6, 12.4]	12, 333, [10]	9.7", 26", [0.6"]	410	K4III	122938, 252599	1	651	Cen
	Slr 19		14 07.7 –49 52	7.1, 7.4	323	1.2"	46.5	G3V	123227, 224702	0	652	Cen
	Pol 3		14 11.0 –46 55	8.2, 8.8	53	3.8"	152	F3IV	123794, 224745	1	653	Cen
	CorO 167	(AaAb) (BaBb) C	14 15.0 –61 42	6.9, 8.7, 13.1	157, 42	2.8", 2.5"	—	O8nke	124314, 252665	0	654	Cen
	BrO 10	(AB) H	14 16.5 –57 18	7.2, 10.0	115	30"	260	B9IV	124620, 241583	1	655	Cen
★	Pol 9	(AB) [C D]	14 20.8 –42 25	7.2, [8.9, 9.0]	211, [202]	78", [1.7"]	132	A1V	125494, 224851	0	656	Cen
		A type (2)+2 quadruple, visual triple; the two binaries are joined by parallax. AC: ps = 13,900 AU. (2013)								0	656	Cen
★	Δ 159	(AaAb) B	14 22.6 –58 28	5.0, 7.6	157	9.1"	118	G8III F5V	125628, 241673	1	657	Cen
		Solar type (2)+1 spectroscopic triple, visual double with G type giant; brightest of three stars in very rich field. AB: ps = 1450 AU. (2010)								1	657	Cen
	β 1112		14 33.2 –30 43	6.2, 9.9	13	2.7"	101	K0III	127624, 205681	0	658	Cen
★	alp Rhd 1	(AaAb) B (CaCb)	14 39.7 –60 50	0.0, 1.3, 11.1	263, 225	5.1", 185'	1.35	G2V K1V	128620, 252838	1	659	Cen
		Rigel Kent. Local, very high CPM, solar type (2)+1+(2) spectroscopic quintuple, visual triple; striking Y/O color and the closest double system to the Sun. "Beyond comparison the finest double star in the sky" (J. Herschel). Discovered by J. Richard (1689), first system to be visually measured (by L. Feuille, 1709). AB: system mass 2.0 M \odot . P = 80 y, orbit r = 24 AU, e = 0.52, periastron 2035 (446 measures); the C binary is faint Proxima Centauri (HIP 70890, m.11, 0.3"), an M5V flare star (V645 Cen) discovered by R.T.A. Innes (1905) at $\theta = 212'$. $\rho = 150'$. ps = 16,400 AU. (2013) See Figure 1.								1	659	Cen

Skt 1973	14 41.0 –36 08	5.6, 9.4	148	83"	190	A0+F0V	128974, 205823	0	660	Cen
β 414	14 41.9 –30 56	6.8, 7.6	347	1.0"	350	A	129161, 205841	1	661	Cen
h 4702	(AB) C	14 48.5 –35 50	216	9.8"	187	K0III	130311, 205964	0	662	Cen
l 226	A B	14 54.4 –34 09	222	3.2"	98	A1V	131399, 206071	1	663	Cen
l 84	A B	14 54.9 –36 26	260	4.7"	160	A1V	131461, 206083	0	664	Cen
l 227	A B (C)	14 56.5 –34 38	106	0.4"	61	F8V	131751, 206111	1	665	Cen
	Solar type 2+(1) triple. AB: $P = 40$ y, orbit $r = 16$ AU, widening; C component is m.14 at 93°, 10.7". Large aperture challenge. (2010)							1	665	Cen
h 4718		14 57.6 –35 23	63	1.8"	280	M1III	131921, 206128	0	666	Cen
h 4722	A B	14 59.5 –30 43	337	8.5"	102	A3m F0	132347, 206173	1	667	Cen
Cepheus							Charts 1, 2			
★ 1 kap Σ 2675	A B	20 08.9 +77 43	120	7.2"	97	B9III	192907, 9665	0	668	Cep
	High mass double with B type giant; brighter of two stars in sparse field. AB: ps = 940 AU. (2003)							0	668	Cep
β 152		20 42.3 +57 23	83	1.1"	152	A4IV	197618, 32812	1	669	Cep
Σ 2751		21 02.2 +56 40	357	1.6"	280	B8III	200614, 33078	0	670	Cep
Σ 2780	(AaAb) B C E	21 11.8 +59 59	213, 211, 45	1.0", 121", 62"	1315	B0II	202214, 33210	1	671	Cep
	Distant, high mass quintuple with B type supergiant; in small stellar group. Aa,Ab: $P = 57$ y, $e = 0.79$, apastron 2029. (2011)							1	671	Cep
H l 48		21 13.7 +64 24	243	0.5"	42.8	G2IV G2IV	202582, 19257	0	672	Cep
Σ 2783	Matched solar type binary; good subarcsecond resolution test. System mass 3.9 M \odot . AB: $P = 82$ y, orbit $r = 30$ AU, $e = 0.81$, apastron 2044. (2012)							0	672	Cep
	A type binary; several stars, incl. two doubles, 5' f. (part of Triumpler 37). AB: $P = 1,760$ y, orbit $r = 215$ AU. (2011)							1	673	Cep
Bvd 135		21 15.7 +68 21	310	25"	75	F3V F9V	202986, 19281	0	674	Cep
Σ 2801		21 18.5 +80 21	270	2.1"	82	F6V	204129, 3547	1	675	Cep
Σ 2790	(AaAb) B	21 19.3 +58 37	45	4.6"	590	M1I+B2 +B3	203338, 33318	0	676	Cep
Pop 1233	A B C	21 22.3 +57 34	16, 192	1.2", 83"	96	G5	203802, 33367	1	677	Cep
(AaAb) B		21 28.7 +70 34	248	14"	210	B1IV	205021, 10057	0	678	Cep
8 bet	Alfrik. High mass, B type (2)+1 triple, visual double. MSC has system mass 19.1 M \odot . Aa,Ab: $P = 83$ y, $e = 0.73$, apastron 2039. (2013)							0	678	Cep
★ 80 pi 1 Σ 2816	(AaAb) B C D	21 39.0 +57 29	317, 120, 338	1.8", 12", 20"	610	O6	206267, 33626	1	679	Cep
	Distant, high mass (2)+1+1+1 quintuple, difficult visual quadruple; lovely field with Σ 2819 (below), both in IC 1396. (2001)							1	679	Cep
Σ 2819		21 40.4 +57 35	58	13"	310	F5V	206482, 33652	0	680	Cep
	Solar type double; rich field. Σ 2816 14' s.p. (in IC 1396). (2011)							0	680	Cep
Σ 2836	A B	21 49.1 +66 48	156	12"	98	F4V	207826, 19665	1	681	Cep
Σ 2843	A B	21 51.6 +65 45	150	1.3"	88	A1m	208132, 19686	0	682	Cep
Σ 2845	A B	21 52.3 +63 06	173	2.0"	750	B2V	208185, 19694	1	683	Cep
OΣ 226	A B	21 53.1 +68 06	245	76"	420	G8II	208411, 19712	0	684	Cep
EM S 800	A B	21 53.8 +62 37	145	62"	490	B1V	208392, 19718	1	685	Cep
OΣ 457		21 55.5 +65 19	245	1.3"	310	B2.5Ve	208682, 19742	0	686	Cep
OΣ 458	A B	21 56.5 +59 48	348	1.0"	350	A0V	208744, 33894	1	687	Cep
★ Σ 2873	(AaAb) (BaBb)	21 58.2 +82 52	66	14"	29.9	F6IV	209942, 3673	0	688	Cep
	Solar type (2)+(2) quadruple, visual double with eclipsing binary. MSC gives 3.8 M \odot . Aa,Ab: $P = 230$ y, $e = 0.4$, periastron 2016. Ba,Bb (V376), $P = 1.2$ d. AB: ps = 565 AU. (2012)							0	688	Cep
★ 17 xi Σ 2863	(AaAb) B	22 03.8 +64 38	268	8.1"	29.6	A3m	209790, 19827	1	689	Cep

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★	Sti 2618	A I Kurah. A type (2)+1 astrometric and spectroscopic triple, visual binary. Aa,Ab: $P = 2.2$ y, $e = 0.48$. (272 measures; 2013)	22 05.7 +57 08	7.6, 13.0	78	9.7"	107	F5	209991, 34046	1	689	Cep
			Solar type double; optical pair Bar 57 (m.10, 4.7") 5" n. in rich field. AB: ps = 1,400 AU. (2009)									
	Ary 45	A [B C]	22 08.3 +69 59	7.9, 8.1	207	67"	240	B9.5V	210550, 19893	1	691	Cep
			22 08.6 +59 17	7.1, [8.0, 8.0]	316, [297]	22", [0.8"]	190*	B9.5V	210433, 34101	0	692	Cep
	Σ 2872	A B	22 10.6 +70 08	5.6, 8.6	252	15"	33.6	F2V	210884, 19922	1	693	Cep
			22 10.9 +57 56	7.4, 12.0	327	19"	105	A5	210760, 34141	0	694	Cep
	β 436	A B	22 11.0 +63 24	8.0, 8.3	234	0.8"	940	B5	210808, 19921	1	695	Cep
			22 12.9 +73 18	6.2, 7.9	348	29"	210	G8III	211300, 10284	0	696	Cep
	Σ 2893	A B	22 18.5 +63 13	7.8, 8.6	241	22"	2400*	B0.5V	211880, 19993	1	697	Cep
			22 21.0 +66 58	7.4, 9.8	352	4.3"	105	A7V	212278, 20023	0	698	Cep
	Σ 2903	A B	22 21.8 +66 42	7.1, 7.8	95	4.1"	270	A7V G0III	212391, 20034	1	699	Cep
			22 28.0 +57 42	9.9, 11.4	329	1.5"	4.00	M3.5 M4.5	239960, 34788	0	700	Cep
★ DO	Kr 60	A B	Local, high CPM, low mass binary; the preceding corner of faint stellar triangle. AB: $P = 45$ y, orbit $r = 10$ AU, $e = 0.41$, apastron 2037. One of the nearest binary stars, with faint absolute magnitudes ($M_1 = 11.9$, $M_2 = 13.4$) and tiny masses (A: 0.22 M_{\odot} , flare star B: 0.18 M_{\odot}), but with a close orbit that can be resolved in small apertures. All other "components" in WDS are field stars. Extremely rare type of system. (286 measures; 2013)									
			22 29.2 +58 25	4.2, 6.1	191	41"	270	F5I B7V	213306, 34508	1	701	Cep
	★ 27 del	Σ I 58	High mass 1+(2) spectroscopic triple, visual double; the eponymous Cepheid (solar type, supergiant and slowly pulsating) variable star ($P = 5.4$ d). Optical pair H IV 31 (m.8, 25") 6" p. Estimated system mass 9.2 M_{\odot} . AC: ps = 14,900 AU. (2012)									
			22 33.3 +70 22	6.3, 9.2	47	9.6"	126	A0V	214019, 10418	0	702	Cep
	Σ 2923	A B	22 36.1 +72 53	7.6, 8.4	137	42"	84	F5	214511, 10429	1	703	Cep
			22 43.8 +78 31	7.5, 9.5	276	2.3"	390	A0II	215730, 10613	0	704	Cep
	OΣ 236	Solar type (2+1)+1 quadruple. MSC gives 4.4 M_{\odot} . AB (β 1092): $P = 51$ y, $e = 0.66$, apastron 2027. AD: ps = 4,760 AU. (2008)	22 46.1 +58 04	7.7, 8.6	117	31"	210	F8	215714, 34785	1	705	Cep
			Solar type CPM double; in rich field, near NGC 7380. AB: ps = 8,780 AU. (2010)									
	OΣ 482	A B	22 47.5 +83 09	4.9, 9.6	38	3.5"	96	K3III	216446, 3794	0	706	Cep
			22 49.6 +66 33	7.3, 8.6	4	2.7"	260	B6Vn	216227, 20267	1	707	Cep
	Σ 2948	A B C	22 51.4 +61 42	6.0, 7.1, 11.1	276, 355	1.2", 39"	73	G8III	216380, 20281	0	708	Cep
			22 52.7 +67 59	7.0, 7.6	280	68"	59	F2	216606, 20295	1	709	Cep
	OΣ 238	(AaAb) B	22 52.8 +60 55	7.6, 9.5	137	8.3"	250	A0V G0III	216572, 20292	0	710	Cep
			22 54.3 +76 20	8.0, 8.5	2	1.9"	123	A3	216886, 10541	1	711	Cep
	Σ 2953	(AB) C	22 56.2 +72 50	7.6, 10.4	255	31"	179	A2	217085, 10560	0	712	Cep
			High mass, A type (2)+1 triple; easily found in sparse field. AB: $P = 143$ y, orbit $r = 65$ AU implies 13.4 M_{\odot} . AC: ps = 7,490 AU. (2007)									
	OΣ 484	A B	22 56.7 +78 30	8.0, 8.9	4	5.4"	119	G5	217294, 10562	1	713	Cep
			23 06.5 +61 26	6.8, 10.3	354	1.9"	113	F5V	218375, 20424	0	714	Cep
	Σ 2984	A B	23 07.4 +70 40	7.6, 9.8	294	4.4"	290	G8III	218535, 10623	1	715	Cep
			23 07.9 +75 23	4.6, 6.8, 12.2	355, 244	1.1", 58"	76	G2III	218658, 10629	0	716	Cep
33 pi	OΣ 489	(AaAb) B C	High mass solar type (2)+1+1 astrometric and spectroscopic quadruple; faint field. MSC has 8.8 M_{\odot} . Aa,Ab: $P = 163$ y, orbit $r = 60$ AU, apastron 2016. (2010)									
			23 08.9 +82 35	7.7, 11.5	229	8.9"	190	K2	219014, 3851	1	717	Cep

★ 34 omi	Σ 3001	A B C	23 18.6 +68 07	5.0, 7.3, 12.9	221, 356	4.4", 44"	62	K0III	219916, 20554	0	718	Cep
		2+1 triple with K giant; pretty Y/B color. MSC gives 3.8 M _☉ . AB: P = 1,505 y, orbit r = 195 AU, widening. (226 measures; 2012)								0	718	Cep
	Σ 3017	A B	23 27.7 +74 07	7.6, 8.5	21	1.3"	106	F1V	221071, 10742	1	719	Cep
	Σ 3051		00 02.8 +80 17	7.7, 9.5	24	17"	149	F2V	225020, 2	0	720	Cep
	Σ 2		00 09.3 +79 43	6.7, 6.9	17	0.9"	105	A4IV	431, 4048	1	721	Cep
	Σ 13	A type matched binary, faint field. System mass 4.0 M _☉ . AB: P = 540 y, orbit r = 105 AU, e = 0.72, widening. (217 measures; 2012)								1	721	Cep
		High mass, matched binary; unidentified m.11 double 7' n.f. Low quality orbit AB: P = 971 y, orbit r = 190 AU. (207 measures; 2006)								0	722	Cep
			00 16.2 +76 57	7.0, 7.1	51	0.9"	192	B8V	1141, 4071	0	722	Cep
	Σ 26	A B C	00 21.4 +67 00	7.5, 8.8, 9.9	156, 114	0.7", 13"	166	B8.5V	1658, 11128	1	723	Cep
		Solar type 2+1 triple; sparse field. MSC system mass 8.8 M _☉ . AB: P = 335 y, orbit r = 66 AU, widening. (2009)								1	723	Cep
U	Knott 1	A B	01 02.3 +81 53	6.9, 11.8	62	14"	250	B7V G8III	5679, 168	0	724	Cep
	0Σ 28	A B	01 19.1 +80 52	7.6, 8.8	296	0.9"	156	F3V	7471, 218	1	725	Cep
	0Σ 34		01 49.9 +80 53	7.6, 8.1	285	0.5"	199	A0V	10648, 291	0	726	Cep
		A type binary; dark field with three faint binaries. Preliminary orbit AB: P = 196 y, orbit r = 140 AU (?), closing. (2007)								0	726	Cep
	0Σ 37		02 10.5 +81 29	7.0, 9.2	206	1.2"	168	A3	12543, 345	1	727	Cep
	S 405	A B	02 12.8 +79 41	6.5, 7.2	277	55"	141	A5III	12927, 4594	0	728	Cep
	Σ 320		03 06.1 +79 25	5.7, 9.2	231	4.7"	210	M2.5III	18438, 4810	1	729	Cep
	Σ 460		04 10.0 +80 42	5.6, 6.3	143	0.8"	116	G8III A4V	25007, 650	0	730	Cep
		G giant binary with A type companion. Dynamical system mass 7.2 M _☉ . AB: P = 372 y, orbit r = 100 AU, increasing in <i>θ</i> . (2012)								0	730	Cep
		Cetus							Charts 12, 13, 20			
	β 393		00 18.3 −21 08	6.9, 8.4	29	0.7"	182	B9.5IV	1431, 166174	1	731	Cet
	h 1957	A (BC)	00 21.9 −23 00	7.7, 9.2	26	6.1"	59	G0	1766, 166213	0	732	Cet
	Shy 384	A (BaBb)	00 29.3 −05 55	7.8, 9.5	51	14.0'	57	G0 G5	2567, 128781	1	733	Cet
	h 1981	A [B C]	00 31.0 −10 05	6.9, [9.7, 9.1]	88, [318]	79", [0.4"]	149	A5IV	2760, 147317	0	734	Cet
	Σ 39	(AB) (CaCb)	00 34.5 −04 33	7.1, 8.7	44	17"	77	G0IV	3125, 128831	1	735	Cet
		Solar type (2)+(2) quadruple, visual binary; dark field. MSC gives 4.3 M _☉ . AB: P = 2,980 y, orbit r = 210 AU. (2011)								1	735	Cet
★	β 395		00 37.3 −24 46	6.6, 6.2	101	0.6"	15.4	G8V	3443, 166418	0	736	Cet
		Local, very high CPM, solar type binary; isolated in dark field. AB: P = 25 y, orbit r = 10 AU (among the smallest resolvable orbits), e = 0.22, periastron in 2023, closing. (2011)								0	736	Cet
	Mf 1		00 45.7 −16 25	6.5, 10.4	196	2.9"	89	F2V	4338, 147436	1	737	Cet
	Stone 3	A (BD)	00 52.2 −22 37	7.6, 8.4	243	2.0"	53	F8V	5059, 166640	0	738	Cet
	WNO 1		00 53.2 −24 47	6.6, 9.2	7	5.0"	74	F6IV	5156, 166651	1	739	Cet
	h 2004		00 57.6 −19 00	7.0, 7.2	238	3.5"	142	A2Vn	5617, 147537	0	740	Cet
	S 390		00 58.2 −15 41	7.8, 7.9	216	6.4"	59	dF6 dF7	5659, 147543	1	741	Cet
	Σ 81		01 00.1 −02 01	7.3, 10.1	67	18"	90	F5	5861, 129072	0	742	Cet
	Σ 91		01 07.2 −01 44	7.4, 8.6	314	4.3"	48.7	F9V	6651, 129128	1	743	Cet
37	Σ I 3	(AaAb) B	01 14.4 −07 55	5.2, 7.9	330	51"	23.4	F6V G9V	7439, 129193	0	744	Cet
		Local, high CPM solar type 2+1 triple, visual double; YW/O color. MSC system mass 2.4 M _☉ . AB: ps = 1,610 AU. (2012)								0	744	Cet
★ 42	Σ 113	A (BC)	01 19.8 −00 31	6.5, 7.0	22	1.7"	101	A2V G4III	8036, 129235	1	745	Cet
		A type 1+(2) triple with G giant. BC: P = 27 y, e = 0.22, periastron 2022. (339 obs.) A,BC: ps = 230 AU. (2013)								1	745	Cet
	h 2036		01 20.0 −15 49	7.4, 7.6	339	2.3"	46.2	G0IV	8071, 147741	0	746	Cet
	h 2043		01 22.5 −19 05	6.5, 8.7	72	5.0"	62	F6IV	8350, 147767	1	747	Cet

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Se 1	β 1163	Solar type spectroscopic binary. AB: $P = 16$ y, orbit $r = 9$ AU, $e = 0.93$, disappearing to periastron 2021, it returns to view 2027. (2011)	01 23.6–24 21	6.8, 9.1	89	3.1"	81	A8III	8487, 167011	0	748	Cet
			01 24.3–06 55	6.6, 7.0	217	0.4"	46.6	F3V	8556, 129277	1	749	Cet
Σ 120	β 399	A (typically difficult) Burnham double with K giant. AB: ps = 240 AU. Neglected. (1991)	01 25.0–05 57	6.8, 10.0	278	7.4"	112	A0	8627, 129283	0	750	Cet
			01 27.8–10 54	6.4, 8.8	303	1.5"	118	K4III	8921, 147819	1	751	Cet
h 3437	Σ 150	A B	01 28.1–17 16	7.4, 9.4	247	12"	57	F2III	8957, 147822	0	752	Cet
			01 43.4–07 05	7.7, 8.2	196	36"	140*	A	10606, 129472	1	753	Cet
β 6	Eng 8	Local, solar type double with F giant; dominant in dark field. B is EZ Cet, BY Dra type variable. AB: ps = 6,010 AU. (2012)	01 44.7–06 46	6.7, 8.9	163	2.3"	189	G5III	10725, 129482	0	754	Cet
			01 49.6–10 41	4.7, 6.8	250	3.2'	23.2	F3III G1V	11171, 148036	1	755	Cet
Σ 186	Gal 315	Matched solar type binary; dark field. AB: $P = 166$ y, orbit $r = 40$ AU, $e = 0.73$, periastron 2058. (435 measures; 2012)	01 55.9 +01 51	6.8, 6.8	248	0.8"	39.9	F9V	11803, 110235	0	756	Cet
			01 57.2–10 15	6.5, 11.1	134	30"	32.9	G5IV+K7	11964, 148123	1	757	Cet
58 β 7	A A	High CPM, solar type double; dark field, unidentified m.9 double 9' s.p. AB: ps = 1,330 AU. (2007)	01 58.0–02 04	6.6, 10.4	18	2.8"	150	A0	12020, 129588	0	758	Cet
			01 59.0–22 55	7.3, 7.6	303	8.8"	111	A7V+G0	12180, 167451	1	759	Cet
61 H V 102	LDS 3346	High CPM solar type double; m.12 double 4' s.f., faint stars n.p. unrelated. AB: ps = 3,030 AU. (2007)	02 03.8–00 20	6.0, 10.8	194	44"	111	G5II	12641, 129667	0	760	Cet
			02 07.6–00 37	6.9, 10.5	342	82"	36.9	G2V	13043, 129706	1	761	Cet
66 Σ 231	β 8	Binary with K giant; dark field. AB: $P = 653$ y, orbit $r = 130$ AU; slowly closing from cusp of edgewise orbit. (2008)	02 12.8–02 24	6.2, 7.7, 11.5	235, 54	17", 2.5'	39.7	F8V G1V	13612, 129752	0	762	Cet
			02 21.4 +08 53	8.0, 9.2	225	1.5"	120	F0	14562, —	1	763	Cet
β 517	Kui 8	Local, solar type double with del Sct type variable; dark field. AB: ps = 110 AU. (2012)	02 24.9–03 54	6.9, 12.1	248	11"	139	K0	15005, 129887	0	764	Cet
			02 26.0–15 20	5.9, 9.1, 10.5	295, 31	12", 110"	77	A6V	15144, 148386	1	765	Cet
Σ 280	79	Kafalijdhma. Local, A type 2+1 CPM triple; pretty brightness and separation contrast in dark field. AB: ps = 69 AU (229 measures); AC: ps = 27,800 AU. (2013)	02 28.0 +01 58	7.1, 7.6	39	0.5"	167	K0III	15328, 110542	0	766	Cet
			02 34.1–05 38	8.0, 8.0	346	3.7"	178	K1III	15994, 129981	1	767	Cet
78 nu Σ 281	h 3511	Local, solar type double with del Sct type variable; dark field. AB: ps = 70 AU, closing in poorly measured orbit. (2002)	02 35.3–03 34	6.8, 10.4	187	6.2"	39.0	G5IV+M2V	16141, 129992	0	768	Cet
			02 35.9 +05 36	5.0, 9.1	80	8.4"	104	G3III	16161, 110635	1	769	Cet
O Σ 30	84	Local, solar type binary. AB: $P = 1,420$ y (?), ps = 1,420 y (?), ps = 70 AU, closing in poorly measured orbit. (2002)	02 36.0–21 24	7.2, 8.7	99	15"	340	G2III	16263, 167903	0	770	Cet
			02 39.0 +08 55	7.7, 9.6	214	69"	280	A0	16500, 110658	1	771	Cet
Σ 295	Σ 299	Kafalijdhma. Local, A type 2+1 CPM triple; pretty brightness and separation contrast in dark field. AB: ps = 69 AU (229 measures); AC: ps = 27,800 AU. (2013)	02 41.2–00 42	5.8, 9.7	301	3.6"	22.5	F6V	16765, 130055	0	772	Cet
			02 43.3 +03 14	3.5, 6.2, 10.2	298, 306	2.1", 14.1'	24.4	A1V	16970, 110707	1	773	Cet
Σ 323	Σ 330	Local, solar type double with del Sct type variable; dark field. AB: ps = 110 AU. (2012)	02 52.7 +06 28	7.8, 7.9	278	2.7"	196	B9	17907, 110807	0	774	Cet
			02 57.2–00 34	7.3, 9.1	192	8.6"	190*	G8III	18384, 130205	1	775	Cet
Σ 334	94	Local, solar type binary. AB: $P = 1,420$ y (?), ps = 1,420 y (?), ps = 70 AU, closing in poorly measured orbit. (2002)	02 59.4 +06 39	7.9, 8.2	309	1.2"	125	F0	18570, 110883	0	776	Cet
			03 12.8–01 12	5.1, 11	207	2.3"	22.6	F8V	19994, 130355	1	777	Cet
Σ 367	Σ 367	Local, solar type binary. AB: $P = 1,420$ y (?), ps = 1,420 y (?), ps = 70 AU, closing in poorly measured orbit. (2002)	03 14.0 +00 44	8.1, 8.2	131	1.2"	66	F8	20115, 111062	0	778	Cet

β 1039	(AB) C	03 17.4 +07 39	7.4, 7.8	38	26'	46.2	F9IV	20430, 111104	1	779	Cet
95 AC 2	A B (C)	03 18.4 -00 56	5.6, 8.0	259	1.2"	67	G9IV	20559, 130408	0	780	Cet
Solar type 2+(1) triple (C is m.16); Y/B color, dark field. MSC gives 1.8 M \odot . AB: $P = 282$ y, orbit $r = 65$ AU, closing. (2011)											
Chamaeleon Cha											
h 4109		08 22.8 -76 26	7.2, 8.2	130	26"	185	A0V	71972, 256507	1	781	Cha
del 1 I 294		10 45.3 -80 28	6.2, 6.5	85	0.8"	107	K0III	93779, 258592	0	782	Cha
eps h 4486	A B C	11 59.6 -78 13	5.3, 6.0, 6.6	211, 40	0.4", 2.2'	111	B9Vn+A	104174, 256894	1	783	Cha
S h 4590		13 33.2 -77 34	6.6, 9.2	133	22"	35.2	F6V	117360, 257060	0	784	Cha
Circinus Cir											
Δ 145		13 54.6 -66 54	7.8, 8.9	48	24"	174	B9V	120891, 252509	1	785	Cir
h 4632	A B	13 58.5 -65 48	6.4, 9.5	13	6.4"	157	K0III	121557, 252534	0	786	Cir
Don 632		13 59.5 -66 43	7.9, 10.1	268	3.8"	169	K0III	121707, 254347	1	787	Cir
NZO 52		14 40.8 -66 57	7.9, 8.5	59	2.2"	98	F6V	128573, 252840	0	788	Cir
\star alp Δ 166	A B	14 42.5 -64 58	3.2, 8.5	226	15"	16.6	A	128898, 252853	1	789	Cir
Local, A type double with alp2 CVn type variable; faint rich field, double B 823 (m.8, 1.4") 8' s.f. (2013)											
Don 680		14 49.4 -67 14	7.5, 9.8	243	2.2"	24.9	K0V	130042, 252899	0	790	Cir
Local, solar type double; mixed field. AB: $P = 261$ y, orbit $r = 50$ AU, widening. (2013)											
h 4707		14 54.2 -66 25	7.5, 8.1	276	1.1"	38.5	G0V	130940, 252945	1	791	Cir
High CPM, solar type binary. AB: $P = 346$ y, orbit $r = 60$ AU, widening. (2010)											
Gli 213		15 01.3 -67 59	7.1, 9.3	334	5.1"	320	B4V	132127, 252988	0	792	Cir
h 4735		15 12.8 -60 24	7.6, 10.5	31	7.4"	89	F5V	134450, 253056	1	793	Cir
I 329	A B C	15 14.0 -61 21	6.7, 7.7, 9.6	339, 297	0.9", 45"	260	B5V	134657, 253064	0	794	Cir
CorO 180		15 14.7 -59 49	7.6, 9.2	288	12"	172	K2III	134820, 242335	1	795	Cir
\star gam h 4757		15 23.4 -59 19	4.9, 5.7	1	0.8"	138	B5IV F8	136415, 242463	0	796	Cir
High mass binary. AB: $P = 258$ y (?), orbit $r = 355$ AU, decreasing θ in poorly measured orbit. (2012)											
CapO 16	A B	15 29.5 -58 21	7.0, 8.0	32	2.4"	86	A8V	137583, 242593	1	797	Cir
Columba Col											
h 3728		05 08.5 -41 13	6.8, 10.3	260	10"	54	G3V	33473, 217198	0	798	Col
Δ 22		05 31.2 -42 18	7.2, 7.8	169	7.3"	101	A8V+	36648, 217374	1	799	Col
h 3781		05 38.6 -41 18	8.0, 9.4	136	16"	88	F3V	37718, 217448	0	800	Col
h 3825		06 02.1 -27 26	7.2, 10.5	338	32"	57	F5V	41172, 171158	1	801	Col
h 3849		06 19.8 -39 29	6.7, 8.1	54	40"	250	K2III	44404, 196693	0	802	Col
h 3858	A B C	06 25.5 -35 04	6.4, 7.6, 8.2	48, 309	2.2", 3.8"	168	K3III	45383, 196805	1	803	Col
h 3860		06 25.8 -40 59	7.3, 8.8	228	8.6"	150	A5V	45501, 217921	0	804	Col
I 4		06 30.7 -40 27	7.3, 7.5	306	0.8"	820*	B3IV	46288, 217981	1	805	Col
β 754	A B	06 34.7 -34 01	7.2, 7.7, 12.2	49, 51	1.0", 49"	200	A4V	46973, 196959	0	806	Col
β 755	A B C	06 35.4 -36 47	5.9, 6.9, 11.5	260, 302	1.5", 21"	156	A0V	47144, 196978	1	807	Col
CapO 6		06 35.4 -38 49	8.2, 8.2	241	1.1"	182	A0V	47146, 196979	0	808	Col
UC 1454		06 35.6 -36 16	7.2, 12.0	181	34"	162	A1V	47168, 196982	1	809	Col
Shy 185	(AaAb) (BaBb)	06 35.9 -36 05	6.4, 7.3	129	4.8'	39.6	G0V G1V	47230, 196987	0	810	Col
Solar type (2)+(2) quadruple, visual binary. Aa,Ab (Fin 19): $P = 29$ y, $e = 0.44$, periastron 2022 (2013); Ba,Bb (Rst 4816): $P = 14$ y, $e = 0.38$, periastron 2018 (2013); AB: $ps = 0$ 15,400 AU is physical. Neglected. (1999)											

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
	Rst 4819		06 37.2 −36 59	5.9, 7.5	4	0.5"	350	B7IV	47500, 197014	1	811	Col
	Coma Berenices	Com							Chart 9			
2	Σ 1596		12 04.3 +21 28	6.2, 7.5	236	3.7"	101	F0IV	104827, 82123	0	812	Com
	Cbl 141		12 05.4 +17 17	7.7, 11.0	312	44"	97	F5	104999, 99936	1	813	Com
	Σ 1615	A (BaBb)	12 14.1 +32 47	7.0, 8.6	87	27"	127	G5	106365, 82904	0	814	Com
	β 27		12 20.1 +13 51	7.1, 10.5	108	3.6"	143	G9III	107288, 100048	1	815	Com
	Σ 1633		12 20.7 +27 03	7.0, 7.1	246	9.0"	92	F3V F3V	107398, 82254	0	816	Com
	Sh 143	A C	12 22.5 +25 51	4.9, 8.9	168	59"	90	G0III+A3	107700, 82273	1	817	Com
	Σ 1639	A B	12 24.4 +25 35	6.7, 7.8	324	1.8"	90	A7V F4V	108007, 82293	0	818	Com
		A type binary; dark field. AB: $P = 575$ y, orbit $r = 110$ AU. (439 measures; 2013)								0	818	Com
AI	Σ I 21	A B	12 28.9 +25 55	5.2, 6.6	250	2.4'	73	A0	108662, 82330	1	819	Com
	Hjl 1069		12 30.3 +21 57	7.9, 10.1	312	115"	139	G7III	108863, 82342	0	820	Com
★ 24	Σ 1657	A (BaBb)	12 35.1 +18 23	5.1, 6.3	270	20"	138	K0II A9V	109511, 100160	1	821	Com
		Probable high mass 1+(2) spectroscopic triple with variable K supergiant; classic YO/B color contrast, dark field. AB: ps = 3,720 AU. (2012)								1	821	Com
	Hjl 1072		12 39.2 +16 29	7.6, 9.3	23	118"	102	F3V	110025, 100194	0	822	Com
	Σ 1685	A B	12 51.9 +19 10	7.3, 7.8	201	16"	220	Am F8III	111844, 100307	1	823	Com
★ 35	Σ 1687	(AaAb) B C	12 53.3 +21 15	5.2, 7.1, 9.8	194, 128	1.2', 29"	87	G7III	112033, 82550	0	824	Com
		High mass (2)+1+1 quadruple with G giant. MSC 6.9 M \odot . AB: $P = 359$ y, orbit $r = 105$ AU, $e = 0.15$. (385 measures; 2012)								0	824	Com
	Met 9		12 54.7 +22 06	5.7, 7.8	51	1.7"	33.9	F8V M3V	112196, 82559	1	825	Com
	Σ 1709		13 02.5 +23 30	7.9, 10.0	251	2.7"	160	F4V	113303, 82618	0	826	Com
	Σ 259		13 07.7 +24 01	8.2, 8.6	21	39"	35.4	G5V	114060, 82662	1	827	Com
		High CPM, solar type double; W/W color in dark field. AB: ps = 1,860 AU, near 100% probability the pair is physical. (2012)								1	827	Com
★ 42 alp	Σ 1728	A B	13 10.0 +17 32	4.9, 5.5	12	0.6"	17.8	F5V F6V	114378, 100443	0	828	Com
		Diadem. Local, high CPM, solar type, possible Algol type eclipsing binary in remarkably large but edge on orbit; AB: $P = 26$ y, orbit $r = 12$ AU, last transit 2015, widening to 0.5' in 2019 before next potential eclipse (duration ~ 1.5 d) in 2026. (657 measures; 2011)								0	828	Com
	Bgh 46	(AaAb) B	13 16.5 +19 47	6.5, 7.6	58	3.4'	85	A3 A2	115365, 82751	1	829	Com
	β 800	A B	13 16.8 +17 01	6.7, 9.5	105	7.2"	11.1	K1V M1V	115404, 100491	0	830	Com
		Local, high CPM, solar type binary, discovered by W. Herschel (1782). AB: $P = 770$ y, orbit $r = 90$ AU. (200 measures; 2012)								0	830	Com
	Σ 1737		13 21.8 +17 46	7.9, 10.3	220	15"	98	F0	116206, 100534	1	831	Com
	Σ 266		13 28.4 +15 43	8.0, 8.4	358	2.1"	51	F5	117190, 100583	0	832	Com
		Solar type binary; wide double n.p. AB: $P = 1,954$ y, orbit $r = 170$ AU, increasing θ in poor quality orbit. (216 measures; 2013)								0	832	Com
	Corona Australis	CrA							Chart 25			
★	h 5014		18 06.8 −43 26	5.7, 5.7	4	1.8"	41.8	A5V A5V	165189, 228708	1	833	CrA
		A type, matched binary, member of the beta Pictoris comoving group. AB: $P = 450$ y, orbit $r = 85$ AU, widening. (2010)								1	833	CrA
	h 5023		18 10.8 −40 26	8.3, 8.6	276	8.8"	400	A2	166060, 228773	0	834	CrA
	l 1020		18 16.4 −40 28	8.2, 8.0	275	0.4"	520	B7V	167297, 228864	1	835	CrA
kap 1,2	Δ 222		18 33.4 −38 44	5.6, 6.2	358	22"	300	B9V A0III	170868, 210295	0	836	CrA
	l 250		18 41.2 −42 10	7.4, 8.6	115	1.1"	210	A2IV	172261, 229191	1	837	CrA
	CorO 227	A B	18 43.8 −38 19	5.1, 10.0	214	29"	63	A2Vn	172777, 210501	0	838	CrA

h 5074	18 59.2–39 32	6.5, 11.8	246	16″	153	B9.5V	175855, 210786	1	839	CrA	
Brσ 14	(AaAb) B	6.3, 6.6	280	13″	230	B8V B9V	176270, 210816	0	840	CrA	
TY	A B (CaCb)	19 01.6–36 53	137, 23	4.1″, 57″	128	B9IV	176386, 210828	1	841	CrA	
★ gam	h 5084	19 06.4–37 04	0	1.4″	17.3	F8V F8V	177474, 210928	0	842	CrA	
	Local, solar type binary. System mass 2.4 M _☉ . AB: P = 122 y, orbit r = 33 AU, e = 0.32, apastron 2062. (269 measures; 2013)										
Chart 10											
Corona Borealis	CrB	A B	15 18.3+26 50	7.3, 7.4	264	1.6″	F6V F6V	136176, 83756	1	843	CrB
★	Σ 1932	Matched solar type binary. AB: P = 203 y, orbit r = 43 AU, e = 0.65, apastron 2043. (547 measures; 2013)									
★ 2 eta	Σ 1937	A B (E)	15 23.2+30 17	5.6, 6.0	198	0.7″	F8V G0V	137107, 64673	0	844	CrB
	Local, solar type 2+(1) tripler; AB is a visually resolvable spectroscopic binary. AB: P = 42 y, orbit r = 15 AU, e = 0.28. (1,094 measures; 2013) Component E (K _{ir} 4, m.17, 3.2″), below the magnitude limit, is a brown dwarf; AE: ps = 4,680 AU. See Figure 1.										
4 the	Cou 610	(AaAb) B [C (DaDb)]	15 32.9+31 22	4.3, 6.3	200	0.8″	B6Ve	138749, 64769	1	845	CrB
★	Σ 1964		15 38.2+36 15	8.1, 9.9, [8.1, 9.0]	79, 85, [21]	1.2″, 15″, [1.6″]	F5	139691, 64821	0	846	CrB
	According to MSC, a solar type (2)+1+1+(2) sextuple; visually a charming, tiny quadruple often mistaken for binary. MSC system mass 6.1 M _☉ . AB: P = 834 y, orbit r = 140 AU; CD: P = 1,230 y, orbit r = 175 AU. AB,CD: ps = 2,225 AU (probably foreshortened). (2012)										
★ 7 zet 1.2	Σ 1965	(AaAbAc) (BaBb)	15 39.4+36 38	5.0, 5.9	306	6.4″	B7V B9V	139891, 64833	1	847	CrB
	High mass, B type (2+1)+(2) quintuple, visual double. MSC system mass 17.5 M _☉ . A is a (2+1) spectroscopic triple with periods of 1.7 and 251 d. CPM pair AB: ps = 1,250 AU. (324 measures; 2013)										
★ 8 gam	Σ 1967		15 42.7+26 18	4.0, 5.6	111	0.8″	B9V A3V	140436, 83958	0	848	CrB
	A type binary with del Sct type variable. System mass 4.3 M _☉ . AB: P = 91 y, orbit r = 33 AU, e = 0.48, disappearing to periastron 2022; reappears in 2027. (487 measures; 2012)										
Σ 1973			15 46.4+36 27	7.6, 8.8	321	31″	F5	141186, 64893	1	849	CrB
Ho 399			15 55.4+29 32	7.7, 10.5	117	3.5″	A2V	142796, 84078	0	850	CrB
WNO 47			16 04.9+39 09	6.7, 12.9	280	70″	K0V	144579, 65065	1	851	CrB
	Local, high CPM, low mass double. AB: ps = 13.70 AU. (2000)										
OU 305		A B	16 11.7+33 21	6.4, 10.2	268	5.0″	K2III	145802, 65129	0	852	CrB
Σ 2022			16 12.8+26 40	6.5, 10.0	153	2.2″	F2V	145976, 84247	1	853	CrB
Σ 2029			16 13.8+28 44	8.0, 9.6	186	6.1″	F4IV	146168, 84258	0	854	CrB
★ 17 sig	Σ 2032	(AaAb) B (EaEb)	16 14.7+33 52	5.6, 6.5, 12.3	238, 241	7.2″, 11″	G0V G1V	146361, 65165	1	855	CrB
	TZ CrB. Local, high CPM, solar type (2)+1+(2) quintuple, visual 2+1 triple with RS CVn type variable. MSC system mass 3.8 M _☉ . AB: P = 726 y, orbit r = 110 AU. AE: ps = 18,100 AU. (1,071 measures; 2013)										
Chart 23											
Corvus	CrV		12 15.8–23 21	6.9, 8.2	305	1.9″	F7V	106612, 180617	0	856	CrV
β 920			12 17.9–24 01	7.0, 10.7	221	3.4″	A0V	106955, 180662	1	857	CrV
β 921		A (BC)	12 17.9–24 01	7.0, 10.7	221	3.4″	A0V	106955, 180662	1	857	CrV
7 del	Sh 145	A B	12 29.9–16 31	3.0, 8.5	213	25″	B9.5V	108767, 157323	0	858	CrV
β 28		A B	12 30.1–13 24	6.5, 9.6	342	2.1″	F9V	108799, 157326	1	859	CrV
	Local, solar type binary. System mass 1.9 M _☉ . AB: P = 151 y, orbit r = 35 AU, widening. (2009)										
Σ 1659		A B	12 35.7–12 02	7.9, 8.3	351	28″	G0	109556, 157384	0	860	CrV
★ 58	Σ 1669	(AaAb) (BaBb) C	12 41.3–13 01	5.9, 5.9, 10.3	314, 229	5.2″, 60″	F5V F5V	110318, 157447	1	861	CrV
	B = VV Crv. Solar type (2)+(2)+1 quintuple, visual matched 2+1 triple with Algol type (detached) eclipsing variable. MSC system mass 5.2 M _☉ . Aa,Ab: P = 44 d; Ba,Bb: P = 1.5 d. AB: ps = 550 AU, AC: ps = 6,400 AU. (2010)										

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Crater												
★ 15 gam	Σ 1509	h 840	11 06.5 –13 25	7.4, 9.4	16	33"	210	K0III	Charts 16, 23 96377, 156461	0	862	Crt
			11 24.9 –17 41	4.1, 7.9	93	5.3"	25.2	A5V		1	863	Crt
Local A type double; AB: ps = 180 AU. Despite proximity to Sun it has only 5 measures – neglected! (1968)												
H IV 112	A [B C]		11 29.2 –17 21	4.1, [8.5, 9.1]	331, [202]	28", [0.9"]	78*	F5V	99878, 156707	0	864	Crt
Jc 16	A B C		11 29.6 –24 28	5.8, 8.6, 8.9	82, 116	8.4", 2.8'	137	A0V	99922, 179935	1	865	Crt
Σ 3072			11 30.9 –06 43	7.7, 9.9	331	9.8"	110	F6V	100070, 138243	0	866	Crt
Cru												
Chart 28												
Hrg 74			12 09.4 –63 49	7.4, 9.5	163	2.3"	850	B M1e	105563, 251765	1	867	Cru
BrO 8			12 24.8 –58 07	7.8, 8.0	334	5.3"	173	G0V	107976, 239932	0	868	Cru
★ alp 1 Δ 252	(AaAb) B (CaCb)		12 26.6 –63 06	1.3, 1.6, 4.8	112, 202	3.9", 90"	99	B0IV B1V B4V	108248, 251904	1	869	Cru
Acrux. Brilliant, wide, high mass (2)+1+(2) spectroscopic quintuple, visual triple with more possible components nearby; brilliant W/W/Y colors in rich field, discovered by Father Fontenay (1685). MSC system mass 49.5 M \odot . AB: ps = 920 AU; AC: ps = 12,000 AU. (2013)												
CapO 12	(AaAb) (BC)		12 28.3 –61 46	7.3, 8.2	188	2.0"	48.4	G3V	108500, 251919	0	870	Cru
Solar type (2)+(2) quadruple. MSC has 3.2 M \odot . BC: $P = 28$ y, orbit $r = 11$ AU; A,BC: $P = 2,520$ y, orbit $r = 265$ AU. (2013)												
H1d 116	A B		12 38.1 –55 56	7.1, 8.9	182	1.9"	111	A1V	109808, 240104	1	871	Cru
CoO 140			12 45.2 –62 13	7.9, 9.9	97	4.6"	3480*	A3Ib	110786, 252014	0	872	Cru
★ mu 1,2 Δ 126	A B		12 54.6 –57 11	3.9, 5.0	24	37"	127	B2IV B5Ve	112092, 240366	1	873	Cru
High mass double, joined by CPM and equivalent parallax; W/YW color, rich field. AB: ps = 6,340 AU. (2011)												
Cygnus												
Charts 5, 11												
Σ 2479	A B C		19 08.3 +55 20	7.7, 9.5, 9.7	348, 28	0.5", 6.5"	120	A5IV	179142, 31417	0	874	Cyg
★ Σ 2486	A B		19 12.1 +49 51	6.5, 6.7	205	7.2"	24.5	G3V G3V	179957, 48193	1	875	Cyg
Local, high CPM, matched solar type binary; lovely rich field. AB: $P = 3,100$ y, orbit $r = 310$ AU. (284 measures; 2013)												
OS 373			19 24.1 +46 26	7.6, 9.9	232	1.8"	280	B9.5II	182754, 48406	0	876	Cyg
Σ 2534			19 27.7 +36 32	8.2, 8.4	63	6.3"	900	B9III	183363, 68347	1	877	Cyg
★ 6 bet 1,2 Σ 143	(AaAb) Ac B		19 30.7 +27 58	3.4, 5.2, 4.7	101, 55	0.4", 35"	133	K3II B9.5 B8	183912, 87301	0	878	Cyg
Albireo. High mass (2)+1+1 quadruple, visual triple, discovered by C. Mayer (1777). K supergiant with high mass companion and celebrated YO/B hues (Victorian observers described "topaz and sapphire"). A,Ac (MCA 55, $P = 214$ y), identified by McAlister (1976) with speckle interferometry, is widening and now can be visually resolved with skill, large aperture and good seeing. AB: ps = 6,280 AU. Hipparcos data imply a 12 pc separation but given the total system mass (11.5 M \odot) and parallaxes equal within errors, many consider this a physical system. (273 measures; 2012)												
Arn 82	A B		19 36.4 +35 41	8.1, 8.4	34	44"	220*		185173, 68569	1	879	Cyg
OS 378	A B C		19 36.5 +41 01	7.7, 8.9, 7.8	285, 161	1.3", 2.8'	350	A0	185266, 48640	0	880	Cyg
★ 16 Σ 146	(AaAb) B		19 41.9 +50 31	6.0, 6.2	133	40"	21.1	G1.5V	186408, 31898	1	881	Cyg
Local (2)+1 triple, visual double; near planetary nebula NGC 6826. AB: $P = 13,500$ y, orbit $r = 740$ AU. (580 measures; 2012)												
OS 383	A B		19 42.9 +40 43	7.0, 8.3	15	0.8"	155	B9.5V	186465, 48756	0	882	Cyg
OS 384	A B		19 43.8 +38 19	7.6, 8.2	196	1.0"	680	B5V	186605, 68767	1	883	Cyg
★ 18 del Σ 2579	A B		19 45.0 +45 08	2.9, 6.3	218	2.5"	51	B9.5IV	186882, 48796	0	884	Cyg
Rukh. High mass binary; pretty brightness contrast, needs good seeing. AB: $P = 918$ y, orbit $r = 175$ AU. (462 measures; 2013)												
★ 17 chi Σ 2580	A B [F G J]		19 46.4 +33 44	5.1, 9.3, [8.5, 8.6, 11.7]	70, 235, [157, 241]	26", 13.0', [3.0", 21"]	21.2	F5V	187013, 68827	1	885	Cyg
Local, high CPM, solar type 2+[2+1] wide visual quintuple; color contrast, rich field. MSC system mass 3.3 M \odot . AB: ps = 740 AU; AF: ps = 22,300 AU. FG (Σ 2576): $P = 232$ y, orbit $r = 44$ AU, $e = 0.77$; apastron 2061. (2013)												
												Cyg

