

Doubles & Variables

Visual Observer's Guide

30 famous doubles · 22 variable stars worth watching tonight
Targets that work in any sky — light pollution doesn't matter for these.

Why doubles and variables?

These are the targets that don't care about your sky. Doubles split cleanly under city light pollution where galaxies and nebulae have already disappeared. Variable stars are bright enough to follow with the naked eye or modest binoculars, even from suburban backyards. If your skies won't cooperate for deep-sky imaging, this is what you do tonight.

Doubles are the better visual showpieces — color contrasts (Albireo's gold and blue, Almach's gold and sapphire), tightness challenges that test optics and seeing (the Double Double, Castor at 5.6"), and slow orbital motion you can track over decades (Porrina, ξ Boo). They work in any aperture from binoculars to large dobsonians.

Variables are the targets where you participate in real science. Recording brightness estimates compared to nearby reference stars contributes to AAVSO databases that astronomers actually use. You're watching stellar physics happen — pulsations, eclipses, eruptions. The most exciting variable right now is **T Coronae Borealis**, expected to erupt as a naked-eye 'new star' any month — see its entry below.

DOUBLE STARS

Visual showpieces — color, tightness, and orbital motion

31 curated doubles · split-difficulty varies from naked-eye to challenge-class

Double stars come in three flavors: **optical doubles** (line-of-sight coincidence — Mizar/Alcor, Albireo); **visual binaries** (gravitationally bound, slow orbit visible over decades — Porrima, Castor); and **spectroscopic binaries** (revealed only by spectroscopy, often hidden inside the visual components). The catalog below leans toward the most rewarding visual targets — color contrasts, tightness challenges, and historical favorites. Listed by season for evening observation. Aperture recommendations assume moderate conditions; tighter splits often need very steady seeing more than larger optics.

Mizar / Alcor · Horse and Rider

SPRING

Ursa Major · 13h 24m +54° 56' · mag 2.27 + 4.0 · sep 11.8" · PA 71°

Colors white + white

How to split Naked eye for the pair, any binoculars resolve. Mizar itself is a true binary (14.4" sep) — telescope reveals.

Notes The most famous naked-eye double — used as a vision test by ancient civilizations. The wide pair is line-of-sight; Mizar A and B are gravitationally bound.

ε UMa region — Mizar · Mizar telescopic pair

SPRING

Ursa Major · 13h 24m +54° 56' · mag 2.3 + 4.0 · sep 14.4" · PA 153°

Colors white + white

How to split Any small telescope splits Mizar A/B easily.

Notes First true binary identified telescopically (1650). Both components are themselves spectroscopic binaries — Mizar is a sextuple system.

Algieba (γ Leo)

SPRING

Leo · 10h 20m +19° 50' · mag 2.4 + 3.6 · sep 4.7" · PA 126°

Colors gold + gold

How to split Tight gold pair; needs 4-inch scope at moderate magnification (~120x) to split cleanly.

Notes Beautiful matched gold pair — both components are evolved K-class giants. One of the prettiest tight matched-color doubles.

Cor Caroli (α CVn) · Heart of Charles

SPRING

Canes Venatici · 12h 56m +38° 19' · mag 2.9 + 5.5 · sep 19.4" · PA 229°

Colors white + pale yellow

How to split Easy split in any small telescope.

Notes Named in honor of Charles I of England by Edmond Halley. Wide pair good for first-time double observers.

Porrima (γ Vir)

SPRING

Virgo · 12h 42m -1° 27' · mag 3.5 + 3.5 · sep 3.5" · PA 5°

Colors yellow + yellow

How to split Currently widening; needs 4-inch+ at high power to split. Was nearly closed (0.4") in 2005.

Notes Famous binary with 169-year orbit. Watching the separation change over years is a classic project. Will be at maximum separation (~6") around 2080.

Izar (ϵ Boo) · Pulcherrima

SPRING

Bootes · 14h 45m +27° 04' · mag 2.7 + 5.1 · sep 2.9" · PA 343°

Colors yellow-orange + blue**How to split** Tight; needs 4-inch+ at 150x and steady seeing.**Notes** Stunning color contrast pair — Friedrich Struve nicknamed it 'Pulcherrima' (Latin for 'most beautiful'). One of the great visual showcase doubles. **ξ Boo**

SPRING

Bootes · 14h 51m +19° 06' · mag 4.7 + 7.0 · sep 4.9" · PA 296°

Colors yellow + orange**How to split** Splits easily in 4-inch.**Notes** Nearby system at 22 light-years; orbit is 152 years. Slow visible orbital motion over a lifetime.**Albireo (β Cyg)**

