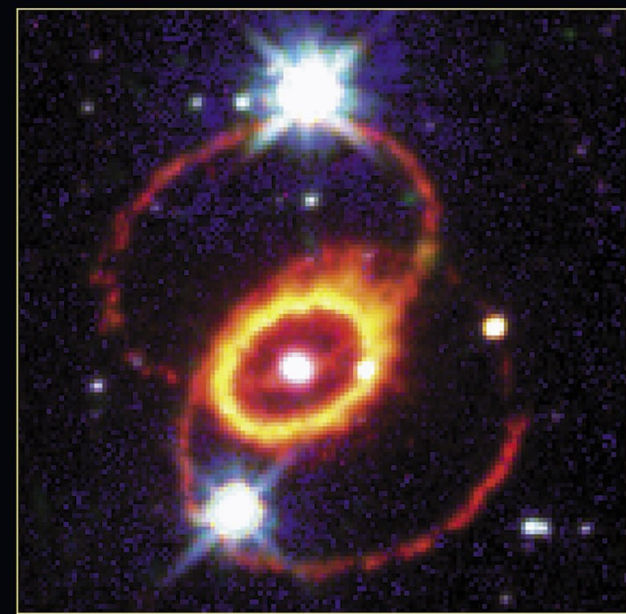
THE HEAVENS

NATIONAL GEOGRAPHIC

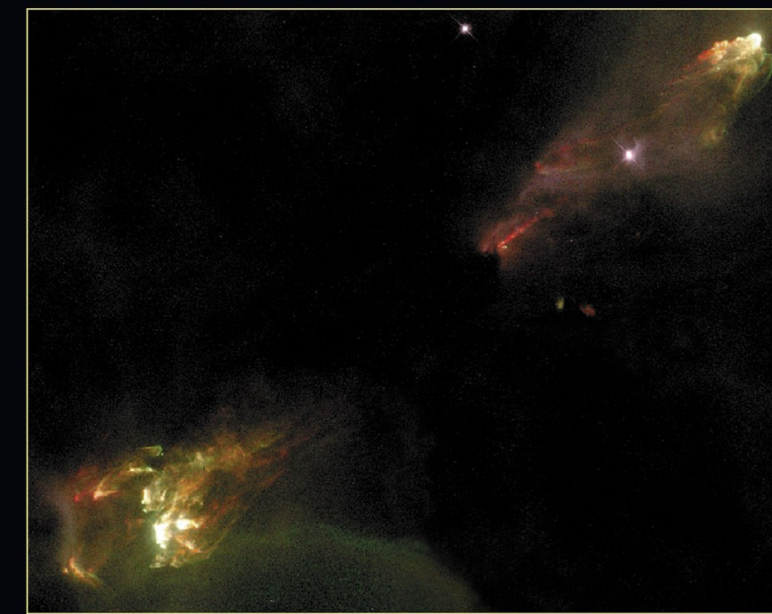
Gravitational Lens

1 Intense gravity of Abell 2218, a cluster of galaxies in the constellation Draco, acts as a huge distorting lens. It bends light from galaxies billions of light-years beyond, creating multiple images of some. Gravitational lenses also magnify, acting as "boosters" for telescopes on earth.



Supernova Rings

2 Seven years after a star's 1987 explosion in the Large Magellanic Cloud galaxy, a new view shows three rings. Astronomers suspect that the two large rings mark where ultraviolet radiation from the supernova illuminates a thin hourglass-shaped bubble of gas and dust emitted 10,000 to 20,000 years ago by the dying star. A smaller bright ring of material circles its equator.

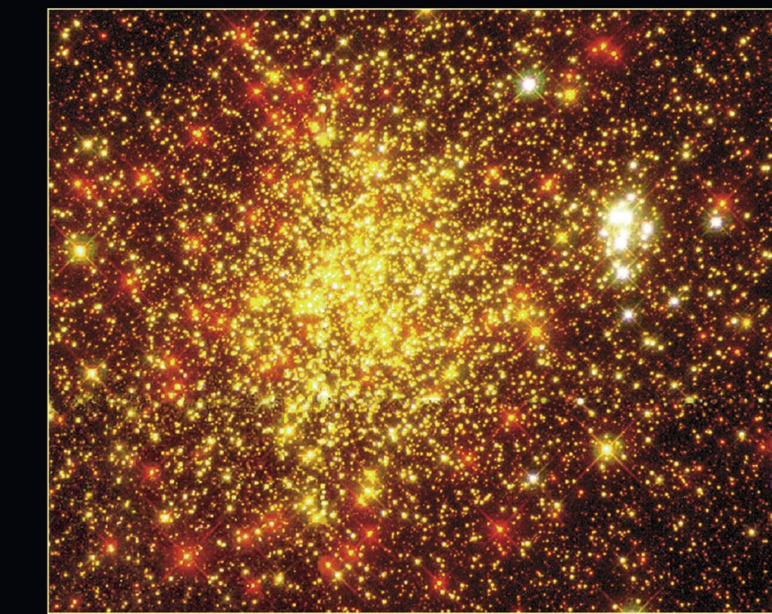


Stellar Gas Jets

3 Twin blowtorches reach a half light-year in opposite directions from a young star, which is hidden behind a dark cloud of gas and dust in the Orion constellation. Astronomers theorize that such jets occur when material near the star is channeled to its poles by the magnetic field, superheated, and blasted into space. The formation of jets may play a role in determining the mass of the star by preventing additional material from reaching it.