0Σ 387	19 48.7 +35 19	7.1, 7.9	117	0.5"	64	F6V	187458, 68893	0	886	Cyg
Solar type binary; rich field. AB: P = 165 y, orbit r = 41 AU, e = 0.06, decreasing θ to periastron 2035. (363 measures; 2012)										
Lep 94	19 49.3 +41 35	7.5, 10.5	67	67"	53	F5	187637, 48869	1	887	Cyg
0Σ 390	A B	19 55.1 +30 12	6.6, 9.5	25	9.0"	B6V A5V	188651, 69079	0	888	Cyg
★ 24 psi	Σ 2605	19 55.6 +52 26	5.0, 7.5	177	2.7"	A4Vn	189037, 32114	1	889	Cyg
Pretty A type (2)+1 triple, visual double. MSC system mass 4.9 M☉. Aa,Ab (Yr 2): P = 54 y, orbit r = 12 AU. (2013)										
Σ 2607	(AB) C	19 57.9 +42 16	6.6, 9.1	289	3.0"	A3V	189377, 49031	0	890	Cyg
Distant, A type (2)+1 triple. MSC 7.1 M☉. AB: P = 270 y, orbit r = 85 AU; AC: ps = 1,340 AU. Neglected. (1996)										
Σ 2606	A B	19 58.5 +33 17	7.7, 8.4	147	0.7"	F5IV	189378, 69186	1	891	Cyg
Σ 2609		19 58.6 +38 06	6.7, 7.6	22	2.0"	B5IV	189432, 69193	0	892	Cyg
Σ 2611		19 58.9 +47 22	8.5, 8.5	208	5.4"	K0	189636, 49052	1	893	Cyg
0Σ 394	A B	20 00.2 +36 25	7.1, 10.3	295	11"	K1III	189751, 69238	0	894	Cyg
Σ 2624	(AaAb) B	20 03.5 +36 02	7.1, 7.7	175	2.0"	O9.5IIIe	190429, 69324	1	895	Cyg
Sh 316	A B D	20 05.7 +35 36	7.8, 8.8, 13.1	323, 85	70", 17"	O7IIIIe	190864, 69391	0	896	Cyg
Es 25	A B D F	20 06.0 +35 46	7.9, 12.0, 8.7, 6.8	119, 236, 329	8.8", 20", 96"	B5n	227634, 69405	1	897	Cyg
A 382		20 08.0 +42 23	7.2, 9.5	96	1.7"	K0	191394, 49217	0	898	Cyg
0Σ 400	A B	20 10.2 +43 57	7.6, 9.8	332	0.7"	G3V	191854, 49262	1	899	Cyg
Solar type visual and spectroscopic binary; sparkling field. AB: P = 86 y, orbit r = 23 AU, e = 0.49, periastron 2056. (236 measures; 2012)										
AC 17	A B	20 12.5 +51 28	6.2, 10.6	83	4.3"	K2.5III	192439, 32354	0	900	Cyg
Σ 2658	A B D	20 13.7 +53 08	7.2, 9.4, 12.9	105, 285	6.8", 31"	F5V	192679, 32380	1	901	Cyg
0Σ 403	A B C	20 14.4 +42 06	7.3, 7.6, 9.8	171, 32	0.9", 12"	B9IV	192659, 49345	0	902	Cyg
Σ 2663	A B	20 16.8 +39 42	8.2, 8.7	324	5.4"	A0II	193063, 69749	1	903	Cyg
Ho 588	A [B C]	20 16.9 +31 30	6.9, [8.9, 12.6]	297, [29]	51", [8.9"]	A0III	193010, 69743	0	904	Cyg
Σ 2666	(AaAbAc) B C D	20 18.1 +40 44	5.8, 8.2, 11.1, 10.4	245, 207, 181	2.8", 34", 50"	O9V B1.5V	193322, 49438	1	905	Cyg
High mass, distant (3)+1+1+1 system; possible cluster remnant, rich field, m:10 double2' n.f. MSC system mass 41.9 M☉. Aa,Ab: P = 35.2 y, e = 0.49, periastron 2030. A.D: ps = 1										
Σ 2671	A B	20 18.4 +55 24	6.0, 7.5	338	3.7"	A2V	193592, 32455	0	906	Cyg
Σ 2668	(AB) C	20 20.3 +39 24	6.3, 8.5	281	3.4"	A2V A5V	193702, 69856	1	907	Cyg
A type (2)+1 triple, visual double. MSC gives 6.8 M☉. AB: P = 83 y, closing. 5' south are Es 2050, Sei 1090, Sei1091. (2008)										
Ho 128	A B	20 22.9 +42 59	6.4, 8.8	358	1.4"	G8III	194220, 49550	0	908	Cyg
S 755	A B	20 30.9 +49 13	6.6, 9.7	278	60"	A2	195710, 49731	1	909	Cyg
0Σ 408		20 34.0 +34 41	6.8, 9.4	193	1.6"	B7V	196120, 70206	0	910	Cyg
Stu 13		20 34.9 +41 43	7.6, 10.1	196	27"	B9	196305, 49828	1	911	Cyg
Σ 2705	A B	20 37.7 +33 22	7.5, 8.5	262	3.1"	K0II	196673, 70300	0	912	Cyg
Ary 48		20 37.8 +32 24	8.2, 8.8	41	53"	F8	—, 70298	1	913	Cyg
Σ 2717	A B	20 37.8 +60 45	7.3, 9.5	259	2.0"	G3III	196988, 18958	0	914	Cyg
Σ 2707	A (CaCb)	20 37.9 +47 57	7.9, 8.6	195	55"	A0	196808, 49879	1	915	Cyg
0Σ 410	A B C	20 39.6 +40 35	6.7, 6.8, 8.7	4, 69	0.9", 68"	B8III	197018, 49899	0	916	Cyg
Distant, high mass, nicely displayed 2+1 triple. AB: P = 1,408 y, orbit r = 210 AU; AC: ps = 25,700 AU. (2013)										
49	Σ 2716	20 41.0 +32 18	5.8, 8.1	44	2.6"	G2III	197177, 70362	1	917	Cyg
★ 52	Σ 2726	20 45.7 +30 43	4.2, 8.7	70	6.0"	G9III	197912, 70467	0	918	Cyg
Solar type double with G giant; YOJ- color, rich field with the Veil Nebula (NGC 6960). AB: ps = 500 AU. (2006)										

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
T	β 677	A B C	20 47.2 +34 22	4.9, 10.0, 11.2	120, 212	8.1", 16"	136	K3III	198134, 70499	1	919	Cyg
	σ 414	A B C	20 47.2 +42 25	7.4, 8.9, 9.9	94, 16	9.9", 106"	350	B7V	198195, 50055	0	920	Cyg
	σ 413	(AaAb) B	20 47.4 +36 29	4.7, 6.3	5	1.0"	240	B5Ve	198183, 70505	1	921	Cyg
54 lam	High mass (2)+1 spectroscopic triple. Aa,Ab: $P = 11.6$ y, $e = 0.52$, periastron 2017; AB: $P = 391$ y, orbit $r = 190$ AU. (417 measures; 2013)											
	Σ 2731	A B	20 49.0 +39 47	7.7, 9.6	85	4.2"	500	B9IV	198436, 70541	0	922	Cyg
	β 67		20 50.6 +30 55	6.9, 9.9	306	1.6"	120	A8III	198626, 70564	1	923	Cyg
β 155	Double with A type giant, at the center of the Veil Nebula NGC 6960. Neglected. (1999)											
	A B C		20 51.1 +51 25	7.4, 8.1, 12.6	39, 40	0.7", 15"	125	A9IV	198834, 32933	0	924	Cyg
	σ 419		20 54.7 +37 04	7.2, 10.0	25	1.7"	194	A0	199234, 70659	1	925	Cyg
σ 418			20 54.8 +32 42	8.2, 8.3	284	1.0"	61	G0	199220, 70660	0	926	Cyg
	Solar type binary, matched m.8 arcsecond resolution test AB: $P = 787$ y, orbit $r = 110$ AU. (2013)											
	σ 423		20 55.3 +42 31	7.1, 9.6	76	2.8"	420	B9	199355, 50226	1	927	Cyg
60	Distant, high mass twin of σ 422 (m.8, 2.6") 3.6" n. (2011)											
	Σ 2741	A B	20 58.5 +50 28	5.9, 6.8	25	2.0"	330	B5Vn	199955, 33034	0	928	Cyg
	σ 426		21 01.2 +46 09	5.4, 9.5	161	2.9"	470	B1Ve	200310, 50359	1	929	Cyg
Σ 2746	V1931 Cyg. High mass double; Be star is variable, probably a spectroscopic binary, large brightness contrast. AB: $p_s = 1,840$ AU. (2009)											
			21 01.8 +39 16	7.9, 8.7	322	1.2"	250	F0	200370, 70808	0	930	Cyg
	β 445	A B	21 03.5 +29 06	7.0, 11.1	109	4.8"	197	G8III	200578, 89415	1	931	Cyg
σ 214	A B		21 03.9 +41 38	6.4, 8.6	185	57"	96	F3IV	200723, 50409	0	932	Cyg
	Σ 2757		21 04.6 +52 24	7.8, 9.2	262	1.9"	230	B9.5V	200943, 33110	1	933	Cyg
	\star 61 Σ 2758	A B	21 06.9 +38 45	5.2, 6.1	152	31"	3.49	K5V K7V	201091, 70919	0	934	Cyg
V389	Local, high CPM, low mass binary; YOYO pair in a sparkling low power field. Noted as binary by J. Bradley (1753); first measured parallax (by Bessel, 1838); as "Piazzi's Flying Star" it has the highest proper motion (5.3"/yr) in this catalog. The A (northern) component is a 0.74 M \odot BY Dra type variable, with massive star spots that dim the brightness as they rotate into view; B is a 0.46 M \odot flare star that can abruptly brighten as flares erupt. AB: $P = 678$ y, orbit $r = 145$ AU, widening to a 34" apastron in 2106; all other "components" in WDS are field stars. (1,667 measures; 2013)											
	Σ 2762	A B	21 08.6 +30 12	5.7, 8.1	304	3.3"	116	B9V	201433, 70968	1	935	Cyg
	β 159		21 10.5 +47 42	6.6, 9.1	312	1.2"	420	B6IV	201836, 50536	0	936	Cyg
Sei 1445			21 12.5 +38 34	7.2, 10.5	23	28"	200*	B9	202088, 71065	1	937	Cyg
	σ 432		21 14.3 +41 09	7.8, 8.1	115	1.3"	240	F8V	202403, 50604	0	938	Cyg
	\star 65 tau	A B (FaFb) (I)	21 14.8 +38 03	3.8, 6.6, 12.0	213, 184	0.9", 90"	20.3	F3V+F7V	202444, 71121	1	939	Cyg
Skl 346	Local, high CPM 2+(2)+(1) quintuple, visual triple (I is m.16) with del Sct type variable. MSC system mass 3.0 M \odot . AB $P = 50$ y, orbit $r = 18$ AU, $e = 0.24$, decreasing θ , Fa,Fb: $P = 2.2$ y, $e = 0.43$. (346 measures; 2013)											
			21 17.8 +52 29	7.7, 11.1	305	56"	107	F2	203046, 33295	0	940	Cyg
	σ 434	A B	21 19.0 +39 45	6.7, 9.9	122	24"	144	B9V	203112, 71195	1	941	Cyg
Σ 2789	A B		21 20.0 +52 59	7.7, 7.9	114	6.9"	720	F8V	203380, 33334	0	942	Cyg
	Distant, solar type matched double; faint field. Colorful, ambiguous S 786 (m.7, 48") 6' n.p. (2012)											
	σ 437	A B	21 20.8 +32 27	7.2, 7.4	20	2.5"	66	G4V	203358, 71230	1	943	Cyg
β 369	Solar type binary; several faint doubles visible in a pretty field. AB: $P = 1,421$ y, orbit $r = 170$ AU. (285 measures; 2013)											
	A B		21 26.5 +52 45	7.6, 11.8	31	16"	199	B9.5V	204401, 33431	0	944	Cyg
	Arm 78		21 31.7 +48 29	7.6, 8.8	99	50"	260	A0m A1IV	205117, 50985	1	945	Cyg

Ho 603	A B	21 32.1 +34 12	7.5, 9.8	251	81"	97	F0	205075, 71434	0	946	Cyg
β 167		21 36.2 +30 03	6.4, 10.0	89	1.8"	111	G8III	205688, 89834	1	947	Cyg
h 1676		21 39.6 +47 12	7.8, 11.0	136	30"	580	K0	206268, 51158	0	948	Cyg
Σ 2820	A B	21 42.6 +42 26	7.5, 10.6	233	16"	154	A0	206673, 51214	1	949	Cyg
★ mu	(AaAb) B	21 44.1 +28 45	4.8, 6.2	318	1.7"	22.2	F6V G2V	206826, 89940	0	950	Cyg
Local, high CPM, solar type (2)+1 spectroscopic triple; a tiny "diamond ring." AB: P = 789 y, orbit r = 120 AU. (735 measures; 2013)											
Σ 2832	A B	21 49.2 +50 31	7.8, 8.3	213	13"	152	B9IV	207661, 33781	1	951	Cyg
V1942	A B	22 02.9 +44 39	5.7, 7.8	7	1.0"	151	A0IV	209515, 51595	0	952	Cyg
Chart 19											
Delphinus Del											
Σ 2665	A (BC)	20 19.4 +14 22	6.9, 9.6	12	3.3"	168	A0 G	193350, 105957	1	953	Del
Σ 2664		20 19.6 +13 00	8.1, 8.3	322	28"	410	K0	193391, 105967	0	954	Del
Ho 131	A B	20 28.3 +18 46	7.0, 10.6	331	3.5"	38.5	G1V	195019, 106138	1	955	Del
S 752	A B C	20 30.2 +19 25	6.8, 11.1, 7.3	126, 288	2.6", 107"	390	B7IV	195358, 106177	0	956	Del
1	A B	20 30.3 +10 54	6.2, 8.0	350	0.9"	230	A1sShell	195325, 106172	1	957	Del
Σ 2703	A B	20 36.8 +14 44	8.4, 8.4	290	25"	440	A5	196411, 106302	0	958	Del
Σ 2701		20 37.0 +12 03	8.3, 8.6	221	2.1"	118	G5	196423, 106305	1	959	Del
0Σ 533	(AaAb) C	20 39.1 +10 05	5.2, 8.6	100	3.5'	30.1	G11V K2IV	198755, 126059	0	960	Del
7 kap	High CPM, solar type (2)+1 triple; several faint stars nearby; component B is optical. Aa,Ab: P = 45 y, orbit r = 16 AU; now unresolved, m.9 Ab may widen to 0.5" in 2022. AC: ps = 8,530 AU. (2001)										
0Σ 409	A B	20 40.3 +03 26	7.1, 10.2	84	17"	250	K0	196929, 126088	1	961	Del
Σ 2715		20 41.8 +12 31	7.8, 10.2	3	12"	92	F8	197179, 106390	0	962	Del
Σ 2718	A B	20 42.6 +12 44	8.3, 8.4	87	8.4"	145	F5	197312, 106409	1	963	Del
Σ 2723	(AaAb) B	20 44.9 +12 19	7.0, 8.3	146	1.2"	210	A3IV	197684, 106443	0	964	Del
Σ 2725	(AaAb) B	20 46.2 +15 54	7.5, 8.2	12	6.1"	36.5	K0	197913, 106466	1	965	Del
★ 12 gam	Solar type (2)+1 triple, visual double. MSC gives 2.6M☉. Low quality orbit AB: P = 2,850 y, orbit r = 270 AU. (260 measures; 2013)								1	965	Del
1,2	A B	20 46.7 +16 07	4.4, 5.0	266	9.0"	38.7	F7V K1IV	197963, 106477	0	966	Del
Solar type binary; in rich field with double Σ 2725 (above) 14' s.p., subtle Y/V color contrast. AB: P = 3,250 y, orbit γ = 395 AU. (515 measures; 2013)											
13	β 65	20 47.8 +06 00	5.6, 8.2	199	1.5"	131	A0V	198069, 126222	1	967	Del
Σ 2730		20 51.1 +06 23	8.4, 8.6	333	3.3"	45.5	K1III	198569, 128196	0	968	Del
Σ 2733		20 52.7 +07 20	8.4, 8.6	145	41"	370	A	198812, 126322	1	969	Del
★	Σ 2735	20 55.7 +04 32	6.5, 7.5	281	2.0"	142	G6III	199223, 126373	0	970	Del
Probable A type double with G giant; sparse bright field. AB: ps = 385 AU. (2011)											
0ΣΣ 213		20 59.8 +16 49	6.7, 9.2	37	71"	48.1	F4III	199941, 106738	1	971	Del
h 1608	A B	21 04.9 +12 27	7.7, 11.4	257	20"	90	F2V	200745, 106819	0	972	Del
Chart 27											
Dorado Dor											
Shy 462	Aa Ab B	04 18.7 −52 52	6.2, 8.8, 7.8	106, 236	0.8", 4.5'	72	F7IV F5V	27604, 233476	1	973	Dor
Rmk 4		04 24.2 −57 04	6.9, 7.2	248	5.4"	27.7	G4V	28255, 233506	0	974	Dor
Slr 6		04 25.5 −53 07	7.1, 9.1	105	0.9"	136	F0V	28349, 233512	1	975	Dor
h 3658		04 28.9 −49 36	8.1, 8.5	122	5.7"	158	A	28689, —	0	976	Dor
★	h 3683	04 40.3 −58 57	7.3, 7.5	89	3.7"	30.6	G5V	30003, 233622	1	977	Dor
Solar type binary; sparse field. AB: P = 326 y, orbit r = 75 AU, widening. (2013)											
CapO 4		04 47.4 −61 29	7.4, 10.3	45	2.6"	69	F3V	30865, 249108	0	978	Dor

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
zet	LDS 135		05 02.3 −56 05	7.1, 10.8	144	79"	22.5	G5V	32778, 233796	1	979	Dor
	Shy 22	Local, high CPM solar type double, n.p. of three similar stars. AB: ps = 2,400 AU. (2010)								1	979	Dor
		05 05.5 −57 28	4.8, 9.1	155	5.4'		11.7	F7V K7V	33262, 233822	0	980	Dor
I 276		Local, solar type double; sparse field. AB: ps = 5,110 AU. (2010)								0	980	Dor
		05 27.0 −68 37	6.7, 7.0	161	1.4"		78	F0IV	36584, 249281	1	981	Dor
		Solar type double; faint rich field, centered in front of Large Magellanic Cloud. AB: ps = 145 AU. (2008)								1	981	Dor
Δ 26	A B	06 12.2 −65 32	6.9, 8.1	120	21"		70	F6V F7IV	43618, 249477	0	982	Dor
									Charts 4, 5			
	Draco											
\star Σ 1382		09 37.9 +73 05	7.0, 7.2	125	4.9"		71	F1V F2V	82685, 6915	1	983	Dra
		Matched solar type double; a classic Struve binary, beautifully displayed in dark field. AB: ps = 470 AU. (2007)								1	983	Dra
	Σ 1437	10 34.2 +73 50	7.6, 10.4	291	24"		186	A3	91114, 7161	0	984	Dra
$O\Sigma$ 539	A C	11 15.2 +73 29	7.8, 11.3	326	6.5"		14.7	K4V+M2	97584, 7320	1	985	Dra
		Local, low mass double; dark field, m.8 B is optical. AC: ps = 130 AU. (2011)								1	985	Dra
	β 794	11 53.7 +73 45	7.2, 8.3	50	0.5"		58	F8V	103246, 7445	0	986	Dra
Σ 1590	A B	12 01.6 +70 51	7.4, 10.1	235	5.3"		157	K1III	104435, 7485	1	987	Dra
		13 13.5 +67 17	6.6, 7.1	296	3.0'		122	K2III	115136, 16018	0	988	Dra
	$O\Sigma$ 123	13 27.1 +64 44	6.7, 7.0	148	70"		72	F0	117200, 16078	1	989	Dra
Σ 1860	A B	14 33.9 +55 14	8.0, 9.0	112	1.0"		152	A5	128230, 29198	0	990	Dra
		14 41.0 +57 57	7.5, 8.3	49	7.8"		55	K0	129580, 29244	1	991	Dra
	DL Σ 1878	14 42.1 +61 16	6.3, 9.2	314	4.1"		40.7	F4V	129798, 16466	0	992	Dra
Σ 1882	A B C	14 44.1 +61 06	6.9, 9.2, 10.5	359, 223	12", 7.2"		82	F3V	130173, 16478	1	993	Dra
		Solar type triple (probable 1+2); in same rich field with Σ 1878 (above). AB: ps = 1,330 AU. (2010)								1	993	Dra
	BV, BW Σ 1927	(AaAb) (BaBb)	15 11.8 +61 51	8.1, 8.8	353	16"	71	F8V G3V	135421, 16636	0	994	Dra
TW	$O\Sigma$ 299	Solar type (2)+(2) spectroscopic quadruple, visual double; both components are W UMa type eclipsing contact binaries, an extreme example of hierarchical segregation. Aa,Ab: P = 0.29 d. Ba,Bb: P = 0.35 d. AB: ps = 1,530 AU. (2013)								0	994	Dra
		15 24.6 +54 13	7.5, 7.6	270	0.7"		230	K0	137588, 29514	1	995	Dra
	β 946	(AaAb) B	15 33.9 +63 54	7.5, 9.9	25	3.4"	139	A5	139319, 16767	0	996	Dra
Σ 1984	A B	15 47.6 +55 23	5.9, 9.5	129	2.3"		74	A3m	141675, 29668	1	997	Dra
		15 51.2 +52 54	6.9, 8.9	278	6.4"		127	A1V	142282, 29691	0	998	Dra
	Σ 2054	(AaAb) B	16 23.8 +61 42	6.2, 7.1	350	1.0"	155	G8III	148374, 17073	1	999	Dra
14 eta	$O\Sigma$ 312	(2)+1 triple, visual double with G giant; in field with $O\Sigma$ 312 (below) 12' s.f. AB: ps = 210 AU. (2013)								1	999	Dra
		A B	16 24.0 +61 31	2.8, 8.2	139	4.8"	28.2	G8III	148387, 17074	0	1000	Dra
	\star 17,16 Σ 2078	A B (CaCb)	16 36.2 +52 55	5.4, 6.4, 5.5	104, 193	3.1", 90"	126	B9.5V	150117, 30013	1	1001	Dra
β 953		High mass 2+(2) quadruple; visual wide triple. MSC system mass 11.4 M_{\odot} . AB: ps = 595 AU. AC: ps = 15,300 AU. (2013)								1	1001	Dra
		(AB) (DaDb)	16 36.7 +69 48	8.0, 8.0	46	2.4'	107	F2V	150631, 17167	0	1002	Dra
		Solar type matched (2)+(2) quadruple, visual wide binary. AB: P = 21 y, e = 0.44, periastron 2120, AD: ps = 20,800 AU. (2008)								0	1002	Dra
20 Σ 2118	A B	16 56.4 +65 02	7.1, 7.3	65	0.9"		70	F2IV	153697, 17285	1	1003	Dra
		Solar type binary. System mass 2.2 M_{\odot} . AB: P = 422 y, orbit r = 75 AU, e = 0.14, apastron 2050. (286 measures; 2013)								1	1003	Dra
	\star 21 mu Σ 2130	A B	17 05.3 +54 28	5.7, 5.7	5	2.4"	27.4	F7V	154905, 30239	0	1004	Dra

Arrakis. Matched solar type binary; sparse field. System mass 2.8 M☉. AB: P = 812 y, orbit r = 125 AU. (812 measures; 2013)									
Σ 2146	A B	17 13.1 +54 08	6.9, 8.8	224	2.6"	109	A9III	156162, 30299	0 1004
Σ 2155	A B	17 16.1 +60 43	6.9, 10.0	113	9.8"	182	F3III	156890, 17410	1 1005
Σ 2180		17 29.0 +50 52	7.8, 8.1	258	3.1"	111	A7IV	158868, 30413	0 1006
LDS 5227		17 29.7 +63 51	7.7, 8.4	288	3.2"	45.2	G0	159329, 17504	1 1007
Solar type, wide CPM double; sparse or dark field. Near 100% probability pair is physical. AB: ps = 11,700 AU. (2003)									
★ 24,25 nu 1,2	Σ I 35	17 32.3 +55 10	4.9, 4.9	311	62"	30.5	A4m A6V	159560, 30450	0 1008
Kuma. Regal, matched A type (2)+(2) spectroscopic and CPM quadruple; fine binocular pair. AB: ps = 2,550 AU; near 100% probability pair is physical. (2012)									
★ 26	LDS 2736	17 35.0 +61 52	5.3, 8.5, 10.2	313, 161	0.9", 12'	14.2	G0V	160269, 17546	1 1009
Local, high CPM, solar type 2+1 triple. AB: P = 76 y, orbit r = 22 AU, e = 0.18, periastron 2023. AB.C: ps = 14,100 AU; near 100% probability pair is physical. (2011)									
Σ 2199		17 38.6 +55 46	8.0, 8.6	55	2.1"	121	F8V	160780, 30494	0 1010
Solar type binary; wide m.10 double 3' n.f. Low quality orbit AB: P = 1,299 y, orbit r = 270 AU. (226 measures; 2013)									
H I 141		17 39.7 +72 56	8.1, 8.5	335	1.0"	110*	F2	161692, 8876	1 1011
Σ 2218		17 40.3 +63 41	7.1, 8.4	309	1.4"	68	F8V	161285, 17599	0 1012
★ 31 psi 1	Σ 2241	17 41.9 +72 09	4.6, 5.6	16	30"	22.8	F5IV F8V	162003, 8890	1 1013
Dziban. Local, solar type, long period double; dominant in dark field, superb in any aperture. AB: ps = 925 AU. (2013)									
Σ 2261	A B	17 58.1 +52 13	7.6, 10.0, 12.1	261, 45	9.6", 59"	114	A2	164394, 30665	0 1014
Σ 2273	A B	17 59.2 +64 09	7.3, 7.6	283	21"	73	F4V F5V	164984, 17717	1 1015
★ 40,41	Σ 2308	18 00.2 +80 00	5.7, 6.0	231	19"	64	F7V F7V	166866, 8996	0 1016
Solar type (2)+(2) spectroscopic quadruple, visual matched binary; bright, wide, pretty. MSC system mass 5.2 M☉. Aa,Ab: P = 3.4 y, e = 0.975 (highest known spectroscopic ellipticity). Ba,Bb: P = 1640 AU; near 100% probability the pair is a long period binary, despite linear solution. (2013)									
Σ 2284		18 01.4 +65 57	8.0, 9.5	191	3.6"	190	F7IV	165522, 17729	1 1017
Σ 2302	A B C	18 02.8 +75 47	7.0, 10.0, 9.7	249, 277	5.0", 23"	141	A0V	166655, 8999	0 1018
Σ 2278	B C	18 02.9 +56 26	8.1, 8.5	38	34"	138	A9V	165501, 30716	1 1019
Σ 2326		18 05.3 +81 29	8.0, 9.0	194	16"	190*	A8IV	168518, 2993	0 1020
★ 43 phi	OΣ 353	18 20.8 +71 20	4.5, 5.9	266	0.5"	93	B8V A0	170000, 9084	1 1021
High mass (2)+1 spectroscopic triple with alp2 CVn type variable. AB: P = 308 y, orbit r = 90 AU, e = 0.75, widening. (2011)									
39	Σ 2323	18 23.9 +58 48	5.1, 8.1, 8.0	345, 20	3.6", 89"	56	A1V	170073, 30949	0 1022
UC 3571		18 24.1 +79 13	6.7, 12.3	73	46"	130	K0	171606, 9130	1 1023
OΣ 351	(AB) C	18 25.3 +48 46	7.9, 8.3	25	0.8"	145	G5	170109, 47482	0 1024
Solar type (2)+1 triple; poorly measured. AB: P = 300 y, orbit r = 60 AU. AC: P = 560 y, orbit r = 160 AU, closing. (2011)									
OΣ 363		18 37.4 +77 41	7.5, 8.1	338	0.5"	110	F0IV	173831, 9199	1 1025
Solar type binary; resolution challenge, ~1" n.f m.6 star in sparse field. Low quality orbit AB: P = 642 y, orbit r = 105 AU. (2011)									
Σ 2377	A B	18 38.4 +63 32	7.0, 9.8	339	17"	230	K2III	172923, 17963	0 1026
Σ 2368	A B	18 38.9 +52 21	7.6, 7.8	320	1.9"	260	A3	172712, 31086	1 1027
Σ 2403		18 44.3 +61 03	6.3, 8.4	278	1.1"	110	G8III	173949, 17995	0 1028
Σ 2452		18 53.6 +75 47	6.7, 7.4	218	5.1"	250	A1V	176795, 9286	1 1029
Σ 2433	A B	18 56.9 +56 45	7.2, 10.1	124	7.5"	141	F2V	176409, 31286	0 1030
Σ 2440	A B C	18 57.3 +62 24	6.6, 9.6, 10.9	122, 60	18", 2.7'	95	G8III	176668, 18082	1 1031
Σ 2438		18 57.5 +58 14	7.0, 7.4	358	0.9"	125	A2IV	176560, 31292	0 1032
A type binary; system mass 3.9 M☉. AB: P = 231 y, orbit r = 60 AU, e = 0.99, at cusp of highly eccentric orbit. (2013)									
Σ 2450	A (BC)	19 02.1 +52 16	6.5, 9.5	299	5.2"	210	G8III	177483, 31337	1 1033
									0 1034

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation	
63 eps	05 369	Solar type binary; unidentified m.11 double 5' s.f. AB: $P = 627$ y, orbit $r = 105$ AU, widening. (2011)	19 07.1 +72 04	7.8, 7.9	10	0.7''	210	F7V	179729, 9323	1	1035	Dra	
	Σ 2509		19 16.9 +63 12	7.4, 8.2	328	1.8''	78	F6V	181566, 18257	0	1036	Dra	
	Σ 2550		19 27.0 +73 22	8.5, 8.4	251	1.9''	146	F2	184292, 9428	1	1037	Dra	
	Σ 2571		19 29.5 +78 16	7.7, 8.3	19	11''	200	F0IV	185497, 9452	0	1038	Dra	
	Σ 2549		19 31.2 +63 19	8.3, 12	329	2.1''	470	K0	184563, 19285	1	1039	Dra	
	Σ I 44		19 33.2 +60 10	6.5, 8.2	288	76''	310	K4III	184936, 18395	0	1040	Dra	
	Σ 2574		19 40.6 +62 40	7.7, 8.9	90	0.5''	129	F8V	186453, 18469	1	1041	Dra	
	Σ 2603		Solar type binary; pretty field. AB: $P = 665$ y, orbit $r = 170$ AU. (2009)	19 48.2 +70 16	4.0, 6.9	21	3.2''	45.4	G7III	188119, 9540	0	1042	Dra
	Σ 2604		19 52.8 +64 11	6.9, 9.0	183	28''	240	G5	188772, 18575	1	1043	Dra	
	Σ 2640		A B	20 04.7 +63 53	6.3, 9.5	15	5.7''	79	A2III	191174, 18692	0	1044	Dra
75	Σ 2650	Double with A type giant; CPM binary Σ 2642 (m.9, 1.8'') 12' s.f. AC: ps = 16,600 AU. (2006)	20 07.0 +66 18	7.0, 10.8	227	22''	185	A1V	191700, 18722	1	1045	Dra	
	Σ 2694	20 14.4 +80 32	6.9, 9.6	343	4.2''	130	B9.5IV	194375, 3364	0	1046	Dra		
	β pm 211	A B C	20 28.2 +81 25	5.5, 11.3, 6.7	11, 282	110'', 3.3'	140	G9III	196787, 3408	1	1047	Dra	
	05 593	A B	20 29.5 +81 05	6.1, 8.7	36	3.6'	64	K0III F8V	196925, 3413	0	1048	Dra	
	Equuleus	Equ							Chart 19				
	\star 1 eps	Σ 2737	(AaAb) B C	20 59.1 +04 18	6.0, 6.3, 7.1	284, 67	0.4'', 11''	54	F6IV	199766, 126428	1	1049	Equ
	2	Σ 2742	Solar type (2)+1+1 spectroscopic quadruple, visual triple; impressive in rich field. MSC system mass 3.5 M \odot . Aa,Ab: $P = 2.0$ d. AB: $P = 101$ y, orbit $r = 35$ AU, $e = 0.71$, periastron 2021. (479 obs.). AC: ps = 800 AU. (296 measures; 2012)	21 02.2 +07 11	7.4, 7.6	214	2.9''	81	F8	200256, 126482	0	1050	Equ
	Σ 2765	A B	21 11.0 +09 33	8.5, 8.5	78	2.8''	152	A3IV	201686, 126601	1	1051	Equ	
	S 781	A B D	21 13.5 +07 13	7.4, 9.4, 7.2	347, 172	0.6'', 3.1'	96	A7V	202073, 126625	0	1052	Equ	
	β 163	A type 2+1 triple, MSC system mass 4.2 M \odot . AB: $P = 113$ y, orbit $r = 34$, slowly closing; AD: ps = 24,100 AU. (2008)	(AaAb) B	21 18.6 +11 34	7.3, 8.9	258	0.8''	47.7	G0V G6V	202908, 107015	1	1053	Equ
Eridanus	Σ 2786	Solar type (2)+1 spectroscopic triple. Aa,Ab: $P = 4.0$ d. AB: $P = 79$ y, orbit $r = 25$ AU, $e = 0.87$, apastron 2026. (213 measures; 2012)	21 19.7 +09 32	7.5, 8.2	189	2.7''	186	A3IV	203067, 126707	0	1054	Equ	
	Σ 2793	(AB) C	21 25.1 +09 23	7.4, 9.0	242	27''	136	A5IV	203943, 126783	1	1055	Equ	
	Δ 4	A type 2+1 triple, visual double. AB (β 164): $P = 362$ y, orbit $r = 75$ AU. (2008)							Charts 13, 21, 26				
	\star p	Δ 5	01 38.8 -53 26	7.2, 8.5	104	11''	90	F5IV	10241, 232483	0	1056	Eri	
	I 455	Local, solar type matched double; dark field, at low end of solar mass. AB: ps = 100 AU. (2013)	01 39.8 -56 12	5.8, 5.9	187	11''	6.76	K2V+K2V	10360, 232490	1	1057	Eri	
	h 3527		02 08.2 -55 32	7.8, 11.3	199	4.9''	220	K1III	13307, 232645	0	1058	Eri	
	β 83	A B	02 43.3 -40 32	7.0, 7.2	41	2.3''	182	B9.5V	17098, 216019	1	1059	Eri	
			02 46.0 -04 57	7.7, 9.6	14	1.0''	76	F2	17251, 130100	0	1060	Eri	
			Solar type double. AB: $P = 716$ y, orbit $r = 180$ AU, $e = 0.15$, apastron 2026. (2012)										

	β 10	02 50.4 –04 59	7.2, 10.4	100	28"	135	A0	17699, 130139	1	1061	Eri
★ the	P z 2	(AaAb) B	02 58.3 –40 18	91	8.6"	49.9	A4III A1V	18622, 216113	0	1062	Eri
		Acamar. Spectacular high mass (2)+1(?) spectroscopic binary with rare A giant; B may be optical! AB: ps = 580 AU. (2013)							0	1062	Eri
9 rho 2	β 11	03 02.7 –07 41	5.4, 8.9	63	1.4"	81	K0II	18953, 130254	1	1063	Eri
	Σ 341	03 03.0 –02 05	7.6, 10.0	221	9.0"	53	F5	18975, 130256	0	1064	Eri
	h 3548	03 03.8 –21 22	7.5, 11.2	125	12"	58	K0V	19096, 168268	1	1065	Eri
	β 527	03 06.1 –13 26	8.2, 8.9	98	1.3"	124	F5V	19313, —	0	1066	Eri
	Cbl 120	03 10.7 –20 07	7.7, 11.1	313	59"	197	G9IV	19814, 168355	1	1067	Eri
★	h 3556	A B C	03 12.4 –44 25	159, 189	0.6", 3.9"	42.5	F7III A0V	20121, 216209	0	1068	Eri
		A type 2+1 triple with F giant. MSC gives 5.8 M \odot . AB: P = 45 y, orbit r = 17 AU, e = 0.90, periastron 2022. AC: ps = 220 AU. (2013)							0	1068	Eri
	β 84	03 16.0 –05 55	6.4, 7.9	9	1.0"	200	B9V	20319, 130388	1	1069	Eri
16 tau 4	Jc 1	A B	03 19.5 –21 45	291	5.7"	93	M3III	20720, 168460	0	1070	Eri
	β 12	03 24.4 –14 00	7.0, 9.1	281	2.4"	197	A2V	21160, 148943	1	1071	Eri
	Σ 408	03 30.7 –04 16	8.2, 8.4	323	1.2"	113	A3	21789, 130529	0	1072	Eri
	β 532	A B C	03 33.3 –10 04	272, 311	2.7", 8.0"	185	F2	22096, 149032	1	1073	Eri
	CII 2	03 33.6 –07 25	7.6, 8.0	139	66"	166	A9IV	22128, 130572	0	1074	Eri
	Δ 15	03 39.8 –40 21	6.9, 7.7	330	7.7"	132	A3V	22986, 216431	1	1075	Eri
	h 3589	03 44.1 –40 40	6.7, 9.3	349	5.0"	97	K1III	23508, 216459	0	1076	Eri
★ f	Δ 16	03 48.6 –37 37	4.7, 5.3	216	8.4"	51	B9V A1V	24072, 194551	1	1077	Eri
		High mass double with possible bet Lyr type variable; very bright in dark field. AB: ps = 580 AU. (2009)							1	1077	Eri
	β 401	A B	03 50.3 –01 31	254	4.2"	43.7	F2	24098, 130762	0	1078	Eri
		Solar type double, comoving with E (HD 22584, m:10) 3.2" s.p. AB: ps = 580 AU. AE (Shy 164): ps = 2.5 p.c. (2009)							0	1078	Eri
★ 32	Σ 470	(AaAb) B	03 54.3 –02 57	351	6.9"	96	G8III A2V	24555, 130806	1	1079	Eri
		A type (2)+1 spectroscopic triple with G giant; sparse bright field. AB: ps = 895 AU. (2011)							1	1079	Eri
	h 3611	03 56.6 –39 55	8.0, 8.7	139	4.1"	129	A3	24988, 216564	0	1080	Eri
	β 1004	A B	04 02.1 –34 29	57	1.2"	52	G1V	25535, 194709	1	1081	Eri
	I 152	A (BC)	04 04.9 –35 27	76	1.1"	71	G2V	25926, 194747	0	1082	Eri
	I 153	04 08.3 –32 51	8.1, 8.2	347	1.1"	127	A7V	26301, 194790	1	1083	Eri
	Srt 2	04 11.6 –20 21	5.8, 7.7	334	62"	81	A1V F0	26591, 169206	0	1084	Eri
	h 3628	04 12.5 –36 09	7.2, 8.0	50	50"	134	F3V	26758, 194831	1	1085	Eri
39	Σ 516	A B	04 14.4 –10 15	144	6.3"	74	K2III	26846, 149478	0	1086	Eri
	h 3632	04 15.1 –30 04	7.8, 9.7	163	11"	140	A0V	27016, 194866	1	1087	Eri
★ 40 omi 2	Σ 518	A [B C]	04 15.3 –07 39	102, [331]	82", [8.2"]	4.99	G9V DA	26965, 131063	0	1088	Eri
		Keid. Local, very high CPM, solar type 1+2 triple; YO/- color; dark field. Fascinating system: A is a del Set type variable; B is a white dwarf, the most easily observed from Earth; its companion C is a flare star (DY Eri). MSC system mass 1.5 M \odot . AB: ps = 550 AU; BC: P = 252 y, orbit r = 35 AU. (2011)							0	1088	Eri
	β 548	04 16.6 –10 05	7.5, 11.4	345	6.2"	250	A3III	27093, 149503	1	1089	Eri
	h 3642	04 19.0 –33 54	6.5, 8.7	160	6.3"	102	A3V	27490, 194923	0	1090	Eri
	h 3644	(AB) D	04 21.5 –25 44	42	44"	59	F2V	27710, 169368	1	1091	Eri
		Local, solar type (2)+1 triple, visual binary. MSC system mass 4.1 M \odot . AB: P = 81 y, e = 0.59, apastron 2045. (2011)							1	1091	Eri
	Σ 536	04 22.2 –04 41	7.9, 8.7	190	1.5"	142	A7IV	27699, 131150	0	1092	Eri
	β 311	04 26.9 –24 05	6.7, 7.1	150	0.4"	98	A3V	28312, 169455	1	1093	Eri

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
		A type binary; difficult resolution challenge typical of Burnham inventory. AB: $P = 596$ y, orbit $r = 100$ AU. (2010)								1	1093	Eri
	β 184		04 27.9 -21 30	7.4, 7.7	248	1.9"	101	F6V	28396, 169475	0	1094	Eri
	Stone 8	(AB) C	04 28.9 -25 12	7.9, 9.5	352	7.0"	340	K0IV	28521, —	1	1095	Eri
	Σ 560		04 31.4 -13 39	6.3, 9.3	45	30"	113	A2V	28763, 149702	0	1096	Eri
	Σ 570		04 35.2 -09 44	6.7, 7.6	260	13"	198	A1m	29173, 131335	1	1097	Eri
	Wal 32	A (CaCb)	04 37.6 -02 28	5.2, 10.6	163	67"	29.4	F0V	29391, 131358	0	1098	Eri
	Σ 576	A B	04 38.0 -13 02	7.3, 7.9	172	12"	118	B9.5IV	29482, 149776	1	1099	Eri
53	Kui 18		04 38.2 -14 18	4.0, 7.0	0	1.1"	33.7	K2III	29503, 149781	0	1100	Eri
		Double with K giant primary; brightness contrast challenge. AB: $P = 77$ y, ps = 24 AU, near apastron. (2010)								0	1100	Eri
	β 1236	A B C	04 39.6 -21 15	7.3, 10.3, 9.0	97, 314	1.5", 40"	87	K1III	29674, 169540	1	1101	Eri
55	Σ 590	(AaAb) (BaBb)	04 43.6 -08 48	6.7, 6.8	318	9.3"	650	G5III	30021, 131443	0	1102	Eri
		High mass, distant (2)+ (2) spectroscopic quadruple with G giant; dark field, YW/- color. B (DW Eri) is a del Sct type variable. MSC system mass 7.2 M_{\odot} . AB: ps = 8,150 AU. (2011)								0	1102	Eri
62	Sh 48	Aa Ab B	04 56.4 -05 10	5.5, 9.6, 8.9	247, 76	0.6", 67"	230	B6V	31512, 131614	1	1103	Eri
	Σ 631		05 00.7 -13 30	7.5, 8.8	107	5.9"	350	A0	32179, 150076	0	1104	Eri
	Σ 636		05 03.0 -08 40	7.1, 8.5	107	3.5"	188	A0V	32468, 131720	1	1105	Eri
66	Σ 642	(AaAb) C	05 06.8 -04 39	5.1, 10.8	10	52"	95	B9mn	32964, 131777	0	1106	Eri
	Fornax	For						Chart 21				
	Stone 5		02 17.4 -30 43	8.2, 8.9	199	2.5"	107	F6V	14246, 193623	1	1107	For
	β 738		02 23.2 -29 52	7.6, 8.0	212	1.9"	39.0	G1V	14882, 193680	0	1108	For
		Nearly matched, solar type binary. AB: $P = 560$ y, orbit $r = 85$ AU, widening along edgewise orbit. (2010)								0	1108	For
	Skf 1273		02 24.4 -37 22	7.0, 10.7	195	57"	71	F5V	15048, 193690	1	1109	For
	Shy 140		02 28.0 -33 49	5.1, 7.6	218	6.5'	46.6	A2V F7V	15427, 193723	0	1110	For
	ome h 3506		02 33.8 -28 14	5.0, 7.7	246	11"	148	B9.5IV	16046, 167882	1	1111	For
	h 3509	(AaAb) B	02 34.2 -31 31	7.6, 11.3	59	24"	102	A9V	16087, 193774	0	1112	For
	β 261	A B C	02 43.8 -27 54	7.9, 9.2, 10.5	101, 133	3.1", 69"	270	G5III	17082, 168005	1	1113	For
	BrsO 1	(AaAb) B	02 44.2 -25 30	7.0, 8.5	193	13"	41.3	G3V+G0	17134, 168012	0	1114	For
		Solar type (2)+1 triple, visual binary; all three stars G type. MSC system mass 2.8 M_{\odot} . Aa,Ab: $P = 6.7$ y, $e = 0.51$. (2013)								0	1114	For
	h 3532		02 48.6 -37 24	7.0, 8.1	144	5.3"	57	F3IV	17627, 193926	1	1115	For
eta 2	h 3536		02 50.2 -35 51	6.0, 10.0	18	4.9"	138	K0III	17793, 193940	0	1116	For
	β 741	A B [(CaCb) D]	02 57.2 -24 58	8.1, 8.2, [7.9, 11.9] [173]	346, 226, [173]	0.8", 29", [5.1"]	22.5	K1V	18455, 168181	1	1117	For
		Local, solar type 2+(2)+1 quintuple system. MSC system mass 3.4 M_{\odot} . AB: $P = 150$ y, orbit $r = 32$ AU, $e = 0.60$, periastron 2020. (Ca,Cb): $P = 1.5$ y, $e = 0.56$. (2013)								1	1117	For
★ alp	h 3555		03 12.1 -28 59	4.0, 7.2	300	5.2"	14.2	F8V	20010, 168373	0	1118	For
		Local, high CPM, solar type binary. AB: $P = 269$ y, orbit $r = 57$ AU, near cusp of apparent orbit. (2009)								0	1118	For
	LDS 93		03 20.1 -28 51	7.4, 8.5	358	4.2'	35.5	G3V	20782, 168469	1	1119	For
	h 3572		03 24.0 -26 13	8.2, 8.5	94	21"	97*	F4V F4V	21145, 168511	0	1120	For
★ chi 1	Skf 1280	A (BC) D	03 25.9 -35 55	6.4, 7.3, 10.0	164, 214	2.3', 85"	108	A1IV+A9V	21423, 194289	1	1121	For
★ chi 3	I 58	A B C	03 28.2 -35 51	6.5, 10.1, 9.3	247, 193	6.5", 3.6'	114	A1V	21635, 194318	0	1122	For
		A type 2+1 triple, comoving with A type chi 1 Fornacis (Skf 1280) 34' s.p. AC: ps = 32,300 AU. chi1/chi3: ps = 1.3 pc. (2010)								0	1122	For