SUMMER

Cygnus · 19h 31m +27° 58' · mag 3.1 + 5.1 · sep 35.0" · PA 54°

Colors deep gold + sapphire blue**How to split** Easy in any binoculars. The most famous color-contrast double in the sky.**Notes** Probably an optical pair, not gravitationally bound — but the color contrast is unforgettable. Universally recommended as the first double a beginner sees.**Double Double (ϵ Lyr) · Epsilon Lyrae**

SUMMER

Lyra · 18h 44m +39° 40' · mag 5.0 + 5.2 · sep 208" wide / 2.6" + 2.3" close

Colors all white**How to split** Binoculars split the wide pair (208"); 4-inch at high power resolves each into a tight double.**Notes** Famous quadruple system — 'double-double'. Each wide component is itself a tight binary. Test of optics + seeing. **ζ Lyr**

SUMMER

Lyra · 18h 45m +37° 36' · mag 4.4 + 5.7 · sep 44" · PA 150°

Colors white + yellow**How to split** Easy binocular split.**Notes** In the same low-power eyepiece field as the Double Double — easy stop while exploring Lyra. **β Sco (Acrab) · Graffias**

SUMMER

Scorpius · 16h 05m -19° 48' · mag 2.6 + 4.9 · sep 13.7" · PA 21°

Colors white + white**How to split** Easy in small scope; low altitude from Canada.**Notes** Bright wide pair near the head of Scorpius. The brighter component is itself a spectroscopic binary. **ν Sco · Jabbah**

SUMMER

Scorpius · 16h 12m -19° 28' · mag 4.0 + 6.3 · sep 41" wide / 1.3" close

Colors white + white**How to split** Wide pair easy in binoculars; close pair needs 6-inch+ at high power.**Notes** Another double-double system. Splitting the close 1.3" pair is a serious optical test.

Rasalgethi (α Her)

SUMMER

Hercules · 17h 14m +14° 23' · mag 3.5 + 5.4 · sep 4.7" · PA 104°

Colors deep orange + green-blue**How to split** Tight; 4-inch at 120x shows the contrast.**Notes** Stunning color contrast — orange supergiant with bluish companion. The orange star is a slow variable (3.0–4.0 mag, semi-regular). **ν Dra · Kuma**SUMMER
(CIRCUMPOLAR)

Draco · 17h 32m +55° 11' · mag 4.9 + 4.9 · sep 62" · PA 312°

Colors white + white**How to split** Easy naked-eye double in dark skies; binoculars confirm.**Notes** Wide matched pair forming Draco's eye. One of the easiest naked-eye doubles. **ω 1/ ω 2 Sco**

SUMMER

Scorpius · 16h 07m -20° 41' · mag 3.9 + 4.3 · sep 240"

Colors blue + blue**How to split** Naked eye in dark skies.**Notes** Naked-eye optical double near the head of Scorpius. **π Aql**

SUMMER

Aquila · 19h 49m +11° 49' · mag 6.1 + 6.9 · sep 1.4" · PA 110°

Colors white + white**How to split** Tight; 8-inch+ at high power.**Notes** Challenge double for tightness; near Altair in the same wide field. **ζ Cnc · Tegmine**

SPRING

Cancer · 8h 12m +17° 39' · mag 5.0 + 6.0 · sep 5.7" + 1.0"

Colors yellow + yellow**How to split** Wide pair easy in 4-inch; the 1.0" close component needs 8-inch+ in steady seeing.**Notes** Triple system — visible motion in the inner orbit over decades. Classic challenge.**Almach (γ And)**

FALL

Andromeda · 2h 04m +42° 20' · mag 2.3 + 4.8 · sep 9.6" · PA 64°

Colors deep gold + blue**How to split** Easy split in any 3-inch+; one of the prettiest doubles in the sky.**Notes** Stunning color-contrast pair, often called the 'fall Albireo'. The blue companion is itself a tight triple — total 4 stars in the system.**61 Cygni · Bessel's Star**

SUMMER/FALL

Cygnus · 21h 07m +38° 45' · mag 5.2 + 6.0 · sep 31.5" · PA 152°

Colors orange + orange**How to split** Easy in any binoculars.**Notes** Famously close at 11.4 ly — Bessel measured its parallax in 1838, the first stellar distance ever measured. High proper motion ('Bessel's Star').