Gemini		Gem	Chart 8								
0Σ 134	A [B C] D	06 09.3 +24 26	7.6, [9.1, 10.1], 12.6	189 [334], 252	43*	G0	41996, 78038	1	1123	Gem	
7 eta	β 1008	(AaAb) B	06 14.9 +22 30	3.5, 6.2	260	118	M3.5I	42995, 78135	0	1124	Gem
	Propus. High mass (2)+1 spectroscopic triple with M type supergiant; faint field. MSC system mass 9.5 M☉. Aa,Ab: P = 8.2 y. AB: P = 474 y, orbit r = 127 AU, decreasing <i>i</i> . (2012)										
18 nu	Σ 899	06 22.8 +17 34	7.4, 8.0	13	330	A0V	44496, 95602	1	1125	Gem	
	0Σ 140	A B	06 26.6 +15 31	6.9, 10.1	119	340	B9.5IV	45180, 95684	0	1126	Gem
High mass, spectroscopic (2)+(2) quadruple with B giant; Aa,Ab: P = 18.8 y, e = 0.3, apastron 2020. AB: ps = 25,000 AU. (2013)	(AaAb) (BaBb)	06 29.0 +20 13	4.1, 8.0	330	167	B6IIe	45542, 78423	1	1127	Gem	
	0Σ 145	06 32.3 +15 42	7.3, 9.9	338	198	F5	46148, 95800	0	1128	Gem	
20	Σ 924	06 32.3 +17 47	6.3, 6.9	211	20.2"	F8III	46136, 95795	1	1129	Gem	
S 524	A B	06 34.1 +22 07	7.2, 7.4	244	53"	A3	46401, 78508	0	1130	Gem	
	Σ 932	06 34.4 +14 45	8.3, 8.5	305	1.7"	F5	46495, 95847	1	1131	Gem	
0Σ 149		06 36.4 +27 17	7.1, 9.0	285	0.7"	dG2	46780, 78540	0	1132	Gem	
	Solar type binary; YW/− color, sparse field. AB: P = 119 y, orbit <i>r</i> = 28 AU, <i>e</i> = 0.73, periastron 2042. (2009)										
Σ 957	A B	06 45.2 +30 50	7.5, 9.4	91	3.6"	A0	48510, 59444	1	1133	Gem	
	0Σ 160	06 54.4 +21 10	6.7, 9.9	188	1.3"	K1III	50482, 78852	0	1134	Gem	
★ 38 e	Σ 982	06 54.6 +13 11	4.8, 7.8	147	7.1"	F0V	50635, 96265	1	1135	Gem	
Solar type (2)+1 triple, visual binary with del Sct type variable; pretty YW/B color. MSC system mass 5.7 M☉. AB: ps = 250 AU. (295 measures; 2012)											
Σ 1007	A D	07 00.6 +12 43	7.4, 7.7	28	68"	A2V	52155, 96372	0	1136	Gem	
	Ho 342	07 02.8 +13 05	8.0, 8.7	88	1.2"	F5	52715, —	1	1137	Gem	
Eng 28	A B	07 08.0 +15 32	7.9, 7.7	99	2.9"	G0V	54046, 96526	0	1138	Gem	
	Σ 1035	07 12.0 +22 17	8.1, 8.4	41	8.9"	F7IV	55005, 79151	1	1139	Gem	
Wei 14		07 12.8 +15 11	7.8, 8.9	160	2.1"	B9.5IV	55283, 96630	0	1140	Gem	
	★ Σ 1037	07 12.8 +27 14	7.2, 7.3	307	1.0"	F8V	55130, 79170	1	1141	Gem	
Solar type matched binary. AB: P = 119 y, orbit <i>r</i> = 34 AU, <i>e</i> = 0.93, closing to periastron 2039. (421 measures; 2012)											
0Σ 167	A B	07 13.5 +32 09	7.4, 10.9	180	4.3"	A8V	55225, 59896	0	1142	Gem	
	(AaAb) B	07 20.1 +21 59	3.6, 8.2	230	5.6"	A9III K3V	56986, 79294	1	1143	Gem	
Wasat. Local (2)+1 spectroscopic triple with A type giant; pretty Y/R color. Aa,Ab: P = 6.1 y, <i>e</i> = 0.35. P = 1,200 y, widening and a good occultation target. (254 measures; 2013)											
Σ 1081	A B	07 24.1 +21 27	7.7, 8.5	238	1.9"	B9	57900, 79361	0	1144	Gem	
	Σ 1083	07 25.6 +20 30	7.3, 8.1	47	6.7"	A5	58246, 79375	1	1145	Gem	
Ho 346	A B	07 25.9 +18 09	7.0, 11.7	58	14"	G5	58338, 96888	0	1146	Gem	
	Σ 1090	07 26.5 +18 31	7.3, 8.2	99	60"	F2V	58453, 96897	1	1147	Gem	
0Σ 171		07 26.7 +31 37	7.4, 9.2	137	1.1"	G5	58382, 60080	0	1148	Gem	
	Σ 1094	07 27.4 +15 19	7.6, 8.5	96	2.5"	A0V	58729, 96914	1	1149	Gem	
63	Sh 368	07 27.7 +21 27	5.3, 9.3, 10.9	98, 324	3.9", 43"	F5V	58728, 79403	0	1150	Gem	
	Local, solar type (2+1)+1+1 quintuple with 2+1 spectroscopic and occultation tripler; visual triple has Y/B color. MSC system mass 4.7 M☉. Aa,Ab: P = 2.1 y, <i>e</i> = 0.42. Aa1, Aa2: P = 1.9 d, <i>e</i> = 0. AD: ps = 125 AU, est. P = 760 y; AB: ps = 1860 AU, est. P = 26,000 y. (2006)										
62 rho	Aic 3	07 29.1 +31 47	4.2, 12.5, 7.8	8, 355	2.8", 12.6"	F0V	58946, 60118	1	1151	Gem	
	Local, solar type (2)+1+1 spectroscopic quadruple, visual binary; bright sparse field. AE: ps = 13,600 AU, near 100% probability pair is physical. (2001)										
Σ 1102	A B D	07 30.4 +13 52	7.4, 9.2, 8.0	46, 131	7.5", 112"	F5	59432, 96964	0	1152	Gem	
	Σ 1116	07 34.5 +12 18	7.8, 8.5	96	1.7"	B8	60355, 97033	1	1153	Gem	

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★ 66 alp	Σ 1110	(AaAb) (BaBb) (CaCb)	07 34.6 +31 53	1.9, 3.0, 9.8	55, 165	5.0", 71"	15.6	A1V A2Vm	60179, 60198	0	1154	Gem
		Castor. Local. A type (2)+(2)+(2) spectroscopic sextuple system, closest sextuple to the Sun. One of the grandest doubles in the northern skies. Discovered by Bradley and Pound (1719), one of six cited by W. Herschel (1802) as proof of gravitational attraction (orbital motion) in double stars. Aa,Ab: $P = 9.2$ d, $ps = 0.12$ AU; Ba,Bb: $P = 2.9$ d, $ps = 0.03$ AU; AB: $P = 467$ y, orbit $r = 105$ AU, $e = 0.34$, widening; Ca,Cb: $P = 19.5$ h, $ps = 0.03$ AU (eclipsing variable YY Gem); AB,C: $P = 25,800$ y, orbit $r = 1,490$ AU. (1,414 measures; 2014)										
77 kap	OS 179		07 44.4 +24 24	3.7, 8.2	242	7.5"	43.4	G8III	62345, 79653	1	1155	Gem
	Σ 1140		07 48.4 +18 20	7.0, 8.7	275	6.2"	210	K0III	63210, 97260	0	1156	Gem
	OSΣ 89		07 51.0 +31 37	6.8, 7.7	83	77"	200	A6III	63610, 60380	1	1157	Gem
Gru	h 5275	Gru							Charts 20, 26			
		(AB) C	21 31.0 −36 33	7.7, 11.3	201	41"	101	F3V	204635, 213058	0	1158	Gru
			22 12.0 −38 18	7.7, 7.7	315	2.1"	76	F3V	210571, 213631	1	1159	Gru
	h 5319		22 13.0 −49 03	7.7, 10.4	353	5.6"	220	G8III	210657, 231031	0	1160	Gru
	CorO 250		22 25.9 −45 07	7.8, 8.9	278	2.1"	120	G8IV	212538, 231134	1	1161	Gru
sig 2	β 771	A B C	22 37.0 −40 35	5.9, 10.0, 6.3	265, 275	2.7", 5.6'	66	A1V	214150, 231217	0	1162	Gru
			22 37.8 −39 51	6.7, 10.7	277	3.4"	90	F7V	214291, 231223	1	1163	Gru
			22 42.6 −47 13	6.0, 11.1	121	8.4"	23.6	F9V M1V	214953, 231257	0	1164	Gru
	h 5362	Local, unequal solar type double; dark field, 18' s. of bet Gru, C probably unrelated. AB: $ps = 270$ AU. (2013)										
	1 22	A B (CD)	22 55.3 −48 28	7.3, 8.9, 6.7	175, 181	0.6", 93"	47.7	G3	216655, 231354	0	1166	Gru
	ups	Solar type 2+(2) quadruple, visual triple; faint group 5' s.f. AB: $P = 198$ y, orbital $r = 46$ AU. AB,CD: $ps = 5,980$ AU, near 100% probability pair is physical. (2013)										
β 1011		23 02.6 −36 25	6.6, 9.3	293	2.1"	126	K1III	217642, 214261	1	1167	Gru	
β 773		23 06.9 −38 54	5.7, 8.2	205	0.9"	87	A1V	218242, 214313	0	1168	Gru	
★ the	Jc 20	A B C	23 06.9 −43 31	4.5, 6.6, 7.8	115, 292	1.5", 2.6'	40.4	F3V F5m	218227, 231444	1	1169	Gru
		Solar type 2+1 triple; sparse field. AC: $ps = 8,500$ AU, near 100% probability pair is physical. (2013)										
			23 07.2 −50 41	6.3, 7.1	254	9.1"	45.7	F7IV	218269, 247739	0	1170	Gru
	Δ 248	Solar type double; sparse field. Easy pair in all apertures, characteristic of the Dunlop catalog. AB: $ps = 560$ AU. (2010)										
	Δ 249	A B	23 20.8 −50 18	6.2, 8.9	232	1.3"	86	A8	220003, 247838	1	1171	Gru
			23 23.9 −53 49	6.1, 7.1	211	27"	119	A4III	220392, 247854	0	1172	Gru
★	Δ 246	Hercules							Charts 10, 11			
		Her										
			OS 307	16 10.5 +47 48	7.7, 10.7	201	18"	240	K0	145768, 45940	1	1173
	Σ 2024		16 11.8 +42 22	5.9, 10.7	44	23"	194	K4III	145931, 45957	0	1174	Her
★ 49	Σ 2021	(AaAb) B	16 13.3 +13 32	7.4, 7.5	357	4.1"	23.6	G9V	145958, 102018	1	1175	Her
		Local, high CPM, solar type (2)+1 triple, visual matched binary. AB: $P = 1354$ y, orbit $r = 120$ AU. (406 measures; 2012)										
			Σ 2049	16 27.9 +25 59	7.3, 8.1	195	1.1"	133	A2.5V	148554, 84393	0	1176
★	Σ 2052	A B	16 28.9 +18 25	7.7, 7.9	119	2.3"	19.7	K1V	148653, 102200	1	1177	Her
		Local, high CPM, solar type binary, AB: $P = 244$ y, orbit $r = 44$ AU, $e = 0.75$, apastron 2033. (526 measures; 2013)										
			Σ 2051	16 29.4 +10 36	7.7, 9.4	19	14"	220	G5III	148683, 102204	0	1178
	Sh 233		16 31.5 +08 18	7.1, 8.3	70	59"	78	G5	148979, 121665	1	1179	Her
	Σ 2056		16 31.6 +05 26	7.8, 9.2	313	6.8"	118	A3	148980, 121667	0	1180	Her
	Σ 2063		16 31.8 +45 36	5.7, 8.7	196	17"	69	A2V	149303, 46147	1	1181	Her
	OS 313		16 32.6 +40 07	8.0, 8.3	130	0.9"	460	F9IV	149379, 46152	0	1182	Her

Webb 6	(AaAb) B	16 35.4 +17 03	6.4, 7.3	359	2.6'	160	A2V	149632, 102259	1	1183	Her
Σ 2079		16 39.6 +23 00	7.6, 8.1	91	17"	410	F0	150340, 84521	0	1184	Her
37	Σ I 31	16 40.6 +04 13	5.8, 6.9	229	70"	90	A1V+A3IV	150378, 121776	1	1185	Her
★ 40 zet	Σ 2084	16 41.3 +31 36	3.0, 5.4	149	1.3"	10.7	G1IV	150680, 65485	0	1186	Her
Local, high CPM, solar type binary. AB: $P = 34$ y, orbit $r = 19$ AU, $e = 0.46$, apastron 2019. (834 measures; 2013)											
Σ 2085		16 42.4 +21 36	7.4, 9.2	311	6.3"	190	A0IV	150781, 84550	1	1187	Her
Σ 2094	A B C	16 44.2 +23 31	7.5, 7.9, 11.7	73, 310	1.1", 25"	156	F5III	151070, 84572	0	1188	Her
41	OS 585	16 45.0 +06 05	6.7, 10.4	191	2.7"	45.9	K0V K3V	151090, 121831	1	1189	Her
Σ 2095		16 45.1 +28 21	7.4, 9.2	160	5.3"	220	F7III	151237, 84577	0	1190	Her
Σ 2101	A B	16 45.8 +35 38	7.5, 9.4	47	4.0"	59	F6V	151428, 65537	1	1191	Her
Σ 2104	A B	16 48.7 +35 55	7.5, 8.8	21	5.9"	173	F2	151878, 65569	0	1192	Her
52	β 627	16 49.2 +45 59	4.8, 8.5	38	2.0"	55	A1V	152107, 46305	1	1193	Her
V637 Her. A type 1+ (2) triple, visual binary with alp2 CVn variable. BC: $P = 56$ y. A, BC: $P = 1,977$ y, orbit $r = 270$ AU, widening. (2012)											
Σ 2107	A B C	16 51.8 +28 40	6.9, 8.5, 11.5	109, 309	1.8", 83"	58	F5IV	152380, 84655	0	1194	Her
Solar type 2+1 triple. MSC 3.7 M \odot . AB: $P = 268$ y, orbit $r = 55$ AU, apastron 2029. AC: ps = 6,500 AU. (430 measures; 2012)											
Σ 2109		16 53.8 +21 10	7.5, 10.3	313	5.7"	189	K0	152629, 84674	1	1195	Her
OS 318		16 56.7 +14 08	7.0, 9.6	242	2.9"	132	G9III	153064, 102488	0	1196	Her
Σ I 32	A B C	16 57.9 +47 22	7.9, 10.9, 8.1	63, 260	4.9", 112"	18.3	K0	153557, 46409	1	1197	Her
Local, high CPM, solar type 2+1 triple; dark field. MSC gives 2.1 M \odot . AB: ps = 120 AU; AC: $P = 64,000$ y, orbit $r = 2,010$ AU, near 100% probability pair is physical. (2007)											
Pry 2	A B	17 04.7 +19 36	6.2, 9.3	227	1.8"	177	A0IV	154441, 102579	0	1198	Her
Shy 713		17 11.1 +24 14	6.2, 7.0	74	3.3'	82	A8V F2V	155514, 84896	1	1199	Her
Σ 2142	A B	17 11.7 +49 45	6.2, 9.4	109	5.3"	95	A5III	155860, 46561	0	1200	Her
★ 64 alp 1.2	(AaAb) (BaBb)	17 14.6 +14 23	3.5, 5.4	102	4.8"	110	M5II	156014, 102680	1	1201	Her
Rasalgethi. High mass (2)+(2) quadruple, visual double with semiregular pulsating M type supergiant; shows YOYO color at low magnification but Y/B at high magnification. Discovered (with rho Her, below) by C. Mayer (1777). MSC lists a (2)+(2) quadruple, system mass 22.4 M \odot , but there are possibly more components. Ba, Bb: $P = 52$ d. AB: $P = 3,600$ y, orbit $r = 520$ AU. (471 measures; 2013)											
★ rho	(AaAb) B	17 23.7 +37 09	4.5, 5.4	321	4.0"	121	B9.5III	157778, 66001	0	1202	Her
High mass (2)+1 interferometric triple, visual double. MSC system mass 9.2 M \odot . AB: ps = 650 AU. (375 measures; 2013)											
OS 329		17 24.5 +36 57	6.4, 9.9	12	34"	230	G5III F0V	157910, 66014	1	1203	Her
Σ 2160		17 24.6 +15 36	6.4, 9.3	66	3.8"	153	B9V	157741, 102806	0	1204	Her
Σ 2189	A B C	17 32.8 +47 53	7.8, 11.2, 8.9	98, 359	21", 66"	210	A2V	159543, 46791	1	1205	Her
Σ 2190	A B	17 36.0 +21 00	6.1, 9.5	23	10"	113	A7IV	159834, 85232	0	1206	Her
Σ 2194	A B	17 41.1 +24 31	6.5, 9.3	8	16"	162	K1III	160835, 85310	1	1207	Her
Σ 2203		17 41.2 +41 39	7.7, 7.8	292	0.8"	158	A4V	161016, 46884	0	1208	Her
Σ 2198		17 42.6 +26 33	7.6, 11.2	25	7.7"	177	K0III	161112, 85346	1	1209	Her
★ 86 mu	(AaAb) [B C]	17 46.5 +27 43	3.5, [10.2, 10.7]	249, [245]	36", [1.1"]	8.31	G5IV	161797, 85397	0	1210	Her
Local, high CPM, solar type (2)+2 quadruple, visual triple; dominant in dark field. MSC system mass 1.7M \odot . BC (Ac 7): $P = 43.2$ y, orbit $r = 11$ AU, $e = 0.18$, apastron 2030; large amplitude astrometric binary Aa,Ab. $P = 65$ y, $e = 0.32$, periastron 2016. (2013)											
Σ 2215	A B	17 47.1 +17 42	6.0, 6.9	253	0.5"	143	A1V	161833, 103106	1	1211	Her
A type spectroscopic binary; 5 stars 6' f., m.12 binary 4' n.p. Low quality orbit AB: $P = 1,062$ y, orbit $r = 120$ AU. (220 measures; 2013)											
Σ 2232		17 50.3 +25 17	6.7, 8.9	137	6.3"	147	A1V	162485, 85459	0	1212	Her
Σ 2242		17 51.2 +44 54	8.1, 8.3	326	3.5"	118	F0	162880, 47012	1	1213	Her
OS 338	A B	17 52.0 +15 20	7.2, 7.4	163	0.8"	230	G8III	162734, 103161	0	1214	Her

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGCOLOR	ID	Constellation
90	β 130	Binary with G giant. AB: $P = 1,277$ y, orbit $r = 260$ AU. (320 measures; 2013)	17 53.3 +40 00	5.3, 8.8	110	1.6"	108	K3III	163217, 47037	0	1214	Her
	Σ 2245		17 56.4 +18 20	7.4, 7.6	290	2.6"	240	A0III	163640, 103227	1	1215	Her
	Hu 235		17 57.1 +45 51	6.9, 9.0	283	1.6"	70	F7IV	164059, 47084	0	1216	Her
	LDS 6413		18 00.6 +29 34	7.1, 13.1	104	88"	28.4	G2V+M	164595, 85632	1	1217	Her
	Σ 3129		18 01.1 +45 21	7.6, 10.6	168	31"	132	B9	164898, 47139	0	1218	Her
★ 95	Σ 2264	Double with A type giant; faint field. AB: ps = 1,100 AU. (262 measures; 2013)	18 01.5 +21 36	4.9, 5.2	257	6.5"	128	A5IIIn	164669, 85648	1	1219	Her
	β 1127		18 02.5 +44 14	7.3, 9.2	50	0.7"	81	F5V	165170, 47163	0	1220	Her
	Σ 341		18 05.8 +21 27	7.4, 8.8	92	0.5"	39.5	G0V+G5V	165590, 85723	0	1221	Her
	V772		Solar type (2)+1 spectroscopic triple; primary is an eclipsing type variable ($P = 0.9$ d), AB: $P = 20$ y, orbital $r = 10$ AU, $e = 0.96$, periastron 2018, returns to view 2025. (266 measures; 2010)									
	Σ 2282		18 06.5 +40 22	7.9, 8.7	80	2.7"	510	A1V	165941, 47220	0	1222	Her
99 b	AC 15	Local, solar type binary; faint field. AB: $P = 56$ y, orbit $r = 17$ AU, $e = 0.77$, apastron 2025. (212 measures; 2011)	18 07.0 +30 34	5.1, 9.0	317	1.2"	15.6	F7V	165908, 66648	1	1223	Her
	Σ 344		18 07.1 +49 43	6.5, 10.3	140	2.3"	220	A2V	166228, 47233	0	1224	Her
	Hu 674		18 09.7 +50 24	7.7, 8.6	212	0.7"	141	A3V	166820, 30776	0	1224	Her
	Σ 2289		18 10.1 +16 29	6.7, 7.2	222	1.2"	260	A0V G0III	166479, 103443	1	1225	Her
	H V 93		18 13.0 +28 15	8.2, 8.3	136	55"	82	F8	167215, 85832	0	1226	Her
★	Σ 2315	A type (2)+1 spectroscopic triple, visual double; three stars n. unrelated; galaxy NGC 6632 10' n. AB: $P = 2,094$ y, orbit $r = 240$ AU. (284 measures; 2011)	18 25.0 +27 24	6.6, 7.8	118	0.6"	118	A0V A4V	169718, 86019	1	1227	Her
	β 1326		18 26.7 +26 27	6.5, 12.1, 9.6	104, 60	4.7", 62"	320	B3V	170111, 86060	0	1228	Her
	Σ 2319		18 27.7 +19 18	8.4, 8.2	190	5.4"	161	F5	170267, 103740	0	1229	Her
	Σ 2320		18 27.8 +24 42	7.1, 8.9	358	1.1"	260	B9V	170314, 86083	1	1230	Her
	Σ 2339		18 33.8 +17 44	7.5, [9.3, 9.6]	273, [262]	2.0", [0.4"]	183	F6V	171965, 103853	0	1231	Her
★	Σ 359	Binary with G giant; faint rich field. AB: $P = 219$ y, orbit $r = 60$ AU, $e = 0.84$, widening to apastron 2038. (265 measures; 2013)	18 35.5 +23 36	6.4, 6.6	4	0.8"	144	G9III+G7III	171745, 86224	1	1232	Her
	Σ 358		18 35.9 +16 59	6.9, 7.1, 12.0	149, 349	1.7", 35"	32.9	F8V	171746, 103886	0	1233	Her
	Σ 2360		18 39.3 +20 56	8.0, 9.2	358	2.4"	820*	B5IV	172421, 86288	0	1234	Her
	Σ 2401		18 49.0 +21 10	7.3, 9.3	38	4.3"	620*	B3V	174261, 86458	0	1235	Her
	Σ 2411		18 52.3 +14 32	6.6, 9.6, 11.0, 11.2	95, 96, 134	13", 66", 113"	111	G9III	174897, 104203	1	1236	Her
★	Σ 2415	High mass, solar type (2)+2 quadruple, miniature visual 1+2 triple; faint field, CD is a large aperture detection test. AB: $P = 42$ y, orbit $r = 27$ AU, apastron 2030; AC: ps = 490 AU. (2011)	18 54.5 +20 37	7.1, 8.7	289	2.0"	195	A0IV	175427, 86563	0	1237	Her
	Horologium		Chart 27									
	δ 1		02 28.0 -58 08	8.0, 8.5, 9.6	32, 301	1.2", 18"	90	F8	15546, 232780	0	1238	Her
	CorO 14		02 38.7 -52 57	7.9, 8.5, 6.8	129, 75	8.9", 3.6'	60	F1III F8V G8V	16699, 232841	0	1239	Her
	Σ 2415		18 54.5 +20 37	7.1, 8.7	289	2.0"	195	A0IV	175427, 86563	1	1240	Her

Solar type 1+2 triple with F giant; most splendid in a dark sky. AC: ps = 17500 AU. (2013)											
h 3520	02 38.9 –54 50	7.7, 8.6	205	21"	129	F0V	16744, 232845	1	1241	Hor	
Δ 7	02 39.7 –59 34	7.7, [8.0, 8.9]	97, [9]	37", [0.4"]	185	K0III	16892, 232851	1	1242	Hor	
φ 333	02 43.4 –66 43	6.5, 8.2	215	0.5"	54	F5V	17326, 248632	0	1243	Hor	
Solar type binary. AB: P = 33 y, orbit r = 14 AU, e = 0.96, closing to periastron 2027. Large aperture challenge. (2013)											
Δ 10	03 04.6 –51 19	7.6, 8.5	70	38"	53	G1V	19330, 232983	1	1244	Hor	
h 3559	03 10.1 –63 55	6.7, 10.1	41	43"	260	A3III	20060, 248748	0	1245	Hor	
h 3576	03 24.6 –45 40	7.3, 8.8	341	2.9"	138	A2V+	21319, 216302	1	1246	Hor	
Skf 949	03 53.6 –46 54	6.1, 8.5	4	77"	108	K2III+G	24706, 216540	0	1247	Hor	
Shv 458	04 03.8 –44 29	8.2, 8.6	123	10'	69	G5V	25842, 216623	1	1248	Hor	
h 3643	04 19.3 –44 16	5.5, 8.6	115	70'	77	K2III	27588, 216749	0	1249	Hor	
Charts 15, 23											
Hydra											
β 102	08 16.8 –09 01	7.1, 10.3	117	3.2"	144	A0V	69460, 135717	1	1250	Hya	
Σ 1216	08 21.3 –01 36	6.9, 7.9	305	0.5"	156	A2Vn	70340, 135804	0	1251	Hya	
A type binary; double Wz 12 (m.10, 8") 8' f. in sparse field. AB: P = 402 y, orbit r = 90 AU, e = 0.11, apastron 2121. (2013)											
Σ 1243	08 33.9 +01 35	7.9, 9.4	233	1.7"	270	A0	72605, 72605	1	1252	Hya	
Σ 1255	08 39.7 +05 46	7.3, 8.6	33	26"	36.3	G1V	73688, 117000	0	1253	Hya	
Σ 1261	08 40.7 –11 56	7.7, 9.6	303	30"	78	G5	73940, 154533	1	1254	Hya	
Σ 1260	08 40.7 –12 10	7.9, 8.1	302	4.9"	139	A2	73941, 154531	0	1255	Hya	
S 579	08 43.7 –07 14	4.7, 8.2	310	79"	240	G1Ib	74395, 136221	1	1256	Hya	
Σ 1270	08 45.3 –02 36	6.9, 7.5	265	4.5"	62	F2IV	74688, 136243	0	1257	Hya	
★ 11 eps	08 46.8 +06 25	3.5, 6.7, 12.5	307, 200	2.9", 18"	39.6	F8V	74874, 117112	1	1258	Hya	
Ashlesha. Solar type (2)+(2)+1 spectroscopic quintuple, visual triple with BY Dra variable; dark field. MSC system mass 7.0 M _⊙ . AB: P = 15.1 y, e = 0.66. (265 measures); Ca,Cb: P = 9.9 d. AB,C: P = 589 y, orbit r = 135 AU. AD: ps = 710 AU. (426 measures; 2012)											
β 335	08 48.2 +02 35	7.5, 9.4	265	2.6"	153	F5	75121, 117140	0	1259	Hya	
15	08 51.6 –07 11	5.8, 7.4	121	1.2"	137	A4m	75737, 136345	1	1260	Hya	
β 407	08 51.7 –06 47	7.8, 10.3, 11.4	167, 165	5.9", 92"	230	A0	75770, —	0	1261	Hya	
Σ 1290	08 52.1 +04 28	7.4, 9.2	325	2.8"	200	A2	75768, 117208	1	1262	Hya	
β 24	08 54.2 –08 46	8.0, 8.6	176	1.2"	260	F0 A2	76174, 136388	0	1263	Hya	
β 103	08 54.9 –07 49	7.7, 9.8	72	3.1"	130*	A5	76274, 136400	1	1264	Hya	
17	08 55.5 –07 58	6.7, 6.9	4	3.9"	89	A2m A7m	76370, 136409	0	1265	Hya	
β 409	09 00.8 –09 11	7.3, 10.1	187	10"	167	A0	77196, 136489	1	1266	Hya	
NP	09 02.0 +02 40	7.3, 8.8	268	1.1"	147	A2	77314, 117363	0	1267	Hya	
Σ 1309	09 06.6 +02 49	8.5, 8.4	274	12"	98	F5	78126, 117428	1	1268	Hya	
Ω 197	09 09.5 +02 56	7.9, 9.0	66	1.4"	165	F1V	78637, —	0	1269	Hya	
β 104	09 11.5 +00 17	7.0, 10.6	105	3.3"	230	K2III	79011, 117483	1	1270	Hya	
Ho 363	09 15.0 –20 07	7.5, 9.3	183	2.5"	157	A1V	79709, —	0	1271	Hya	
β 212	09 16.1 –08 21	7.8, 8.3	198	1.6"	131	A5	79825, —	1	1272	Hya	
Σ 1336	09 17.5 +00 33	7.0, 11.1	181	41"	98	A0	80046, 117569	0	1273	Hya	
27	09 20.5 –09 33	4.9, [7.0, 11.0]	211, [198]	3.8', [9.1"]	68	G8III F4V	80586, 136768	1	1274	Hya	
Bvd 145	09 21.5 –17 45	8.2, 9.0	317	46"	90*	F5V F7V	80828, 155124	0	1275	Hya	
β 337	09 22.5 –17 54	7.0, 10.2	351	9.6"	102	F4V	80971, 155129	1	1276	Hya	
Σ 1347	09 23.3 +03 30	7.3, 8.3	312	21"	109	F0	81029, 117641	0	1277	Hya	
									1278	Hya	

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★	Σ 1348	A B	09 24.5 +06 21	7.5, 7.6, 14?	316	2.1"	71	F7V	81212, 117661	1	1279	Hya
		Exquisite matched double; dark field, CPM component C (m.14) 2' n.p. AB: ps = 200 AU. (245 measures; 2012)										
29	β 590	A B C	09 27.2 −09 13	7.8, 7.0, 11.3	196, 169	0.4", 11"	230	A2V	81728, 136861	0	1280	Hya
★	Σ 1355		09 27.3 +06 14	7.7, 7.8	353	1.8"	54	F7V	81670, 117704	1	1281	Hya
		Matched solar type binary; wandering in a lonely field. AB: P = 591 y, orbit r = 95 AU. (2013)										
	Σ 1357	A B	09 28.3 −09 59	6.9, 9.9	55	7.6"	240	K0	81902, 136883	0	1282	Hya
31 tau 1	h 1167	(AaAb) B	09 29.1 −02 46	4.6, 7.3	4	68"	17.3	F6V K0	81997, 136895	1	1283	Hya
		Ukdah. Local, solar type (2)+1 triple; sparse field. MSC system mass 2.3 M \odot . (A)B: ps = 1590 AU. (2012)										
	β 591		09 29.6 −03 07	7.8, 8.9	32	0.9"	470	F5 A3	82072, 136903	0	1284	Hya
	Σ 1365		09 31.5 +01 28	7.4, 8.0	157	3.4"	96	F9III	82355, 117747	1	1285	Hya
	β 910	A B	09 32.9 −14 00	7.3, 10.2	306	7.0"	146	K0IV	82661, 155280	0	1286	Hya
	Cbl 131		09 33.3 −07 11	6.4, 11.0	20	57"	125	K0	82674, 136951	1	1287	Hya
	Σ 1371	A B	09 35.4 +03 54	7.9, 10.2	276	7.7"	47.0	G0	82994, 117792	0	1288	Hya
	S 604		09 35.6 −19 35	6.3, 9.4	90	52"	88	A2V	83104, 155323	1	1289	Hya
	Cbl 132		09 51.1 −18 40	7.4, 11.2	116	51"	120	F7V	85402, 155533	0	1290	Hya
	h 4261		09 53.6 −19 29	7.8, 9.4	82	8.4"	250	K0III	85752, —	1	1291	Hya
	β 217		10 06.8 −24 43	7.9, 8.0	132	2.1"	88	F8IV	87793, 178425	0	1292	Hya
★	β 218		10 07.4 −19 43	8.2, 8.2	138	0.5"	210	A2IV	87840, 155744	1	1293	Hya
		A type double; sparse or dark field, m.12 star 1' n.p. is unrelated. AB: ps = 140 AU. Neglected. (1998)										
	β 911	A B	10 08.4 −19 45	7.4, 11.2	313	4.1"	37.6	G0V	87998, 155757	0	1294	Hya
	Σ 1416		10 12.3 −16 05	7.7, 9.3	277	12"	240	A3III	88536, 155811	1	1295	Hya
	β 219		10 21.6 −22 32	6.7, 8.5	186	1.8"	165	A1V	89828, 178723	0	1296	Hya
	h 4311		10 23.3 −13 23	6.7, 10.3	121	5.1"	53	F5V	90045, 155947	1	1297	Hya
	UC 1941		10 29.7 −22 03	7.2, 10.6	216	38"	164	F0V	90954, 178895	0	1298	Hya
	UC 1946		10 30.9 −26 29	6.6, 10.2	29	29"	86	F7III	91135, 178917	1	1299	Hya
	β 411		10 36.1 −26 41	6.7, 7.8	306	1.3"	41.3	F6V	91881, 179014	0	1300	Hya
		Solar type binary; brightest star in field. System mass 1.8 M \odot . AB: P = 159 y, orbit r = 35 AU, e = 0.76, apastron 2028. (2013)										
	Σ 1474	A B	10 47.6 −15 16	6.7, 7.0	28	68"	410	B9IV	93526, 156235	1	1301	Hya
	Σ 1473	A B	10 47.6 −15 38	7.7, 8.9	10	30"	83	F7II	93527, 156233	0	1302	Hya
	I 503		10 49.3 −26 49	7.8, 8.8	119	1.2"	136	F3V	93785, —	1	1303	Hya
	I 211		10 59.2 −33 44	5.8, 9.5	220	1.9"	48.5	F2V	95221, 201976	0	1304	Hya
★ N	H III 96		11 32.3 −29 16	5.6, 5.7	210	9.4"	26.3	F8V F8V	100286, 179968	1	1305	Hya
		Matched solar type double; s.p. of two stars, beautifully matched in sparse faint field. AB: ps = 335 AU. (2007)										
	h 4455	A B	11 36.6 −33 34	6.0, 7.8	241	3.4"	112	K0III	100893, 202622	0	1306	Hya
	I 232		11 40.0 −33 27	7.0, 10.1	161	2.2"	111	K1III	101387, 202686	1	1307	Hya
	h 4465	A C	11 41.7 −32 30	5.4, 8.3	43	67"	124	K5III F7V	101666, 202717	0	1308	Hya
★ bet	h 4478		11 52.9 −33 54	4.7, 5.5	37	0.7"	95	B9III	103192, 202901	1	1309	Hya
		High mass double with B giant, alp2 CVn type variable; sparse field. AB: ps = 90 AU. Neglected. (1998)										
	Δ 116	A B	11 56.7 −32 16	7.7, 7.8	82	19"	47.3	G8V G8V	103743, 202965	0	1310	Hya

Jc 17	A B	12 10.0–34 42	6.4, 8.0	17	3.2"	99	A0V	105686, 203183	1	1311	Hya
h 4505	A B	12 11.7–30 36	7.8, 10.8	274	10"	410	G8III	105953, 203219	0	1312	Hya
Howe 72		12 13.6–33 48	6.5, 8.6	164	1.3"	128	A0V	106257, 203252	1	1313	Hya
h 4556		12 54.3–27 58	7.7, 8.8	82	5.9"	101	F9V	112086, 181664	0	1314	Hya
Stone 28	(AB) C	13 14.5–24 17	6.7, 11.5	331	12"	100	F0V	114993, 181476	1	1315	Hya
★	Solar type (2)+1 triple, visual binary; faint field. MSC gives 4.0 M \odot . AB: $P = 61$ y, $e = 0.69$, periastron 2030; AC: $ps = 1,600$ AU. (2013)										
h N 69	A B	13 36.8–26 30	5.7, 6.6	189	10"	82	A7III A7IV	118349, 181790	0	1316	Hya
	Matched A type double with A giant; dark field, m.11 double 5' p. AB: $ps = 1,105$ AU. (2009)										
β 938		14 06.3–26 35	8.1, 8.2	125	0.4"	111	A8V	123107, 182242	1	1317	Hya
V353		14 10.2–25 24	7.5, 10.9	115	43"	132	F5V	123767, 182302	0	1318	Hya
β 345	A B	14 41.8–29 42	7.6, 8.1	287	1.0"	88	A5III	129160, 182772	1	1319	Hya
★ 54 m	H III 97	14 46.0–25 27	5.1, 7.3	121	8.3"	30.3	F2V	129926, 182855	0	1320	Hya
	Solar type double; pretty brightness contrast, dark field, m.13 double 4' n. AB: $ps = 340$ AU. (2009)										
59	β 239	14 58.7–27 39	6.2, 6.8	8	0.5"	113	A4V+A6V	132219, 183058	1	1321	Hya
	Binary with A type giant; brighter of two stars in field. AB: $P = 429$ y, orbit $r = 95$ AU. (2010)										
	Charts 26, 30										
Hydrus											
Gli 8	Hyi	00 59.6–75 49	8.1, 8.9	84	27"	102	G0V	6058, 255726	0	1322	Hyi
h 3435		01 25.3–59 30	7.1, 9.4	1	25"	124	F2IV	8787, 232418	1	1323	Hyi
h 3475		01 55.3–60 19	7.2, 7.2	77	2.5"	56	F2V	11944, 248461	0	1324	Hyi
h 3484		02 07.4–59 41	7.6, 10.5	62	52"	44.2	F8V	13246, 232642	1	1325	Hyi
h 3568		03 07.5–78 59	5.7, 7.7	226	15"	83	F2II	20313, 255962	0	1326	Hyi
★	Lfr 1	03 44.8–70 02	7.4, 7.6	83	76"	55	G0V G0V	24062, 256022	1	1327	Hyi
	Matched solar type double; distinctive in sparse field. AB: $ps = 5,640$ AU, near 100% probability the pair is physical. (2000)										
	Charts 26, 29										
Indus											
I 41		20 36.5–45 33	7.7, 8.5	356	2.2"	125	A7III	196014, 230292	0	1328	Ind
I 17	A B C	20 45.0–50 29	8.0, 8.0, 7.5	35, 122	1.0", 2.1"	330	A0IV K0III	197322, 246715	1	1329	Ind
	Pretty A type 1+2 wide matched triple. AB: $ps = 450$ AU, neglected (1992); AC (Δ 235): $ps = 56,100$ AU, also neglected. (1999)										
Skf 1168		20 53.1–46 37	7.6, 11.6	231	17"	220	A3III	198592, 230414	0	1329	Ind
I 1429		20 54.8–46 36	7.8, 8.8	143	0.9"	77	F7V	198828, 230431	1	1331	Ind
I 130		21 04.1–47 58	7.2, 9.9	319	3.3"	270	K2III	200248, 230501	0	1332	Ind
h 5246		21 10.4–54 34	7.8, 8.0	131	4.1"	34.8	K1V F	201247, 246894	1	1333	Ind
BR	Hu 1626	21 11.4–52 20	7.3, 8.8	117	1.1"	48.4	F8V	201427, 246896	0	1334	Ind
h 5267	A D	21 26.6–46 04	7.3, 10.0	182	44"	63	F7V	203934, 230687	1	1335	Ind
	Solar type CPM double; stars n. unrelated. component B has not been seen since 1834. AD: $ps = 3,740$ AU, neglected. (1999)										
★	Jc 25	21 44.0–57 20	6.5, 6.9	4	2.5'	45.5	F5V	206429, 247151	0	1336	Ind
	Wide solar type CPM double; dark field, Y/YO color. Despite similarity, C (3' s.p.) is unrelated. AB: $ps = 9,210$ AU. Neglected. (1999)										
I 19	A B	21 48.7–65 30	7.3, 8.7	309	1.3"	101	F3V	207015, 255076	1	1337	Ind
	Charts 2, 6										
Lacerta	Lac										
Sei 1549	(AB) C	22 01.1 +39 15	7.1, 10.3	20	38"	186	A0	209260, 71949	0	1338	Lac
h 1741	A D	22 11.2 +50 49	5.4, 10.0	271	74"	56	A5V	210715, 34143	1	1339	Lac
Σ 2894	A B	22 18.9 +37 46	6.2, 8.9	189	16"	74	A8III	211797, 72228	0	1340	Lac
h 1756	A B	22 21.9 +40 40	6.7, 10.5	286	22"	165	K3.5III	212212, 51919	1	1341	Lac

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
	Σ 2902	A B Solar type double; CD (m.13, 9'') 3' n.f. is unrelated. AB: ps = 1,730 A.U. (2004)	22 23.6 +45 21	7.6, 8.2	88	6.4''	200	G5	212468, 51957	0	1342	Lac
	Σ 2906		22 26.8 +37 27	6.5, 9.6	1	4.2''	460	B2V	212883, 72344	1	1343	Lac
	Σ 2917	A B	22 30.6 +53 32	8.3, 8.6	71	4.6''	370	F0IV	213495, 34534	0	1344	Lac
	Σ 2918		22 31.3 +50 52	8.0, 9.4	237	1.6''	230	A1V	213557, 34541	1	1345	Lac
	h 1791	A B Solar type double; rich field, Sti 2828 (m.11, 13'') 7' n.p. AB: ps = 1,060 A.U. (2006)	22 35.7 +56 52	7.7, 9.7	59	17''	46*	G0	214238, 34602	0	1346	Lac
	Es 1028		22 42.4 +54 15	7.6, 10.6	243	5.8''	210	A0V	215178, 34718	1	1347	Lac
	O Σ 476	A (BC) Distant, matched A type 1+(2) triple, visual double; rich field. MSC 8.5 M \odot . Low quality orbit BC: P = 240 y, orbit r = 110 A.U. (2007)	22 43.1 +47 10	7.4, 7.1	301	0.5''	780	A1V G	215242, 52296	0	1348	Lac
	Σ 2942	A B C	22 44.1 +39 28	6.2, 8.9, 11.7	277, 247	3.2'', 9.0''	210	K5III	215359, 72675	1	1349	Lac
	Σ 2946		22 49.7 +40 31	8.1, 8.3	261	5.2''	91	F8 F8	216122, 52401	0	1350	Lac
	β 382	(AaAb) B Mixed A/solar type (2)+1 spectroscopic triple; AB: P = 105 y, orbit r = 36 A.U., e = 0.54, closing to periastron 2044. (2011)	22 53.7 +44 45	6.0, 7.8	237	0.8''	57	A3m F6V	216608, 52465	1	1351	Lac
1 kap	Leo											
	β 105	A B	09 24.7 +26 11	4.6, 9.7	211	2.4''	62	K3III	81146, 80807	0	1352	Leo
		A1 Minliar al Asad. Solar type double with K giant; dark field. AB: ps = 200 A.U. Neglected. (1975)								0	1352	Leo
	3 H IV 47		09 28.5 +08 11	5.8, 11.1	80	25''	124	G9III	81873, 117718	1	1353	Leo
	2 ome Σ 1356	(AaAb) B Solar type (2)+1 triple, visual binary; dark field. AB: P = 118 y, orbit r = 29 A.U., e = 0.56, widening. (663 measures; 2013)	09 28.5 +09 03	5.7, 7.3	111	0.9''	33.2	F9IV	81858, 117717	0	1354	Leo
6	Sh 107		09 32.0 +09 43	5.2, 9.3	75	37''	153	K3III	82381, 117751	1	1355	Leo
	7 H V 58		09 35.9 +14 23	6.3, 9.4	80	41''	210	A1V	83023, 98662	0	1356	Leo
	Wal 56	A B C	09 38.8 +10 47	6.7, 11.6, 10.7	99, 82	7.8'', 85''	94	A5III	83452, 98690	1	1357	Leo
	Σ 1379		09 45.3 +08 53	7.2, 10.8	176	10''	63	F5	84407, 117890	0	1358	Leo
	Hjl 115	A [B C]	09 47.3 +08 34	7.1, [9.7, 12.0]	190, [281]	59'', [1.8'']	82	F0	84701, 117908	1	1359	Leo
32 alp	Σ 1399		09 57.0 +19 46	7.7, 8.4	176	31''	41.8	G0	86133, 81101	0	1360	Leo
	Σ II 6	A (BC)	10 08.4 +11 58	1.4, 8.2	307	2.9'	24.3	B7V	87901, 98967	1	1361	Leo
		Regulus. Local, high mass 1+(2) triple, visual double; featureless field. MSC system mass 6.2 M \odot . AB: ps = 5,700 A.U. (2012)								1	1361	Leo
	h 476		10 12.0 +20 07	7.4, 11.7	49	24''	440	G5	88403, 81225	0	1362	Leo
	O Σ 215		10 16.3 +17 44	7.3, 7.5	176	1.4''	115	A9IV	88987, 99032	1	1363	Leo
39	Bvd 81		10 16.7 +25 22	5.8, 10.0	28	79''	109	K2III G6V	89024, 81264	0	1364	Leo
	O Σ 523		10 17.2 +23 06	5.8, 11.4	299	7.7''	22.8	F7V dM1	89125, 81270	1	1365	Leo
		Local, solar type double with low mass component; dark field. AB: ps = 235 A.U. (2005)								1	1365	Leo
	\star 41 gam Σ 1424	A B	10 20.0 +19 51	2.4, 3.6	126	4.6''	39.9	K0III	89484, 81298	0	1366	Leo
		Algieba. High CPM binary with K giant; m.10 stars n.p. C, D are unrelated. AB: P = 510 y, ps = 170 A.U. (823 measures; 2013)								0	1366	Leo
\star	Σ 1426	A B C	10 20.5 +06 26	8.0, 8.3, 9.4	311, 9	0.9'', 7.8''	150	F5	89619, 118241	1	1367	Leo
		Probable 2+1 solar type triple; difficult, compact object in very dark field. AC: ps = 1,580 A.U. (2011)								1	1367	Leo
	O Σ 216		10 22.7 +15 21	7.4, 10.3	232	2.3''	28.8	G5	89906, 99091	0	1368	Leo

Solar type binary; dark field, uncatalogued m.13 star 2' n.p. AB: $P = 315$ y, orbit $r = 55$ AU, widening. (2013)									
Σ 1431	10 25.6 +08 47	7.8, 9.1	74	3.6"	152	A8III	90303, 118292	0	1368 Leo
$\Omega\Sigma$ 217	10 26.9 +17 13	7.9, 8.6	148	0.8"	85	F6V	90444, 99127	1	1369 Leo
Solar type binary; dark field, 7' f. m.9 star. AB: $P = 140$ y, orbit $r = 40$ AU, $e = 0.98$, widening to apastron 2036. (2012)									
$\Omega\Sigma$ 220	10 29.2 +10 09	7.5, 8.6	98	0.6"	50*	F8	90791, 99153	0	1370 Leo
Σ 1448	10 34.4 +21 36	7.5, 9.6	259	11"	530	K0	91527, 81420	1	1371 Leo
\star 49 Σ 1450	10 35.0 +08 39	5.8, 7.9	157	2.1"	131	A2V	91636, 118380	0	1372 Leo
A = TX Leo. A type (2)+1 triple with Algol type eclipsing binary ($P = 2.5$ d); very dark field. AB: ps = 370 AU. (2009)									
S 617	10 53.4 -02 15	6.2, 8.7	178	35"	79	G9IV	94363, 137863	1	1373 Leo
Solar type (2)+1 spectroscopic triple; dark field, 7' s.p. p1 Leo. MSC system mass 5.7 M_{\odot} . Aa,Ab: $P = 3.2$ y, $e = 0.38$. (2012)									
\star 54 Σ 1487	10 55.6 +24 45	4.5, 6.3	113	6.4"	88	A1V A2Vn	94601, 81583	0	1374 Leo
Pretty A type 1+(2) spectroscopic triple; dark field, Algiba twin. AB: ps = 760 AU. (246 measures; 2013)									
55 β 1076	10 55.7 +00 44	6.0, 9.0	53	1.1"	44.9	F4V	94672, 118574	1	1375 Leo
Solar type binary; dark field. AB: $P = 138$ y, orbit $r = 34$ AU, at cusp of orbit. (2013)									
Σ 1500	11 00.0 -03 28	7.9, 8.3	300	1.4"	54	F8V	95280, 137933	0	1376 Leo
Σ 1504	11 04.0 +03 38	7.9, 8.1	122	1.3"	220	F0	95899, 118638	1	1377 Leo
Σ 1506	11 04.7 -04 13	7.7, 10.2	224	12"	26.3	G5 M5	96064, 137978	0	1378 Leo
Low mass 1+(2) triple, visual binary with BY Dra variable; several nearby faint stars in dark field. MSC system mass 1.8 M_{\odot} . AB: ps = 430 AU. BC: $P = 23$ y, $e = 0.12$, periastron 2018. (2012)									
65 p4 β 599	11 06.9 +01 57	5.7, 9.7	104	2.7"	63	G9IIICN	96436, 118668	1	1379 Leo
High CPM double with an R Leporis type giant carbon star; YO/- color, unrelated m.7 star 7' s.p. AB: ps = 230 AU. Neglected. (1991)									
Σ 1517	11 13.7 +20 08	7.5, 8.0	320	0.7"	55	G5III	97561, 81725	0	1380 Leo
High CPM binary with G type giant; dark field. AB: $P = 924$ y, orbit $r = 125$ AU. (224 measures; 2010)									
Σ 1521	11 15.3 +27 34	7.7, 8.1	98	3.5"	116	A5	97799, 81740	1	1381 Leo
Σ 1529	11 19.4 -01 39	7.1, 7.9	255	8.9"	48.1	F6IV dG3	98427, 138130	0	1382 Leo
\star 78 lot Σ 1536	11 23.9 +10 32	4.1, 6.7, 11.1	98, 346	2.1", 5.5"	23.7	F4IV	99028, 99587	1	1383 Leo
Local, solar type (2)+1+1 quadruple with del Sct type variable; dark field. (A)B: $P = 186$ y, orbit $r = 45$ AU, $e = 0.53$, apastron 2041. (536 measures; 2013)									
83 Σ 1540	11 26.8 +03 01	6.6, 7.5	150	28"	17.8	G7V	99491, 118864	0	1384 Leo
Local, high CPM, solar type double; dark field. AB: ps = 670 AU. (2013)									
88 Σ 1547	11 31.7 +14 22	6.3, 9.1	331	15"	23.3	G0IV	100180, 99648	1	1385 Leo
Local, solar type (2)+1 triple, visual binary; m.10 double 6' s.f. MSC system mass 2.4 M_{\odot} . AB: ps = 470 AU. (2013)									
90 Σ 1552	11 34.7 +16 48	6.3, 7.3, 9.8	206, 235	3.5", 64"	580	B4V B9V F5	100600, 99673	0	1386 Leo
Σ 1565	11 39.6 +19 00	7.3, 8.4	305	22"	670	F4IV	101302, 99718	1	1387 Leo
93 Σ II 7	11 48.0 +20 13	4.6, 9.0	355	75"	71	A7V G5III G5V	102509, 81998	0	1388 Leo
Solar type (2)+(2) quadruple with G giant; Aa is RS CVn type variable. MSC gives 5.2 M_{\odot} . Aa,Ab: $P = 72$ d, $e = 0$. (2012)									
β 603	11 48.6 +14 17	6.0, 8.5	334	1.0"	60	A8III	102590, 99800	1	1389 Leo
Binary with A type giant; dark field, 20' s.p. bet Leo. AB: $P = 136$ y, orbit $r = 42$ AU, decreasing θ . (2011)									
Sh 132	11 52.8 +15 26	6.9, 10.2	14	39"	93	A2	103152, 99840	0	1390 Leo
$\Omega\Sigma$ 112	11 54.5 +19 25	8.3, 8.5	35	73"	40.5	G0	103432, 99858	1	1391 Leo
Leo Minor LMi	Chart 9								1392 Leo
11 Hu 1128	09 35.7 +35 49	5.3, 12.5	61	5.7"	11.4	G8V M5V	82885, 61586	0	LMi
SV LMi. Local, high CPM, solar type double with RS CVn type variable. AB: ps = 90 AU. (2006)									
								1	1393 LMi

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGCOLOR	ID	Constellation
	Shy 212		09 40.0 +35 20	7.0, 7.2	228	8.2'	49.0	F5 F5	83525, 61620	0	1394	LMi
	Σ 1374	A B	09 41.4 +38 57	7.3, 8.7	313	2.8"	51	G3IV	83698, 61629	1	1395	LMi
	A 2142		10 05.7 +41 03	8.0, 8.8	295	1.1"	138	F0	87411, 43178	0	1396	LMi
	Σ 1405		10 05.9 +39 35	7.3, 11.8	252	22'	106	A9V	87442, 61855	1	1397	LMi
	Shy 552		10 16.6 +41 17	7.4, 8.8	6	107"	56	F5 F8	88959, 43264	0	1398	LMi
	Σ 1432	(AaAb) B	10 27.0 +29 41	7.8, 10.3	121	29'	100	F2	90441, 81347	1	1399	LMi
★ 31 bet	Hu 879		10 27.9 +36 42	4.6, 6.0	225	0.5"	47.2	G8III	90537, 62053	0	1400	LMi
		Spectroscopic (2)+1 triple with G giant; very dark field. A B: $P = 39$ y, orbit $r = 17$ AU, $e = 0.67$, apastron 2018.5 (2012)								0	1400	LMi
	Cou 961	(AaAb) B	11 01.8 +29 52	7.2, 9.4	327	1.2'	132	K0	95515, 62361	1	1401	LMi
Lepus												
	Lepus								Chart 21			
	β 314	A B	04 59.0 −16 23	5.9, 7.5	320	0.8"	40.5	F3V F9V	31925, 150052	0	1402	Lep
★ kap		Solar type binary; system mass 2.3 M \odot . AB: $P = 55$ y, orbit $r = 18$ AU, $e = 0.88$, periastron 2034. (2012)								0	1402	Lep
	Σ 661		05 13.2 −12 56	4.4, 6.8	357	2.2'	220	B9V	33949, 150239	1	1403	Lep
		High mass double; bright mixed field, stars n. unrelated. AB: ps = 655 AU. (2008)								1	1403	Lep
	β 317	A B	05 13.9 −22 59	7.5, 10.3	13	8.6"	240	K0III	34087, 170216	0	1404	Lep
	Bvd 52		05 18.1 −16 11	7.7, 9.1	226	90'	57	KIV G3V	34616, 150319	1	1405	Lep
	S 476	A B	05 19.3 −18 31	6.3, 6.5	20	38"	260	B3V A	34798, 150335	0	1406	Lep
★	h 3750		05 20.4 −21 14	4.7, 8.5	279	4.1"	128	A0V	34968, 170327	1	1407	Lep
	h 3752	A B	05 21.8 −24 46	5.4, 6.6	99	3.5"	108	G0	35162, 170351	0	1408	Lep
		Solar type double; sparse field, globular cluster NGC 1904 1/2° n.f. AB: ps = 510 AU. (2009)								0	1408	Lep
★ 9 bet	CorO 31		05 23.6 −22 18	7.5, 10.2	284	17'	185	A7V	35430, 170383	1	1409	Lep
	β 320	A B E	05 28.2 −20 46	2.9, 7.5, 12.2	3, 59	2.6", 4.0'	49.2	G5II	36079, 170457	0	1410	Lep
		Nihal. (2)+1 triple with G type supergiant; other nearby stars are unrelated. AB: ps = 170 AU; AE: ps = 15,900 AU. (2008)								0	1410	Lep
	h 3770		05 33.5 −24 20	7.8, 11.4	23	3.8"	51	F7V	36846, 170549	1	1411	Lep
	β 321		05 39.3 −17 51	6.7, 7.8	160	0.5"	470	B7V	37643, 150652	0	1412	Lep
	UC 1344		05 40.1 −23 43	7.3, 10.0	269	21"	164	K2III	37778, 170663	1	1413	Lep
★ 13 gam	h 3788		05 41.3 −26 21	7.6, 9.2	155	26"	68	F3V	37987, 170697	0	1414	Lep
	H VI 40	A B	05 44.5 −22 27	3.6, 6.3	350	95"	8.93	F6V K2V	38393, 170759	1	1415	Lep
		Local, high CPM, solar type double; dramatic in sparse field. AB: ps = 1,100 AU. (2012)								1	1415	Lep
	h 3798		05 47.2 −24 30	8.2, 8.8	70	16"	110*	F2	38788, 170838	0	1416	Lep
	Σ 801	A (BC)	05 48.5 −13 21	7.5, 10.5	328	27'	320	K0III	38904, 150823	1	1417	Lep
	β 94		05 49.6 −14 29	5.7, 8.2	165	2.3"	82	G8III	39070, 150845	0	1418	Lep
	Gan 2		05 54.5 −19 42	7.6, 10.6	19	11"	23.6	G6V	39855, 150931	1	1419	Lep
		Local, solar type double; f. of two stars in sparse field. AB: ps = 350 AU. (2010)								1	1419	Lep
	Arg 12		06 05.3 −25 02	8.4, 8.5	296	4.6"	270	A2V	41628, —	0	1420	Lep
Libra	β 17	A B C	06 08.4 −11 09	6.9, 9.3, 10.8	189, 257	3.7", 10"	105	A5IV	42116, 151154	1	1421	Lep
	Libra								Charts 17, 24			
Sh 179	Σ 1837		14 24.7 −11 40	6.9, 7.9	274	1.2"	91	F5III	126251, 158550	0	1422	Lib
		(AaAb) [B C]	14 25.5 −19 58	6.6, [7.2, 8.4]	296, [91]	35", [1.2"]	128	A2V	126367, 158558	1	1423	Lib

A type (2)+2 quadruple, visual triple; impressive in faint field. MSC system mass 6.8M☉. AB: ps = 6,040 AU. (2012)									
Bvd 108	14 38.1–09 44	7.7, 10.1	279	46"	M11II	1180	128595, 140042	1	1423 Lib
β 226	14 38.9–22 20	7.9, 8.4	117	0.8"	A2V	195	128687, 182731	0	1424 Lib
5	14 46.0–15 28	6.4, 10.1	249	4.7"	K1III	440	129978, 158788	1	1425 Lib
7 mu	14 49.3–14 09	5.6, 6.6, 12.6	2, 231	1.9", 27"	A1	73	130559, 158821	0	1426 Lib
★ 9 alp 1,2	14 50.9–16 02	2.7, 5.2, 12.5	314, 291	3.9", 4.6"	A3IV F4IV	23.2	130841, 158840	1	1427 Lib
Zubeneschamali. Local, A type (2)+(2)+1 spectroscopic quintuple, comoving with BY Dra type variable D (KU Lib, HD 128987) 2.6" preceding. MSC system mass 5.1 M☉. AB: ps = 7,300 AU. AD (Cab 1): ps = 1.0 pc. (2012)									
H N 28	14 57.5–21 25	5.9, 8.2	305	26"	K5Ve M2V	5.84	131977, 183040	0	1428 Lib
Local, very high CPM, low mass 1+(2) triple. MSC system mass 1.7 M☉. Ba,Bb: P = 308 d. AB: ps = 205 AU. (2011)									
h 2757	14 58.7–22 24	8.0, 9.6	95	12"	F6V	117	132234, 183060	1	1429 Lib
Σ 1899	15 01.6–03 10	6.7, 10.2	67	28"	K2IV K0V	109	132883, 140278	0	1430 Lib
h 4727	15 03.6–27 50	8.5, 8.5	220	7.5"	G2V G2V	44.0	133131, 183129	1	1431 Lib
S 665	15 04.5–17 54	8.1, 8.9	90	25"	K2IIICN	—	133353, 159004	0	1432 Lib
β 119	15 05.5–07 01	8.1, 8.8	273	2.1"	G0	47.6	133584, —	1	1433 Lib
Sh 195	15 14.5–18 26	6.8, 8.3	140	47"	F3V	70	135208, 159118	0	1434 Lib
Σ 3091	15 16.0–04 54	7.7, 8.5	225	0.6"	F8V	63	135578, 140421	1	1435 Lib
Solar type binary; sparse field. AB: P = 148 y, orbit r = 45 AU, e = 0.82, periastron 2032. (2010)									
β 227	15 19.2–24 16	7.5, 8.6, 11.2	161, 84	1.8", 46"	K1III	70	136032, 183368	0	1436 Lib
h 4756	15 19.7–24 16	7.9, 8.3	247	0.6"	F4V	70	136121, 183377	1	1437 Lib
Lv 6	15 20.6–27 01	7.9, 10.0	29	17"	K2II	650	136259, 183391	0	1438 Lib
h 4769	15 25.4–21 56	7.9, 9.7	192	9.8"	K0III	210	137210, 184077	1	1439 Lib
Sh 202	15 28.2–09 21	7.0, 7.6	133	52"	K1V K2	20.6	137763, 140550	0	1440 Lib
Local, high CPM, solar type (2)+(2)+1 triple. MSC system mass 2.0 M☉. Aa,Ab: P = 2.4 y, orbit r = 3 AU, e = 0.97 (!). (2012)									
S 672	15 31.7–20 10	6.3, 8.9	281	11"	A8V	87	138268, 159317	1	1441 Lib
Lal 123	15 33.2–24 29	6.9, 7.0	300	9.2"	A3+F0V	97	138488, 183567	0	1442 Lib
Matched (2)+(2) quadruple, visual binary; sparse field. MSC gives 6.9 M☉. Ba,Bb: P = 60.44 y, e = 0.64, apastron 2028. (2013)									
Σ 1962	15 38.7–08 47	6.4, 6.5	190	12"	F8V F8V	26.6	139461, 140672	1	1443 Lib
β 121	15 39.6–27 39	8.4, 8.5	282	1.8"	A2V	160	139519, 183668	0	1444 Lib
β 122	15 39.9–19 46	7.7, 7.7	228	1.9"	F5V	57	139628, 159421	1	1445 Lib
β 35	15 42.8–16 01	7.3, 8.7	109	1.7"	F7IV	64	140164, 159453	0	1446 Lib
β 354	15 43.2–25 25	7.3, 9.3	288	5.7"	F1V	126	140192, 183731	1	1447 Lib
β 620	15 46.2–28 04	7.6, 7.0, 9.0	174, 213	0.6", 51"	F2IV	71	140722, 183772	0	1448 Lib
Solar type (2)+(2)+1 quadruple, visual triple; rich field. MSC system mass 6.0 M☉. AB: ps = 60 AU. AC: ps = 4,890 AU. (2013)									
Sh 213	15 59.1–19 56	8.1, 8.5	318	18"	A5V	57	143094, 159618	1	1449 Lib
Lupus									
h 4672	14 20.2–43 04	5.8, 7.9	301	3.5"	G8III	113	125383, 224838	0	1450 Lib
R 244	14 22.6–48 19	6.1, 9.5	122	4.5"	B1III	670	125721, 224870	1	Charts 24, 28
h 4706	14 51.3–47 24	7.7, 9.0	219	6.8"	K0	320	130717, 225239	0	1451 Lup
h 4715	14 56.5–47 53	6.0, 6.8	278	2.1"	B9V	169	131657, 225306	1	1452 Lup
h 4723	15 01.9–51 55	7.6, 10.0	170	5.2"	K0III	220	132606, 242180	0	1453 Lup
★ pi	15 05.1–47 03	4.6, 4.6	65	1.7"	B5V	136	133242, 225426	1	1454 Lup
High mass (2)+(2) spectroscopic quadruple, visual CPM double; dominant in faint rich field. AB: ps = 310 AU. (2010)									
Hd 242	15 05.3–41 04	5.2, 11.1	182	49"	G8III	108	133340, 225435	0	1455 Lup

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGCOLOR	ID	Constellation
★ kap 1,2	CapO 415		15 10.7 −43 44	7.1, 7.7	20	50"	30.4	G5V	134331, 225508	0	1458	Lup
	Δ 178		15 11.6 −45 17	6.5, 9.6	314	1.2"	156	K1III	134444, 225517	1	1459	Lup
	Δ 177		15 11.9 −48 44	3.8, 5.5	143	27"	55	B9.5V A5V	134481, 225525	0	1460	Lup
High mass double; brilliant pair in faint rich field. AB: ps = 2,000 AU. (2010)												
zet	Δ 176		15 12.3 −52 06	3.5, 6.7	249	71"	36.0	K0III F8V	134505, 242304	1	1461	Lup
	HId 121		15 12.8 −52 02	7.7, 8.9	216	2.1"	510	B6III	134598, 242314	0	1462	Lup
	CorO 179		15 13.0 −37 15	8.0, 8.1	228	6.5"	117	A3V	134799, 206805	1	1463	Lup
V348	I 228		15 14.0 −43 48	8.0, 8.2	16	1.3"	550	A4V	134930, 225554	0	1464	Lup
		A type double; primary is bet Cep type variable; double I 565 4' n.f. AB: ps = 550 AU. Neglected. (1991)								0	1464	Lup
	★ mu	A B C	15 18.5 −47 53	4.9, 5.0, 6.3	302, 128	0.9", 23"	103	B8V	135734, 225638	1	1465	Lup
High mass 2+1 tripler; dominant in rich field, stars s.p. unrelated. MSC system mass 11.0 M \odot . AC: ps = 3,200 AU. (2013)												
Howe 76			15 21.5 −38 13	6.6, 9.3	121	5.7"	143	A0	136347, 206543	0	1466	Lup
	h 4776		15 30.4 −41 55	6.3, 8.4	229	5.6"	126	B9.5V	137919, 225846	1	1467	Lup
	B 2036	A B C	15 31.3 −33 49	7.7, 7.9, 9.1	2, 120	0.4", 1.5"	103	A2V	138138, 206720	0	1468	Lup
★ gam	h 4786	A B	15 35.1 −41 10	3.0, 4.5	275	0.8"	129	B2IV	138690, 225938	1	1469	Lup
		High mass binary with ellipsoidal variable (RV Lup); faint field. AB: P = 190 y, orbit r = 50 AU, e = 0.51, periastron 2075. (2013)								1	1469	Lup
	h 4788		15 35.9 −44 58	4.7, 6.5	10	2.1"	131	B3V	138769, 225950	0	1470	Lup
I 89			15 41.1 −39 59	6.8, 8.1	163	1.4"	117	F5V	139677, 206867	1	1471	Lup
Arg 28		A B	15 41.9 −30 09	7.9, 10.1	24	35"	260	K3III	139911, 183710	0	1472	Lup
Skf 2047		A C	15 43.8 −39 28	7.6, 8.8	132	114"	140*	A2V	140197, 206910	1	1473	Lup
Howe 79			15 44.4 −41 49	6.1, 7.9	338	3.2"	144	A0V B	140285, 226132	0	1474	Lup
Δ 192		A B C	15 47.1 −35 31	7.1, 9.0, 7.3	67, 143	0.7", 35"	147	B9.5V	140817, 206968	1	1475	Lup
	Pz 4		15 56.9 −33 58	5.1, 5.6	49	10"	42.4	A3V B9V	142629, 207144	0	1476	Lup
	★ eta	A B C	16 00.1 −38 24	3.4, 7.5, 9.4	19, 248	15", 116"	136	B2.5IV	143118, 207208	1	1477	Lup
High mass 2+1 tripler; faint rich field, D 2' n.p. possibly related. AB: ps = 2,750 AU. (2013)												
Howe 82			16 03.8 −33 04	7.7, 7.9	346	2.4"	320	F3V	143823, 207285	0	1478	Lup
V856	Δ 199	A B (CaCbD)	16 08.6 −39 06	6.6, 13.0, 7.1	297, 184	16", 44"	171	A7IVe	144668, 207368	1	1479	Lup
A type 2+(2+1) quintuple with del Sct type variable; sparse field. MSC system mass 6.1 M \odot . AC: ps = 10,200 AU. (2000)												
4	Lynx											
	★ 881	(AaAb) B	06 22.1 +59 22	6.1, 7.7	149	0.6"	152	A3V	43812, 25678	0	1480	Lyn
		A type (2)+1 tripler, visual binary; sparse field. Aa,Ab: P = 503 y. (2013)								0	1480	Lyn
O22 72		A B C	06 24.7 +59 40	7.6, 10.8, 7.6	305, 323	46", 2.2'	212	K0III A3	44271, 25709	1	1481	Lyn
	Σ 936		06 39.7 +58 06	7.3, 9.0	283	1.2"	250	G5	46963, 25861	0	1482	Lyn
	★ Σ 946		06 44.9 +59 27	7.3, 9.1	130	3.9"	101	F5	47977, 25925	1	1483	Lyn
Solar type double; lovely W/B color, group of stars p. and n.p., including I 757 (m.9, 1.6"). AB: ps = 530 AU. (2012)												
★ 12	Σ 948	A B C	06 46.2 +59 27	5.4, 6.0, 7.1	69, 311	1.9", 8.5"	66	A3V	48250, 25939	0	1484	Lyn
		A type, compact 2+1 tripler. MSC system mass 5.9 M \odot . AB: P = 903 y, orbit r = 150 AU, decreasing θ (394 measures; 2012)								0	1484	Lyn
	★ Σ 958	A (BaBb)	06 48.2 +55 42	6.3, 6.3	257	4.5"	44.3	dF5 dF6	48766, 25962	1	1485	Lyn
Solar type 1+(2) spectroscopic tripler, visual double; sparse or dark field. AB: P = 2,200 y, orbit r = 215 AU. (2012)												
Σ 960			06 49.6 +53 02	7.9, 9.9	69	22"	270	F0	49082, 25973	0	1486	Lyn

Charts 3, 8

★ 15	05 159	A B C	06 57.3 +58 25	4.5, 5.5, 12.2	232, 351	0.7", 40"	55	G8III F8V	50522, 26051	1	1487	Lyn
		Solar type 2+1 triple with G giant; WY/W color. AB: $P = 262$ y, orbit $r = 65$ AU, $e = 0.74$, widening. (2012)										
	Σ 1032	A B	07 13.9 +48 30	7.3, 10.3	113	2.7"	149	A2V	55078, 41630	0	1487	Lyn
	Σ 1033	A B	07 14.8 +52 33	7.8, 8.4	275	1.6"	270	F0	55199, 26240	1	1488	Lyn
	Σ 1050	A B	07 19.9 +54 55	8.1, 8.8	24	19"	141	A0V	56385, 26279	0	1490	Lyn
★ 20	Σ 1065		07 22.3 +50 09	7.5, 7.7	255	15"	95*	F0	57066, 26306	1	1491	Lyn
		Solar type spectroscopic binary, visual CPM double; radiant W/W color in dark field. AB: $ps = 1,920$ AU. (2005)										
★ 19	Σ 1062	A B C D	07 22.9 +55 17	5.8, 6.7, 12.8, 7.6	316, 283, 6	15", 87", 3.6"	140*	B8V B9V	57103, 26312	0	1492	Lyn
		Exquisite, high mass 2+1+1 quadruple, possible spectroscopic (2)+(2)+1+1 sextuple. MSC gives 10.7 M \odot . AB: $ps = 2,830$ AU; AD: $ps = 41,800$ AU. (2012)										
	β 758	A B C	07 28.9 +48 11	5.7, 9.9, 10.2	94, 93	1.1", 17"	153	B9	58661, 41797	1	1493	Lyn
CC	05 174	(AaAb) B	07 35.9 +43 02	6.6, 8.3	88	2.2"	141	F0	60335, 41877	0	1494	Lyn
		Solar type (2)+1 triple: primary is W UMa type contact binary; pretty field, YW/— color, MAD 3 (m.10, 4") 2' p. AB: $ps = 420$ AU. (2012)										
	Σ 1172		08 04.6 +54 45	7.9, 9.6	244	1.7"	390	A0IV	66067, 26648	1	1495	Lyn
	h 2424		08 06.0 +59 15	6.7, 10.8	150	43"	230	A0	66286, 26662	0	1496	Lyn
	05 189		08 14.8 +43 02	6.9, 10.7	295	4.3"	200	A2IV	68562, 42242	1	1497	Lyn
	055 92	A B	08 23.8 +57 25	7.6, 9.3	181	58"	70	F2	70253, 26815	0	1498	Lyn
	Σ 1217		08 24.3 +44 57	7.8, 9.4	242	29"	37.8	G0	70516, 42337	1	1499	Lyn
	05 193		08 28.1 +33 32	7.7, 11.7	297	14"	23*	K0	71354, 60832	0	1500	Lyn
	Σ 1274		08 49.0 +38 21	7.4, 9.3	43	9.4"	240	A2	75052, 61060	1	1501	Lyn
	Σ 1282	A B C	08 50.7 +35 04	7.6, 7.8, 12.4	277, 10	3.5", 49"	52	F8	75353, 61077	0	1502	Lyn
	Σ 1289		08 54.7 +43 35	8.2, 8.9	7	3.7"	58	G2V	75949, 42594	1	1503	Lyn
★	Σ 1333		09 18.4 +35 22	6.6, 6.7	51	1.8"	87	A8V	80024, 61387	0	1504	Lyn
		A type double; very dark field. AB: $ps = 210$ AU. (2013)										
★ 38	Σ 1334	(AaAb) (BaBb)	09 18.8 +36 48	3.9, 6.1	224	2.6"	38.3	A3V	80081, 61391	1	1505	Lyn
		A type (2)+(2) spectroscopic quadruple; a pure white "diamond ring." MSC gives 6.2 M \odot . AB: $ps = 135$ AU. (220 measures; 2013)										
★	Σ 1338	A B	09 21.0 +38 11	6.7, 7.1	308	1.1"	42.7	F2V F4V	80441, 61411	0	1506	Lyn
		Matched solar type binary; isolated in field. AB: $P = 303$ y, orbit $r = 57$ AU, $e = 0.25$. (432 measures; 2013)										
DI	Σ 1369	(AaAb) B	09 35.4 +39 58	7.0, 8.0	151	25"	85	F2V	82780, 42931	1	1507	Lyn
		Chart 11										
		Lyr										
			18 26.4 +46 49	7.9, 9.4	221	24"	100	F2	170313, 47497	0	1508	Lyr
	Σ 2333	A B	18 31.1 +32 15	7.8, 8.6	333	6.4"	220	B9IV	171026, 67059	1	1509	Lyr
	Σ 2351		18 36.2 +41 17	7.6, 7.6	160	5.1"	210	A1V A0V	172068, 47639	0	1510	Lyr
	Σ 2349	A B C	18 36.6 +33 28	5.4, 9.4, 12.1	204, 314	7.4", 33"	155	B8II	172044, 67164	1	1511	Lyr
	Σ 2362		18 38.4 +36 03	7.5, 8.7	187	4.4"	105	A5	172394, 67198	0	1512	Lyr
★	Σ 2367	A B C	18 41.3 +30 18	7.7, 8.0, 8.8	75, 192	0.4", 14"	65*	G8III F8IV F7V	172865, 67250	1	1513	Lyr
		Solar type 2+1 spectroscopic triple with G giant; YO/YW color. MSC 5.6 M \odot . AB: $P = 92$ y, orbit $r = 16$ AU, $e = 0.91$, apastron 2026. (2012)										
	Σ 2380		18 42.9 +44 56	7.3, 8.7	8	26"	138	G8III	173399, 47727	0	1513	Lyr
★ 4.5 eps 1,2	Σ 37	A B [(CaCb) D]	18 44.3 +39 40	5.2, 6.1, [5.3, 5.4]	344, 171, [79]	2.3", 3.5", [2.5"]	49.8	A4V F1V	173582, 67310	1	1514	Lyr
		Mixed A/solar type 2+[(2)+1] quintuple, visual quadruple; the most famous "Double Double". C. Mayer (1777) noted the wide pair of binaries but W. Herschel (1779) first resolved them. MSC system mass 10.3 M \odot . AB (Σ 2382): $P = 1,804$ y, orbit $r = 235$ AU, closing. (585 measures). CD (Σ 2383): $P = 724$ y, orbit $r = 44$ AU, decreasing θ . (616 measures) AB,CD: $ps = 14,100$ AU. (2013)										
											1515	Lyr
	055 172		18 44.5 +34 00	7.9, 8.7	6	61"	54	F8	173548, 67311	0	1516	Lyr
★ 6,7 zet 1,2	Σ 38	(AaAb) D	18 44.8 +37 36	4.3, 5.6	150	44"	47.9	F0IV	173648, 67321	1	1517	Lyr

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
	Σ 2390	Solar type (2)+1 spectroscopic triple, visual binary; rich field. MSC system mass 4.9 M \odot . AD: ps = 2,840 AU. (2013)	18 45.8 +34 31	7.4, 8.6	155	4.2"	360	A7V	173815, 67350	1	1517	Lyr
	Σ 2397		18 47.2 +31 24	7.5, 9.1	266	3.9"	270	G3III	174022, 67378	1	1519	Lyr
	Σ 2406		18 49.9 +26 26	7.1, 11.2	5	4.8"	118	A3V	174549, 66481	0	1520	Lyr
★ 10 bet	Σ I 39	(Aa1Aa2) Ab B F	18 50.1 +33 22	3.6, 8.2, 6.7, 10.6	176, 147, 19	0.5", 45", 87"	296	B7IIe ~B2V	174638, 67451	1	1521	Lyr
	Sheliak. High-mass (2)+1+1+1 quintuple, visual quadruple; in a beautiful field with unidentified m.10 double 4' s. The eponymous eclipsing, semi-detached binary: variability detected by J. Goodricke (1784), the Aa mass transfer binary imaged (2008) with terrestrial CHARA interferometer (USA). Aa1,Aa2: P = 12.9 d, orbit r = ~0.25 AU, e = 0.0 (circular). Estimated system mass 15.6 M \odot (super-giant donor star 2.8 M \odot , ellipsoidal main sequence gainer star 12.8 M \odot); the nearly edge on orbit brackets a thick accretion disk with bipolar plasma jets. An astonishing astrophysical system. (2012)											
	Sh 282	A B C	18 54.9 +33 58	6.1, 9.1, 7.6	129, 350	1.8", 45"	360	A8 G5III	175635, 67566	0	1522	Lyr
	Σ 3130	A B C D	18 56.0 +44 14	7.2, 8.3, 10.5, 12.0	288, 258, 310	0.4", 2.7", 3.0"	187	A2	176003, 47928	1	1523	Lyr
	β 648	A (BaBb)	18 57.0 +32 54	5.3, 8.0	251	1.2"	14.9	G0V	176051, 67612	0	1524	Lyr
17	Local, solar type 1+(2) triple, visual binary; faint rich field. AB: P = 61 y, orbit r = 19 AU, e = 0.27. (411 measures; 2011)											
	Dawes 9		19 04.3 +43 53	7.1, 10.2	172	2.0"	230	A0V	177829, 48054	1	1525	Lyr
	Σ 2461	(AaAb) B	19 07.4 +32 30	5.3, 9.1	290	3.7"	41.6	F0V	178449, 67835	0	1526	Lyr
★	Σ 2469	(AaAb) B C	19 07.8 +38 56	7.9, 9.1, 12.4	125, 163	1.3", 37"	139	A3	178661, 67846	1	1527	Lyr
	Σ 2474	(AaAb) B	19 09.1 +34 36	6.8, 7.9	263	16"	52	G1V	178911, 67879	0	1528	Lyr
	Solar type (2)+1 spectroscopic triple, visual double; group of stars n, in rich field. AB: ps = 210 AU. (2001)											
	Σ 2481	(AaAb) (BCaCb)	19 11.1 +38 47	8.4, 8.3	20	4.6"	53	G6V	179484, 67936	1	1529	Lyr
	Σ 2483	A B	19 12.4 +30 21	8.0, 9.1	318	10"	520	B9IV	179709, 67963	0	1530	Lyr
	Sh 289		19 13.5 +39 02	8.0, 8.7	55	39"	—	A	180077, 68003	1	1531	Lyr
★	Σ 367	A [B C]	19 14.5 +34 34	7.3, [9.7, 9.8]	226, [262]	35", [1.0"]	67	F5IV	180286, 68022	0	1532	Lyr
	Solar type 1+2 visual triple; rich field, faint doubles nearby, BC a resolution challenge. AB: ps = 3,160 AU; BC: ps = 90 AU. (2013)											
	Σ 371	(AaAb) B	19 15.9 +27 27	7.0, 7.6	160	0.9"	280	B8V	180553, 67005	1	1533	Lyr
Mensa	Distant, high mass (2)+1 spectroscopic triple; rich field. MSC gives 13.3 M \odot . AB: ps = 340 AU. AC: ps = 17,800 AU. (229 measures; 2013)											
	Chart 30											
	h 3673	Men	04 24.9 –77 41	8.1, 8.3	67	10"	71	F7V	29058, 256092	0	1534	Men
	Hrg 2		05 01.2 –74 20	7.4, 8.0	169	0.8"	270	B9.5V	33244, 256152	1	1535	Men
	h 3888		06 28.6 –78 54	7.6, 10.3	125	35"	188	F0IV	47674, 256310	0	1536	Men
	h 3996		07 11.6 –84 28	7.5, 11.9	260	16"	210	B9.5V	60102, 258468	1	1537	Men
★	Microscopium											
	Gl 259	A B	20 31.9 –40 54	8.4, 8.4	158	4.2"	43.8	K1	195284, 230257	0	1538	Mic
	Jc 18	A B C	20 33.8 –40 33	7.8, 8.5, 10.9	223, 145	4.4", 108"	153	A1V	195599, 230275	1	1539	Mic
	Chart 25											
	A type 2+1 triple; dark field. AB: ps = 910 AU. Like many southern hemisphere systems, this one is neglected. (1998)											
	h 5211	A B	20 40.9 –42 24	6.3, 10.1	298	20"	164	G6III	196748, 230321	0	1540	Mic
	h 5228		20 51.7 –40 54	7.4, 9.3	104	32"	520	K0IIICN	198433, 230405	1	1541	Mic

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
	Skf 2097		21 01.1 -29 44	7.0, 8.1	152	88"	186	A2IV+F0V	199917, 189930	0	1542	Mic
	Δ 236		21 02.2 -43 00	6.7, 7.0	72	58"	82	G3IV K0IV	200011, 230492	1	1543	Mic
	UC 4365		21 03.0 -38 38	5.4, 10.7	207	100"	35.4	F5V	200163, 212666	0	1544	Mic
	β 251		21 12.1 -30 35	7.4, 9.4	232	2.1"	105	F5V	201695, 212786	1	1545	Mic
	Skf 2098		21 19.1 -32 21	7.1, 11.0	27	101"	330	K3III	202774, 212895	0	1546	Mic
	Skf 1173		21 23.7 -39 47	7.5, 9.0	153	94"	105	F3IV+F6V	203493, 212968	1	1547	Mic
	MlbO 6	A B C	21 27.0 -42 33	5.6, 8.2, 11.9	150, 75	2.9", 4.9'	56	Am	204018, 230692	0	1548	Mic
Chart 14												
3	β 16	Monoceros Mon	06 01.8 -10 36	5.0, 8.0	355	1.9"	240	B5III	40967, 151037	1	1549	Mon
	AC 3		06 11.7 -04 40	6.3, 8.2	203	0.7"	176	B9	42657, 132941	0	1550	Mon
	β 567		06 15.5 -04 55	6.0, 10.0	240	4.2"	65	A5IV	43319, 133027	1	1551	Mon
	β 569	A B	06 25.2 -10 56	7.9, 9.7	117	1.7"	186	K0	45140, 151478	0	1552	Mon
	Σ 914		06 26.7 -07 31	6.3, 9.3	299	21"	75	A0Vn	45380, 133263	1	1553	Mon
	Σ 910	A [B C]	06 26.7 +00 27	7.0, [9.2, 8.5]	152, [151]	66", [0.5"]	210	G5	45317, 113892	0	1554	Mon
★ 11 bet	Σ 919	A B C	06 28.8 -07 02	4.6, 5.0, 5.4	133, 125	7.1", 9.8"	210	B3Ve B3ne	45725, 133316	1	1555	Mon
	O Σ 142		06 29.9 +07 07	7.1, 10.6	354	8.4"	410	B2.5V	45789, 113953	0	1556	Mon
	Σ 926	Aa Ab B	06 31.7 +05 46	7.2, 9.6, 8.6	18, 288	0.9", 11"	130*	A1	46105, 114003	1	1557	Mon
	A 509	A B	06 37.9 -08 47	7.7, 9.7	137	1.4"	340	K0	47364, 133500	0	1558	Mon
★ 15	Σ 950	(AaAb) B C	06 41.0 +09 54	4.7, 7.8, 9.9	213, 16	2.9", 16"	280	O7Ve	47839, 114258	1	1559	Mon
	S Mon. Young cluster of high mass OB stars (Σ 952); proper motions are complex, but suggest Aa, Ab, B and C are related as (2)+1+1. Aa, Ab: $P = 74$ y, widening. The three wide pairs s. are apparently unrelated. (2012)											
	Σ 953		06 41.2 +08 59	7.1, 7.7	331	7.3"	500	F5	47888, 114266	0	1560	Mon
	Σ 987		06 54.1 -05 51	7.1, 7.2	176	1.3"	164	A6Vn	50700, 133855	1	1561	Mon
★	β 327	A B C	06 58.5 -03 01	7.8, 8.2, 11.1	102, 100	0.7", 13"	3020*	B0.5IV	51756, 133972	0	1562	Mon
	Distant, high mass 2+1 triple; in faint cluster in a splendid field. AB: $ps = 2,850$ AU; AC: $ps = 53,000$ AU. Neglected. (1997)											
V752	β 573		07 01.8 -10 53	7.2, 7.8	301	0.8"	118	F8	52694, 152256	1	1563	Mon
	Σ 1029		07 07.9 -04 41	7.5, 8.0	26	1.6"	230	A9V	54250, 134234	0	1564	Mon
	β 197	A B	07 12.8 -07 09	7.8, 9.3	148	2.2"	700	F2	55489, 134360	1	1565	Mon
	A 524		07 14.2 -03 54	6.1, 10.2	152	2.7"	400	M1III	55775, 134391	0	1566	Mon
	Σ 1056		07 15.6 -01 52	8.0, 8.9	300	4.0"	250	G0	56083, 134420	1	1567	Mon
	Ho 245	A B	07 38.7 -01 27	7.9, 8.7	186	0.7"	380*	A3III+	61343, 134933	0	1568	Mon
	Σ 1128		07 39.8 -06 15	7.9, 10.0	169	16"	101	G5	61583, 134950	1	1569	Mon
	Bgh 3		07 40.0 -03 36	7.3, 9.0	113	58"	14.2	K2V	61606, 134954	0	1570	Mon
	Local, solar type double with BY Dra type variable; bright rich field. AB: $ps = 1,110$ AU. (2003)											
	Σ 1154		07 52.1 -03 03	7.1, 9.3	354	2.8"	112	A5	64110, 135190	1	1571	Mon
φ 325			07 52.8 -05 26	7.3, 6.2	358	0.4"	39.7	F5IV	64235, 135205	0	1572	Mon
	Solar type binary; sparkling field. AB: $P = 31$ y, orbit $r = 13$ AU, $e = 0.65$, disappearing toward periastron 2020. (2013)											

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★	Σ 1157		07 54.6 −02 48	7.9, 7.9	177	0.7"	115*	F0	64607, 135238	1	1573	Mon
	Σ 1189	Matched solar type double, in glorious field; fine subarcsecond challenge. AB: ps = 110 AU. (2013)	08 07.9 −01 21	7.8, 10.1	334	8.9"	180*	A1V	67452, —	0	1574	Mon
		Musca							Chart 28			
★	h 4432		11 23.4 −64 57	5.4, 6.6	308	2.4"	124	B5V	99104, 251382	1	1575	Mus
		High mass double; pretty brightness contrast, faint field. AB: ps = 400 AU. Neglected. (1991)								1	1575	Mus
	CorO 130		11 51.9 −65 12	5.0, 7.3	159	1.6"	111	B4V	103079, 251617	0	1576	Mus
	Shy 230		11 54.7 −66 23	6.4, 8.5	123	3.7"	43.5	F2IV G3V	103482, 251637	1	1577	Mus
	h 4498	(AaAb) B	12 06.4 −65 43	6.1, 7.7	60	8.9"	126	K0III	105151, 251738	0	1578	Mus
		(2)+1 triple with K giant, visual binary; rich field. Low quality orbit Aa,Ab: P = 48 y, widening. (2000)								0	1578	Mus
	h 4522	A B	12 25.5 −69 29	7.9, 8.7	66	13"	260	B8	108073, 251894	1	1579	Mus
	l 296		12 39.2 −75 22	6.6, 9.1	271	2.0"	175	B7Vn+A2V	109857, 256967	0	1580	Mus
★ bet	R 207	(AaAb) B (C)	12 46.3 −68 06	3.5, 4.0	50	1.0"	105	B2.5V	110879, 252019	1	1581	Mus
		High mass (2)+1(+1) quadruple (C is m.16); faint rich field. System mass 20.9 M \odot ; AB: ps = 140 AU. (2013)								1	1581	Mus
	h 4550		12 48.3 −67 08	7.6, 8.7	98	12"	123	A3III	111161, 252034	0	1582	Mus
	Gli 185		12 49.0 −65 36	7.3, 9.7	8	8.7"	910	B6IV	111283, 252038	1	1583	Mus
★ eta	Δ 131	(AaAb) B C	13 15.2 −67 54	4.8, 10.0, 7.2	125, 332	2.7", 58"	117	B8V	114911, 252224	0	1584	Mus
		High mass (2)+1+1 spectroscopic quadruple; nicely displayed in faint field. MSC system mass 10.2 M \odot . AC: ps = 9, 150 AU. (2002)								0	1584	Mus
	Hd 224		13 17.9 −68 30	7.0, 8.1	208	0.7"	220	B9IV	115286, 252245	1	1585	Mus
	h 4586		13 28.4 −67 52	7.3, 9.1	141	2.9"	142	A5III	116865, 252318	0	1586	Mus
	l 298		13 32.5 −69 14	7.4, 8.5	156	0.5"	126	F5II	117445, 252353	1	1587	Mus
	h 4596		13 37.4 −64 56	8.2, 8.4	280	1.4"	390	A	118242, 252388	0	1588	Mus
		Norma							Chart 29			
	h 4777		15 32.7 −57 24	7.5, 9.1	295	5.6"	133	F2IV	138109, 242668	1	1589	Nor
	Hld 124		15 45.0 −50 47	6.6, 8.5	195	2.2"	122	A3V	140274, 242915	0	1590	Nor
	h 4795	A B	15 45.0 −59 07	7.6, 10.4	222	7.6"	129	A2III	140111, 242901	1	1591	Nor
	Δ 191	(AB) C	15 45.3 −58 41	7.8, 8.1	296	33"	590	A5V	140178, 242913	0	1592	Nor
★ V360	Δ 193	(AaAb) B	15 51.1 −55 03	5.8, 9.1	10	16"	660	B2II	141318, 243044	1	1593	Nor
		Distant, high mass (2)+1 spectroscopic triple with pulsating variable star; sparse field. AB: ps = 14, 200 AU. (2013)								1	1593	Nor
	Δ 195	A B	15 54.8 −50 20	6.8, 7.5	9	12"	95	A2	142080, 243110	0	1594	Nor
	h 4813		15 55.5 −60 11	5.9, 8.4	100	4.4"	51	G5II	142049, 253349	1	1595	Nor
	Spm 33		15 57.1 −48 10	6.3, 11.5	314	34"	48.5	F2V	142529, 226392	0	1596	Nor
iot 1	h 4825	A B C	16 03.5 −57 46	5.2, 5.8, 8.0	228, 241	0.4", 11"	39.4	A7IV	143474, 243279	1	1597	Nor
		A type 2+1 triple; rich field. MSC gives 4.5 M \odot . AB: P = 27 y, orbit r = 13 AU, e = 0.52, periastron 2017, reappears in 2025. (2010)								1	1597	Nor
	Rss 30		16 21.5 −53 06	8.3, 8.4	238	47"	360	B9III	146921, 243684	0	1598	Nor
	CorO 197	(AaAb) (BaBb)	16 25.3 −49 09	8.1, 8.2	96	2.3"	47.0	K1V	147633, 226738	1	1599	Nor
★ eps	h 4853	(AaAb) B	16 27.2 −47 33	4.5, 6.1	334	23"	163	B2V	147971, 226773	0	1600	Nor
		High mass (2)+1 spectroscopic triple, visual binary; easy pair in faint rich field. AB: ps = 5, 060 AU. (2013)								0	1600	Nor