γ Ari (Mesarthim)

FALL

Aries · 1h 53m +19° 18' · mag 4.5 + 4.6 · sep 7.5" · PA 1°

Colors white + white**How to split** Easy in any small scope.**Notes** First double star ever discovered (Robert Hooke, 1664). Wide white-white pair — almost identical magnitudes.**Polaris (α UMi) · North Star**YEAR-ROUND
(CIRCUMPOLAR)

Ursa Minor · 2h 32m +89° 16' · mag 2.0 + 9.0 · sep 18.4" · PA 232°

Colors white + faint**How to split** Easy split with 3-inch+ scope at 100x.**Notes** Always visible. The companion is a faint mag-9 star — easy to find but the brightness contrast makes it a good optical-quality test. **ψ^1 Aurigae**

WINTER/FALL

Auriga · 5h 12m +47° 57' · mag 4.9 + 8.0 · sep 32" · PA 75°

Colors orange + blue**How to split** Easy in 4-inch.**Notes** Wide unequal-magnitude pair; orange supergiant primary.**Trapezium (θ^1 Ori) · M42 core**

WINTER

Orion · 5h 35m -5° 23' · mag 6.7 + 7.9 · sep 8.8" + 12.7" + 21.5"

Colors all white-blue**How to split** Four stars (A, B, C, D) splittable in 3-inch+; E and F components in 8-inch.**Notes** Multiple-star system at the heart of the Orion Nebula. Classic optical-quality test — how many components can your scope show?**Castor (α Gem)**

WINTER/SPRING

Gemini · 7h 35m +31° 53' · mag 1.9 + 3.0 · sep 5.6" · PA 50°

Colors white + white**How to split** Tight bright pair; 4-inch at 120x splits cleanly.**Notes** Six-star system in total — Castor A, B, and C are themselves all spectroscopic binaries. Visible orbital motion (445 yr period) over decades. **β Mon · Beta Monocerotis**

WINTER

Monoceros · 6h 29m -7° 02' · mag 4.6 + 5.4 · sep 7.4" + 2.8"

Colors white + white + white**How to split** Triple system; main 7.4" pair easy in 4-inch, the close 2.8" component needs steady seeing.**Notes** William Herschel called it 'one of the most beautiful sights in the heavens' when he discovered it. Crisp triple in any quality scope.**h3945 (CMa) · Winter Albireo**

WINTER

Canis Major · 7h 17m -23° 19' · mag 4.8 + 6.8 · sep 26.8" · PA 51°

Colors deep gold + blue**How to split** Easy in any small scope.**Notes** Stunning gold-blue color contrast — the winter equivalent of summer Albireo. Often missed because it's not as advertised.

ι Cnc**WINTER/SPRING**Cancer · 8h 47m +28° 46' · **mag 4.0 + 6.6** · sep **30.5"** · PA 308°**Colors** yellow + blue**How to split** Easy in any small scope.**Notes** Beautiful color-contrast pair often called 'winter Albireo' (also a contender with h3945). Bright, easy.**Σ 762 (in Mon)****WINTER**Monoceros · 5h 56m -6° 31' · **mag 6.7 + 8.0** · sep **2.3"** · PA 117°**Colors** white + white**How to split** Tight pair; 4-inch at 150x to split.**Notes** Classic Struve double — one of many that test optical resolving power.**32 Eri****WINTER**Eridanus · 3h 54m -2° 57' · **mag 4.8 + 5.9** · sep **6.8"** · PA 348°**Colors** yellow + green-blue**How to split** Easy in 4-inch.**Notes** Striking color contrast — yellow primary with greenish secondary. Underrated.**ε Mon****WINTER**Monoceros · 6h 24m +4° 36' · **mag 4.4 + 6.7** · sep **12.6"** · PA 27°**Colors** yellow + faint**How to split** Easy in 4-inch.**Notes** Wide unequal pair near the Christmas Tree Cluster region.**STT 547 (Σ 2725) · Albireo's neighbor****SUMMER**Cygnus · 19h 32m +27° 51' · **mag 7.2 + 7.8** · sep **5.7"** · PA 8°**Colors** white + white**How to split** In the same low-power field as Albireo; small scope shows.**Notes** Worth a look while you're at Albireo — different character (matched white) right next door.

VARIABLE STARS

Stellar physics in real time — and how to participate

22 variables · ranging from naked-eye famous to telescopic challenge

Variable stars vary in brightness for many reasons — pulsation, eclipsing, eruption, dust ejection. We've grouped the catalog by type below: **Mira-type long-period** (months between max/min, large amplitude); **eclipsing binaries** (predictable dimming events on hourly timescales); **Cepheids and short-period pulsators** (the cosmic distance ladder); **recurrent novae and eruptive variables** (rare but spectacular, watch list); and **semi-regular supergiants** (slow drift over months). To estimate brightness, compare against nearby constant stars of known magnitude — the AAVSO website (aavso.org) provides finder charts with comparison stars labeled. Your observations contribute to a database used by professional astronomers.