Octans	Oct	Chart 30									
Gll 14		01 37.4 –82 17	7.6, 8.4	54	5.4"	123	K1	10693, 258270	1	1601	Oct
R 38		03 42.5 –85 16	6.6, 8.1	252	1.9"	153	B9.5IV	25887, 258356	0	1602	Oct
Δ 82		09 33.3 –86 01	7.1, 7.6	276	16"	48.6	F5IV	85300, 258542	1	1603	Oct
h 4310		10 05.6 –84 05	7.7, 8.4	262	4.3"	64	F8V	88948, 258564	0	1604	Oct
h 4490		12 02.3 –85 38	6.2, 9.0	146	25"	114	K3III	104555, 258632	1	1605	Oct
Rst 2819	A B	12 55.0 –85 07	5.9, 6.9	240	0.7"	108	K0III	111482, 258654	0	1606	Oct
Grv 1247		15 43.3 –84 28	5.6, 11.6	333	66"	66	A2V K0	137333, 258731	1	1607	Oct
h 4798		16 10.3 –84 14	7.7, 11.2	130	20"	34.3	K0	142022, 258738	0	1608	Oct
mu 2 Δ 232		20 41.7 –75 21	6.5, 7.1	19	17"	44.3	G5III	196067, 257836	1	1609	Oct
Gll 263		21 06.7 –80 42	7.3, 9.6	245	4.6"	79	F0IV	199391, 258879	0	1610	Oct
h 5235		21 21.3 –84 19	8.2, 8.4	80	3.1"	190	F5II	200816, 258888	1	1611	Oct
h 5262		21 33.4 –80 02	6.5, 10.4	92	24"	117	A0V	203955, 258904	0	1612	Oct
★ lam h 5278		21 50.9 –82 43	5.6, 7.3	63	3.5"	125	G9III	206240, 258914	1	1613	Oct
Probable A type double with G giant; YO/IV color, sparse or dark field. AB: ps = 590 AU. (2010)											
h 5261		21 52.2 –85 50	8.3, 8.6	197	4.9"	104	F7V	205195, 258908	0	1614	Oct
h 5306		22 03.1 –76 07	6.0, 10.6	71	35"	63	F3III	208741, 257993	1	1615	Oct
Δ 238	A B C	22 25.9 –75 01	6.2, 8.9, 13.0	80, 129	21", 4.4'	23.1	G3V M8V	212168, 258036	0	1616	Oct
Local, solar type 2+1 triple; dark field. No orbit. AB: ps = 655 AU. AC: ps = 8,230 AU. (2010)											
Charts 18, 24											
Σ 2005	(AaAb) B C E	16 05.7 –06 17	6.5, 9.0, 11.3, 7.9	86, 232, 270	0.7", 29", 4.3'	87	F3V	144382, 140945	1	1617	Oph
Solar type (2)+1+1+1 quintuple, visual quadruple. MSC system mass 4.9 M _☉ . AaAb: P = 5.0y, e = 0.56. (2010)											
★ 5 rho H II 19	A B (DE) [C F]	16 25.6 –23 27	5.1, 5.7, 6.8, [5.8, 13.2]	334, 252, 0, [206]	3.3", 2.6', 2.5', [4.8"]	111	B2IV B2V	147933, 184382	0	1618	Oph
Young, high mass 2?,(2),2 congerie near an intensively studied star forming region. AB (103 measures) has both a linear and low quality orbital solution, with a small CPM divergence, so it may be orbiting edgewise or comoving; both DE (β 1115, 0.3") 2.6' s.p. and CF (Kou 63, 5") 2.5' n. are apparently separate CPM binaries unrelated to A. (2009)											
Σ 2048	A B	16 28.8 –08 08	6.6, 9.7	300	5.5"	51	F4V	148515, 141195	1	1619	Oph
★ 10 lam Σ 2055	A B C	16 30.9 +01 59	4.2, 5.2, 11.8	40, 169	1.5", 120"	53	A0V A0V	148857, 121658	0	1620	Oph
Marfik. A type 2+1 triple. MSC gives 6.1 M _☉ . AB: P = 129 y, orbit r = 48 AU, e = 0.61, periastron 2069. (802 measures; 2013)											
Ho 407		16 32.9 –10 34	6.8, 11.8	218	15"	85	A9V	149108, 159972	1	1621	Oph
Σ 2106	A B	16 51.1 +09 24	7.1, 8.2	172	0.7"	64	F7IV	152113, 121908	0	1622	Oph
Solar type binary; faint field. AB: P = 1,270 y, orbit r = 90 AU. (2012)											
21 OΣ 315		16 51.4 +01 13	5.8, 7.3	312	0.7"	116	A2V	152127, 121911	1	1623	Oph
A type binary; low quality orbit AB: P = 1,115 y, orbit r = 195 AU. (219 measures; 2011)											
★ 24 β 1117		16 56.8 –23 09	6.3, 6.3	305	1.0"	93	A0V	152849, 184822	0	1624	Oph
A type binary; exact "Dawes" (matched m.6) arcsecond resolution test. AB: ps = 125 AU. (2011)											
Sh 240		16 57.1 –19 32	6.6, 7.6	232	4.5"	178	B6V B7V	152909, 160180	1	1625	Oph
Σ 2114		17 02.0 +08 27	6.7, 7.6	195	1.3"	121	A4V	153914, 122023	0	1626	Oph
A type spectroscopic binary and visual double; sparse field. Frequently measured, but no visual orbit or linear solution. AB: ps = 210 AU. (309 measures; 2012)											
Σ 2119		17 06.5 –13 56	8.2, 8.3	185	2.4"	108	F6V	154520, 160280	1	1627	Oph
Σ 2122		17 06.9 –01 39	6.4, 9.7	279	20"	91	A9V	154660, 141522	0	1628	Oph
A 1145	(AaAb) B	17 08.2 –01 05	6.3, 7.8	343	0.7"	90	A1V F3V	154895, 141528	1	1629	Oph
Mixed A/solar type (2)+1 spectroscopic triple; four stars f. AB: P = 204 y, orbit r = 50 AU, e = 0.43, apastron 2062. (2012)											
									1	1629	Oph

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★ 35 eta	β 1118	A B E Sabik. Matched A type 2+1 triple. AB: $P = 88$ y, orbit $r = 38$ AU, $e = 0.95$, apastron 2088. AE: $ps = 2,300$ AU. (257 measures; 2010)	17 10.4 -15 44	3.1, 3.3, 11.1	235, 317	0.6'', 63''	27.1	A1IV A1IV	15125, 160332	0	1630	Oph
	β 125	A B	17 12.2 -27 03	6.9, 9.7	66	1.8''	141	G8IV	155363, 185137	1	1631	Oph
★ 36 A	Sh 243	A B C Local, very high CPM, solar type 2+1 triple. AB: $P = 471$ y, orbit $r = 70$ AU. AC: $ps = 5,400$ AU. (270 measures; 2012)	17 15.3 -26 36	5.1, 5.1, 6.5	142, 74	4.9', 12.2'	5.46	K5Ve K1V	155886, 185198	0	1632	Oph
	41	A 2984	17 16.6 -00 27	4.9, 7.5	15	0.8''	63	K1IV	156266, 141586	1	1633	Oph
	H I 35		17 17.7 -26 38	6.9, 9.1	336	5.8''	156	B9.5V	156252, 185233	0	1634	Oph
	β 126	A B C	17 19.9 -17 45	6.3, 7.6, 11.2	263, 138	2.4'', 12''	115	A2V	156717, 160462	1	1635	Oph
40 xi	Don 832		17 21.0 -21 07	4.4, 8.9	40	4.4''	17.4	F1III	156897, 185296	0	1636	Oph
		Local, solar type double with F giant; faint field. AB: $ps = 100$ AU. Neglected. (1989)								0	1636	Oph
	Rag 9	A [B C]	17 22.9 -02 23	6.3, [11.9, 12.0]	146, [86]	46'', [0.8'']	19.5	G3V M3V	157847, 141642	1	1637	Oph
		Local, solar type 1+2 triple with low mass binary companion; sparse field. AB: $ps = 1,210$ AU. (2012)								1	1637	Oph
	Σ 2166		17 27.9 +11 23	7.2, 8.6	281	27''	115	A5V	158263, 102835	0	1638	Oph
	Σ 2171	A B	17 29.3 -09 59	8.3, 8.5	61	1.5''	115	F2	158373, 141684	1	1639	Oph
	β 1089		17 29.8 -05 55	6.6, 9.0	323	1.5''	79	G8IV	158463, 141691	0	1640	Oph
★	Σ 2173	A B	17 30.4 -01 04	6.1, 6.2	148	0.8''	16.3	G5V	158614, 141702	1	1641	Oph
		Local matched binary; faint field. AB: $P = 46.4$ y, orbit $r = 16$ AU, $e = 0.18$, apastron 2032. (716 measures; 2013)								1	1641	Oph
V2373	O Σ 331	A B	17 32.0 +02 49	7.7, 8.8	351	1.0''	480	B5V	158976, 122481	0	1642	Oph
	Shy 726		17 33.9 +08 06	7.9, 8.6	12	3.8'	84	G0 G	159333, 122512	1	1643	Oph
	Σ 2185	(AaAb) B High CPM, solar type (2)+1 triple. AB: $ps = 3,440$ AU. (2013)	17 34.8 +06 01	7.5, 10.3	4	28''	91	F8	159481, 122529	0	1644	Oph
	Σ 2186		17 35.8 +01 00	8.2, 8.4	77	3.0''	300	B8IV	159660, 122544	1	1645	Oph
	Sh 251	A B	17 39.1 +02 02	6.4, 7.8	328	111''	113	K0III	160315, 122607	0	1646	Oph
	Σ 2191	A B	17 39.8 -04 58	7.8, 8.5	267	26''	140	F2V	160388, 141793	1	1647	Oph
61	Σ 2202	A B	17 44.6 +02 35	6.1, 6.5	93	21''	85	A1IV	161270, 122690	0	1648	Oph
	Σ 2223		17 49.0 +04 58	7.6, 9.7	211	18''	87	F0	162056, 122780	1	1649	Oph
	Σ 3128	A B	17 53.0 -07 55	7.8, 10.0	51	1.2''	58	G0IV	162756, 141935	0	1650	Oph
	Σ 2244		17 57.1 +00 04	6.9, 6.6	100	0.7''	118	A3V	163624, 122950	1	1651	Oph
		High mass A type binary. System mass 5.1 M_{\odot} . AB: $P = 368$ y, orbit $r = 105$ AU, $e = 0.52$. (218 measures; 2012)								1	1651	Oph
67	H VI 2	A C	18 00.6 +02 56	4.0, 8.1	142	54''	380	B5Ib	164353, 123013	0	1652	Oph
	β 1202	E [A B]	18 01.5 +03 31	8.0, [8.7, 9.7]	318, [345]	90'', [0.6'']	250	A0	164529, 123031	1	1653	Oph
		An A type 1+2 triple; unrelated double β 1202 CD (m.10, 2.8'') 2' n.f. AB: $ps = 200$ AU; EA: $ps = 30,400$ AU. (1999)								1	1653	Oph
★ 69 tau	Σ 2262	(AaAb) B C Local, solar type (2)+1+1 quadruple; faint field, brightest of three stars about 40' s.p. globular cluster NGC 6539. MSC system mass 3.1 M_{\odot} implies low mass components. AB: $P = 257$ y, orbit $r = 70$ AU, $e = 0.77$, closing to periastron 2086. (684 measures; 2013)	18 03.1 -08 11	5.3, 5.9, 11.3	286, 125	1.5'', 101''	51	F4IV F5V	164765, 142050	0	1654	Oph
	Σ 2266	A B	18 04.4 +03 29	7.9, 9.6	185	8.5''	108	F5	165111, 123086	1	1655	Oph
★ 70 p	Σ 2272	A B Local, very high CPM, low mass binary; pretty YO/O color. Discovered by C. Mayer (1977), it has completed more than 2.5 orbits since it was first measured by W. Herschel (1779) and is always easily resolved: it is currently the most measured double star. A third component is suspected but not confirmed; other "components" in WDS are field stars. AB: $P = 88$ y, orbit $r = 23$ AU, $e = 0.50$, next apastron in 2028. (1,731 measures; 2013)	18 05.5 +02 30	4.2, 6.2	130	5.9''	5.08	K0V K4V	165341, 123107	0	1656	Oph
	Σ 2276	A B	18 05.7 +12 00	7.1, 7.4	256	7.0''	138	A7	165475, 103373	1	1657	Oph

73	Σ 2281	A B	18 09.6 +04 00	6.0, 7.5, 12.6	287, 194	0.7", 68"	55	F2V	166233, 123187	0	1658	Oph
Solar type double with gam Dor type variable; faint rich field. AB: $P = 294$ y, orbit $r = 65$ AU, $e = 0.61$, apastron 2060. (403 measures; 2011)												
β 637	Σ 2294	(AaAb) B C	18 09.9 +03 07	5.7, 11.7, 10.9	189, 245	6.7", 98"	46.9	F6V	166285, 123198	1	1659	Oph
Solar type binary; rich field, tiny unrelated pair (m.11, 15") g' p. AB: $P = 345$ y, orbit $r = 85$ AU, widening. (242 measures; 2012)												
LDS 1012		(AaAb) B	18 14.6 +00 11	8.2, 8.6	93	1.3"	114	F2	167278, 123283	0	1660	Oph
		(AaAb) B	18 26.2 +08 47	7.9, 8.4	163	10.1"	28.9	G7V	169822, 169822	1	1661	Oph
High CPM, solar type (2)+1 triple; rich field. MSC gives 1.7 M \odot . Interferometric binary Aa,Ab: $P = 302$ d, $e = 0.35$. AB: ps = 23,600 AU; near 100% probability pair is physical. (2001)												
OΣ 350		A B	18 26.9 +06 25	7.8, 9.4	166	1.8"	520*	A0III	169959, —	0	1662	Oph
Distant, probably high mass double with A type giant; difficult to find in a rich field (NGC 6633). AB: ps = 1,260 AU. (2011)												
Orion		Ori	Chart 14									
β 552		(AaAb) (BaBb) C	04 51.8 +13 39	6.4, 8.9, 12.4	258, 224	0.7", 49"	40.7	dF6	30869, 94171	1	1663	Ori
Solar type (2)+(2)+1 spectroscopic quintuple; sparse field. MSC 3.6 M \odot . System mass 2.0 M \odot . Ab,Ab: $P = 143$ d. AB: $P = 95$ y, $e = 0.59$, apastron 2029. A C: ps = 2,700 AU. (2012)												
S 457		A B C	04 53.1 −01 17	7.9, 8.1	355	41"	200	A	31125, 131570	0	1664	Ori
Σ 612		A B C	04 54.3 +07 22	8.3, 8.4, 13.3	200, 264	16", 60"	30.3	K0	31208, 112196	1	1665	Ori
High CPM, solar type 2+1 triple; Y/Y color, in close group of faint stars. AB: ps = 650 AU. (2010)												
★ V1834	OΣ 90	(AaAb) B [C D]	04 54.9 +08 36	7.0, 9.0, [122, 13.0]	339, 97, [320]	1.8", 40", [12"]	145	A0	31306, 112205	0	1666	Ori
Compact A type (2)+1+2 (?) system with Algol type eclipsing binary ($P = 1.5$ d); it's unclear from the data if AB and CD are related. AB: ps = 350 AU, AC ps = 7,800 AU. (2012)												
h 689		A B	04 58.2 −02 13	6.4, 10.9	277	21"	133	A2V	31739, 131640	1	1667	Ori
Sh 49		A B	04 59.0 +14 33	6.1, 7.4	307	39"	350	B7V	31764, 94240	0	1668	Ori
S 463		(AaAb) B	05 01.8 +11 23	7.2, 10.1	29	32"	470	B8	32202, 94274	1	1669	Ori
★ 14 i	OΣ 98	(AaAb) B	05 07.9 +08 30	5.8, 6.7	295	0.9"	65	Am	33054, 112440	0	1670	Ori
A type (2)+1 spectroscopic triple; W/− color, centered in faint group that includes CPM companion Σ 643 (m.9, 2.4") δ' s. AB: $P = 197$ y, orbit $r = 65$ AU, $e = 0.18$, apastron 2075. (479 measures; 2013)												
Bvd 50		A B C	05 09.2 +11 30	8.4, 8.5	104	31"	87	F3V F3V	33221, 94353	1	1671	Ori
Σ 652		(AaAb) B	05 11.8 +01 02	6.3, 7.4	180	1.7"	195	A G2III	33646, 112509	0	1672	Ori
★ 17 rho	Σ 654	(AaAb) B	05 13.3 +02 52	4.6, 8.5	63	6.8"	107	K0.5III	33856, 112528	1	1673	Ori
Solar type (2)+1 spectroscopic triple; Y O/B color, brilliant in sparse field. MSC gives 6.4 M \odot . Aa,Ab: $P = 2.8$ y, $e = 0.10$. (2011)												
OΣ 517		A B C	05 13.5 +01 58	6.8, 7.0, 13.0	241, 138	0.7", 6.5"	210	A5V	33883, 112535	0	1674	Ori
An A type, probable 2+1 triple; faint field. MSC system mass 4.3 M \odot . AB: $P = 987$ y, orbit $r = 160$ AU. (2013)												
★ 19 bet	Σ 668	A (BaBbC)	05 14.5 −08 12	0.3, 6.8	205	9.5"	260	B8Iae B9V	34085, 131907	1	1675	Ori
Rigel. Distant 1+(2+1) quadruple, visual double; spectacular example of B type blue supergiant, pulsating variable with high mass (2+1) triple companion. MSC system mass 33.4 M \odot . W/w color. A,BC: ps = 3,330 AU. (2013)												
Σ 667		A B C	05 14.7 −07 04	7.2, 8.8	316	4.2"	300	K2	34121, 131910	0	1676	Ori
Σ 664		(AaAb) B	05 15.2 +08 26	7.8, 8.4	177	4.7"	120	A9IV	34081, —	1	1677	Ori
Bvd 51		(AaAb) B	05 15.4 −03 22	7.8, 9.6	318	45"	83	F7V G1V	34195, 131918	0	1678	Ori
Σ 688		(AaAb) B	05 19.3 −10 45	7.5, 7.6	95	11"	96*	F0	34750, 150333	1	1679	Ori
β 189		(AaAb) B	05 20.4 −05 22	6.4, 9.8	285	4.6"	280	B8III	34880, 132004	0	1680	Ori
OΣ 106		(AaAb) B	05 22.2 +05 24	7.1, 10.1	41	9.4"	57	F6V	35066, 112681	1	1681	Ori
Σ 700		(AaAb) B	05 23.1 +01 03	7.7, 7.9	6	4.9"	230	B9V B9.5V	35192, 112704	0	1682	Ori
Σ 701		(AaAb) B	05 23.3 −08 25	6.1, 8.1	141	6.0"	123	B8III	35281, 132053	1	1683	Ori
Wnc 2		(AaAb) (BC)	05 23.9 −00 52	6.9, 7.0	159	3.1"	56	F6V	35317, 132060	0	1684	Ori

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
		Solar type (2)+(2) spectroscopic quadruple, visual matched binary; the middle star of six bright stars. A,BC: $P = 923$ y, orbit $r = 162$ AU. BC (A 847): $P = 48$ y, orbit $r = 18$ AU, $e = 0.22$, apastron 2033. (2011)										
	Σ 708		05 25.2 +01 55	7.7, 8.9	321	2.7"	540	B8V	35501, 112744	1	1684	Ori
	Σ 712	A B	05 26.5 +02 56	6.7, 8.6	66	3.2"	146	B9.5V	35673, 112765	0	1686	Ori
★ 32	Σ 728		05 30.8 +05 57	4.4, 5.8	43	1.4"	93	B5V	36267, 112849	1	1687	Ori
		High mass double; dominant in field. Ambiguous: low quality orbit and nearly rectilinear motion, but parallel proper motion. AB: $P = 614$ y, orbit $r = 200$ AU. (233 measures; 2012)										
	Σ 726		05 30.9 +10 15	7.9, 8.6	262	1.1"	280*	B9	36263, 94602	0	1688	Ori
★ 33 n 1	Σ 729	A B	05 31.2 +03 18	5.7, 6.7	27	1.9"	350	B1.5V	36351, 112861	1	1689	Ori
		Distant, high mass double; sparse field. AB: $ps = 900$ AU. (2012)										
	Σ 734	A B	05 33.1 −01 43	6.7, 8.2	357	1.7"	320	B4Vh	36646, 132247	0	1690	Ori
		Distant, high mass double; splendid field. The pair CD (β 1049, m 8, 0.5") 30" s.p. is unrelated. (2008)										
	Σ 743	A B	05 34.7 −04 24	7.7, 8.3	282	1.8"	315	B5V	36883, 132285	1	1691	Ori
		Distant, high mass double in bright high mass group (NGC 1981); β 13 (m 7, 1.0") 8' s.p.; Σ 750 (see below) 13' f. (2012)										
	Σ 741		05 34.9 −00 07	7.1, 10.0	286	10'	230*	B5	36898, 132291	0	1692	Ori
★ 39 lam 1	Σ 738	A B	05 35.1 +09 56	3.5, 5.5	44	4.4"	340	O8III B0.5V	36861, 112921	1	1693	Ori
		Meissa. Distant, high mass, tiny OB "diamond ring," leading a line of four stars s.; YW/− color. AB: $ps = 2,020$ AU. (2012)										
★ 41 the 1	Σ 748	A' B'' C' D' E	05 35.3 −05 23	6.6, 7.5, 5.1, 6.4, 11.1	32, 132, 96, 352	8.9", 13", 21", 4.6"	490*	O7 B1V O6 B0.5V	37022, 132314	0	1694	Ori
		The Trapezium: a 3 million year old, (2)+(4)+(3)+(2)+(1) association of high mass (O and B type) double and multiple stars illuminating the core of the Great Orion nebula (NGC 1976, M 42). Independently detected as a triple (ACD) by Galileo (1617), then as a quartet by J. Picard (1673); N.-C. de Peiresc and J. Cysat (c. 1611) first noticed the nebula. The quartet can be resolved by a large binocular; E,F need good seeing. F is optical. MSC system mass >107 M \odot . A and B: Algol type variables, D: pre main sequence star, E: Orion type variable. Divergent true motions indicate the group is already breaking apart; as binding mass is lost in the gas and dust dispersed by the stars' intense radiation. (AB: $ps = 5,890$ AU, AD: $ps = 13,900$ AU. (2013) (408 measures; 2013) See Figure 3.										
42	Dawes 4		05 35.4 −04 50	4.6, 7.5	205	1.1"	270	B1V	37018, 132320	1	1695	Ori
43 the 2	Σ 1 16	(AaAb) B	05 35.4 −05 25	5.1, 6.2	93	52"	470	O9.5Ve	37041, 132321	0	1696	Ori
★ 44 iot	Σ 752	(AaAb) B	05 35.4 −05 55	2.8, 7.7	141	12"	710	O9III	37043, 132323	1	1697	Ori
	Σ 750	Nair al Saif. Distant, high mass (2+1)+1 spectroscopic triple; near Σ 745/747. MSC gives 69.3 M \odot . AB: $ps = 11,500$ AU. (2012)	05 35.5 −04 22	6.4, 8.4	60	4.2"	360	B2.5IV	37040, 132325	0	1698	Ori
	Dawes 3	(AaAb) B	05 35.9 −05 38	7.3, 8.5	173	0.9"	440*	B6Ve	37115, −	1	1699	Ori
		Distant, high mass (2)+1 spectroscopic triple, in s.f. rim of NGC 1976 (M 42), 5' p. HD 37150. AB: $ps = 530$ AU. (2006)										
★	Σ 757	A B D	05 38.1 −00 11	8.0, 8.3, 8.5	239, 79	1.5", 42"	270	B6V	37370, −	0	1700	Ori
		High mass 2+1 triple; W/W color, in row of stars, C (m 9, 50' f.) is unrelated. AB: $ps = 550$ AU, AD: $ps = 15,300$ AU. (2010)										
★ 48 sig	Σ 762	(AaAbB) G C D E	05 38.7 −02 36	3.8, 12.0, 8.8, 6.6, 6.3	20, 239, 85, 62	3.2", 11", 13", 41"	330	O9.5V	37468, 132406	1	1701	Ori
		A = V1030 Ori. High mass, distant, young septuple system in a visually remarkable but gravitationally unstable group, displayed to our view in "planetary" alignment; Σ 761 (4' n.p.) is apparently unrelated. Despite the attribution to F.W. Struve, D,E were first detected by C. Mayer (1777), C by W. Dawes (1831). Estimates vary, but system mass likely exceeds 60 M \odot if undetected lower mass components are included. AB: $P = 157$ y, $e = 0.05$, apastron 2078. (2013)										
	Σ 766	A B	05 40.3 +15 21	7.0, 8.4	275	10'	260	F0	37603, 94746	0	1702	Ori
★ 50 zet	Σ 774	(AaAb) B	05 40.8 −01 57	1.9, 3.7	167	2.4"	230	O9.5Ibe B0III	37742, 132444	1	1703	Ori
		Alnitak. High mass (2)+1 spectroscopic triple with O supergiant and B giant; divergent proper motion suggests C (m 10, 58" n.) is unrelated. Aa,Ab: $P = 7.4$ y, $e = 0.34$. (256 measures; 2013)										
β 1052			05 41.7 −02 54	6.7, 8.2	185	0.6"	81	A9IV	37904, 132465	0	1704	Ori
		A type binary, s.f. corner of 16' rectangle of m.8 stars. System mass 3.0 M \odot . AB: $P = 192$ y, orbit $r = 55$ AU, $e = 0.13$. (2013)										
Σ 788		A B C	05 44.7 +03 50	7.6, 10.1, 10.4	89, 148	7.3", 35"	300	B9	38270, 113093	1	1705	Ori

	Σ 790	05 46.0 –04 16	6.4, 9.0	89	7.1"	111	G8III	38495, 132515	0	1706	Ori
52	Σ 795	05 48.0 +06 27	6.0, 6.0	222	1.2"	165	A5V	38710, 113150	1	1707	Ori
	J 36	05 48.3 +03 54	7.8, 9.6	101	1.5"	58*	F8	38767, 113155	0	1708	Ori
	Σ 797	05 48.5 +04 42	7.4, 9.8	19	7.2"	320	A0	38798, 113161	1	1709	Ori
	Ary 39	05 53.0 +20 47	7.7, 10.6	184	32"	250*	B9	39358, 77667	0	1710	Ori
	0Σ 123	05 54.2 +10 15	7.3, 9.1	187	2.1"	133	G5	39612, 94975	1	1711	Ori
	Σ 816	05 54.9 +05 52	6.9, 9.3	286	4.4"	240	B9	39773, 113267	0	1712	Ori
59	Arn 37	05 58.4 +01 50	5.9, 6.9	293	3.0'	112	A5m	40372, 113315	1	1713	Ori
	A = V1004 Ori. A type (2)+1 spectroscopic triple with del Sct type variable; sparse field. AC: ps = 27,200 AU. (2008)										
	0Σ 124	05 58.9 +12 48	6.1, 7.4	299	0.6"	240	K2III A5V	40369, 95075	0	1714	Ori
	0Σ 125	05 59.7 +22 28	7.9, 8.9	0	1.4"	200*	A0	40423, —	1	1715	Ori
	Σ 840	06 06.5 +10 45	7.2, [9.8, 10.1]	249, [126]	22", [0.4"]	230	A0V+F0	41580, 95234	0	1716	Ori
	0Σ 133	06 08.0 +21 18	7.4, 11.2	33	3.3"	103	F0	41786, 78006	1	1717	Ori
★	Σ 848	06 08.5 +13 58	7.3, 8.2, 8.3	110, 122	2.6", 28"	300	B1V B2V	41943, 95282	0	1718	Ori
	V1154 Ori. Distant, high mass 2+1 triple in open cluster NGC 2169, a situation that has confused the correct attribution of component measures. Optical pair Σ 844 (m.8, 23") 3' n.p. (2012)										
	Σ 855	06 09.0 +02 30	5.7, 6.7	114	29"	200	A3Vn A0V	42111, 113507	1	1719	Ori
	Σ 867	06 11.7 +17 23	7.5, 8.9	159	2.2"	460*	B9.5III	42476, 95354	0	1720	Ori
	Pavo							Chart 29			
	h 4979	17 52.1 –60 24	7.5, 10.0	237	11"	108	F0IV	161918, 254059	1	1721	Pav
	h 5029	18 15.1 –57 51	8.3, 8.6	82	1.9"	51	G2V	166653, 245335	0	1722	Pav
	I 249	18 19.7 –63 53	6.2, 10.8	352	7.8"	23.1	F9V	167425, 254209	1	1723	Pav
	Local, solar type double with probable low mass companion; sparse or faint field. AB: ps = 245 AU. (2000)										
xi	Gale 2	18 23.2 –61 30	4.4, 8.1	156	3.4"	144	K4III	168339, 254226	0	1724	Pav
	High mass, long period (2)+1 spectroscopic triple, visual binary with K giant; rich field. MSC gives 10.9 M _☉ . Aa,Ab: P = 6.1 y, e = 0.26. AB neglected. (1988)										
	Skf 973	18 29.9 –57 31	5.9, 8.9	273	2.3'	98	K0III	169836, 245510	1	1725	Pav
	MlbO 5	18 34.2 –66 17	7.0, 9.1	292	4.7"	1150	G5III A5	170407, 254286	0	1726	Pav
	Skf 105	18 45.4 –64 52	4.8, 10.1	65	71"	28.6	A7V K5V	172555, 254358	1	1727	Pav
	R 314	18 49.7 –73 00	6.2, 8.1	271	1.9"	220	B9.5IV	172881, 257630	0	1728	Pav
	h 5065	18 51.9 –57 56	7.9, 9.9	21	23"	135	A0V	174041, 245756	1	1729	Pav
	h 5075	19 04.1 –63 47	7.7, 7.7	113	1.7"	200	A0	176340, 254453	0	1730	Pav
★	h 5085	19 10.6 –60 03	7.6, 9.1	239	2.7"	540	B9II	177999, 254482	1	1731	Pav
	Distant, high mass double with B supergiant; at rim of globular cluster NGC 6752. AB: ps = 1,970 AU. Neglected. (1991)										
	Gale 3	19 17.2 –66 40	6.1, 6.4	350	0.5"	92	A5V+A8V	179366, 254515	0	1732	Pav
	A type binary, subarcsecond resolution test. AB: P = 157 y, orbit r = 50 AU, e = 0.57, increasing θ to apastron in 2029. (2013)										
	I 117	19 32.2 –60 16	7.5, 8.2	185	1.0"	260	A3IV	183237, 254592	1	1733	Pav
	I 119	19 42.6 –59 01	7.9, 9.0	150	2.4"	41.7	G5V	185454, 246222	0	1734	Pav
	h 5132	19 44.0 –66 18	7.6, 9.7	308	22"	67	G1V	185523, 254636	1	1735	Pav
	I 120	19 49.1 –61 49	8.3, 8.0, 10.5	188, 340	0.4", 12"	56	F7V	186602, 254655	0	1736	Pav
	Solar type 2+1 triple; two wide m:12 pairs are 2' and 5' f. MSC gives 2.9 M _☉ . AB: P = 65 y, orbit r = 19 AU, e = 0.68, apastron 2029. (2013)										
	h 5140	19 49.8 –64 54	8.2, 8.3	252	1.3"	64	F7V	186632, 254659	1	1737	Pav
	Shy 759	19 50.7 –59 12	5.5, 7.1, 7.1	151, 232	0.8", 6.8'	85	A0IV A5IV	186957, 246293	0	1738	Pav

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
A type 2+1 triple, comoving with a fourth star C (HD 188162, m.5) 1.6" n.f. The Aa,Ab pair (l 121) is included despite a linear solution, in view of the matching CPM, small ρ and few measures. AC (Shy 761): ps = 1.3 pc. Neglected. (1999)												
	h 5163		20 05.1 –63 04	7.7, 8.4	249	1.3"	153	A3V	189721, 254722	1	1739	Pav
	h 5171	A B	20 14.6 –64 26	6.9, 9.8	305	18"	104	A2IV	191585, 254757	0	1740	Pav
	h 5194		20 30.3 –69 04	7.1, 11.2	259	3.5"	110	A3V	194441, 254800	1	1741	Pav
	h 5200		20 33.0 –68 22	7.5, 10.0	136	12"	141	A1V	194972, 254811	0	1742	Pav
	Mug 4	A (BaBb)	20 37.9 –60 38	6.4, 10.6	175	11"	50	G3V	196050, 254837	1	1743	Pav
★	Rnk 26		20 51.6 –62 26	6.2, 6.6	81	2.4"	76	A3IV	198160, 254883	0	1744	Pav
A type double; prominent in dark field. AB: ps = 245 AU. (2009)												
Charts 6, 11, 12												
Pegasus	Peg											
	Σ 2767		21 10.5 +19 58	8.2, 8.5	29	2.5"	182	F4V	201672, 106894	1	1745	Peg
	β 681		21 13.3 +16 55	7.5, 10.9	243	2.8"	210	K3III	202091, 106927	0	1746	Peg
1	Σ II 11	A B	21 22.1 +19 48	4.2, 9.3	311	37"	47.8	K0.5III	203504, 107073	1	1747	Peg
	Cou 430	A B	21 25.2 +18 28	8.0, 9.4	234	0.6"	177	A0	203991, 107115	0	1748	Peg
KP	Σ 2797	A (BaBb)	21 26.7 +13 41	7.4, 8.8	217	3.5"	220	A2V	204215, 107139	1	1749	Peg
	Σ 2799	A B	21 28.9 +11 05	7.4, 7.4	261	1.8"	105	F4V	204509, 107165	0	1750	Peg
Solar type binary; faint group 5' s.f. Low quality orbit AB: P = 978 y, orbit r = 220 AU. (442 measures; 2012)												
	h 1647	A B	21 29.0 +22 11	6.1, 10.2	178	42"	200	M5III	204585, 89737	1	1751	Peg
	β 74		21 35.2 +21 24	7.5, 9.1	335	1.0"	85	F5V	205497, 99810	0	1752	Peg
★ 3	Σ I 56	A B	21 37.7 +06 37	6.2, 7.5	349	39"	88	A2V	205811, 126940	1	1753	Peg
A type binary; dark field. The occultation double AB: estimated P = 100,000 y, ps = 4.630 AU. OΣ 443 7' north preceding. (2012)												
	OΣΣ 222		21 44.1 +07 09	7.5, 8.5	258	88"	163	F2V	206751, 127028	0	1754	Peg
	β 692	A B	21 50.1 +31 51	7.5, 11.0	10	2.9"	181	K0	207703, 71749	1	1755	Peg
	Σ 2834	A B	21 51.7 +19 18	6.9, 9.9	298	4.2"	92	F5IV	207859, 107450	0	1756	Peg
	Σ 2833		21 51.9 +09 05	7.8, 10.2	337	9.1"	118	A5	207862, 127121	1	1757	Peg
	β 75	A B	21 55.5 +10 53	8.4, 8.6	24	1.0"	47.8	G5	208348, 107510	0	1758	Peg
Solar type binary; dark field. System mass 1.7 M \odot . AB: P = 159 y, orbit r = 36 AU, e = 0.61, apastron 2047. (225 measures; 2013)												
	OΣΣ 225		21 57.5 +04 09	7.1, 8.6	287	75"	97	F5	208632, 127190	1	1759	Peg
	Σ 2854		22 04.4 +13 39	7.8, 7.9	83	1.6"	72	F6V	209601, 107633	0	1760	Peg
Solar type matched double, YO/YO color. AB: ps = 155 AU, but no orbit. (231 measures; 2011)												
	Σ 2869		22 10.4 +14 38	6.3, 12.4	252	21"	136	K0III	210461, 107707	1	1761	Peg
	Ho 178		22 11.5 +32 05	7.4, 11.2	223	3.4"	122	F0	210684, 72108	0	1762	Peg
	Σ 2878	A B	22 14.5 +07 59	6.9, 8.1	116	1.5"	220	B9IV	211048, 127402	1	1763	Peg
	Σ 2881		22 14.6 +29 34	7.7, 8.2	75	1.3"	172	F6III	211139, 90348	0	1764	Peg
Double with F giant; sparse or dark field. AB: ps = 300 AU; frequently measured, but no orbit (284 measures; 2011)												
	OΣ 467		22 14.8 +22 31	6.7, 10.7	274	24"	220	G8III	211153, 90349	1	1765	Peg
	Ho 292		22 23.3 +05 39	7.7, 11.2	65	3.9"	141	A2	212317, 127491	0	1766	Peg
	β 701	A B C	22 28.1 +12 15	7.3, 9.6, 12.0	186, 133	0.9", 2.1'	66	K0V	212989, 107935	1	1767	Peg
	Σ 2908		22 28.2 +17 16	7.7, 9.7	113	9.0"	460	G9III	213014, 107941	0	1768	Peg
	Σ 2920	A B	22 34.5 +04 13	7.6, 8.9	143	14"	89	B9.5V	213892, 127609	1	1769	Peg

Ho 296	A B D	22 40.9 +14 33	6.1, 7.2, 14.1	60, 93	0.5", 4.5'	33.8	G4V	21 4850, 108094	0	1770	Peg
	High CPM, solar type 2+1 spectroscopic triple. AB: $P = 21$ y, orbit $r = 10$ AU, $e = 0.73$, closing. (332 measures; 2012)								0	1770	Peg
Ho 482	A B	22 51.4 +26 23	7.3, 8.3	17	0.5"	133	A9V	21 6285, 90833	1	1771	Peg
	Mixed A/solar type binary; sparse field; three stars s. System mass $2.7 M_{\odot}$. AB: $P = 383$ y, orbit $r = 75$ AU, $e = 0.61$ (2011)								1	1771	Peg
Ho 191	A B C	22 53.6 +30 46	7.8, 13.5, 11.8	90, 280	3.2", 24"	125	A6V	21 6562, 72815	0	1772	Peg
Σ 2952	A B	22 54.2 +28 01	7.7, 10.5	138	18"	51	F8V	21 6632, 90864	1	1773	Peg
Cou 240		22 56.4 +22 57	7.7, 8.8	290	0.8"	186	F0	21 6679, 90881	0	1774	Peg
Σ 2958		22 56.9 +11 51	6.6, 9.1	15	3.9"	99	A3V	21 6900, 108275	1	1775	Peg
O $\Sigma\Sigma$ 241		22 58.6 +12 03	8.3, 8.4	161	84"	111	F2	21 7163, 108300	0	1776	Peg
52 O Σ 483		22 59.2 +11 44	6.1, 7.3	359	0.5"	94	A8III	21 7232, 108307	1	1777	Peg
	Binary with A type giant; dark field. System mass at least $3.3 M_{\odot}$. AB: $P = 249$ y, orbit $r = 65$ AU, $e = 0.39$. (324 measures; 2008)								1	1777	Peg
Σ 2968		23 00.7 +31 05	6.7, 9.5	93	3.2"	136	B9	21 7477, 72924	0	1778	Peg
Σ 2974		23 05.0 +33 23	8.1, 8.5	165	2.7"	240	A0V A3V	21 8097, 72984	1	1779	Peg
O Σ 488		23 07.4 +20 35	6.7, 10.4	335	15"	149	K0III	21 8381, 91021	0	1780	Peg
Σ 2978		23 07.5 +32 50	6.4, 7.5	145	8.3"	163	A3V	21 8395, 73010	1	1781	Peg
β 78	A B	23 07.9 +31 28	7.5, 11.1	54	19"	92	A5V	21 8472, 73021	0	1782	Peg
Σ 2986		23 10.0 +14 26	6.6, 8.9	268	32"	24.8	G0V	21 8687, 108437	1	1783	Peg
	Local, solar type double; very dark field. AB: ps = 1,070 AU. (2013)								1	1783	Peg
h 5532	A B C	23 10.3 +32 29	7.4, 8.2, 9.4	85, 77	0.6", 58"	330	B9V	21 8767, 73054	0	1784	Peg
	Distant, high mass 2+1 triple; center star of 5 stars in dark field. AB (β 385): $P = 830$ y, orbit $r = 205$ AU. (2011)								0	1784	Peg
β 852	(AaAb) [B C]	23 10.7 +26 31	7.2, [10.5, 11.0]	283, [322]	58", [1.2"]	85	A7IV	21 8806, 91061	1	1785	Peg
Σ 3007	A B	23 22.8 +20 34	6.7, 9.8	92	5.8"	37.4	G2V dK6	22 0334, 91222	0	1786	Peg
	High CPM double; dark field, m. 10 star 1.5' n.p. is unrelated. AB: ps = 290 AU, but no orbit. (268 measures; 2007)								0	1786	Peg
Σ 3018	(AaAb BaBb) C	23 30.4 +30 50	7.4, 9.8	202	19"	68	F7V	22 1264, 73306	1	1787	Peg
	Solar type (2+2)+1 spectroscopic quintuple, visual double; dark field. Aa,Ab: $P = 1.9$ d; Ba,Bb: $P = 13.0$ d; AB (β 1266): $P = 48$ y, orbit $r = 13$ AU, $e = 0.43$, apastron 2031. (2007)								1	1787	Peg
Σ 3023		23 32.4 +17 24	7.2, 9.1	280	1.8"	153	F4IV	22 1479, 108669	0	1788	Peg
★ 72 β 720	A (BaBb)	23 34.0 +31 20	5.7, 6.1	102	0.6"	168	K4III	22 1673, 73341	1	1789	Peg
	Solar type 1+(2) interferometric triple with K giant; dark field. O/- color. Ba,Bb: $P = 4.2$ y, orbit $r = < 4$ AU. AB: $P = 492$ y, orbit $r = 95$ AU. (465 measures; 2011)								1	1789	Peg
β 858	A B C	23 41.3 +32 34	7.8, 8.8, 12.9	220, 52	0.8", 23"	210	A1V	22 2529, 73436	0	1790	Peg
O Σ 503	A B	23 42.0 +20 18	8.3, 8.6	133	1.0"	108	F8	22 2610, 91425	1	1791	Peg
O Σ 504		23 42.5 +18 40	7.4, 10.3	176	7.6"	200	K0	22 2659, 108780	0	1792	Peg
78 AGC 14		23 44.0 +29 22	5.1, 8.1	280	0.8"	69	G8III	22 2842, 91457	1	1793	Peg
O Σ 505		23 45.5 +20 25	6.8, 9.6	60	2.3"	159	G8III	22 2978, 91467	0	1794	Peg
Σ 3044		23 53.0 +11 55	7.3, 7.9	283	20"	72	F0	22 3839, 108883	1	1795	Peg
★ 85 β 733	(AaAb) B	00 02.2 +27 05	5.8, 8.9	273	0.8"	12.2	G5V K5V	22 4930, 91669	0	1796	Peg
	Local, very high CPM, solar type (2)+1 triple, visual binary; dark field, C 3' n.p. is unrelated. System mass $1.6 M_{\odot}$. AB: $P = 26$ y, orbit $r = 10$ AU, $e = 0.38$, minimum separation (and periastron) in 2015, then rapidly widens with increasing θ . (2009)								0	1796	Peg
Σ 3055	A B C	00 04.0 +12 09	7.3, 10.3, 12.7	359, 32	5.5", 2.0'	176	F0III	22 5161, 91683	1	1797	Peg
Σ 3058		00 05.2 +30 20	7.8, 9.2	52	13"	250	F3V F6V	4, 53627	0	1798	Peg
Σ 3061		00 05.7 +17 50	8.4, 8.5	149	7.6"	128	F5V F5V	85, 91703	1	1799	Peg
Glc 2	A B	00 09.3 +25 17	7.8, 11.5	237	30"	51	G0	471, 73776	0	1800	Peg

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Perseus												
★	Σ 162	(AaAb) B C	01 49.3 +47 54	6.5, 7.2, 9.2	198, 179	1.8", 21"	128	A3V	11031, 37536	1	1801	Per
		Splendid (2)+1+1 quadruple; YW/BW color, rich field. MSC has 6.4 M \odot . AC: $P = 39,100$ y, orbit $r = 3,450$ AU. (2011)								1	1801	Per
	Sti 1797		02 10.4 +56 18	7.5, 11.9	140	9.3"	117	K2III	13149, 22997	0	1802	Per
			02 15.0 +58 29	7.9, 9.4	259	24"	720*	B8III	13633, 23071	1	1803	Per
★	Σ 230		02 29.4 +55 32	6.7, 8.5	130	2.8"	163	A2Shell	15253, 23369	0	1804	Per
		Close pair, delicate brightness contrast, W/WB color, rich field. CPM double Σ 270 (below) 10' f. AB: ps = 620 AU. (2012)								0	1804	Per
	Σ 270	A B	02 30.8 +55 33	7.0, 9.7	305	21"	55	F4V	15407, 23389	1	1805	Per
			02 33.1 +58 28	8.3, 8.4	216	1.9"	130	A3V	15641, 23419	0	1806	Per
★	Ary 72	A B C D E	02 36.9 +55 55	7.7, 10.0, 9.3, 9.8, 8.7	244, 101, 229, 276	35', 69', 2.2', 2.3'	625*	K4II	16068, 23469	1	1807	Per
		High mass multiple star or comoving group with K supergiant, at the core of Trumpler 2, a cluster about 80 million years old. Fine visual example of the transition from natal cluster to multiple star. AB: ps = 117,200 AU. (2011)								1	1807	Per
	h 1123		02 42.0 +42 48	8.4, 8.5	249	20"	910*	B8III	16705, 38244	0	1808	Per
		A B C	02 42.2 +42 42	8.5, 9.0, 8.3	56, 290	1.4", 88"	250	B9V	16728, 38254	1	1809	Per
	Σ 292		02 42.5 +40 16	7.6, 8.2	212	23"	350	B9	16772, 38265	0	1810	Per
		A B	02 44.2 +49 14	4.2, 10.0	305	21"	11.1	F7V+M1.5	16895, 38288	1	1811	Per
	β 9		02 47.1 +35 33	6.4, 8.6, 13.3	210, 127	1.0", 30"	51	F0IV	17240, 55872	0	1812	Per
		(AaAb) B	02 47.6 +53 57	7.9, 8.7	17	8.2"	990	A0	17198, 23611	1	1813	Per
★ 15 eta	Σ 307	(AaAb) B	02 50.7 +55 54	3.8, 8.5	295	31"	270	K3Ib B9V	17506, 23655	0	1814	Per
		Miram. Probable high mass, (2)+1 spectroscopic triple; characteristic "giant type" pairing of an M supergiant with a high mass companion, seen at great distance, and the attractive Y/B complementary color that results. CD (WRD 1, m.12, 5') 1' p. is unrelated. AB: ps = 11,300 AU. (2012)								0	1814	Per
	Σ 318	(AB) C	02 53.7 +38 20	5.0, 9.7	237	14"	71	F4IV	17904, 55975	1	1815	Per
		Solar type (2)+1 triple, visual binary. MSC system mass 3.4M \odot . AB (β 520): $P = 4.3$ y, $e = 0.76$. (222 obs.) AC: ps = 1,340 AU. (2008)								1	1815	Per
★	Σ 331	(AaAb) (BaBb)	03 00.9 +52 21	5.2, 6.2	85	12"	141	B7V B9V	18537, 23763	0	1816	Per
		High mass (2)+(2) spectroscopic quadruple; blazing in sparse field. AB: ps = 2,280 AU. (2012)								0	1816	Per
	Σ 336		03 01.5 +32 25	7.0, 8.3	8	8.4"	168	G5IV	18715, 56095	1	1817	Per
		A B	03 02.3 +41 24	8.0, 9.3	163	18"	47.8	F5	18751, 38525	0	1818	Per
	Es 558		03 06.8 +45 45	7.7, 10.6	0	8.3"	170	B9	19174, —	1	1819	Per
			03 08.8 +35 28	7.8, 9.7	0	3.8"	156	A0	19444, 56196	0	1820	Per
	Σ 360		03 12.2 +37 13	8.0, 8.3	126	2.8"	39.9	G0	19771, 56241	1	1821	Per
		Hu 544	03 15.8 +50 57	6.7, 8.2	102	1.6"	135	A0	20096, 23907	0	1822	Per
★	Σ 369		03 17.2 +40 29	6.8, 7.7	29	3.6"	198	B9V	20283, 38700	1	1823	Per
		High mass double; dominant in sparse field. AB: ps = 960 AU. (2012)								1	1823	Per
	OΣ 53	A B (CaCh)	03 17.7 +38 38	7.7, 8.5, 13.3	237, 180	0.6", 107"	60	G0	20347, 56320	0	1824	Per
		Solar type 2+(2) quadruple; sparse field. MSC gives 2.4 M \odot . AB: $P = 114$ y, orbit $r = 30$ AU, $e = 0.76$, periastron 2041. (2012)								0	1824	Per
	Σ 382	A B	03 24.5 +33 32	5.8, 9.3	153	4.8"	134	A0V	20995, 56419	1	1825	Per
			03 28.7 +50 26	8.0, 9.0	214	2.8"	130	F0	21332, 24055	0	1826	Per

AG 67	A B	03 29.0 +40 11	7.5, 10.4	349	24"	163	G5	21449, 38870	1	1827	Per
Σ 391		03 29.2 +45 03	7.6, 8.3	96	4.0"	1100	B2IV	21448, 38873	0	1828	Per
Σ 392		03 30.3 +52 54	7.5, 10.3	348	26"	210	K0	21488, 24068	1	1829	Per
β 533	A B C	03 35.6 +31 41	7.6, 7.7, 9.2	221, 294	1.1", 3.8'	86	F4V	22195, 56569	0	1830	Per
S 430	A B	03 38.3 +44 48	7.2, 7.5	96	41"	153	A0	22428, 39005	1	1831	Per
OS 59		03 40.7 +46 01	7.9, 8.9	355	2.8"	111	G5	22679, 39031	0	1832	Per
★ 38 omi	β 535	03 44.3 +32 17	3.9, 6.7	23	1.0"	340	B1III	23180, 56673	1	1833	Per
Atik, Spectroscopic binary with B type giant, an ellipsoidal variable star; β 880 (m.9, 0.6") 9' s.f. in rich field (star forming region and young star cluster IC 348). AB: ps = 1460 AU. (2009)											
V580	Σ 443	(AaAb) B	03 47.0 +41 26	8.2, 8.8	55	6.8"	K1V K2V	23439, 39100	0	1834	Per
Local, very high CPM, solar type (2)+1 triple with eclipsing binary, CD (Fox 135) 2' n.p. is unrelated. The WDS notes cite an m.13 CPM companion (G095-059) at an angular separation of more than 2". AB: ps = 200 AU. (2011)											
Σ 448	(AaAb) B	03 47.9 +33 36	6.7, 9.4	13	3.4"	330	B2.5V	23625, 56709	1	1835	Per
Σ 446	A B	03 49.5 +52 39	6.9, 9.9	255	8.7"	2360*	B0.5III	23675, 24248	0	1836	Per
OS 66		03 52.1 +40 48	8.1, 8.5	144	1.0"	240	A2	24117, 39161	1	1837	Per
44 zet	Σ 464	(AaAb) B E	03 54.1 +31 53	2.9, 9.2, 10.0	209, 186	13", 120"	B1Ib	24398, 56799	0	1838	Per
Menkib, High mass (2)+1+1 spectroscopic quadruple with variable B supergiant; W/- color, dominant in its field. Brightest member of the Perseus OB2 association, about 1 million years old. AE: ps = 37,000 AU. (2012)											
43	S 440	(AaAb) B	03 56.6 +50 42	5.3, 10.7	31	76"	F5IV	24546, 24314	1	1839	Per
Σ 469		03 57.3 +41 53	6.9, 9.9	147	8.9"	121	A2	24689, 39212	0	1840	Per
★ 45 eps	Σ 471	(AaAb) B D	03 57.9 +40 01	2.9, 8.9, 9.3	10, 146	8.7", 2.7'	B0.5V A2V	24760, 56840	1	1841	Per
High mass (2)+1+1 quadruple with bet Lyr type primary; delicate contrast, W/W color, rich field. AD: ps = 43,100 AU. (2012)											
OS 69		03 59.7 +38 49	6.6, 9.1	325	1.5"	194	A1V	24982, 56866	0	1842	Per
IQ	OS 68	(AaAb) B	03 59.7 +48 09	7.8, 9.2	176	39"	B9	24909, 39231	1	1843	Per
Σ 483		04 04.1 +39 31	7.4, 9.4	58	1.4"	32.4	G5	25444, 56936	0	1844	Per
Solar type binary, faint field. Low quality orbit AB: P = 496 y, orbit r = 80 AU. (2009)											
A 1710		04 06.4 +43 25	8.2, 8.3	317	0.6"	69	G5	25693, 39312	1	1845	Per
Solar type matched binary; pretty field. AB: P = 110 y, orbit r = 28 AU, periastron 2057, closing from cusp of orbit. (2009)											
AG	OS 71	(AaAb) B	04 06.9 +33 27	6.9, 8.7	230	0.8"	B3V B5V	25833, 56973	0	1846	Per
50	OS 531	E [A B]	04 07.6 +38 04	5.6, [7.3, 9.7]	280, [356]	12.4', [2.6"]	F7V K1V	25893, 56982	1	1847	Per
Local, solar type 1+2 triple; middle of three stars in dark field. A is BY Dra variable V491 Per, E is RS CVn variable V582 (50 Per); near 100% probability the pair AE is physical. Binary CD (β 545, m.9, 1") 4' s.p. is unrelated. (2012)											
Σ 3114	A B	04 09.2 +40 10	7.7, 9.6	158	3.1"	61	F8V	26051, 39342	0	1848	Per
51 mu	OS 73	(AaAb) B	04 14.9 +48 25	4.2, 10.3	351	14"	G0II	26630, 39404	1	1849	Per
High mass (2)+1 spectroscopic triple with bet Lyr type semi-detached binary (P = 284 d), MSC system mass 14.6 M _⊙ . (2011)											
★	OS 77	A B C	04 15.9 +31 42	8.0, 8.2, 8.6	297, 43	0.5", 56"	F8V	26842, 57110	0	1850	Per
Solar type 2+1 triple; pretty, nearly matched trio beautifully displayed in dark field; m.8 O/- color star 2' n.p. MSC system mass 3.5M _⊙ . AB: P = 188y, orbit r = 55 AU, e = 0.45, periastron 2075. (2012) See Figure 2.											
OSΣ 44		04 17.3 +46 13	7.1, 8.0	323	58"	680	A2	26907, 39438	1	1851	Per
Σ 521		04 21.8 +50 02	7.4, 9.2	259	2.0"	810	G0	27395, 39484	0	1852	Per
β 310		04 22.0 +39 56	7.1, 12.6	173	19"	55	F8	27495, 57186	1	1853	Per
V590	Σ 533	(AaAb) B	04 24.4 +34 19	7.3, 8.5	62	20"	B8V	27770, 57211	0	1854	Per
56	OS 81	(AaAb) [Ba Bb]	04 24.6 +33 58	5.8, [9.6, 11.3]	16, [292]	4.3', [0.6"]	F4IV	27786, 57216	1	1855	Per
★	Σ 552		04 31.4 +40 01	6.8, 7.2	117	9.0"	B8V	28503, 57278	0	1856	Per

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Distant, high mass double; brightest star in the sparse field. AB: 4,490 AU. (2011)												
Σ 565		A B	04 38.1 +42 07	7.7, 9.1	167	1.3"	23*	K0	29235, 39660	0	1856	Per
Phoenix												
Phe												
iot	Shy 834	A B C	23 35.1 -42 37	4.7, 12.8, 6.7	273, 212	6.1", 4.9"	76	A2V	Chart 26 221760, 231675	0	1858	Phe
	Shy 836		23 38.9 -45 37	4.7, 7.1	122	13.4'	62	A2V A7	222226, 231715	1	1859	Phe
★ the	Δ 251	A type double; prominent in dark field. AB: ps = 415 AU. (2009)		6.5, 7.3	278	3.9"	79	A8V F0V	222287, 231719	0	1860	Phe
										0	1860	Phe
	Hd 303		23 40.0 -47 20	7.2, 9.3	66	2.0"	220	K1III	222363, 231726	1	1861	Phe
	h 5416	A B [C D]	23 43.1 -46 19	6.7, 11.1, [10.8, 11.6]	74, 215, [172]	3.8", 45", [0.5"]	141	G8IV	222688, 231749	0	1862	Phe
	Skf 1024		23 57.3 -46 07	7.8, 12.0	161	42"	56	F5V	224360, 231863	1	1863	Phe
	Wg 2		00 15.3 -40 06	7.6, 9.7	2	14"	132	K1III	1116, 215021	0	1864	Phe
	I 45	A B C	00 33.5 -55 20	7.7, 8.6, 9.9	205, 246	0.7", 6.7"	186	A1V	3075, 232087	1	1865	Phe
	LDS 21	(AaAb) B	00 36.6 -49 08	6.9, 8.5	273	5.5'	43.7	G3V	3405, 215165	0	1866	Phe
	MbO 1		00 42.0 -55 47	8.0, 9.0	161	6.3"	90	F7III	4001, 232154	1	1867	Phe
	h 3390		00 43.3 -45 11	7.1, 10.3	313	14"	158	K0III	4130, 215208	0	1868	Phe
	I 47		00 51.9 -43 43	7.5, 8.0	24	0.7"	96	F2V F5V	5042, 215270	1	1869	Phe
	h 3415		01 03.9 -40 39	7.4, 8.4	138	1.0"	210	A3III	6354, 215348	0	1870	Phe
★ bet	Slr 1	A B C	01 06.1 -46 43	4.1, 4.2, 11.5	93, 55	0.5", 65"	58*	G8III	6595, 215365	1	1871	Phe
		Distant, solar type 2+1 triple with G giant; dark field. Low quality orbit AB: $P = 168$ y, orbit $r = 55$ AU, widening. (2013)										
★ zet	Rmk 2	(AaAb) B C	01 08.4 -55 15	4.0, 6.8, 8.2	113, 242	0.6", 6.7"	92	B6V B9V	6882, 232306	0	1872	Phe
		High mass (2)+1+1 spectroscopic quadruple with Algol type eclipsing variable; dark field. MSC gives 10.0 M_{\odot} . AC: ps = 845 AU. (2013)										
	Slr 2	A B	01 08.6 -46 40	7.1, 8.7	182	1.2"	82	A9V	6869, 215379	1	1873	Phe
	Hu 1342		01 09.4 -56 36	7.8, 8.3	329	0.4"	99	F5V	6996, 232315	0	1874	Phe
		Solar type binary; unidentified m.12 double 1.5' s.p. AB: $P = 79$ y, orbit $r = 26$ AU, periastron in 2046; ps = 5000 AU. (2009)										
	h 3428		01 20.3 -48 41	7.7, 9.7	157	21"	75	F6V	8188, 215464	1	1875	Phe
	h 3430		01 20.5 -57 20	7.2, 9.5	223	3.3"	49.3	F7V	8224, 232385	0	1876	Phe
	Hd 185		01 23.7 -40 57	7.4, 10.9	241	4.6"	187	K0III	8534, 215486	1	1877	Phe
	I 51		01 34.3 -45 41	7.1, 9.4	8	1.6"	122	G8IV	9733, 215567	0	1878	Phe
Pictor												
									Chart 27			
	CorO 23		04 41.9 -47 50	7.5, 9.6	228	3.7"	83	A8IV	30065, 216942	1	1879	Pic
★ iot	Δ 18	(AaAb) (BaBb) C	04 50.9 -53 28	5.6, 6.2, 9.1	59, 48	13", 5.0'	41.6	F0IV F4V K2V	31203, 233709	0	1880	Pic
		Solar type (2)+(2)+1 quintuple; sparse field. MSC system mass (AB only) 5.7 M_{\odot} . AB: ps = 730 AU; AC: ps = 16,800 AU. (2009)										
★ VW	h 3715	(AaAb) B	04 59.5 -49 27	7.2, 9.1	112	9.9'	151	F3V	32278, 217101	1	1881	Pic
		Solar type (2)+1 triple with W UMa type eclipsing contact binary ($P = 0.43$ d), sparse field. AB: ps = 2,020 AU. Neglected. (1999)										
	Cbl 124		05 01.6 -44 50	7.6, 11.2	266	51"	94	K0+G	32517, 217124	0	1882	Pic
★ the	Δ 20	(AaAbB) C	05 24.8 -52 19	6.2, 6.7	288	38"	157	A0V	35860, 233965	1	1883	Pic
		Splendid high mass (2+1)+1 quadruple, visual binary; dominant in faint field. MSC system mass 10.8 M_{\odot} . AB (I 345): $P = 123$ y, orbit $r = 45$, $e = 0.69$. apastron 2057. (2013)										
										1	1883	Pic

Skf 828	05 32.9 –47 41	7.7, 10.0	145	55"	109	A3V G0	37004, 217394	0	1884	Pic
HDS 739	05 34.7 –48 57	7.3, 10.4	280	14"	140	A3m	37260, 217408	1	1885	Pic
h 3787	05 37.8 –54 34	7.8, 10.0	249	25"	112	G5III	37761, 234056	0	1886	Pic
h 3784	05 38.2 –46 06	7.6, 9.4	76	4.7"	25.5	G8V	37706, 217444	1	1887	Pic
I 63	05 48.2 –48 55	7.3, 8.6	17	1.0"	210	A1V	39177, 217547	0	1888	Pic
I 3	06 12.5 –61 28	7.1, 7.6	6	1.1"	230	B9.5V	43519, 249475	1	1889	Pic
★ mu h 3874	06 32.0 –58 45	5.6, 9.3	230	2.5"	230	B9Ve	46860, 234564	0	1890	Pic
High mass double; easy to find in sparse field, but a severe brightness contrast challenge. AB: ps = 775 AU. Neglected. (1991)										
AK I 5	06 38.0 –61 32	6.3, 8.8, 9.8	101, 76	0.6", 14'	21.3	G2V	48189, 249604	1	1891	Pic
Local, solar type 2+1 triple with BY Dra variable, comoving with D (HD 45270, m.7), a pre main sequence star 2.1° n.p. AB: P = 218 y, orbit r = 43 AU. AC: ps = 17,200 AU. AD (Shy 35): ps = 0.85 pc. (2012)										
I 6	06 42.5 –61 45	7.7, 8.2	257	0.6"	130*	F5V	49076, 249627	0	1892	Pic
Charts 6, 12										
Pisces Psc										
OS 491	23 13.7 +02 12	7.2, [10.9, 11.1]	319, [86]	118", [0.8"]	88	F2	219150, 128046	1	1893	Psc
Σ 2995	23 16.6 –01 35	8.2, 8.6	32	5.2"	65	G5	219542, 146605	0	1894	Psc
Σ 3009	23 24.3 +03 43	6.9, 8.8	229	7.3"	220	K2III	220512, 128160	1	1895	Psc
Cbl 194	23 28.1 –02 27	8.1, 8.5	226	57"	114	F2	220966, 146717	0	1896	Psc
Σ 3031	23 41.2 +06 16	7.8, 8.6	309	15"	58*	F8	222502, 128327	1	1897	Psc
Σ 3045	23 54.4 +02 28	8.0, 9.3	272	1.7"	200	A2	224004, 128456	0	1898	Psc
A 2100	23 56.8 +04 44	7.4, 7.9	260	0.4"	112	F0	224315, 128487	1	1899	Psc
Solar type binary; sparse field. System mass 2.8 M☉. AB: P = 89 y, orbit r = 30 AU, e = 0.77, apastron 2035. (2013)										
34 Σ 5	00 10.0 +11 09	5.5, 9.4	160	7.7"	94	B9Vn	560, 91750	0	1900	Psc
★ 35 Σ 12	00 15.0 +08 49	6.1, 7.5	145	12"	78	A9V F3V	1061, 109087	1	1901	Psc
UU Psc. Mixed A/solar type (2)+1 spectroscopic tripler; primary is ellipsoidal, Algol type variable star (P = 0.84 d); YW/O color. AB: ps = 1,260 AU. (2014)										
Σ 15	00 15.9 –05 36	7.7, 9.8	199	4.9"	210	G5	1153, 128668	0	1902	Psc
★ 38 Σ 22	00 17.4 +08 53	7.1, 7.7	235	4.0"	15.2	F7V	1317, 109111	1	1903	Psc
Local, solar type (2)+1 triple, visual binary; dark field. MSC system mass 3.7 M☉. AB (A 1803): P = 36 y, orbit r = 4 AU, e = 0.0, periastron 2022; AC: ps = 82 AU. (2008)										
β 1093	00 20.9 +10 59	6.7, 8.6	117	0.8"	310	A0V	1663, 91858	0	1904	Psc
★ 55 Σ 46	00 39.9 +21 26	5.6, 8.5	192	6.6"	127	K0III F3V	3690, 74182	1	1905	Psc
High mass double with K supergiant and complementary contrast Y/B color; dark field. AB: ps = 1,130 AU. (2014)										
OS 18	00 42.4 +04 10	7.9, 9.7	209	2.0"	60	F8V	3972, 109392	0	1906	Psc
Solar type binary; dark field. Low quality orbit AB: P = 387 y, orbit r = 80 AU, widening. (2011)										
66 OS 20	00 54.6 +19 11	6.1, 7.2, 12.8	175, 9	0.6", 2.5'	108	A0V	5267, 92145	1	1907	Psc
A type binary; W/– color; very dark field. AB: P = 343 y, orbit r = 75 AU, e = 0.29, apastron 2076. (311 measures; 2010)										
★ 74 psi 1 Σ 88	01 05.7 +21 28	5.3, 5.5	159	29"	84	B9.5V A0V	6456, 74482	0	1908	Psc
High mass (2)+1 triple; m.11 star 2' s.f. unrelated. Aa,Ab: P = 14.4 y, e = 0.52, periastron 2022. (2012)										
77 Σ 90	01 05.8 +04 55	6.4, 7.3	84	33"	40.6	F3V F5V	6479, 109666	1	1909	Psc
S 393	01 06.2 +32 11	6.4, 11.7	234	2.3'	173	K0	6476, 54421	0	1910	Psc
OS 22	01 07.1 +11 33	7.3, 10.5	200	8.7"	80	A9V	6614, 92255	1	1911	Psc
β 303	01 09.7 +23 48	7.3, 7.6	292	0.6"	122	F0IV	6886, 74523	0	1912	Psc
Σ 98	01 12.9 +32 05	7.0, 8.1, 11.9	248, 35	20", 85"	132	A0V A3IV	7215, 54514	1	1913	Psc
Beautiful A type (2)+1+1 spectroscopic quadruple with similar stars in dark field; galaxy NGC 420 10' p. AB: ps = 3,560 AU. (2014)										
								1	1913	Psc

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★ 86 zet	02 26	(AaAb) B	01 13.0 +30 04	6.3, 10.5	260	11"	116	G9III G1V	7229, 74561	0	1914	Psc
	Σ 100	(AaAb) [(BaBb) C]	01 13.7 +07 35	5.2, [6.3, 12.2]	63, [75]	23", [1.8"]	53	A7IV F7V	7344, 109739	1	1915	Psc
High mass (2)+(2)+1 spectroscopic and occultation quintuple; O/- color; dark field: discovered by C. Mayer (1777). BC (β 1029, $\Delta m = 6$) is the most challenging pair in this Atlas. AB: ps = 1,640 AU. (324 measures; 2012)												
85 phi	Σ 99	A B C	01 13.7 +24 35	4.7, 9.1, 12.7	221, 173	7.8", 2.4'	137	G8III	7318, 74571	0	1916	Psc
h 636	h 636		01 14.3 +30 33	7.4, 11.8	288	20"	270	B9.5IV	7384, 54541	1	1917	Psc
	β 4	A B	01 21.3 +11 32	7.1, 8.9	110	0.6"	210	F1III	8187, 92388	0	1918	Psc
High mass double with F giant; dark field, unrelated stars n.f. System mass 4.8 M \odot . AB: P = 291 y, orbit r = 90 AU, widening. (2008)												
02 30		A B C	01 25.6 +31 33	8.1, 11.8, 8.1	245, 106	4.6', 57"	64	F8	8610, 54687	1	1919	Psc
Σ 122			01 26.9 +03 32	6.7, 9.5	326	6.0"	166	B9V A8V	8803, 109895	0	1920	Psc
S 398		A (BaBb)	01 28.4 +07 58	6.3, 8.0	100	69"	115	K1III	8949, 109907	1	1921	Psc
02 31			01 33.3 +08 13	6.5, 10.6	78	4.0"	148	K0III	9496, 109964	0	1922	Psc
100	Σ 136	A B	01 34.9 +12 34	7.3, 8.3	77	15"	230	A6V	9656, 92521	1	1923	Psc
★	Σ 138	A B	01 36.0 +07 39	7.5, 7.6	58	1.6"	76	F6V	9817, 110001	0	1924	Psc
	Solar type matched pair; Y/Y color, dark field, unrelated m.10 star 1" f. After discovering this pair in 1792, W. Herschel revisited it often: "a very beautiful minute object." AB: ps = 160 AU. (328 measures; 2011)											
h 644	h 644	A B	01 48.7 +07 41	7.2, 11.7	278	18"	172	K0	11049, 110142	1	1925	Psc
	Σ 202	A B C	02 02.0 +02 46	4.1, 5.2, 8.3	263, 63	1.6', 6.8'	42.6	A0 A3m	12447, 110291	0	1926	Psc
★ 113 alp		Alrischa. A type 2+1 triple; dark field, YW/- color, southern apex in triangle of 7th mag. stars. A and possibly B is an alp2 CVn type variable. MSC system mass 7.8 M \odot . AB: P = 933 y, orbit r = 170 AU. (609 measures; 2014)										
Piscis Austrinus												
Chart 20												
Bvd 137			21 33.5 -27 53	7.7, 9.8	58	40"	49.1	G3V K1V	205067, 190437	1	1927	PsA
Cbl 184			21 37.0 -35 53	7.4, 8.6	265	79"	62	F3V	205530, 213139	0	1928	PsA
CPM pair found by datamining Hipparcos astrometry and sky survey photographs (see references). AB: ps = 6,600 AU. (2000)												
h 5311		A B	21 59.5 -29 03	7.2, 11.4	292	40"	154	K0III	208810, 190798	1	1929	PsA
Stone 56			21 59.6 -27 38	7.3, 10.5	36	11"	76	F2V	208851, 190800	0	1930	PsA
12 eta	β 276		22 00.8 -28 27	5.7, 6.8	113	1.9"	250	B8Ve	209014, 190822	1	1931	PsA
β 769		(AaAb) B	22 11.6 -34 28	7.1, 8.2	356	0.9"	240	K1III	210525, 213625	0	1932	PsA
Shy 805		(AaAb) B	22 22.0 -34 31	7.5, 7.5	37	2.4'	86	F4V F2	212025, 213765	1	1933	PsA
	Pz 7	A C	22 31.5 -32 21	4.3, 7.1	172	31"	43.8	A0V	213398, 213883	0	1934	PsA
H VI 119		A [B C]	22 39.7 -28 20	6.4, [7.5, 8.6]	159, [69]	86", [3.1"]	112	K0III	214599, 191308	1	1935	PsA
h 5365		A B C	22 51.8 -35 53	7.5, 11.0, 11.3	276, 36	4.8', 55"	101	A3	216237, 214144	0	1936	PsA
h 5367			22 52.5 -32 53	4.5, 8.2	256	4.1"	66	A0III	216336, 214153	1	1937	PsA
23 del	Howe 91		22 55.9 -32 32	4.2, 9.2	249	4.9"	47.3	G8III	216763, 214189	0	1938	PsA
h 5371			22 57.8 -26 06	7.7, 9.2	343	9.2"	61	G3V	217004, 191529	1	1939	PsA
Rss 39		A B	22 57.8 -33 12	8.0, 9.6	246	59"	81	F3V	216986, 214205	0	1940	PsA
Puppis												
★	h 3834	A B E	06 04.7 -45 05	6.0, 9.0, 6.4	215, 323	5.9', 3.4'	26.9	F5V	41742, 217706	1	1941	Pup
Solar type 2+1 triple; wide pair in glittering field. MSC system mass 3.3 M \odot . AB: ps = 215 AU. AE: ps = 7,370 AU. (2010)												

Δ 23	06 04.8 –48 28	7.3, 7.7	127	2.6"	30.0	G6V	41824, 217708	0	1942	Pup
h 3856	06 22.9 –45 38	6.9, 10.7	7	35"	240	K1III	45056, 217893	1	1943	Pup
l 156	06 25.7 –48 11	5.9, 8.1	125	1.0"	180	B9V	45572, 217922	0	1944	Pup
★ Δ 30	A B [C D] 06 29.8 –50 14	6.0, 6.2, [8.0, 8.7]	258, 312, [159]	0.5", 12", [0.4"]	51	F2V	46273, 234539	1	1945	Pup
High mass, solar type 2+2 quadruple; a tiny gem in large aperture. MSC system mass 4.3 M _☉ . AB (R 65): P = 53 y, orbit r = 32 AU, e = 0.98, periastron 2022; CD (Hd 195): P = 99 y, orbit r = 28 AU, e = 0.25, apastron 2055. AB,CD: ps = 825 AU. (2013)										
Δ 31	06 38.6 –48 13	5.1, 7.4	326	14"	146	G8III	47973, 218033	0	1946	Pup
h 5443	06 41.2 –40 21	6.1, 9.4	108	16"	360	B4V	48383, 218126	1	1947	Pup
Δ 32	06 42.3 –38 24	6.6, 7.7	277	7.9"	83	A5m	48543, 197108	0	1948	Pup
h 3895	06 46.7 –47 48	7.1, 10.9	66	26"	320	K3III	49614, 218186	1	1949	Pup
h 3900	06 54.2 –34 13	7.6, 8.9	277	2.2"	169	A1IV	51042, 197334	0	1950	Pup
l 66	06 58.3 –35 25	7.8, 9.3	253	1.9"	280	A	52093, 197424	1	1951	Pup
★ Δ 38	(AaAb) B C 07 04.0 –43 37	5.6, 6.7, 8.8	126, 337	21", 3.1"	16.5	G3V KOV	53705, 218421	0	1952	Pup
Local, high CPM, solar type (2)+1+1 quadruple, visual triple. MSC has 2.9 M _☉ . AC: ps = 4,100 AU. Neglected. (1999)										
h 3928	A B C 07 05.5 –34 47	6.5, 7.8, 9.7	144, 291	2.7", 38"	53	F2V	53952, 197557	1	1953	Pup
h 3931	A C 07 06.0 –42 20	7.2, 8.8	41	72"	142	A0V	54208, 218447	0	1954	Pup
β 757	07 12.4 –36 33	6.0, 8.4	69	2.5"	280	B3V	55718, 197694	1	1955	Pup
★ pi	Aa Ab B 07 17.1 –37 06	2.9, 6.5, 7.9	152, 213	0.7", 67"	250	K3Ib	56855, 197795	0	1956	Pup
Tureis. Distant, high mass 2+1 triple with K supergiant; near Collinder 135, the difficult Δm needs a large aperture. Neglected. (1991)										
l 7	07 17.5 –46 59	7.1, 8.4	203	0.7"	14.6	K3V	57095, 218611	1	1957	Pup
Local, high CPM, low mass binary. AB: P = 85 y, orbit r = 15 AU, predicted to go below 0.5' in 2026, but if delayed this may suggest the true period is actually longer. (2012)										
Δ 45	07 21.4 –48 32	6.8, 7.7	157	23"	240	B9V	58017, 218666	0	1958	Pup
h 3957	07 22.3 –35 55	7.1, 7.9	191	7.5"	60	F8	58038, 197907	1	1959	Pup
h 3966	07 24.8 –37 17	6.9, 6.9	322	6.9"	210	F0V F0V	58635, 197975	0	1960	Pup
h 3969	07 27.0 –34 19	7.1, 8.1	227	18"	32.0	F6V F8	59099, 198005	1	1961	Pup
Δ 49	07 28.9 –31 51	6.3, 7.0	54	9.0"	230	B3V B4V	59499, 198038	0	1962	Pup
Σ 1104	A B C 07 29.4 –15 00	6.4, 7.6, 11.8	35, 185	1.8", 22"	35.1	F7V	59438, 152943	1	1963	Pup
★ Howe 18	07 34.0 –23 42	8.1, 8.9	204	1.9"	980*	B6III	60535, —	0	1964	Pup
Distant, high mass double with B giant; mixed field, stellar group f. AB: ps = 2510 AU. Neglected. (1991)										
H N 19	07 34.3 –23 28	5.8, 5.9	117	9.7"	31.7	F5V	60584, 174019	1	1965	Pup
★ Σ 1120	A C D E F 07 36.1 –14 30	5.6, 9.7, 10.0, 9.8, 11.7	37, 41, 327, 7	20", 2.5", 104", 92"	389	B2Ve B6V	60855, 153118	0	1966	Pup
Distant, high mass CPM group in NGC 2422; optical (I) pair Σ 1121 (m.6, 7") 7' f. AD: ps = 78,700 AU. (2001)										
★ k 1,2 H III 27	A B 07 38.8 –26 48	4.4, 4.6	317	10"	106	B6V B6V	61556, 174199	1	1967	Pup
Beautiful high mass, matched double; 4 m.8 stars s.p. and s.f. AB: ps = 1430 AU. (2009)										
β 201	07 38.9 –20 16	7.8, 8.4	334	2.9"	128	A7III	61532, —	0	1968	Pup
d 2 l 160	07 39.7 –38 08	5.8, 8.6	149	1.2"	175	B5Vh	61878, 198265	1	1969	Pup
l 353	07 39.7 –43 17	7.6, 8.4	41	0.7"	580	B5V	61946, 218877	0	1970	Pup
Hu 710	07 43.0 –17 04	7.0, 8.0	63	0.5"	109	G5III	62351, 153301	1	1971	Pup
Solar type binary with G giant; faint field. System mass 2.7 M _☉ . AB: P = 159 y, orbit r = 39 AU, e = 0.62, apastron 2031. (2013)										
Δ 55	07 44.2 –50 27	6.6, 7.6	133	52"	30.9	F9V	63008, 235458	0	1972	Pup

h 4115	A B	08 37.5 –33 45	6.5, 11.8	159	22"	61	F0IV	73476, 199436	0	2002	Pyx
β 207		08 38.7 –19 44	6.6, 9.2	102	4.4"	360	K5III	73603, 154492	1	2003	Pyx
β 208	A B	08 39.1 –22 40	5.4, 6.8	40	1.0"	19.4	G6IV	73752, 176226	0	2004	Pyx
	Local, high CPM, solar type binary with G subgiant. AB: $P = 123$ y, orbit $r = 33$ AU, $e = 0.33$; below $0.4''$ during the 2020s, then widens to apastron 2048 and greatest visual separation around 2065. (2013)										Pyx
l 314		08 39.4 –36 36	6.4, 7.9	244	0.8"	37.9	F1IV	73900, 199473	1	2005	Pyx
zet	Solar type binary; rich field. System mass $1.8 M_{\odot}$. AB: $P = 67$ y, orbit $r = 20$ AU, widening to apastron around 2030. (2011)										Pyx
		08 39.7 –29 34	5.0, 9.6	59	51"	75	G4III	73898, 176253	0	2006	Pyx
★ Skf 1307		08 46.6 –29 44	7.5, 7.8	189	110"	650	C5.5J+K2II	75021, 176458	1	2007	Pyx
	UZ Pyx. Striking pair: a distant carbon star and semiregular pulsating variable, comoving with K supergiant in a rich field. Culled from the legacy research literature by B. Skiff. AB: $ps = 96,700$ AU; high mass could sustain the wide orbit. (1999)										Pyx
h 4144		08 50.4 –36 56	7.0, 9.0	315	2.4"	490	B5IV	75722, 199690	0	2008	Pyx
★ h 4166	A (BC)	09 03.3 –33 36	7.1, 7.9	153	14"	140*	A0V	77737, 199924	1	2009	Pyx
	A type 1+(2) triple, visual double; Skf 1466 (see below) 8' s.f. A,BC: $ps = 2,640$ AU. (1999)										Pyx
Skf 1466		09 03.6 –33 42	7.8, 9.4	147	74"	340	A2IV+A4V	77788, 199933	0	2010	Pyx
β 410		09 09.8 –25 48	7.3, 8.8	157	1.8"	370	A0V	78876, 177055	1	2011	Pyx
eps H N 96	A (BC)	09 09.9 –30 22	5.6, 9.5	147	18"	65	A4IV	78922, 200047	0	2012	Pyx
h 4200		09 20.7 –31 46	7.4, 7.9	75	3.0"	260	B9.5V	80773, 200259	1	2013	Pyx
Jc 5		09 26.7 –28 47	6.4, 7.5	281	0.5"	630	B6Ve	81753, 177461	0	2014	Pyx
	Reticulum							Chart 27			
Δ 12	A [B C]	03 15.2 –64 27	6.7, [9.5, 9.8]	104, [25]	19", [0.7"]	110	F5	20586, 248764	1	2015	Ret
★ zet 1,2 Alb 1	A B	03 18.2 –62 30	5.3, 5.6	217	5.2'	120	G2V	20807, 248774	0	2016	Ret
	Local, very high CPM, solar type double; pretty binocular pair, near 100% probability it is physical. AB: $ps = 5,050$ AU. (2007)										Ret
Δ 14		03 38.2 –59 47	7.0, 8.3	272	57"	74	F3V F5	22989, 233197	1	2017	Ret
★ h 3592		03 44.6 –54 16	6.5, 9.3	17	5.0"	76	K1III	23697, 233252	0	2018	Ret
	Double with K type giant; sparse field, north corner of three m.7 stars. AB: $ps = 515$ AU. Neglected. (1993)										Ret
Pol 2		04 02.9 –59 35	8.3, 8.6	104	1.9"	270	F3III	25903, 233379	1	2019	Ret
the Rmk 3		04 17.7 –63 15	6.0, 7.7	5	3.9"	141	B9III	27657, 248986	0	2020	Ret
h 3670		04 33.6 –62 49	5.9, 9.3	100	32"	45.2	K1III	28399, 249054	1	2021	Ret
	Sagitta							Chart 11			
V338 β 139	A B	19 12.6 +16 51	7.1, 8.0	135	0.7"	240	B9IV	179588, 104602	0	2022	Sge
	V338 Sge. High mass binary, Algol type variable; rich field, stars $30''$ f. and $2'$ p. are unrelated. AB: $P = 587$ y, orbit $r = 130$ AU. (2009)										Sge
Σ 2484		19 14.3 +19 04	7.9, 9.5	240	2.1"	67	F8	180054, 104635	1	2023	Sge
Σ 2504	A B	19 21.0 +19 09	7.0, 9.0	282	8.6"	63	F5V	181752, 104753	0	2024	Sge
QΣ 375		19 34.6 +18 08	7.7, 8.9	186	0.6"	230	G5	184591, 104991	1	2025	Sge
H IV 99	A C	19 50.0 +17 57	8.0, 9.1	256	69"	480*	B7V B9V	187566, 105324	0	2026	Sge
Webb 12		20 07.8 +19 50	8.4, 8.4	77	41"	290	F0	191140, 105724	1	2027	Sge
Σ 2634	A B	20 09.6 +16 48	7.8, 9.9	14	4.1"	23.7	G9V	191499, 105765	0	2028	Sge
	Local, solar type binary; s.f. of two stars in field strewn with faint close pairs. AB: $ps = 130$ AU. (2011)										Sge
17 the Σ 2637	A B	20 09.9 +20 55	6.6, 8.9	331	12"	45.3	F3V	191570, 88276	1	2029	Sge
	Sagittarius							Chart 25			
★ Pz 6	A B	17 59.1 –30 15	5.4, 7.0	104	5.7"	310	M1Ib G8II	163755, 209553	0	2030	Sgr
	Distant, colorful and extremely rare CPM double of M and G supergiants; rich field. AB: $ps = 2,400$ AU. (2013)										Sgr

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
V1647	h 5000	(AaAb) B	17 59.2 –36 56	7.1, 9.0	101	7.3"	123	A3III	163708, 209552	1	2031	Sgr
	Howe 88	A (BC)	18 05.7 –36 35	7.9, 8.9	4	3.2"	510	B8	165063, 209691	0	2032	Sgr
	β 244		18 08.6 –27 52	7.6, 9.1	265	2.2"	280	G6III	165723, 186598	1	2033	Sgr
★	β 245		18 10.1 –30 44	5.8, 8.0	352	4.1"	138	K1III	166023, 209803	0	2034	Sgr
		Albireo colors in an m.6 system with K supergiant primary. AB: ps = 760 AU. (2007)								0	2034	Sgr
	β 132	(AaAb) B	18 11.2 –19 51	7.0, 7.1	188	1.4"	102	A4V	166393, 161153	1	2035	Sgr
11	h 5030		18 11.7 –23 42	5.1, 11.5	286	43"	78	K0III	166464, 186437	0	2036	Sgr
eta	β 760	A B	18 17.6 –36 46	3.3, 8.0	8	3.6"	44.7	M3.5III	167618, 209957	1	2037	Sgr
21	Jc 6		18 25.4 –20 32	5.0, 7.4	284	1.7"	126	K1III A1V	169420, 186794	0	2038	Sgr
	β 133		18 27.7 –26 38	6.6, 8.5	243	0.9"	78	A8V F2V	169851, 186837	1	2039	Sgr
	H N 125		18 28.9 –25 03	8.2, 8.5	107	2.5"	62	G2V	170121, 186864	0	2040	Sgr
	WNO 6		18 29.0 –26 35	6.7, 8.0	181	42"	132	A3III	170141, 186863	1	2041	Sgr
	Howe 43	A B	18 31.1 –32 59	5.4, 9.8	185	3.5"	89	A3m	170479, 210257	0	2042	Sgr
U	β 966	A [Ba Bb] M Q	18 31.9 –19 08	6.9 [9.1, 9.9], 10.4, 10.2	252, [95], 317, 219	66", [0.9"], 2.8', 2.6'	615*	G1.5Ib	170764, 161571	1	2043	Sgr
		High mass CPM group with G type supergiant, a Cepheid variable; in IC 4725 (M25). (2012)								1	2043	Sgr
	Stone 62		18 34.5 –34 49	7.6, 7.8	132	2.3"	84	F0V	171119, 210321	0	2044	Sgr
	λ 361		18 49.7 –33 36	8.4, 8.5	233	1.2"	130	F3V	173968, 210606	1	2045	Sgr
★ 38 zet	Hd 150	A B	19 02.6 –29 53	3.3, 3.5	271	0.5"	27.0	A2III	176687, 187600	0	2046	Sgr
		Ascella. A type binary, dominant in rich field. AB: P = 21 y, orbit r = 13 AU, e = 0.21, apastron in 2016, drops below 0.4" in 2020, then reappears in 2033. A bright, matched resolution challenge. (2013)								0	2046	Sgr
	h 5082	A B C	19 03.1 –19 15	6.2, 9.0, 10.8	89, 11 2	7.6", 20"	610	G5II	176884, 162130	1	2047	Sgr
	H N 129		19 04.2 –22 54	6.9, 9.2	309	8.1"	300	A0V	177120, 187632	0	2048	Sgr
	H N 126		19 04.3 –21 32	7.9, 8.1	187	1.3"	56	F8V	177166, 187634	1	2049	Sgr
		Solar type binary; very tiny in a pretty field. AB: P = 500y, orbit r = 90 AU. (2013)								1	2049	Sgr
	S 710		19 06.9 –16 14	6.1, 8.4	0	6.3"	260	B8IV	177817, 162201	0	2050	Sgr
	CorO 233	A B	19 08.7 –33 48	8.2, 9.0	256	12"	220	F5	178079, 210980	1	2051	Sgr
	S 715		19 17.7 –15 58	7.1, 7.9	17	8.4"	133	A3V	180562, 162417	0	2052	Sgr
		A type double; rich field. S 716 (m.8, 5") 6' f. AB: ps = 1,510 AU. (2007)								0	2052	Sgr
	Shy 753		19 22.1 –29 31	7.2, 7.2	227	7.3'	51	G0IV G0IV	181544, 188025	1	2053	Sgr
	λ 375		19 26.7 –26 19	7.5, 12.0	166	12"	230	A0V	182649, 188125	0	2054	Sgr
	Scj 22		19 28.2 –12 09	8.1, 8.7	284	1.1"	36.6	G8V	183063, 162662	1	2055	Sgr
		Solar type binary; faint field. System mass 1.6 M_{\odot} . AB: P = 165 y, orbit r = 37 AU, e = 0.57, apastron 2067. (2013)								1	2055	Sgr
	H N 119		19 29.9 –26 59	5.6, 8.8	145	7.6"	72	K2III	183275, 188192	0	2056	Sgr
	S 722	(AaAb) B	19 39.2 –16 54	7.2, 7.5	236	9.9"	74	A8III	185344, 162853	1	2057	Sgr
	h 599	A C	19 40.7 –16 18	5.4, 7.7	41	46"	74	K2III F8V	185644, 162883	0	2058	Sgr
	β 467		19 46.5 –21 31	7.7, 9.9	132	3.3"	97	A8 F3	186666, 188551	1	2059	Sgr
	I 122		19 50.7 –41 52	7.8, 10.1	337	5.2"	167	A8V	187211, 229890	0	2060	Sgr
	Hd 294		20 01.2 –38 35	8.1, 9.1	31	1.2"	68	F3V	189386, 211734	1	2061	Sgr
	Σ 2625		20 06.8 –12 56	7.8, 10.2	5	12"	450	K0II	190723, 163267	0	2062	Sgr
	h 5168		20 07.4 –29 43	6.9, 10.3	80	18"	230	K2IV	190727, 188927	1	2063	Sgr

h 5178	A B C	20 13.7 –34 07	7.1, 8.2, 10.8	9, 16	163	K1III	191957, 211916	0	2064	Sgr
Stone 64		20 16.9 –32 36	8.1, 8.5	296	39.5	G5V	192614, 211959	1	2065	Sgr
Δ 230		20 17.8 –40 11	7.4, 7.7	112	80	F8	192724, 230134	0	2066	Sgr
★ h 5188	A C	20 20.5 –29 12	6.7, 7.6	320	136	A3III A2V	193281, 189164	1	2067	Sgr
Striking group of two mixed A/solar type doubles and a triple – physical h 5188 AC, optical Glp 18 and ambiguous Wie 1. Parallax or proper motion indicate they are unrelated. Neglected. (1998)										
R 321		20 26.9 –37 24	6.6, 8.1	126	37.3	K2IV K1V	194433, 212126	0	2068	Sgr
Rss 36		20 28.0 –42 37	8.2, 8.8	267	99	F6V	194570, 230226	1	2069	Sgr
Scorpius	Sco	Chart 24								
2 β 36		15 53.6 –25 20	4.7, 7.0	268	154	B2.5Vn	142114, 183396	0	2070	Sco
l 977		15 55.7 –26 45	8.0, 8.5	253	76	F7V	142456, 183933	1	2071	Sco
Solar type binary; subarcsecond resolution challenge. System mass 1.9 M _☉ . AB: P = 275 y, orbit r = 55 AU, widening. (2010)										
β 38		16 02.9 –25 01	7.2, 9.5	345	270	B9.5V	143715, 184058	0	2072	Sco
★ 51 xi Σ 1998	A B C	16 04.4 –11 22	5.2, 4.9, 7.3	0, 47	25.3	F7V	144089, 159665	1	2073	Sco
Local solar type triple, joined by CPM with Σ 1999 (see below) as a 2+1+2 quintuple; regal in sparse field. MSC system mass 5.0 M _☉ . AB: P = 46 y, orbit r = 17 AU, e = 0.74, apastron 2020. (630 measures) AC: P = 1,514 y, orbit r = 196 AU. (380 measures) A(Σ 1998)A(Σ 1999): 4.7°, ps = 9,520 AU. (2012)										
★ Σ 1999	A B	16 04.4 –11 27	7.5, 8.1	98	12°	G8+K3	144087, 159668	0	2074	Sco
Local, solar type double; related by CPM to Σ 1998 (above). AB: ps = 410 AU. (2013)										
Kou 49	(AC) B	16 05.7 –21 50	7.1, 10.9	165	162	A0V	144254, 184106	1	2075	Sco
11 β 39	A B	16 07.6 –12 45	5.8, 9.8	263	112	B9.5V	144708, 159715	0	2076	Sco
BrO 11		16 09.5 –32 39	6.7, 7.2	84	121	K2III	144927, 207396	1	2077	Sco
★ 14 nu β 120	(AaAbAc) B [C (DaDb)]	16 12.0 –19 28	4.4, 5.3, [6.6, 7.2]	3, 336, [56]	145	B2IV	145502, 159764	0	2078	Sco
Jabbah. High mass (2+1)+1+[1+(2)] septuple, visual quadruple; faint field. MSC 35.6 M _☉ . (AB: ps = 275 AU. (2013)										
12 h 4839	(AaAb) B	16 12.3 –28 25	5.8, 8.1	71	93	B9V	145483, 184217	1	2079	Sco
Σ 2019	(AB) C	16 14.3 –10 25	7.4, 9.8	153	79	F7V	145996, 159803	0	2080	Sco
λ 268		16 14.7 –39 08	8.4, 8.5	183	127	A9V	145840, 207482	1	2081	Sco
A type double; unrelated m.11 star 1° n.f. AB: ps = 310 AU. Last measured by Hipparcos satellite, since then neglected. (1991)										
Skf 1313		16 14.9 –25 29	6.1, 9.9	37	149	B7IV	146001, 184258	0	2082	Sco
Sh 225		16 20.1 –20 03	7.4, 8.1	333	163	B9	147010, 159860	1	2083	Sco
High mass double; in field with optical pair Sh 226. AB: ps = 10300 AU. (2013)										
20 sig H IV 121	(Aa1Aa2) Ab B	16 21.2 –25 36	3.1, 5.2, 8.4	244, 273	210	B1III B1V	147165, 184336	0	2084	Sco
Al Niyat. High mass (2)+1+1 triple with bet Cep type variable (Aa); faint field, good resolution test. Aa1,Aa2: P = 33 d, e = 0.32, with system mass of 30 M _☉ , orbit r = 0.6 AU. Aa,Ab: ps = 140 AU. Aa,B: ps = 5,670 AU. (2013)										
h 4843		16 21.4 –33 18	7.4, 11.5	267	150	F3V	147149, 207586	1	2085	Sco
β 624		16 22.9 –23 07	7.8, 9.3	319	131	A2.5V	147432, 184350	0	2086	Sco
h 4845		16 23.8 –41 15	8.1, 8.5	128	84	F2IV	147435, 226715	1	2087	Sco
h 4848	A B	16 23.9 –33 12	6.9, 7.3	152	110	A0V A0V	147553, 207625	0	2088	Sco
Rag 8		16 24.0 –39 12	5.4, 11.0	248	12.8	G1V DA2	147513, 207622	1	2089	Sco
Local, solar type wide double; B seems lost in sparse, faint field, but near 100% probability pair is physical. AB: ps = 6,010 AU. (2004)										
★ H N 39		16 24.7 –29 42	5.9, 6.6	355	33.1	G0IV GOV	147723, 184369	0	2090	Sco
Solar type double; asymmetrical pair isolated in rich field. AB: ps = 185 AU. (2012)										
★ 21 alp Gnt 1		16 29.4 –26 26	1.0, 5.4	274	170	M1.5I B4V	148478, 184415	1	2091	Sco