Mira (omicron Ceti) · Wonderful

FALL (BEST MID-OCT
MAX)

Cetus · 2h 19m -2° 59' · Mira-type long-period

Range 2.0 – 10.1 mag · **Period** 332 days

How to observe Naked eye at maximum (rivals nearby stars), invisible without telescope at minimum. Compare to nearby reference stars; AAVSO charts available.

Notes The prototype Mira variable — discovered to vary in 1596, the first known variable star besides the eclipsing Algol. Currently expected near maximum: check AAVSO for current brightness.

Chi Cygni

SUMMER (BEST AT
MAX)

Cygnus · 19h 51m +32° 55' · Mira-type

Range 3.3 – 14.2 mag · **Period** 408 days

How to observe Naked eye at maximum, telescope at minimum.

Notes Among the largest amplitude variables — a 10-magnitude swing means a 10,000x brightness change. Located in Cygnus in a star-rich field.

R Leonis

SPRING (BEST AT
MAX)

Leo · 9h 48m +11° 26' · Mira-type

Range 4.4 – 11.3 mag · **Period** 312 days

How to observe Easy small-scope target throughout cycle.

Notes Bright Mira variable; close to Regulus making it easy to find. Rich red color at maximum.

R Andromedae

FALL

Andromeda · 0h 24m +38° 35' · Mira-type

Range 5.8 – 14.9 mag · **Period** 409 days

How to observe Naked eye at peak, telescope-only at min.

Notes Long-period Mira variable; carbon-rich atmosphere gives deep red color.

R Cassiopeiae

FALL (CIRCUMPOLAR)

Cassiopeia · 23h 58m +51° 24' · Mira-type

Range 4.7 – 13.5 mag · **Period** 430 days

How to observe Naked eye at max, telescope at min.

Notes Circumpolar Mira variable visible year-round from Canada.

R Aquilae

SUMMER

Aquila · 19h 06m +8° 14' · **Mira-type****Range** 5.5 – 12.0 mag · **Period** 271 days**How to observe** Easy small-scope target.**Notes** Period has been shortening over the last century — interesting evolutionary case.**Algol (β Per) · Demon Star**

FALL/WINTER

Perseus · 3h 08m +40° 57' · **Eclipsing binary (EA)****Range** 2.1 – 3.4 mag · **Period** 2.87 days**How to observe** Naked eye throughout cycle. Look for the 10-hour dimming event; predictions at AAVSO and Sky & Telescope.**Notes** Prototype eclipsing binary. Visible naked-eye dimming every 2.87 days when the cooler companion eclipses the brighter star. Known to vary since at least the 18th century — name from Arabic 'al-ghul' (the demon). **β Lyrae · Sheliak**

SUMMER

Lyra · 18h 50m +33° 22' · **Eclipsing binary (EB)****Range** 3.4 – 4.3 mag · **Period** 12.94 days**How to observe** Naked-eye comparison with neighbouring star γ Lyr (3.25 mag, constant).**Notes** Continuously varying — both stars are deformed by gravity, so brightness changes smoothly throughout the orbit, not just during eclipses. Slowly changing period.**Delta Cephei**

FALL (CIRCUMPOLAR)

Cepheus · 22h 29m +58° 25' · **Cepheid****Range** 3.5 – 4.4 mag · **Period** 5.37 days**How to observe** Naked-eye comparison; fast cycle visible over a few nights.**Notes** Prototype Cepheid variable — its period-luminosity relation is the foundation of the cosmic distance ladder. Watch a complete cycle in a week. **η Aquilae**

SUMMER

Aquila · 19h 52m +1° 00' · **Cepheid****Range** 3.5 – 4.4 mag · **Period** 7.18 days**How to observe** Naked-eye comparison.**Notes** Bright Cepheid in Aquila; easier to follow than δ Cep because it's right next to several constant comparison stars. **ζ Geminorum · Mekbuda**

WINTER

Gemini · 7h 04m +20° 34' · **Cepheid****Range** 3.6 – 4.2 mag · **Period** 10.15 days**How to observe** Naked-eye comparison.**Notes** Yellow supergiant Cepheid; slow rise then steeper fall in light curve. Pair with neighbouring Castor and Pollux for context.