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Antares. Prototype of a high mass (~30 M \odot) binary where one component has entered the supergiant phase, here expanding to a radius of ~3.4 AU; the O/BG color often reported for this pair is illusory, created by complementary contrast of a nearly white (B type) star against the bright Y or O hue. Poor quality, edgewise orbit suggests AB; $P = 1,220$ y, orbit $r = 360$ AU, inclination ~80°, closing. Compare with Albireo, Almach, Izar and Rasalgethi, similar high mass "giant type" systems. Neglected. (1997)												
HDS 2335			16 31.5 –39 01	7.4, 10.5	221	4.1"	24.5	K1V+G9V	148704, 207733	0	2092	Sco
Local, high CPM, solar type spectroscopic double; isolated in faint field near NGC 6139. AB: ps = 135 AU. Neglected. (1991)												
I 95			16 33.0 –33 32	7.5, 9.6	0	1.8"	500	A0V	148950, 207759	1	2093	Sco
λ 283		A B C	16 40.4 –39 55	7.7, 12.9, 10.0	149, 269	7.4", 22"	310	F0IV	150070, 207902	0	2094	Sco
Solar type 2+1 triple; rich field, optical pair TOB 8 (m.3, 22") 5' f. AB: ps = 3,100 AU. Neglected. (1999)												
R 283			16 42.5 –37 05	7.0, 7.8	250	0.8"	95	G3III	150420, 207943	1	2095	Sco
β 1116		A B	16 44.3 –27 27	6.6, 10.2	13	2.0"	96	A2V	150768, 184591	0	2096	Sco
I 99			16 49.5 –43 57	8.0, 8.7	65	1.0"	179	A0V	151473, 227264	1	2097	Sco
h 4889			16 51.0 –37 31	6.2, 7.8	5	6.6"	340	B9	151771, 208089	0	2098	Sco
WFC 181		A C	16 51.9 –38 03	3.0, 9.4	257	80"	154	B1.5+B6.5	322326, 208102	1	2099	Sco
★ CorO 289		(AaAb) B C D	16 56.9 –40 31	7.3, 13.0, 9.5, 9.6	129, 253, 237	7.3", 7.7", 15"	400*	O6.5III	152723, 227479	0	2100	Sco
Distant, high mass, probably unstable quintet with O giant; the star cluster Trumpler 24, at 1100 pc, is far behind it. AD: ps = 8,090 AU. (2014)												
λ 318			17 06.2 –38 38	8.4, 8.7	352	1.0"	97	F3V	154287, 208399	1	2101	Sco
Hd 266		A B C	17 06.3 –37 14	5.7, 10.0, 12.5	78, 186	5.8", 41"	142	A2IV	154310, 208406	0	2102	Sco
Tok 310			17 06.4 –37 06	7.9, 10.0	213	97"	58	F8V	154337, 208407	1	2103	Sco
CorO 208			17 07.4 –44 27	7.1, 9.2	138	4.8"	280	A0V	154410, 227637	0	2104	Sco
Howe 86			17 13.9 –38 18	6.9, 9.0	146	2.7"	103	F5V	155536, 208556	1	2105	Sco
I 408			17 16.3 –42 20	7.0, 8.9	173	1.7"	550	B2V	155896, 227768	0	2106	Sco
★ 4 MfbO 4		A B	17 18.9 –34 59	6.4, 7.4	185	1.3"	6.84	K3V+K5V	156384, 208670	1	2107	Sco
Local, very high CPM, low mass binary. AB: $P = 42$ y, orbit $r = 12$ AU, $e = 0.58$, visible through periastron in 2018. (242 measures; 2010)												
Δ 217			17 29.0 –43 58	6.3, 8.5	168	13"	570	B5III	158042, 228010	0	2108	Sco
B 342			17 29.4 –38 31	6.8, 7.6	109	0.4"	118	A2V	158156, 208870	1	2109	Sco
Howe 87			17 31.3 –39 01	7.4, 9.0	231	3.3"	100	F6V	158468, 208903	0	2110	Sco
Hid 136		A B C	17 31.7 –41 02	7.8, 8.1, 8.5	107, 250	1.1", 64"	270	B7IV	158531, 228078	1	2111	Sco
I 603			17 33.2 –45 31	7.2, 9.4	79	1.2"	430	B9.5III	158747, 228107	0	2112	Sco
35 lam Δ 218		(AaAb) C	17 33.6 –37 06	2.1, 9.2	330	94"	175	B2IV B	158926, 208954	1	2113	Sco
Shaula. High mass (2)+1 triple, visual binary; faint field, primary is bet Cep type (high mass and rapidly pulsating) variable star. Aa,Ab: $P = 2.9$ y, $e = 0.12$. AC ps = 1 22,200 AU. (2000)												
I 247			17 37.9 –37 52	7, 8.7	97	0.6"	47.6	G8V	159704, 209047	0	2114	Sco
CorO 222			17 56.8 –39 56	7.9, 8.4	127	3.7"	810	K1III	163195, 209497	1	2115	Sco
R 306		A B	17 57.9 –36 00	6.8, 9.5	15	3.4"	152	A0III	163482, 209525	0	2116	Sco
I 1013			17 58.0 –39 08	6.5, 8.2	138	1.1"	127	A0IV	163433, 209524	1	2117	Sco
Sculptor												
Chart 20												
Howe 92			23 13.0 –32 19	7.7, 10.7	266	6.9"	169	K0III	219034, 214386	0	2118	Scl
Howe 63			23 24.0 –27 17	7.8, 10.7	268	6.7"	179	A1V	220455, 191872	1	2119	Scl
λ 489			23 33.8 –36 16	7.3, 11.0	145	20"	56	F3V	221609, 214624	0	2120	Scl

I 693	23 37.0 –36 48	8.0, 9.2	89	1.4"	82	F6V	22 1982, 21 4657	1	2121	Scl
Howe 93	23 37.1 –31 52	6.7, 9.9	250	5.7"	300	K1III	22 2004, 21 4659	0	2122	Scl
h 5417	23 44.5 –26 15	6.3, 9.4	320	7.9"	69	F7V	22 2872, 19 2116	1	2123	Scl
del	23 48.9 –28 08	4.6, 9.4	297	74"	42.1	A0V	22 3352, 19 2167	0	2124	Scl
h 5423	23 49.8 –25 20	6.4, 11.6	304	13"	98	A3V	22 3466, 19 2180	1	2125	Scl
★ phi	23 54.4 –27 03	6.8, 7.4	272	6.6"	81	A2V F2V	22 3991, 19 2231	0	2126	Scl
Lal 192	Mixed A/solar type spectroscopic binary; sparse field. A pair actually discovered by J. Dunlop. AB: ps = 720 AU. (2013)									
Skf 760	23 55.3 –31 55	6.1, 6.8	0	2.2'	270	B6V B8V	22 4113, 21 4860	1	2127	Scl
Lal 193	23 59.5 –26 31	8.1, 8.3	170	11"	102	F0	22 4641, 19 2295	0	2128	Scl
kap 1	00 09.4 –27 59	6.1, 6.2	259	1.4"	77	F4IV	493, 16 6083	1	2129	Scl
h 3375	00 33.7 –35 00	6.6, 8.5	171	4.9"	33.1	G3IV	30 74, 19 2609	0	2130	Scl
High CPM, solar type double; dark field, pretty YO/- color. AB: ps = 220 AU. (1998)										
h 1991	00 38.8 –25 06	6.6, 9.7	95	47"	270	K0	36 05, 16 6443	1	2131	Scl
h 1992	00 38.9 –25 36	7.8, 8.9	247	46"	123	A7V	36 22, 16 6446	0	2132	Scl
lam 1	00 42.7 –38 28	6.6, 7.0	21	0.7"	145	A0V	40 65, 19 2690	1	2133	Scl
Stone 60	01 04.5 –33 32	6.6, 10.2	218	8.5"	164	K0III	64 03, 19 2907	0	2134	Scl
h 3436	01 27.1 –30 14	6.9, 9.6	128	9.6"	430	K1III	88 87, 19 3123	1	2135	Scl
Arg 4	01 32.3 –26 33	8.0, 9.1	73	18"	270	Am G2V	94 51, 16 7119	0	2136	Scl
tau	01 36.1 –29 54	6.0, 7.4	185	0.8"	69	F2V	99 06, 19 3201	1	2137	Scl
★ eps	01 45.6 –25 03	5.4, 8.5	20	5.1"	28.1	F2V	10 830, 16 7275	0	2138	Scl
Solar type double; delicate brightness contrast, sparse or dark field. AB: ps = 195 AU, low quality orbit P = 1,200 y. (2009)										
Chart 18										
Scutum	Σ 2313	18 24.7 –06 36	7.5, 8.7	195	5.7"	G0IV	16 9392, 14 2290	1	2139	Sct
	Σ 2325	18 31.4 –10 48	5.8, 9.3	257	12"	B2V	17 0740, 16 1569	0	2140	Sct
	Σ 2373	18 45.9 –10 30	7.4, 8.4	337	4.4"	F2	17 3457, 16 1805	1	2141	Sct
Rst 4596		18 46.8 –14 28	7.4, 11.5	154	5.8"	F5V	17 3614, 16 1816	0	2142	Sct
Σ 2391	A B	18 48.7 –06 00	6.5, 9.6	332	38"	A2II	17 4005, 14 2640	1	2143	Sct
Charts 10, 17, 18										
Serpens										
Σ 1919		15 12.7 +19 17	6.7, 7.4	10	23'	G1V G5V	13 5101, 10 1437	0	2144	Ser
Ho 547		15 16.4 +16 48	7.8, 11.5	291	5.5"	G0	13 5792, 10 1471	1	2145	Ser
β 943		15 18.4 +00 56	6.7, 10.9	92	3.0"	K1III	13 6027, 12 0938	0	2146	Ser
Σ 1931	A B	15 18.7 +10 26	7.2, 8.1	167	13"	F7V G3V	13 6160, 10 1480	1	2147	Ser
★ 5	Σ 1930	15 19.3 +01 46	5.1, 10.1	35	11"	F8V	13 6202, 12 0946	0	2148	Ser
MQ Ser. Local, high CPM, solar type double; primary is BY Dra type variable star. AB: ps = 380 AU. (2013)										
6	β 32	15 21.0 +00 43	5.5, 8.8	22	3.4"	K2III	13 6514, 12 0955	1	2149	Ser
Σ 1950		15 30.0 +25 31	8.1, 9.2	91	3.4"	K4III	13 8232, 8 3852	0	2150	Ser
★ 13 del	Σ 1954	15 34.8 +10 32	4.2, 5.2	173	3.9"	F0IV	13 8918, 10 1624	1	2151	Ser
Solar type binary with del Sct type variable star; YW/YW color, sparse field. In large apertures, forms charming "reflection" quadruple with CD (m.14, 4") 1' n., which may be related. AB: P = 1,038 y, orbit i = 270 AU, at cusp. (476 measures; 2013)										
28 bet	Σ 1970	15 46.2 +15 25	3.7, 10.0	264	30"	A2IV	14 1003, 10 1725	0	2152	Ser
V382	Els 1	15 48.2 +01 34	7.5, 9.5	357	18"	G8V	14 1272, 12 1196	1	2153	Ser
Local, solar type double with BY Dra type variable; 11' f. m.11 K giant star in sparse field. AB: ps = 515 AU, estimated P = ~7,000 y. (2006)										
								1	2153	Ser

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Σ 1985	Σ 1985	Σ 1985	15 50.3 +02 12	5.3, 10.3	300	75"	84	G8III+K0	141680, 121215	0	2154	Ser
			15 55.9 −02 10	7.0, 8.7	353	5.9"	36.9	F8V	142661, 140842	1	2155	Ser
			15 56.8 +12 29	7.6, 7.8	249	1.9"	96	F1V	142910, 101829	0	2156	Ser
			15 57.2 +03 24	7.3, 8.7	322	11"	179	A0V	142930, 121277	1	2157	Ser
OΣ 303	OΣ 303	A B	16 00.9 +13 16	7.7, 8.1	173	1.6"	97	F7V	143597, 101874	0	2158	Ser
			Solar type double; dark field. AB: ps = 210 AU. Frequently measured, but no orbit or linear solution. (296 measures; 2012)									
Σ 2003	Σ 2003	A B	16 03.7 +11 26	7.3, 10.5	171	14"	133	K3III	144064, 101898	1	2159	Ser
			16 16.3 −01 39	7.2, 11.0	229	21"	47.4	F7V	146433, 141069	0	2160	Ser
Σ 2041	Σ 2041	Hu 189	16 21.8 +01 13	7.5, 10.5	1	2.6"	187	K0	147411, 121534	1	2161	Ser
			17 53.1 −13 39	7.4, 9.0	254	1.5"	63	F8V	162739, 160930	0	2162	Ser
HId 139	HId 139	A B C	17 54.9 −11 38	7.0, 11.1, 12.9	144, 97	3.2", 66"	68	F3V	163117, 160899	1	2163	Ser
			17 56.3 −15 49	5.9, 9.2	157	21"	74	A1V	163336, 160915	0	2164	Ser
Σ 2303	Σ 2303	AC 11	18 20.1 −07 59	6.6, 9.3	240	1.6"	60	F2V	168459, 142229	1	2165	Ser
			18 25.0 −01 35	6.7, 7.2	355	0.9"	134	A9III+F6III	169493, 142294	0	2166	Ser
59 d	Σ 2316	(AaAb) B	18 27.2 +00 12	5.4, 7.6	320	3.7"	144	G0III+A6V	169885, 123497	1	2167	Ser
			18 38.7 +04 51	6.9, 9.1	282	1.7"	142	K2III	172190, 123756	0	2168	Ser
★	Σ 2375	(AaAb) (BaBb)	18 45.5 +05 30	6.3, 6.7	120	2.6"	189	A1V	173495, 123886	1	2169	Ser
			Matched A type (2)+2 interferometric quadruple; visual binary. The "Tweedledum and Tweedledee" system: two similar binaries, first detected visually by W. Finsen (1953), so alike they are frequently mismeasured. Aa,Ab: P = 27 y, e = 0.779, periastron 2021. Ba,Bb: P = 38.6y, e = 0.87, apastron 2025. AB: ps = 670 AU. (322 measures; 2013)									
★ 63 the	Σ 2417	A B	18 56.2 +04 12	4.6, 4.9	104	22"	47.4	A5V A5Vn	175638, 124068	0	2170	Ser
			Lovely wide, bright, matched A type pair; discovered by C. Mayer (1777). AB: ps = 1,410 AU, no orbit. (218 measures; 2012)									
8 gam	Σ 1377	A B C	09 43.5 +02 38	7.5, 10.5	137	4.2"	154	F7V	84184, 117871	1	2171	Sex
			09 52.5 −08 06	5.4, 6.4, 12.3	49, 333	0.5", 37"	85	A1V	85558, 137199	0	2172	Sex
			A type 2+1 triple. MSC has 3.3 M \odot . AB: P = 78 y, orbit r = 34 AU, e = 0.74, drops below 0.4" in 2025. (330 measures; 2011)									
			10 00.2 +06 15	7.7, 10.5	21	22"	60	F5	86683, 118045	1	2173	Sex
Σ 1401	HJ1 1056	A B	10 02.8 −01 04	6.8, 10.6	32	109"	110	K0	87095, 137312	0	2174	Sex
			10 29.8 −03 55	7.8, 9.2	346	15"	118	G0	90934, 137604	1	2175	Sex
Σ 1441	Σ 1441	A B	10 31.0 −07 38	6.5, 8.8	167	2.8"	350	K5III F6V	91106, 137614	0	2176	Sex
			10 37.0 −08 50	7.2, 9.7	199	0.9"	39.9	G0	91982, 137678	1	2177	Sex
A 556	Σ 1457	A B	10 38.7 +05 44	7.7, 8.2	333	1.8"	65	F5V	92184, 118410	0	2178	Sex
			Solar type binary; very dark field. AB: ps = 160 AU. (203 measures; 2013)									
34	A 2768	A B	10 42.6 +03 35	6.9, 8.5	247	0.6"	71	F7V	92749, 118443	1	2179	Sex
			Solar type binary; very dark field. AB: P = 81 y, orbit r = 28 AU, e = 0.55, apastron in 2017. (2013)									
★ 35	Σ 1466	A B	10 43.3 +04 45	6.2, 7.1	240	6.7"	169	K2III+K1III	92841, 118449	0	2180	Sex
			Rare pair of two K giants; OY/OY color; dark field. AB: ps = 1,530 AU. (2012)									
40	Σ 1476	A B	10 49.3 −04 01	7.1, 7.8	16	2.4"	86	A2IV	93742, 137808	1	2181	Sex

Chart 15

Taurus		Tau		Charts 7, 13									
β 879		03 28.6 +11 23	6.8, 12.8	71	25"	118	G9III	21524, 93448	0	2182	Tau		
Σ 406		03 30.8 +05 09	7.6, 9.3	127	9.1"	182	F0	21788, 111233	1	2183	Tau		
Σ 1 7		03 31.1 +27 44	7.4, 7.8	233	44"	120	B9	21700, 75964	0	2184	Tau		
★ Σ 401		03 31.3 +27 34	6.6, 6.9	269	11"	97	A2V	21743, 75970	1	2185	Tau		
AG 68		A type double; W/W color, with Σ 1 7 (above) 10' n.p., spectacular in a sparse field. AB: ps = 1,440 AU. (2013)									1	2185	Tau
★ 7 Σ 412		03 32.2 +11 33	6.8, 9.9	248	17"	220	A1V	21915, 93479	0	2186	Tau		
		03 34.4 +24 28	6.6, 6.9, 9.9	353, 54	0.8", 22"	132	A3V+A3V	22091, 75999	1	2187	Tau		
★ V711 Σ 422		A type 2+1 triple; YW/- color, sparse field. AB: P = 522 y, orbit r = 85 AU, e = 0.68, widening. (298 measures; 2012)									1	2187	Tau
		03 36.8 +00 35	6.0, 8.9	274	7.1"	30.7	G8V K6	22468, 111291	0	2188	Tau		
		Solar type (2)+1 spectroscopic triple, primary is an RS Cvn variable; Y/W color, 12' n. of 10 Tau. Aa,Ab: P = 2.8 d. AB: ps = 290 AU. (200 measures; 2013)									0	2188	Tau
Σ 427		03 40.6 +28 46	7.4, 7.8	208	7.0"	113	A1V A2V	22766, 76071	1	2189	Tau		
Σ 435		03 43.1 +25 41	7.2, 8.9	3	14"	66*	F3V	23075, 76094	0	2190	Tau		
Hjl 1024		03 43.7 +23 39	8.0, 9.6	175	3.3'	132	A9V	23157, 76103	1	2191	Tau		
Hjl 1025		03 45.6 +24 20	7.2, 9.9	164	2.9'	150*	A1V F5V	23387, 76152	0	2192	Tau		
		A type (2)+1 CPM triple, wide visual double; in Pleiades (M 45), unrelated to 20 Tau 3' n.f. AB: ps = 34,000 AU. (2011)									0	2192	Tau
Σ 444		03 45.8 +23 09	6.9, 10.1	332	3.8"	121	A0V	23410, 76156	1	2193	Tau		
★ 21 Hjl 1026		03 45.9 +24 33	5.8, 6.4, [12.7, 13.0]	130, 74, [162]	2.5', 2.9', [18"]	114	B8V A0V	23432, 76159	0	2194	Tau		
Asterope. High mass 1+1+2 quadruple or comoving group, in Pleiades (M 45); B is 22 Tau, E may be optical. Wide, fragile pairs may originate as stars released in parallel trajectories from the natal cluster: linked by CPM, parallax and radial velocity, this group is perhaps an example. (Compare with Hjl 1024 and 02Σ 40.) AB: ps = 17,100 AU. (2013)													
02Σ 40		03 49.4 +24 23	6.6, 7.5	309	87"	122	B9.5V	23873, 76236	1	2195	Tau		
02 64		03 50.0 +23 51	6.8, 10.2, [9.1 11.1]	236, 235, [259]	3.2", 10", [0.6"]	147	B9.5V	23964, 76251	0	2196	Tau		
High mass (2)+1+2 spectroscopic quintuple. MSC system mass 5.5 M _☉ . Aa,Ab: P = 16.7 d. Ca,Cb (Bov 25): ps = 120 AU, requires large aperture. (2012)													
02 65		03 50.3 +25 35	5.7, 6.5	195	0.2"	57	A2V A5V	23985, 76256	1	2197	Tau		
A type binary; faint field. System mass 3.8 M _☉ . AB: P = 61 y, orbit r = 25 AU, e = 0.63, ps = 34 AU, reappears in 2016. (236 measures; 2008)													
A 1830		03 51.3 +26 21	8.0, 8.0, 11.1	194, 330	0.4", 61"	64*	F8	24104, 76270	0	2198	Tau		
V479 02Σ 41		03 54.5 +05 10	7.5, 8.9	358	59"	158	F3II	24550, 111492	1	2199	Tau		
Σ 479		04 00.9 +23 12	6.9, 7.8, 9.5	127, 242	7.2", 57"	330	B9V	25201, 76388	0	2200	Tau		
Σ 495		04 07.7 +15 10	6.1, 8.8	222	3.7"	43.6	F3V	26015, 93775	1	2201	Tau		
02 72		04 08.0 +17 20	6.1, 9.7	328	4.7"	123	K5III	26038, 93777	0	2202	Tau		
Σ 494		04 08.9 +23 06	7.5, 7.7	188	5.3"	105	A8IV A8IV	26128, 76476	1	2203	Tau		
Σ 510		04 12.2 +00 44	6.7, 10.1	303	11"	146	G8III	26573, 111659	0	2204	Tau		
47 β 547		04 13.9 +09 16	5.1, 7.3, 13.2	341, 227	1.2', 29'	102	G5IV A8V	26722, 111674	1	2205	Tau		
02Σ 45		04 15.5 +06 11	6.4, 7.0	316	64"	21.3	G0IV G3V	26923, 111698	0	2206	Tau		
Local, solar type double with BY Dra variable; striking pair in dark field; near 100% probability pair is physical. AB: ps = 1,840 AU. (2012)													
Σ 517		04 16.0 +00 27	7.4, 9.3	8	3.3'	117	A1V	26991, 111705	1	2207	Tau		
Ho 328		04 17.0 +19 41	7.4, 9.1	2	0.5"	85	F5V	27028, 93840	0	2208	Tau		
Solar type binary; dark field, LDS 5536 (m.10, 12") 8' n.f. AB: P = 63 y, orbit r = 31 AU, at cusp, periastron 2035. (2008)													
LDS 5535		04 17.3 +20 35	5.0, 9.6	118	3.0'	28.9	A3	27045, 76532	1	2209	Tau		
55 02 79		04 19.9 +16 31	7.3, 8.6	358	0.5"	46.5	F9V	27383, 93870	0	2210	Tau		
Solar type binary; sparse field, member of Hyades cluster. AB: P = 90 y, orbit r = 27 AU, e = 0.60, apastron 2031. (212 measures; 2012)													
									0	2210	Tau		

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★ 65,67	β 87		04 22.4 +20 49	6.2, 8.6	167	1.9"	710	B3V K3II	27639, 76571	1	2211	Tau
	0Σ 82	(AaAb) B (C) Solar type (2)+1+(1) spectroscopic quadruple (C is m.16), visual binary; YW/B color, member of Hyades cluster. Aa,Ab: $P = 241$ y, orbit $r = 50$ AU, $e = 0.26$. (211 measures; 2012)	04 22.7 +15 03	7.3, 8.6	333	1.3"	43.6	F9V	27691, 93896	0	2212	Tau
	Σ 535		04 23.3 +11 23	7.0, 8.3	271	1.1"	87	A5III	27762, 93899	1	2213	Tau
★ 65,67	kap 1,2											
	Σ 541	Double with A type giant; delicate brightness contrast, dark field. AB: $ps = 130$ AU. (231 measures; 2013)	04 25.4 +22 18	4.2, 5.3	174	5.8"	47.2	A7V	27934, 76601	0	2214	Tau
	★ 78 the 2	K Tau. A type (2)+1 CPM triple; dark field, both members of the Hyades cluster, A is an occultation binary, B is a del Sct type variable. The AB pair brackets CD, a tiny (m.10, 6") matched and unrelated pair. AB: $ps = 22,000$ AU. (2011)										
68 del 3	H VI 101	(AaAb) B C D	04 25.5 +17 56	4.3, 7.9, 11.1, 9.1	341, 236, 40	1.8", 7.7" 6.9"	45.5	A2IV	27962, 93923	1	2215	Tau
		A = V776 Tau. A type (2)+1+1+1 spectroscopic quintuple with alp2 CVn type variable; sparse field. AB: $ps = 110$ AU. AD: $ps = 25,300$ AU. (2006)										
	Σ 546		04 27.0 +19 07	7.9, 9.2	181	6.9"	65	G0	28139, 93940	0	2216	Tau
★ 78 the 2	Σ 545	(AaAb) B	04 27.1 +18 12	6.9, 8.8	58	19"	107	A0V	28150, 93942	1	2217	Tau
	Σ I 10	(AaAb) B	04 28.7 +15 52	3.4, 3.9	347	5.7"	46.1	A7III	28319, 93957	0	2218	Tau
		A type (2)+1 triple with del Sct variable; sparse field, member of Hyades cluster. LDS 2246 (see below) 30' n.f. AB: $ps = 21,300$ AU. (1998)										
V921	Bgh 2		04 29.5 +17 52	7.0, 9.1	9	110"	46.4	G5	28406, 93963	1	2219	Tau
	80		04 30.1 +15 38	5.7, 8.1	14	1.6"	45.8	F0V G0V	28485, 93970	0	2220	Tau
		Solar type binary; dark field, member of Hyades cluster. AB: $P = 180$ y, orbit $r = 46$ AU, closing. (2013)										
81	β pm 62		04 30.6 +15 42	5.5, 8.9	339	2.7"	44.9	Am	28546, 93978	1	2221	Tau
	LDS 2246		04 30.6 +16 12	4.8, 6.5	130	4.2"	43.2	A6IV	28527, 93975	0	2222	Tau
	0Σ 84		04 31.1 +06 47	7.2, 8.1	256	9.4"	84	K0IV	28630, 111863	1	2223	Tau
★	Σ 559		04 33.6 +18 01	7.0, 7.0	276	3.1"	134	B9IVn	28867, 94002	0	2224	Tau
		High mass double; possible T Tauri (pre main sequence star), dark field. AB: $ps = 560$ AU. (2012)										
	h 5461	A B C	04 34.6 +28 58	5.9, 10.3, 11.7	102, 134	25", 50"	149	B9	28929, 76654	1	2225	Tau
88	Σ 562		04 34.8 +22 42	6.8, 9.9	285	1.9"	159	F5III	28976, 76658	0	2226	Tau
	Sh 45	(Aa1Aa2Ab1Ab2) (BaBb)	04 35.7 +10 10	4.3, 7.8	300	71"	47.9	A6m+G3V	29140, 94026	1	2227	Tau
		A type (2+2)+(2) spectroscopic sextuple, visual binary with alp2 CVn type variable; dark field. MSC system mass $6.9 M_{\odot}$. Aa,Ab: $P = 18.0$ y, orbit $r = 12$ AU, $e = 0.07$. (2008)										
0Σ 86			04 36.6 +19 46	8.7, 7.7	1	0.5"	270	A2	29183, 94031	0	2228	Tau
		A type binary; dark field. AB: $P = 828$ y, orbit $r = 165$ AU. (2008)										
	0ΣΣ 53		04 37.4 +00 33	7.6, 7.6	353	78"	67	G5	29355, 111935	1	2229	Tau
h 346		A B	04 41.3 +28 37	5.7, 10.7	54	43"	117	A2V	29646, 76707	0	2230	Tau
	LDS 2266	A B	04 42.9 +18 43	7.2, 10.2	102	2.4"	43.5	G5+K3	29836, 94078	1	2231	Tau
	Σ 623		04 59.9 +27 20	7.0, 8.7	206	21"	110	B7V A0V	31806, 76880	0	2232	Tau
S 461		(AB) (CaCb)	05 01.7 +26 40	6.9, 8.3	159	79"	40.6	G2V	32092, 76903	1	2233	Tau
		Solar type (2)+(2) spectroscopic quadruple, visual binary. MSC system mass $3.9 M_{\odot}$. AB: $P = 25$ y, $e = 0.29$, periastron 2025. (2013)										
	0Σ 95		05 05.5 +19 48	7.0, 7.6	296	0.9"	138	A5m	32642, 94306	0	2234	Tau
		A type binary; dark field. AB: $P = 760$ y; given the spectral type, the orbit $r = \sim 140$ AU. (210 measures; 2012)										

Σ 645	(AaAb) (BC)	05 09.8 +28 02	6.0, 9.1	28	11"	53	A5m	33204, 76990	1	2235	Tau
Bgh 21		05 10.1 +27 33	7.0, 9.3	353	5.3'	40.0	F5 G5	33252, 76998	0	2236	Tau
Σ 670	A (BaBb)	05 16.7 +18 26	7.7, 8.3	164	2.6"	199	B3V	34251, 94431	1	2237	Tau
CD Σ 674		05 17.5 +20 08	6.8, 9.7	149	9.9"	81	F7V F5IV	34335, 77084	0	2238	Tau
Σ 680		05 19.2 +20 08	6.2, 9.7	203	8.9"	120	K0III	34579, 77098	1	2239	Tau
OS 108		05 29.3 +18 22	6.8, 10.4	130	3.2"	187	A2	35985, 94586	0	2240	Tau
★ 118 Σ 716	(AaAb) (BaBb)	05 29.3 +25 09	5.8, 6.7	209	4.7"	130	B8.5V	35943, 77201	1	2241	Tau
	High mass (2)+(2) quadruple; WB/W color, dark field. MSC system mass 8.6M _☉ . AB: ps = 820 AU. (2012)								1	2241	Tau
h 3275	(AB) [C D]	05 29.8 +18 25	7.7, [8.2, 12.0]	21, [254]	56", [1.4"]	174	A0	36073, 94589	0	2242	Tau
★ Σ 730	(AaAb) B	05 32.2 +17 03	6.1, 6.4	141	9.6"	920	B7IIle	36408, 94630	1	2243	Tau
	Distant, high mass (2)+1 spectroscopic triple, visual double with B giant; lovely matched YW/YW color. AB: ps = 11,900 AU. (2013)								1	2243	Tau
Σ 742	(AaAb) B	05 36.4 +22 00	7.1, 7.5	274	4.1"	67	F8	37013, 77313	0	2244	Tau
	Solar type (2)+1 triple; ambiguous Σ 740 (m.9 22") 50' s. MSC system mass 2.6 M _☉ . AB: ps = 370 AU. (206 measures; 2012)								0	2244	Tau
★ Σ 749	A B	05 37.1 +26 55	6.5, 6.6	320	1.2"	155	B9IV	37086, 77322	1	2245	Tau
	High mass binary; pretty field, CD (Bow 4, m.11, 4") 3' n.p. is unrelated. AB: P = 987 y, orbit r = 160 AU. (256 measures; 2012)								1	2245	Tau
Σ 787	A B D	05 46.0 +21 19	8.3, 8.8, 8.1	57, 160	0.7", 2.1'	158	F2	38363, 77527	0	2246	Tau
OSΣ 67	(AB) C	05 48.4 +20 52	6.0, 8.3	162	76"	168	B9Vn	38670, 77578	1	2247	Tau
Ku 23		05 50.8 +14 27	7, 8.6	107	0.8"	470	B9	39098, 94914	0	2248	Tau
Chart 29											
Telescopium Tel											
h 5033	A B	18 15.4 -48 51	6.7, 9.8	114	17"	91	G8III	166949, 228845	1	2249	Tel
★ h 5034		18 16.2 -46 01	7.5, 8.6	98	2.2"	180*	A5IV	167153, 228857	0	2250	Tel
	A type double; faint rich field. AB: ps = 535 AU. As with many southern hemisphere stars: neglected. (1994)								0	2250	Tel
Δ 220		18 22.2 -55 34	8.1, 8.5	177	31"	91	G0	168292, 245426	1	2251	Tel
h 5041		18 25.8 -53 38	7.3, 9.2	260	2.9"	132	Fm	169058, 245461	0	2252	Tel
h 5045		18 30.9 -48 01	6.7, 9.7	21	7.9"	69	F6V	170283, 229077	1	2253	Tel
Skf 1147		18 31.5 -50 11	7.2, 10.4	173	85"	51	F0III	170338, 245531	0	2254	Tel
h 5053	(AB) C	18 43.4 -55 46	7.7, 10.2	197	33"	62	F7V	172447, 245656	1	2255	Tel
	Solar type (2)+1 triple; visual binary, faint field. AB: P = 73 y, orbit r = 17 AU, widening. (2013)								1	2255	Tel
I 112	A B	18 54.0 -47 16	7.1, 9.1	190	1.8"	69	F5V	174691, 229354	0	2256	Tel
★ R 317	A B C	19 03.1 -45 43	8.0, 8.8, 8.8	284, 211	1.5", 19"	560*	B9III	176555, 229458	1	2257	Tel
	Distant, high mass 2+1 triple; a mini bet Mon, similar brightness to stars in rich field. AC was detected by J. Herschel during his observing expedition in South Africa (1834). AB: ps = 1,100 AU, AC: ps = 14,400 AU. (1991)								1	2257	Tel
Δ 225	A B	19 12.4 -51 48	7.2, 8.4	250	70"	440	K5III	178734, 245970	0	2258	Tel
h 5092		19 13.9 -47 22	8.1, 8.4	350	18"	340*	G2III	179211, 229568	1	2259	Tel
eta Tok 331	A B C	19 22.9 -54 25	5.0, 11.9, 7.1	170, 171	4.2', 6.9'	48.2	A0Vn+M7	181296, 246055	0	2260	Tel
CorO 238		19 42.3 -52 57	7.7, 9.3	48	3.3"	141	A6V	185559, 246224	1	2261	Tel
Tok 335		19 48.0 -56 22	5.3, 9.3	333	102"	49.6	A7IV	186543, 246271	0	2262	Tel
Δ 227		19 52.6 -54 58	5.8, 6.4	148	23"	172	K0III A2V	187420, 246311	1	2263	Tel
	A type double with K giant; mixed field, stars n. unrelated. AB: ps = 5,340 AU. (2013)								1	2263	Tel
Δ 229		19 58.3 -51 54	7.7, 8.2	242	80"	88	F0	188557, 246357	0	2264	Tel
I 256		20 01.4 -47 24	7.1, 9.6	189	0.8"	102	F2IV	189307, 229991	1	2265	Tel

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
λ 415	Skf 376		20 20.9 −45 33	7.3, 12.0	95	11"	67	G6III	193213, 230165	0	2266	Tel
			20 21.7 −50 00	6.3, 12.8	300	21"	31.0	F9V	193307, 246546	1	2267	Tel
★	Σ 183	Triangulum Tri (AB) C Solar type (2)+1 triple, visual binary, sparse field. MSC has 3.9 M \odot . AB: $P = 333$ y, orbit $r = 80$ AU, $e = 0.52$, widening. (2008)	01 55.1 +28 48	7.7, 9.3	163	5.6"	166	F2	11671, 75020	0	2268	Tri
Frk 2	A 819	(AB) C Solar type (2)+1 triple, visual binary, sparse field. MSC system mass 3.4 M \odot . AB: $P = 164$ y, $e = 0.46$, apastron 2092. (2007)	01 56.4 +30 26	8.0, 9.1	307	54"	220	F0	11813, 55115	1	2269	Tri
			01 57.0 +31 01	7.8, 10.0	271	67"	86	F5	11849, 55122	0	2270	Tri
★ 6 iot	Σ 227	(AaAb) B A = TZ Tri. Bright (2)+1 spectroscopic triple, visual double with G giant, an ellipsoidal variable; YW/BW color, faint field. Aa,Ab: $P = 2.2$ d. AB: ps = 460 AU. (244 measures; 2012)	02 12.4 +30 18	5.3, 6.7	69	3.8"	89	G0III	13480, 55347	1	2271	Tri
Σ 239	Σ 246	Ho 216	02 17.4 +28 45	7.1, 7.8	212	14"	34.5	F7V F9V	14082, 75265	0	2272	Tri
			02 18.7 +34 29	7.8, 9.3	122	9.6"	90	G0IV	14202, 55446	1	2273	Tri
Σ 269	h 653	Σ 285	02 27.0 +31 17	7.9, 9.4	3	1.3"	79	F6V	15128, 55566	0	2274	Tri
			02 28.2 +29 52	7.6, 9.0	345	1.7"	192	G0	15256, 75383	1	2275	Tri
Σ 286	Σ 310	Tri h 653	02 33.6 +31 25	7.6, 12.7	43	23"	370	K3Ib	15832, 55658	0	2276	Tri
			02 38.8 +33 25	7.5, 8.1	163	1.7"	220	K2III+	16396, 55748	1	2277	Tri
Σ 286	Σ 310	Tri h 653	02 39.8 +33 57	7.8, 10.2	258	3.0"	430	K0III+	16511, 55761	0	2278	Tri
			02 49.4 +33 56	7.4, 10.4	92	2.2"	139	A2	17497, 55911	1	2279	Tri
Triangulum Australe	I 332	TrA	15 20.7 −67 29	6.4, 8.2	107	1.1"	310	B3V	135737, 253115	0	2280	TrA
			15 29.9 −67 29	7.3, 9.3	243	21"	450	B3IV	137384, 253183	1	2281	TrA
Rss 26	Rmk 20	A B	15 47.9 −65 27	6.2, 6.4	147	1.8"	112	A5III	140484, 253297	0	2282	TrA
			15 54.9 −60 45	6.4, 8.1	95	1.1"	420	B9II	141913, 253344	1	2283	TrA
Rss 29	I 336	HDS 2352	16 03.7 −60 30	7.1, 8.1	180	53"	650	B3IV	143448, 253406	0	2284	TrA
			16 31.9 −62 17	7.8, 8.1	199	1.1"	230	B9V	148431, 253588	1	2285	TrA
Tucana	I 20	Tuc	16 37.8 −64 15	7.7, 10.3	148	11"	91	K1IV	149237, 253631	0	2286	TrA
			22 18.0 −62 49	7.4, 8.4	188	0.6"	122	F5V	211299, 255187	1	2287	Tuc
del	Δ 245	h 5334	22 27.3 −64 58	4.5, 8.7	282	7.0"	77	B9.5V	212581, 255222	0	2288	Tuc
			23 08.6 −59 44	7.5, 9.4	289	14"	79	F5V	218392, 255413	1	2289	Tuc
h 5402	Glt 289	(AB) (CD) E High mass, matched (2)+(2)+1 quintuple, visual triple, in 2" wide comoving group with bet 3 Tuc, 9' s.f. MSC system mass 15.3 M \odot . CD (1 260): $P = 45$ y, $e = 0.74$, reappears in 2024, apastron 2035. AE (Shy 114): ps = 30,700 AU. (2009)	23 31.0 −69 05	7.2, 9.1	198	36"	30.7	G0V	221231, 255503	0	2290	Tuc
			00 00.6 −66 41	7.7, 9.2	273	3.8"	65	G2V	224783, 255620	1	2291	Tuc
★ bet 1,2	Lcl 119	lam 1	00 31.5 −62 57	4.3, 4.5, 5.1	168, 118	27", 9.2"	41.4	B9V	2884, 248201	0	2292	Tuc
			00 44.5 −62 30	6.3, 8.0	65	2.3"	88	F5III	4294, 248243	1	2293	Tuc
CorO 3	Δ 2	h 3416	00 52.4 −69 30	6.7, 7.4	82	20"	63	F7IV	5190, 248269	0	2294	Tuc
			01 03.3 −60 06	7.6, 7.7	129	5.2"	80	F5V	6334, 248309	1	2295	Tuc

★ kap	h 3423	(AaAb) B [C D]	01 15.8 –68 53	5.0, 7.7, [7.8, 8.4]	316, 310, [313]	4.7", 5.3', [1.1"]	20.9	F6IV	7788, —	0	2296	Tuc	
Local, high CPM, solar type (2)+1+2 quintuple. MSC system mass 4.3 M☉. AB: P = 857 y, orbit r = 135 AU. CD (l 27): P = 85 y, orbit r = 31 AU, e = 0.04, apastron 2046. (2013)													
	h 3426		01 17.1 –66 24	6.4, 8.3	330	2.4"	94	A0V	7916, 248350	1	2297	Tuc	
	Ursa Major	UMa							Charts 4, 9				
	Σ 1192	A B C	08 15.8 +60 23	6.5, 10.1, 10.4	256, 224	2.7", 49"	151	A7Vm	68457, 14479	0	2298	UMa	
	Shy 199	A [B C]	08 21.1 +65 27	8.1, [8.5, 12.0]	227, [246]	4.3', [2.8"]	36.5	G0 G5	69433, 14509	1	2299	UMa	
	Σ 1258		08 43.4 +48 52	7.7, 7.9	331	10"	143	F0	74010, 42512	0	2300	UMa	
	A 1584		08 53.1 +54 57	9.0, 7.7	90	0.7"	52	G0	75553, 27027	1	2301	UMa	
Solar type binary; dark field. AB: P = 71 y, orbit r = 22 AU, e = 0.71, apastron 2020. (2013)													
	★ 9 iot	(AaAb) [B C]	08 58.2 +48 03	3.1, [9.9, 10.1]	82, [40]	2.4", [0.7"]	14.5	A7IV	76644, 42630	0	2302	UMa	
Talitha Borealis. Local, high CPM, A type (2)+2 spectroscopic quadruple with del Sct type variable; dark field. Aa,Ab: P = 11.0 y, A,BC: P = 803 y, orbit r = 170 AU. BC: P = 39y, orbit r = 10 AU, e = 0.35, apastron 2018. (2012)													
	13 sig 2	Σ 1306	A B C	09 10.4 +67 08	4.9, 8.9, 10.3	349, 148	4.3", 3.3'	20.4	F7V	78154, 14788	1	2303	UMa
Local, solar type 2+1 triple. AB: P = 1141 y, orbit r = 130 AU. AC: ps = 5.450 AU. (221 measures; 2012)													
	Σ 1315		09 12.8 +61 41	7.3, 7.7	27	25"	100	A3IV	78767, 14808	0	2304	UMa	
	★	Σ 1321	A B	09 14.4 +52 41	7.8, 7.9	98	17"	5.81	M0V M0V	79210, 27178	1	2305	UMa
Local, very high CPM, rare low mass matched binary; A is a flare star, both may be spectroscopic binaries. AB: P = 975 y, orbit r = 114 AU Note, at just 6 pc distance, the weak brightness of low mass dwarf K/M type stars. (447 measures; 2013)													
	Arm 71	A B D	09 20.7 +51 16	6.2, 10.0, 7.9	138, 52	5.6", 3.9'	27.5	F5V	80290, 27215	0	2306	UMa	
	Σ 1340	A B C	09 22.5 +49 33	7.1, 9.0, 12.5	319, 83	6.2", 2.3'	230	B9.5V	80608, 42825	1	2307	UMa	
	0Σ 200	(AaAb) B	09 24.9 +51 34	6.5, 8.6	337	1.2"	129	G0IV	81025, 27246	0	2308	UMa	
	Σ 1346	A B	09 25.6 +54 01	7.7, 8.6	314	5.7"	196	A2V	81104, 27249	1	2309	UMa	
	Σ 1349		09 31.2 +67 32	7.5, 9.0	166	19"	550	A3V	81787, 14903	0	2310	UMa	
	★ 23 h	Σ 1351	A B	09 31.5 +63 04	3.7, 9.2	269	23"	F0IV	81937, 14908	1	2311	UMa	
Local solar type double with del Sct type variable; a dark field makes the brightness contrast distinctive. AB: ps = 740 AU. (2003)													
	Σ 1350	A B C	09 34.3 +66 48	8.3, 8.3, 9.2	249, 213	10", 2.0'	230	F4V F6V	82285, 14923	0	2312	UMa	
	Σ 1363		09 35.2 +60 54	7.3, 10.6	356	11"	76	F0	82569, 14931	1	2313	UMa	
	Cbl 38		09 50.5 +45 05	7.5, 11.7	11	53"	101	F3Vh	85039, 43063	0	2314	UMa	
	★ 30 phi	0Σ 208	09 52.1 +54 04	5.3, 5.4	298	0.4"	156	A2V	85235, 27408	1	2315	UMa	
Matched A type binary; dark field. System mass 8.4 M☉. AB: P = 105 y, orbit r = 55 AU, e = 0.45, apastron 2040. (316 measures; 2012)													
	0Σ 209		09 53.3 +50 37	7.4, 10.3	309	4.9"	197	G8IV	85439, 27416	0	2316	UMa	
	0Σ 522		09 53.9 +64 47	7.5, 11.2	123	14"	220	K0	85360, 15013	1	2317	UMa	
	Σ 1415	A B	10 17.8 +71 04	6.7, 7.3	168	17"	400	A7m	88849, 7099	0	2318	UMa	
	Σ 1427		10 22.0 +43 54	8.2, 8.5	214	9.0"	105	F5V	89686, 43306	1	2319	UMa	
	Σ 1428		10 26.0 +52 37	8.0, 8.4	87	2.8"	87	F6V	90204, 27639	0	2320	UMa	
	Kui 50		10 28.1 +48 47	6.4, 7.4	22	4.0"	22.9	F9V	90508, 43351	1	2321	UMa	
Local, high CPM, solar type double. AB: ps = 120 AU. (2012)													
	0Σ 219		10 30.2 +51 00	7.6, 11.2	297	13"	158	A7IV	90806, 27664	0	2322	UMa	
	36	LDS 2863	A B	10 30.6 +55 59	4.9, 8.9	303	12.8	F6V	90839, 27670	1	2323	UMa	
Local, solar type wide double; isolated in dark field. AB: ps = 2,070 AU. (2012)													
										1	2323	UMa	