T Coronae Borealis - Blaze Star

SPRING/SUMMER

Corona Borealis · 15h 59m +25° 55' · Recurrent nova

Range 10.8 → 2.0 (outburst) mag · **Period** ~80 years**How to observe** Normally invisible to naked eye (10.8 mag); during outburst rivals Polaris briefly. Check AAVSO and astronomy news for outburst alerts.**Notes** Last erupted in 1946. Astronomers expect the next outburst imminently (predicted 2024–2026 window). When it goes, naked-eye observers will see a 'new star' appear in Corona Borealis for several days. Check current status before observing — this is the variable to watch right now.**R Coronae Borealis**

SPRING/SUMMER

Corona Borealis · 15h 49m +28° 09' · R CrB type

Range 5.7 – 14.8 mag · **Period** irregular**How to observe** Normally naked-eye visible; suddenly fades to telescope-only over weeks, then slowly recovers over months.**Notes** Prototype of the R CrB class. Carbon dust ejection blocks the star's light for irregular periods. Always interesting to check — never know when next fade is.**SS Cygni**

SUMMER/FALL

Cygnus · 21h 43m +43° 35' · Dwarf nova (UGSS)

Range 8.3 – 12.0 mag · **Period** ~50 days between outbursts**How to observe** Telescope; easy to monitor with a 4-inch+ scope. Outbursts last days.**Notes** Most-observed dwarf nova; AAVSO has the longest continuous record of any variable star. Outbursts every ~50 days, but timing is unpredictable.**U Geminorum**

WINTER

Gemini · 7h 55m +22° 00' · Dwarf nova (UGSS prototype)

Range 9.3 – 14.7 mag · **Period** ~100 days between outbursts**How to observe** Telescope; outbursts brighten in 1-2 days.**Notes** Prototype of the dwarf-nova class. Discovered 1855, the first cataclysmic variable known.**Betelgeuse (α Ori)**

WINTER

Orion · 5h 55m +7° 24' · Semi-regular supergiant

Range 0.0 – 1.6 mag · **Period** ~400 days (irregular)**How to observe** Naked-eye comparison with neighboring Rigel (0.13, constant) and Aldebaran (0.85, constant).**Notes** Red supergiant 600+ ly away; possible supernova candidate (within ~100,000 yr). The 2019–2020 'Great Dimming' event caught everyone's attention when it dropped to 1.6 mag. Always worth checking. **μ Cephei - Garnet Star**SUMMER/FALL
(CIRCUMPOLAR)

Cepheus · 21h 44m +58° 47' · Semi-regular red supergiant

Range 3.4 – 5.1 mag · **Period** ~860 days (irregular)**How to observe** Binoculars; the deep red color is the highlight.**Notes** One of the largest stars known — would extend past Saturn's orbit if placed at the Sun. William Herschel called it 'a most beautiful, deep garnet color'.

R Lyrae**SUMMER**Lyra · 18h 55m +43° 57' · **Semi-regular****Range** 3.9 – 5.0 mag · **Period** ~46 days**How to observe** Naked-eye comparison with neighbouring stars in Lyra.**Notes** Bright easy semi-regular target near Vega. Small swing but easily noticeable over weeks.**R Scuti****SUMMER**Scutum · 18h 47m -5° 42' · **RV Tauri type****Range** 4.4 – 8.2 mag · **Period** ~144 days**How to observe** Naked eye to telescope; alternating deep and shallow minima.**Notes** Prototype of RV Tauri class — alternating deep + shallow minima within each cycle. Found in the rich star fields near M11.**RR Lyrae****SUMMER**Lyra · 19h 26m +42° 47' · **RR Lyrae prototype****Range** 7.1 – 8.1 mag · **Period** 0.567 days (13.6h)**How to observe** Telescope; full cycle visible in one night.**Notes** Prototype of the RR Lyrae class — short-period pulsating variables important for measuring distances to globular clusters. Watch a full cycle in 13 hours.**δ Scuti****SUMMER**Scutum · 18h 42m -9° 03' · **δ Scuti prototype****Range** 4.6 – 4.8 mag · **Period** 0.194 days (4.7h)**How to observe** Naked-eye amplitude tiny; mostly photometric interest.**Notes** Prototype of δ Scuti class — very short-period pulsators. The visible amplitude is small but the rapid period is unique among naked-eye variables.**P Cygni****SUMMER**Cygnus · 20h 18m +38° 02' · **Luminous blue variable****Range** 3 – 6 (long-term) mag · **Period** irregular**How to observe** Naked eye; currently quiet at ~5 mag.**Notes** Famous luminous blue variable that erupted brightly in 1600 (rose from invisible to mag 3). 'P Cygni profile' in spectroscopy — gas outflow signature — is named after this star.