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
Σ 1462		A B	10 42.9 +50 48	7.4, 10.1	175	8.0"	129	A8IV	92668, 27744	0	2324	UMa
Sma 75		A B	10 43.5 +46 12	5.2, 7.4	88	4.8"	37.1	F5III	92787, 43444	1	2325	UMa
Σ 1469		A B	10 47.7 +65 28	7.7, 10.4	324	11"	87	F8V	93270, 15292	0	2326	UMa
O Σ 229			10 48.0 +41 07	7.6, 7.9	260	0.6"	166	A5IV	93457, 43475	1	2327	UMa
		A type binary; preceding of two m.7 stars in dark field. AB: $P = 320$ y, orbit $r = 105$ AU. (219 measures; 2013)								1	2327	UMa
Skf 59			10 54.7 +36 46	7.4, 11.5	58	34"	99	F2V	94456, 62308	0	2328	UMa
UC 2059		(Aa Ab) Ba Bb	11 01.8 +36 41	7.5, 11.2, 11.5	46, 38	47", 0.6"	75	F0	95485, 62360	1	2329	UMa
50 alp	β 1077	A B (CaCb)	11 03.7 +61 45	2.0, 5.0, 7.2	5, 204	0.7", 6.3'	37.7	G9III	95689, 15384	0	2330	UMa
		Dubhe, 2+ (2) quadruple, visual triple with G giant; dominant in dark field, brightness contrast challenge. AB: $P = 44$ y, orbit $r = 22$ AU, $e = 0.44$, decreasing ρ to apastron 2024; AC: $ps = 19,200$ AU. (2012)								0	2330	UMa
51	H ζ 8	A B C	11 04.5 +38 14	6.0, 11.6, 7.6	111, 83	7.7", 2.5'	79	A3III	95934, 62387	1	2331	UMa
Σ 1510			11 08.0 +52 49	7.7, 9.0	330	5.4"	56	F8V	96527, 27918	0	2332	UMa
Eng 45		A B	11 11.8 +42 50	7.2, 8.3	247	2.2"	46.8	F8 G5	97194, 43641	1	2333	UMa
Ho 50			11 13.7 +41 05	6.5, 8.4	35	3.0"	114	K2III	97501, 43649	0	2334	UMa
Σ 1520		(AaAb) (BaBb)	11 16.1 +52 46	6.5, 7.8	343	12"	34.1	F6V F9V	97855, 27970	1	2335	UMa
\star 53 xi	Σ 1523		11 18.2 +31 32	4.3, 4.8	188	1.6"	10.4	F9V G9V	98230, 62484	0	2336	UMa
		Alula Australis. Local, high CPM, solar type (2)+(2) spectroscopic quadruple, visual binary; dark field. MSC system mass $2.4 M_{\odot}$. Discovered by W. Herschel (1780), first to have its orbit computed (Savary, 1830); components are astrometric (Aa,Ab, $P = 1.8$ y, orbit $r = 1.6$ AU) and spectroscopic (Ba,Bb, $P = 4.0$ d) binaries. Bright, nearly matched, never closer than $1.4''$, a beautiful system in all apertures, mildly challenging in small ones. AB: $P = 60$ y, orbit $r = 36$ AU, $e = 0.40$, apastron 2025. (1,625 measures; 2013)								0	2336	UMa
\star 54 nu	Σ 1524	A B D	11 18.5 +33 06	3.5, 10.1	149, 268	7.4", 4.7"	122	K3III	98262, 62486	1	2337	UMa
		Alula Borealis. Probable solar type 2+1 triple with K giant; dark field. AB: $ps = 1,220$ AU. (2005)								1	2337	UMa
Σ 1542			11 27.9 +44 34	6.9, 9.7	265	3.5"	89	F2V	99607, 43750	0	2338	UMa
57	Σ 1543	A B	11 29.1 +39 20	5.4, 10.7	355	5.4"	65	A2V	99787, 62572	1	2339	UMa
A W	O $\Sigma\Sigma$ 111	(AaAbAc) B	11 30.1 +29 58	7.0, 9.5	33	67"	69	A9n	99946, 62579	0	2340	UMa
		A type (2+1)+1 spectroscopic quadruple, visual binary; Aa,Ab is a W UMa type (contact) eclipsing variable ($P = 0.4$ d), situated between two identical stars in dark field. MSC system mass $3.7 M_{\odot}$. Aa,Ac: $P = 17$ y, $e = 0.46$. (2006)								0	2340	UMa
O Σ 234		(AaAb) B	11 30.8 +41 17	7.5, 8.1	175	0.5"	75	F6V	100018, 43789	1	2341	UMa
		Solar type (2)+1 spectroscopic triple; dark field. AB: $P = 87$ y, $e = 0.36$, slips below $0.4''$ in 2020 to periastron 2055. (256 measures; 2012)								1	2341	UMa
Σ 1546			11 32.3 +56 06	7.5, 10.3	347	11"	57	F8	100214, 28050	0	2342	UMa
O Σ 235		A B	11 32.3 +61 05	5.7, 7.6	32	0.8"	28.0	F8V	100203, 15542	1	2343	UMa
		Solar type binary. System mass $2.3 M_{\odot}$. AB: $P = 73$ y, orbit $r = 22$ AU, $e = 0.40$, apastron 2018. (333 measures; 2013)								1	2343	UMa
Σ 1553			11 36.6 +56 08	7.7, 8.2	166	6.2"	47.0	G5	100831, 28071	0	2344	UMa
Σ 1561		A (BaBb)	11 38.7 +45 07	6.5, 8.2	246	9.1"	23.3	G0V	101177, 43841	1	2345	UMa
		Local, high CPM, solar type 1+ (2) spectroscopic triple; m.9 C 3' f. is unrelated. AB: $ps = 290$ AU. Ba,Bb: $P = 23.5$ d. (2013)								1	2345	UMa
Σ 1559			11 38.8 +64 21	6.8, 8.0	324	2.0"	210	A5IV	101150, 15580	0	2346	UMa
Arg 101			11 51.2 +33 23	6.3, 9.3	273	46"	65	Am	102942, 62731	1	2347	UMa
\star 65	Σ 1579	(Aa1Aa2AbB) C (DaDb)	11 55.1 +46 29	6.7, 8.3, 7.0	42, 114	3.7", 63"	210	A3Vn	103483, 43945	0	2348	UMa
		Aa = DN UMa. Remarkable (2+1+1)+1+ (2) spectroscopic septuple, visual triple with Algol type variable ($P = 1.7$ d); sparkling in very dark field. MSC system mass $10.4 M_{\odot}$. Aa,Ab: $P = 640$ d. AB: $P = 118$ y, $e = 0.50$. AC: $ps = 1,050$ AU. AD: $ps = 17,800$ AU. (2007)								0	2348	UMa

★	OS 241	11 56.3 +35 27	6.8, 8.7	145	1.8"	176	F3V	103659, 62763	1	2349	UMa
	Σ 1600	Solar type double; delicate gem. n.f. of two equal stars in dark field. AB: ps = 430 AU. (2011)							1	2349	UMa
	Hu 1136	12 05.6 +51 56	7.6, 8.3	93	7.9"	370	G8III	105031, 28241	0	2350	UMa
	Σ 1603	12 05.7 +62 56	6.3, 10.2	217	1.9"	118	K1III	105043, 15710	1	2351	UMa
	Σ 1603	12 08.1 +55 28	7.8, 8.3	83	22"	49.1	F8V F9V	105421, 28253	0	2352	UMa
★	Σ 1695	(AaAb) B	12 56.3 +54 06	6.0, 7.8	280	3.8"	A5m	112486, 28572	1	2353	UMa
	78 β 1082	A type (2)+1 spectroscopic triple; dark field. MSC system mass 5.4 M _☉ . AB: ps = 450 AU. (2014)							1	2353	UMa
		13 00.7 +56 22	5.0, 7.9	108	1.0"	25.5	F2V	113139, 28601	0	2354	UMa
		Local solar type binary; dark field. A.B: P = 105 y, orbit r = 31 AU, e = 0.39, increasing θ , dips to 0.5" at periastron 2026. (2012)							0	2354	UMa
	OΣΣ 121	13 09.8 +62 14	6.5, 10.6	9	108"	230	A1V	114504, 15999	1	2355	UMa
★	79 zet, 80 Σ 1744	(AaAb) (BaBb) (CaCb)	13 23.9 +54 56	2.2, 3.9, 4.0	152, 70	26.3	A1V	116656, 28737	0	2356	UMa
		Mizar and Alcor. Nearby, A type (2)+(2)+(2) sextuple (second closest to the Sun), visual triple, comoving with a dozen stars that follow within 4 pc (the UMa star cluster, Collinder 285). Striking pure white trio, second closest sextuple to the Sun (after Castor), best viewed with low power. First double identified (Castelli, 1617), first double photographed (G. P. Bond, 1857), first double line spectroscopic binary (E. C. Pickering, 1889). Aa,Ab: P = 20.5 d; Ba,Bb: P = 175 d; Ca,Cb: ps = 28 AU; AB,C: ps = 25 500 AU. (473 measures; 2013) See Figure 2.							0	2356	UMa
	S 649	C [A B]	13 28.5 +59 57	5.5, [8.2, 9.9]	110, [108]	73	F8	117433, 16083	1	2357	UMa
	Σ 1770	13 37.7 +50 43	6.9, 8.2	126	1.8"	430	K3III	118741, 28819	0	2358	UMa
	β 802	13 48.6 +48 21	7.6, 11.8	224	3.7"	117	A8IV	120475, 44759	1	2359	UMa
	Σ 1831	A B	14 16.1 +56 43	7.2, 9.6	139	156	A7IV	125229, 29074	0	2360	UMa
		A type double; dark field, s.f. m. 7 C and m. 10 EF (optical pair Σ 1830) is unrelated. AB: ps = 1,180 AU. (2013)							0	2360	UMa
Ursa Minor											
UMi											
★	1 alp Σ 93	(AaAb) B	02 31.8 +89 16	2.0, 9.1	233	18"	F8Ib	8890, 308	1	2361	UMi
	β 799	Polaris. (2)+1 spectroscopic triple, visual binary with supergiant Cepheid variable. MSC has 6.1 M _☉ . Aa,Ab: P = 30 y, e = 0.61. (2013)							1	2361	UMi
	Skf 1229	A B C	13 04.8 +73 01	6.6, 8.5, 11.1	266, 17	120	A7IV	113889, 7741	0	2362	UMi
	Σ 1798	(AB) C	13 49.5 +75 34	7.7, 9.2	199	113	F0	121128, 7888	1	2363	UMi
	Σ 1798		13 55.0 +78 24	7.7, 9.7	11	125	F2	122189, 7912	0	2364	UMi
	Σ 1840	A B	14 19.9 +67 47	7.0, 10.1	222	143	B9V	126028, 16342	1	2365	UMi
	Σ 1915		14 33.3 +85 56	7.3, 9.7	318	180	K0	131616, 2433	0	2366	UMi
	Hu 908	A B	14 53.1 +78 11	6.8, 8.9	237	68	K0IV	132698, 8111	1	2367	UMi
★	Σ 1972	(AaAb) (BaBb)	15 29.2 +80 27	6.6, 7.3	79	21.9	G0IV	139777, 2556	0	2368	UMi
		Local, solar type (2)+(2) spectroscopic quadruple system; dark field; doubles θ' s.f. and 10"n. AB: ps = 920 AU. (2010)							0	2368	UMi
	18 pi 2 Σ 1989		15 39.6 +79 59	7.3, 8.2	23	120	F2V	141652, 2588	1	2369	UMi
	Σ 2034	Solar type binary; faint field. System mass 3.6 M _☉ . AB: P = 172 y, e = 0.96, closing to periastron 2076. (2011)							1	2369	UMi
	OΣΣ 143	(AaAb) B	15 48.7 +83 37	7.7, 8.0	108	380	A3	144463, 2625	0	2370	UMi
	Ku 1	A B	16 04.8 +70 16	6.9, 8.8	83	130	A0	145309, 8415	1	2371	UMi
			16 43.1 +77 31	6.1, 10.2	179	36.1	F5IV	152303, 8612	0	2372	UMi
	Vela										
	Jc 12		08 05.2 −45 25	8.4, 8.6	18	580	B7V	67269, 219390	1	2373	Vel
	HDS 1162		08 09.3 −51 01	7.6, 9.0	179	123	A0V	68276, 235778	0	2374	Vel
★	gam 1,2 Δ 65	(AaAb) (BaBb) C	08 09.5 −47 20	1.8, 4.1, 7.3	221, 152	340	WC8 B1IV	68273, 219504	1	2375	Vel
		Regor. Distant, high mass (2)+(2)+1 quintuple, likely member of Vela OB2 association; the primary (gam 2) is massive Wolf-Rayet+O7.5e binary, probably the nearest to the Sun. MSC gives 155 M _☉ for AB only. Aa,Ab: estimated orbit r = 1.2 AU. AB: ps = 18,300 AU. (2009)							1	2375	Vel

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGCOLOR	ID	Constellation
λ 96		(AaAb) B	08 12.5 −46 16	6.2, 7.7	275	0.6"	320	B5V	68895, 219602	0	2376	Vel
		High mass (2)+1 triple, visual binary; rich field. MSC system mass 15.8 M \odot . Aa,Ab: $P = 26$ y, $e = 0.61$. (2012)								0	2376	Vel
B	I 67		08 22.5 −48 29	5.1, 6.1	136	0.7"	530	B2III	70930, 219848	1	2377	Vel
h 4104		(AaAb) B	08 29.1 −47 56	5.5, 7.2	250	3.0"	650	B2IV	72108, 219885	0	2378	Vel
		High mass, distant (2)+1 triple, visual binary, rich field. MSC system mass 35.2 M \odot . Aa,Ab: $P = 340$ y, $e = 0.75$. (1999)								0	2378	Vel
Δ 70			08 29.5 −44 43	5.2, 7.0	349	4.3"	800	B2IV	72127, 219996	1	2379	Vel
I 313		A B	08 30.8 −41 31	6.8, 9.6	214	3.6"	184	K1III	72348, 220026	0	2380	Vel
h 4107		(AaAb) B C	08 31.4 −39 04	6.5, 8.2, 9.1	330, 99	4.3", 30"	460	B4V	72436, 199329	1	2381	Vel
Sir 8		Distant, high mass, probable (2)+1 spectroscopic quadruple; middle of three star row in mixed field. AC: $ps = 18,600$ AU. Neglected. (1999)								1	2381	Vel
			08 32.1 −53 13	6.1, 7.1	285	0.8"	230	K0III A3	72737, 236062	0	2382	Vel
I 195			08 34.5 −37 37	6.6, 8.9	42	1.9"	410	K5III	72993, 199389	1	2383	Vel
h 4119			08 37.2 −49 26	7.4, 9.7	226	10"	187	A2m	73609, 220195	0	2384	Vel
CorO 268		A B	08 38.4 −46 47	7.8, 9.4	255	14"	60*	B5V	73813, 220225	1	2385	Vel
CorO 74			08 40.3 −40 16	5.2, 9.1	66	4.1"	86	B9V	74067, 220252	0	2386	Vel
★ HY	BrO 18	A [B (CaCb) D]	08 42.4 −53 07	4.8, [5.6, 7.9, 9.9]	311, [153, 266]	76", [0.6", 60"]	149	B3IV B8	74560, 236205	1	2387	Vel
High mass 1+(1+2)+1 spectroscopic quintuple; set in quadrangle of m.8 stars in IC 2391. A is HY Vel, an ellipsoidal variable; B is KT Vel, an alp2 CVn type variable. MSC system mass 7.0 M \odot . AB: $ps = 15,300$ AU. Neglected. (1998)												
del	I 10	(AaAb) B F	08 44.7 −54 43	2.0, 5.6, 5.8	263, 99	0.4", 94'	24.7	A1Va+F8V	74956, 236232	0	2388	Vel
		Local. A type (2)+1 triple with Algol type variable, bound or comoving with F; faint rich field. MSC has 6.8 M \odot (AB only). AB: $P = 147$ y, orbit $r = 50$ AU, widening. AF (Shy 49): $ps = 136,000$ AU, near 100% probability pair is physical. (2013)								0	2388	Vel
Jc 13			08 46.6 −42 34	7.2, 9.2	311	2.2"	380	B3III	75126, 220439	1	2389	Vel
I 70			08 47.7 −38 56	7.1, 9.1	111	1.4"	230	B2V	75271, 199628	0	2390	Vel
CapO 9			08 52.7 −52 08	6.6, 8.2	83	2.9"	124	A0V	76230, 236362	1	2391	Vel
h 4150			08 53.9 −41 50	7.3, 10.0	265	18"	480*	B5V	76323, 220634	0	2392	Vel
H	R 87	(AaAb) B	08 56.3 −52 43	4.7, 7.7	335	2.6"	108	B5V	76805, 236417	1	2393	Vel
Gli 104			09 00.0 −49 33	7.1, 9.7	307	9.0"	720	K1II	77321, 220735	0	2394	Vel
h 4165			09 01.7 −52 11	5.6, 6.6	136	0.7"	113	B9	77653, 236518	1	2395	Vel
Rst 3620			09 04.5 −56 20	7.2, 9.6	132	0.7"	140*	B5V	78190, 236568	0	2396	Vel
h 4188		(AaAb) B	09 12.5 −43 37	6.0, 6.8	281	2.9"	210	B8V	79416, 220952	1	2397	Vel
h 4191			09 14.4 −43 14	5.3, 9.2	14	5.7"	188	B4V	79735, 220978	0	2398	Vel
★	I 11		09 15.2 −45 33	6.6, 7.7	293	0.8"	560	B8V	79900, 220998	1	2399	Vel
Distant, high mass double; in rich field with small group p. One of the challenging subarcsecond systems catalogued by R.T.A Innes. AB: $ps = 605$ AU. (2010)												
CorO 83			09 25.6 −53 15	7.0, 10.2	154	19"	46.7	F7V	81734, 236956	0	2400	Vel
Δ 77		(AaAb) (BaBb)	09 29.3 −44 32	7.1, 7.0	77	108"	42.2	F8V F8V	82241, 221213	1	2401	Vel
★ psi	Cop 1		09 30.7 −40 28	3.9, 5.1	112	1.0"	18.8	F0IV F3IV	82434, 221234	0	2402	Vel
Local F subgiant binary; set in sparse group. System mass 3.0 M \odot . AB: $P = 34$ y, orbit $r = 16$ AU, $e = 0.43$, apastron 2020. (2013)												
★	h 4220		09 33.7 −49 00	5.5, 6.2	217	1.6"	250	B5III	82984, 221288	1	2403	Vel
High mass double with B giant; rich faint field. AB: $ps = 540$ AU. Neglected. (1996)												
										1	2403	Vel

IM	R 125	09 36.4 –48 45	6.3, 10.3	188	71	A	83388, 221 339	0	2404	Vel
	λ 115	09 37.2 –53 40	6.1, 6.3	9	72	A3V	83520, 237 149	1	2405	Vel
	R 129	09 42.7 –55 50	7.9, 8.2	296	43.0	G5V G	84330, 237 248	0	2406	Vel
	Δ 80	09 45.1 –49 29	8.1, 8.2	250	24.9	F8 G2V	84612, 221 459	1	2407	Vel
		Local, solar type matched double; attractive field, several unidentified faint doubles s.f. AB: ps = 640 AU. (2012)								
	h 4245	09 46.1 –45 55	6.8, 9.6	217	310	G8II	84774, 221 480	0	2408	Vel
	CorO 92	09 50.2 –49 37	8.1, 9.2	24	96	F5V	85409, 221 531	1	2409	Vel
	Δ 81	09 54.3 –45 17	5.8, 8.2	240	310	B5V	85980, 221 592	0	2410	Vel
	h 4283	10 04.5 –51 48	7.3, 8.4	181	200	A0V	87580, 237 664	1	2411	Vel
	h 4284	10 05.1 –45 54	7.4, 9.5	66	210	K0III	87640, 221 758	0	2412	Vel
	I 173	10 06.2 –47 22	5.3, 7.1	7	74	K1IV G5V	87783, 221 773	1	2413	Vel
		Solar type binary; rich field. AB: P = 203 y, orbit r = 45 AU, widening. (2010)								
	I 361	10 12.9 –47 29	8.4, 11	125	39.8	G8V	88746, 221 866	0	2414	Vel
		Solar type double; CPM double CD (Dam 521) 30" p. appears unrelated. AB: ps = 300 AU. (2001)								
★	R 140	10 19.0 –56 01	7.5, 8.2	281	167	A4	89613, 237 907	1	2415	Vel
		A type double; n.f. of 3 m.8 stars in rich field with a possible small stellar group. AB: ps = 720 AU. Neglected. (1998)								
J	Rmk 13	10 20.9 –56 03	4.5, 7.2, 9.2	102, 191	350	B3IIle	89890, 237 969	0	2416	Vel
	Δ 86	10 31.2 –42 14	7.3, 8.0	292	182	A	91239, 222 113	1	2417	Vel
	CapO 10	10 31.9 –52 14	7.4, 9.2	346	270	B5V	91370, 238 152	0	2418	Vel
	Pz 3	10 32.0 –45 04	5.6, 6.0	219	167	B8	91355, 222 126	1	2419	Vel
	h 4330	10 32.9 –47 00	5.2, 8.6	163	400	K4III	91504, 222 136	0	2420	Vel
	H1d 106	10 33.3 –55 23	6.8, [7.8, 8.1]	30, [253]	280	A1V	300791, 238 177	1	2421	Vel
	h 4332	10 33.5 –46 59	7.1, 9.8	162	430	A	91590, 222 145	0	2422	Vel
	Δ 95	10 39.3 –55 36	4.4, [6.1, 11.9]	105, [174]	260	G3Ib	92449, 238 309	1	2423	Vel
★ mu	R 155	10 46.8 –49 25	2.8, 5.7	56	35.9	G5III G2V	93497, 222 321	0	2424	Vel
		Probable high mass binary with G giant; a "count the pairs" rich field. AB: P = 149y, orbit r = 85 AU, widening. (2013)								
	Virgo						Charts 16, 17			
	Σ 1560	11 38.4 –02 26	6.4, 9.4	280	117	G9III	101154, 138 314	1	2425	Vir
	Σ 1575	11 52.0 +08 50	7.4, 7.9	212	97	K0	103047, 119 084	0	2426	Vir
	Shy 588	12 02.7 –10 43	8.6, 7.5	115	55	G3V	104576, 157 055	1	2427	Vir
	Σ 1616	12 14.5 +08 47	7.6, 9.7	296	55	G0	106423, 119 282	0	2428	Vir
	h 204	12 15.0 –01 20	7.6, 11.8	56	230	K0	106498, 138 670	1	2429	Vir
	Σ 1627	12 18.2 –03 57	6.6, 6.9	197	87	F2V F3V	106976, 138 704	0	2430	Vir
17	Σ 1636	12 22.5 +05 18	6.5, 9.3	337	29.9	F8V	107705, 119 360	1	2431	Vir
	Σ 1648	12 30.6 +03 30	7.5, 9.8	40	340	G8III	108877, 108 877	0	2432	Vir
	Σ 1647	12 30.6 +09 43	8.1, 8.4	248	93	F2	108875, 119 436	1	2433	Vir
		Solar type binary; dark field. AB: P = 4273 y, orbit r = 400 AU. (274 measures; 2012)								
	Sh 146	12 31.2 +01 20	7.7, 8.7, 12.0	290, 338	153	A5	108959, 119 447	0	2434	Vir
	Σ 1649	12 31.6 –11 04	8.0, 8.4	196	88	A7	91169, 157 339	1	2435	Vir
	Σ 1668	12 40.9 +08 50	7.8, 8.1	187	121	F5V	110280, 119 530	0	2436	Vir

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
★ 29 gam	Σ 1670	A B	12 41.7 -01 27	3.5, 3.5	7	2.0"	11.7	F0V F0V	110379, 138917	1	2437	Vir
Porrima. Local, high CPM, perfectly matched solar type binary; Y/Y color. System mass 2.8 M _☉ . Discovered by J. Bradley (1718), the separation is less than 0.4" at periastron, but now is an easy split in all apertures, and widening. A summer favorite. AB: P = 169 y, orbit r = 43 AU, e = 0.88; apastron 2090. (1,558 measures; 2013) See Figure 1.												
31	β 924		12 42.0 +06 48	5.6, 10.1	40	3.8"	72	A2V	110423, 119538	0	2438	Vir
	Σ 1677		12 45.3 -03 53	7.3, 8.1	347	16"	260	A9IV	110886, 138952	1	2439	Vir
	Σ 1690		12 56.3 -04 52	7.2, 9.0	148	5.8"	147	A0V	112372, 139049	0	2440	Vir
	QΣ 256		12 56.4 -00 57	7.3, 7.6	101	1.1"	370	F7V	112398, 139053	1	2441	Vir
Distant, solar type double; near center of 1/2° m.8 quadrangle. AB: ps = 550 AU. (225 measures; 2013)												
	Σ 1701		12 59.3 +06 30	7.6, 9.9	306	21"	95	G8IV	112815, 119696	0	2442	Vir
	β 341		13 03.8 -20 35	6.3, 6.5	132	0.6"	28.2	F8V	113415, 181357	1	2443	Vir
Solar type binary; system mass 2.0 M _☉ . AB: P = 59 y, orbit r = 21 AU, e = 0.99, closing to periastron 2023, reappearing 2037. (2010)												
48	β 929		13 03.9 -03 40	7.1, 7.7	198	0.6"	155	F0V	113459, 139131	0	2444	Vir
Solar type binary; sparse field. AB: P = 438 y, orbit r = 120 AU, e = 0.0, disappears below 0.4" in 2029. (2007)												
	Σ 1719	A B	13 07.3 +00 35	7.6, 8.2	358	7.4"	65	F5V F9V	113984, 119774	1	2445	Vir
★ 51 the	Σ 1724	(AaAb) B C	13 10.0 -05 32	4.4, 9.4, 10.4	342, 300	6.4", 71"	97	A0IV	114330, 139189	0	2446	Vir
A type (2)+1+1 quadruple; sparse field. MSC system mass 5.5 M _☉ . AC: ps = 840 AU. (2012)												
GZ	Σ 1731	(AaAb) B	13 13.2 -02 33	7.7, 10.1	303	9.4"	55	F8	114842, 139227	1	2447	Vir
★ 54	Sh 161	(AaAb) (BaBb)	13 13.4 -18 50	6.8, 7.2	33	5.3"	194	A0V A1V	114846, 157798	0	2448	Vir
A type (2)+(2) spectroscopic quadruple; A is a W UMa type contact binary (P = 1.0 d); sparse or dark field. AB: ps = 1,390 AU. (2010)												
	Hu 740		13 19.7 -11 40	7.3, 11.4	274	3.6"	250	A2	115813, 157860	1	2449	Vir
	Σ 1734		13 20.7 +02 57	6.8, 7.3	174	1.1"	136	A3V	115995, 119889	0	2450	Vir
A type double; pretty in a dark field. AB: ps = 200 AU. (204 measures; 2013)												
★	Σ 1740		13 23.7 +02 43	7.1, 7.4	74	26"	15.5	G5V G5V	116442, 119909	1	2451	Vir
Local, solar type matched double; dark field, attractive in all apertures. AB: ps = 540 AU. (2011)												
	β 610		13 24.0 -20 55	6.6, 10.1	17	4.2"	156	G8III	116429, 181615	0	2452	Vir
	Σ 1742		13 24.3 +01 24	7.8, 8.2	356	0.9"	110	A2	116542, 119913	1	2453	Vir
	Sh 165		13 32.4 -12 40	7.6, 8.6	78	48"	142	F3II	117733, 157992	0	2454	Vir
	Σ 1757	A B	13 34.3 -00 19	7.8, 8.8	135	1.8"	26.6	K4III	118036, 139416	1	2455	Vir
Solar type binary with K giant; two stars f. are unrelated. AB: P = 461 y, orbit r = 73 AU, increasing θ . (385 measures; 2011)												
	β 114		13 34.3 -08 37	8.1, 8.2	166	1.3"	49.2	F8V	118024, 139415	0	2456	Vir
	β 932	A B	13 34.7 -13 13	6.3, 7.3	62	0.4"	148	A0V	118054, 158021	1	2457	Vir
A type binary; optical pair S 650 (m.8, 56") 15' s. in dark field. System mass 7.0 M _☉ . AB: P = 178 y, orbit r = 80 AU, widening. (2009)												
	h 228		13 35.6 +10 12	6.6, 9.0	15	70"	120	K0	118266, 100630	0	2458	Vir
81	Σ 1763	A B	13 37.6 -07 52	7.8, 8.1	39	2.7"	196	K0III	118511, 139447	1	2459	Vir
	Σ 1764	A B	13 37.7 +02 23	6.8, 8.6	6	16"	630	K2III	118578, 120042	0	2460	Vir
84	Σ 1777		13 43.1 +03 32	5.6, 8.3	226	2.7"	73	K1III	119425, 120082	1	2461	Vir
	Σ 1775	A B	13 43.5 -04 16	7.2, 10.1	336	28"	320	K2III F7V	119461, 139507	0	2462	Vir
86	β 935	A B [C D]	13 45.9 -12 26	5.7, 8.5, [11.9, 13.1]	306, 163, [272]	1.2", 27", [2.4"]	125	G8III	119853, 158152	1	2463	Vir

HT	Σ 1781	(AaAb) (BaBb)	13 46.1 +05 07	7.9, 8.1	193	1.0"	46.4	F8V F0	119931, 120102	0	2464	Vir
		Solar type (2)+(2) spectroscopic quadruple, visual binary with W UMa type eclipsing binary, dark field. MSC system mass 3.7 M _☉ . AB: P = 262 y, orbit r = 45 AU, e = 0.64, apastron 2106. (290 measures; 2013)								0	2464	Vir
	LDS 3101		13 47.0 +06 21	6.4, 10.2	106	8.1'	31.7	G1IV	120066, 120108	1	2465	Vir
		High CPM, solar type doublet, sparse field. AB: ps = 20800 AU; near 100% probability pair is physical. (2003)								1	2465	Vir
★	Σ 1788	A B	13 55.0 −08 04	6.7, 7.3	100	3.6"	33.1	F8V G0	121325, 139618	0	2466	Vir
		Solar type double; a replica Castor, twice as far as the original. AB: ps = 160 AU. (239 measures; 2012)								0	2466	Vir
	Σ 1802		14 08.1 −12 56	8.1, 9.0	276	6.0"	63	K0V	123453, 158372	1	2467	Vir
★	Σ 1819	A B	14 15.3 +03 08	7.7, 7.9	172	0.9"	40.6	G0V	124757, 120370	0	2468	Vir
		Solar type binary; dark field. System mass 2.0 M _☉ . AB: P = 224 y, orbit r = 45 AU, e = 0.20, decreasing ι . (489 measures; 2013)								0	2468	Vir
	Hid 18	A B	14 19.4 −18 31	7.4, 10.7	356	3.2"	127	A3m F2	125379, 158495	1	2469	Vir
	Σ 1833	A B C	14 22.6 −07 46	7.5, 7.5, 12.9	175, 198	5.8", 98"	39.4	G0V G0V	125906, 139897	0	2470	Vir
105 phi	Σ 1846	A B	14 28.2 −02 14	4.9, 10.0	112	5.3"	36.3	G2III	126868, 139951	1	2471	Vir
	Skf 911		14 29.8 +00 50	6.0, 9.3	331	2.3'	79	A5IV F8	127167, 120499	0	2472	Vir
	Σ 1852		14 30.0 −04 15	7.1, 10.6	267	25"	57	F2V	127168, 139969	1	2473	Vir
	β 1443		14 30.8 +04 46	6.2, 10.6	195	55"	210	gK4	127337, 120504	0	2474	Vir
	A 1109	A B	14 42.8 +06 35	7.4, 9.4	85	1.8"	920	F8	129517, 120616	1	2475	Vir
	Σ 1881		14 47.1 +00 58	6.7, 8.8	0	3.4"	133	B9.5V	130256, 120657	0	2476	Vir
	Σ 1883		14 48.9 +05 57	7.0, 9.0	278	1.0"	56	F6V	130604, 120673	1	2477	Vir
		Solar type binary; dark field. System mass 2.1 M _☉ . AB: P = 216 y, orbit r = 45 AU, e = 0.61, widening to apastron 2073. (339 measures; 2013)								1	2477	Vir
1	H VI 51	A B	14 57.6 −00 10	5.6, 10.4	224	86"	114	K1III	132132, 120758	0	2478	Vir
	β 348		15 01.8 −00 08	6.1, 7.5	108	0.5"	40.5	M0.5II	132933, 120798	1	2479	Vir
	Σ 1904		15 04.1 +05 30	7.2, 7.4	348	10"	76	F0V	133408, 120822	0	2480	Vir
	β 349		15 09.0 +01 41	7.6, 10.9	35	3.0"	89	F1V	134285, 120863	1	2481	Vir
		Volans							Chart 30			
★	gam 1,2 Δ 42	A (BaBb)	07 08.7 −70 30	3.9, 5.4	296	14"	42.9	K0III F2V	55865, 256374	0	2482	Vol
		Possible high mass 1+(2) spectroscopic triple with K giant; faint field. AB: ps = 810 AU. (2002)								0	2482	Vol
	h 3997		07 35.4 −74 17	7.0, 7.1	306	1.9"	360	B9IV B9IV	62153, 256428	1	2483	Vol
zet	Δ 57		07 41.8 −72 36	4.1, 9.3	123	16"	43.2	K0III	63295, 256438	0	2484	Vol
★	eps Rmk 7	(AaAb) B	08 07.9 −68 37	4.4, 7.3	23	6.0"	172	B6IV	68520, 250128	1	2485	Vol
		High mass (2)+1 spectroscopic triple; rich field. MSC system mass 11.9 M _☉ . AB: ps = 1390. (2010)								1	2485	Vol
	l 9		08 14.7 −73 48	7.3, 7.5	103	0.8"	106	A8III	70270, 256489	0	2486	Vol
kap 1,2	BrsO 17	A B C	08 19.8 −71 31	5.3, 5.6, 7.7	60, 50	64", 100"	133	B9III	71046, 256497	1	2487	Vol
	Hrg 19		08 48.4 −65 26	7.3, 10.0	181	4.4"	159	K0III	75795, 250332	0	2488	Vol
	h 4164		08 57.4 −66 12	7.7, 9.5	145	11"	112	K0III	77187, 250396	1	2489	Vol
		Vulpecula							Chart 11			
	Σ 2445	A B	19 04.6 +23 20	7.3, 8.6	262	12"	480	B2Ve	177648, 86774	0	2490	Vul
	Σ 2457		19 07.1 +22 35	7.5, 9.5	200	10"	95	A7IV	178277, 86628	1	2491	Vul
2	β 248	A B	19 17.7 +23 02	5.4, 8.8	128	1.7"	370	B0.5IV	180968, 87036	0	2492	Vul
	Σ 2525	A B	19 26.6 +27 19	8.2, 8.4	289	2.2"	65	F8	183032, 87213	1	2493	Vul
		Solar type binary; faint rich field. AB: P = 850 y, orbit r = 115 AU. (478 measures; 2013)								1	2493	Vul

Label	Catalog ID	Components	Coordinates (J2000)	Mag.	θ	ρ	Dist.	Spectral type	HD, SAO No.	BGColor	ID	Constellation
13	Σ 2523	A B	19 26.8 +21 10	8.0, 8.1	148	6.3''	850*	B3V B7V	183014, 87218	0	2494	Vul
	Σ 2540	A B	19 33.3 +20 25	7.5, 9.2	146	5.1''	153	A3	184360, 87342	1	2495	Vul
	Σ I 48	A (BaBb)	19 53.4 +20 20	7.1, 7.3	147	42''	146	A0	188211, 87874	0	2496	Vul
	DJu 4		19 53.5 +24 05	4.6, 7.4	245	1.4''	103	B9.5III	188260, 87883	1	2497	Vul
	\star 16 O Σ 395		20 02.0 +24 56	5.8, 6.2	126	0.8''	68	F2III	190004, 88098	0	2498	Vul
		Binary with F giant; faint rich field, n.f. of two stars. AB; $P = 1,201$ y, orbit $r = 185$ A.U. (355 measures; 2013)										
	Σ 2653		20 13.7 +24 14	6.7, 9.2	274	2.8''	91	A1m	192342, 88377	1	2499	Vul
	Σ 2769	A B	21 10.5 +22 27	6.7, 7.4	299	18''	240	A1V	201671, 89505	0	2500	Vul

Appendix B: Double star formulas

Basic quantity	Definition
π	<i>Geometric parallax (arcseconds)</i>
m	<i>Apparent magnitude</i>
M	<i>Absolute magnitude</i>
ρ	<i>Angular separation (arcseconds)</i>
D	<i>Telescope aperture (mm)</i>
f_o	<i>Telescope focal length (mm)</i>
f_e	<i>Eyepiece focal length (mm)</i>
NELM	<i>Naked eye limit magnitude</i>
AFOV	<i>Eyepiece apparent field of view (degrees)</i>

Symbol	Formula	Calculated quantity (units)
Star systems		
d	$= 1/\pi$	System distance (parsecs)
d	$(= 10^{((m - M)/5)+1})$	(Photometric distance, from m and M , in parsecs)
ps	$= \rho \cdot d$	Projected separation (AU)
ps	$(= d \cdot 10^{(\log(\rho)+0.13)})$	(Projected separation in AU, with Couteau correction for foreshortening)
p	$= \sqrt{r^3/(M_1+M_2)}$	Period, for stars of masses M_1 and M_2 (in solar units) (years)
e	$= \sqrt{1 - b^2/a^2}$	Orbital eccentricity (a is semi-major axis, b is semi-minor axis)
r_p	$= r(1 - e)$	Periastron distance (AU)
r_a	$= r(1 + e)$	Apastron distance (AU)
Δm	$= m_2 - m_1$	Magnitude difference (m_2 is magnitude of the fainter star)
b_1/b_2	$= 2.512^{\Delta m}$	Brightness ratio of two magnitudes (b_2 is brightness of the fainter star)
q	$= 10^{-[\Delta m/10]}$	Mass ratio (main sequence stars only)
M	$= m - 5(\log(d)-1)$	Absolute magnitude (from d and m)
Telescope optics		
N	$= f_o/D$	Telescope relative aperture (focal ratio)
R_o	$= 113/D$	Abbe resolution limit (arcseconds)
R_s	$= 108/D$	Sparrow resolution criterion ($0.95R_o$ arcseconds)
R_D	$= 116/D$	Dawes resolution criterion ($1.08R_o$ arcseconds)
R_R	$= 138/D$	Rayleigh resolution criterion ($1.22R_o$ arcseconds)
m_L	$= \text{NELM}+5\log(D)-4$	Magnitude limit (for averted vision; varies with observer and quality of telescope)
M	$= f_o/f_e$	Object magnification
d_e	$= f_e/N$	Exit pupil
TFOV	$= \text{AFOV} \cdot 60/M$	True field of view (arc minutes)

Appendix C: Double star orbits

This table illustrates the wide range in double star orbits, conventionally described using the orbital period in log days. It assumes two solar mass stars ($2P^2 = r^3$), and values of period and radius have been rounded for clarity.

Period (log d)	Period (days/years)	Orbital radius (AU)	Percent of WDS stars	Label or description
10^{-1}	<u>0.23</u> /0.0006	0.009	.	CONTACT
10^0	<u>1.02</u> /0.0028	0.025	.	
10^1	<u>8.2</u> /0.022	0.10	.	INTERACTING
10^2	<u>91</u> /0.25	0.50	0.1	(Mercury orbit $r = \sim 0.4$ AU)
10^3	2.8	2.5	1.1	CLOSE (Asteroid belt $r = \sim 3$ AU)
10^4	22	10	7.4	(Saturn orbit $r = \sim 10$ AU)
10^5	250	50	21.9	MEDIAN (Limit of Kuiper belt $r = \sim 50$ AU)
10^6	2,800	250	25.6	(Heliosphere $r = \sim 120$ AU)
10^7	22,000	1,000	26.1	WIDE
10^8	250,000	5,000	14.0	(limit of permanent orbits?)
10^9	2,800,000	25,000	3.7	FRAGILE (likely impermanent)
10^{10}	.	100,000	.	(comoving CPM pairs?)

Appendix D: Double star catalogs

In the 1960s the Aitken Double Star Catalog (ADS) was merged with southern hemisphere catalogs to form a single resource (the Index Catalog of Double Stars, IDS), parent database of the Washington Double Star Catalog (WDS). At that time, many nineteenth century catalog abbreviations were shortened and the use of Greek letter sigla was discontinued, but the numbering of systems within a catalog remained the same (for example, Σ

274 became STF 274). All modern publications now use these standard abbreviations. This table includes the old and modern abbreviations for selected catalogs, the name of the astronomer or observatory, the approximate period of double star discoveries, the number of pairs credited in the WDS (including optical and “lost” systems), and the number of systems in the target list and Atlas charts.

Catalog ID		Observer	Active period	No. pairs in WDS (in this Atlas)
Obsolete	Modern			
H I to VI, H N	H 1 to 6, H N	W. Herschel	1777–1821	269 (42)
Σ	STF	F. Wilhelm von Struve	1814–1843	4,294 (864)
Σ I, Σ II	STFA, STFB	(Supplemental catalogs)		114 (29)
H	HJ	J. Herschel	1820–1837	5924 (294)
Sh	SHJ	J. South and J. Herschel	1821–1840	118 (32)
S	S	J. South	1822–1825	220 (37)
Rmk	RMK	C. Rumker	1825–1837	24 (16)
Δ	DUN	J. Dunlop	1825–1846	200 (77)
Lal	LAL	J.-J. de Lalande	1825–1877	5 (4)
$O\Sigma$	STT	O. von Struve	1832–1878	754 (191)
$O\Sigma\Sigma$	STTA	(Supplemental catalog)		232 (37)
BrsO	BSO	Brisbane Observatory (AUS)	1834–1851	29 (14)
Jc	JC	W. S. Jacob	1836–1879	38 (12)
Dawes	DA	W. Dawes	1841–1858	7 (3)
Gli	GLI	J. M. Gilliss	1850–1852	108 (12)
Knott	KNT	G. Knott	c. 1865	7 (1)
Hd	HDO	Harvard Observatory (USA)	1866–1911	291 (11)
Stone	STN	O. Stone	1867–1882	59 (9)
R	R	H. C. Russell	1870–1882	138 (27)
β	BU	S. Burnham	1870–1911	2669 (231)
β pm	BUP	(Proper motion pairs)		372 (2)
Ho	HO	G. W. Hough	1873–1897	791 (23)
MlbO	MLO	Melbourne Observatory (AUS)	1873–1898	98 (6)
Howe	HWE	H. A. Howe	1875–1879	111 (21)
CapO	CPO	Cape Observatory (ZAF)	1880–1910	68 (14)
Es	ES	Rev. T. E. Espin	1882–1931	3,164 (7)
CorO	COO	Cordoba Observatory (ESP)	1883–1920	305 (29)
J	J	R. Jonckheere	1885–1945	3,223 (1)

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(cont.)

Catalog ID		Observer	Active period	No. pairs in WDS (in this Atlas)
Obsolete	Modern			
Slr	SLR	R. P. Sellors	1890–1896	26 (11)
–	A	R. Aitken	1891–1926	3,489 (17)
–	I	R. T. A. Innes	1891–1927	1,666 (94)
λ	SEE	T. J. J. See	1892–1897	464 (15)
Hu	HU	W. J. Hussey	1892–1914	1,671 (19)
δ	DAW	B. H. Dawson	1904–1924	225 (3)
–	B	W. van den Bos	1903–1935	3,101 (8)
–	LDS	W. J. Luyten (<i>includes PM catalog</i>)	1914–1987	5,963 (16)
Rst	RST	R. A. Rossiter	1920–1946	5,575 (7)
φ	FIN	F. W. Finsen	1920–1961	441 (2)
Cou	COU	P. Couteau	1957–1991	2705 (4)
Mr	MLR	P. Muller	1966–1989	702 (1)
–	TOK	A. Tokovinin	1979–	417 (7)
–	HDS	<i>Hipparcos Catalog</i>	c.1991	3,383 (7)
–	TDS, TDT	<i>Tycho Catalog</i>	c.1991	14,187 (1)
–	BVD	R. Benavides	1994–	341 (10)
–	CBL	R. Caballero	1997–	548 (10)
–	SKF	B. A. Skiff	2000–	1,991 (35)
–	SHY	E. Shaya and R. Olling	2011	226 (20)
–	UC	<i>USNO Astrographic Catalog</i>	2013	5,228 (8)

Appendix E: The Greek alphabet

Symbol	Name	Abbreviation
α	Alpha	alp (alf)
β	Beta	bet
γ	Gamma	gam
δ or Δ	Delta	del
ε	Epsilon	eps
ζ	Zeta	zet
η	Eta	eta
θ	Theta	the (tet)
ι	Iota	iot
κ	Kappa	kap
λ	Lambda	lam
μ	Mu	mu
ν	Nu	nu
ξ	Xi	xi (ksi)
\omicron or O	Omicron	omi
π	Pi	pi
ρ	Rho	rho
σ or Σ	Sigma	sig
τ	Tau	tau
υ	Upsilon	ups
φ or ϕ	Phi	phi
χ	Chi	chi
ψ	Psi	psi
ω	Omega	ome

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