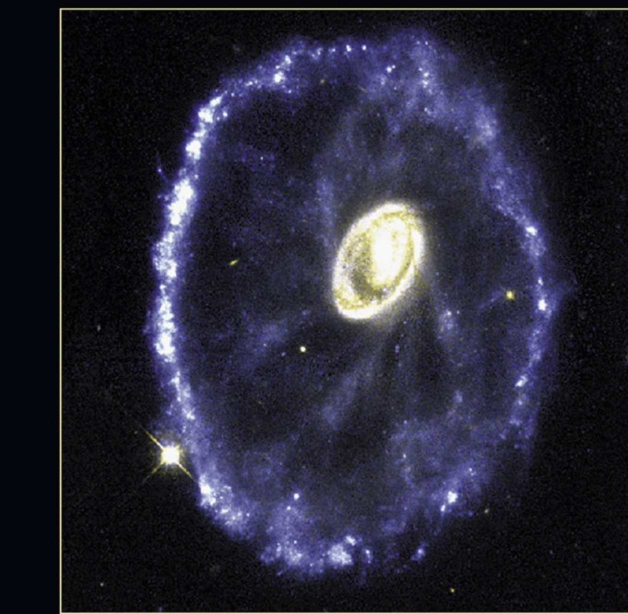
The stars of earth's night sky seem to hang like tranquil lanterns—the violence of their births, lives, and deaths obscured by trillions of miles. Each of the thousands of stars we see is a sun much like our own; some are hotter, some cooler. Just as iron glows brighter as it is heated, stars reveal their temperature by their color: The hottest are blue-white; the coolest reddish, like Orion's supergiant Betelgeuse, with a temperature of only 3000°C.

Stars burn hydrogen and helium and can produce elements as heavy as iron. Some self-destruct in supernova explosions and in the process create the heavier elements. Strewn about space, the materials recombine to form new stars and planets. All matter that makes up our planet, from the Himalaya to a butterfly's wings, was hurled into the cosmos by dying relatives of the galactic furnaces that dimple the night sky.



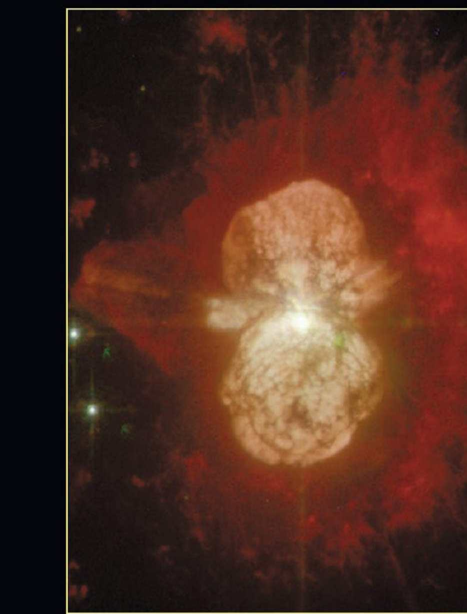
Star Clusters

4 A rich cluster of yellow and red stars is superimposed on a more distant, diffuse cluster of white stars in the Large Magellanic Cloud, about 170,000 light-years from earth. The yellow and red cluster, filling most of the frame, is about 50 million years old. The white one, only 4 million years old, is in the same neighborhood, less than 200 light-years farther away. It may have been created by supernovae in the older cluster.



Cartwheel Galaxy

5 A collision with another galaxy in the constellation Sculptor unleashed a shock wave that tore through the Cartwheel galaxy—now reforming and developing spiral arms visible as faint spokes. A ring of billions of stars was formed from matter struck by the wave, traveling at 200,000 miles an hour. Astronomers have just recently identified the culprit in the galactic hit-and-run.



Exploding Giant Star

6 An eruption of Eta Carinae appeared in the constellation Carina, more than 150 years ago. Two bubbles of gas and dust, each about a quarter light-year across, blast from the star's poles. The lobes are illuminated by the unstable star, 4 million times as bright as our sun.

THE MILKY WAY

Individual stars visible to the naked eye are our closest galactic neighbors. The Milky Way, a misty river of stars that flows across the heavens, is an edge-on view of our home galaxy, which includes a few hundred billion stars. Andromeda, the nearest spiral galaxy like our own, is 2.5 million light-years away.

BRIGHTEST STARS OF THE NORTHERN HEMISPHERE

In order of apparent magnitude with the constellations in which they appear

-0.04 ARCTURUS	Boötes	0.85 ALDEBARAN	Taurus
0.03 VEGA	Lyra	1.14 POLLUX	Gemini
0.08 CAPELLA	Auriga	1.25 DENEB	Cygnus
0.38 PROCYON	Canis Minor	1.35 REGULUS	Leo
0.50 BETELGEUSE	Orion	1.58 CASTOR	Gemini
0.77 ALTAIR	Aquila	1.78 ALIOTH	Ursa Major

BRIGHTEST STARS OF THE SOUTHERN HEMISPHERE

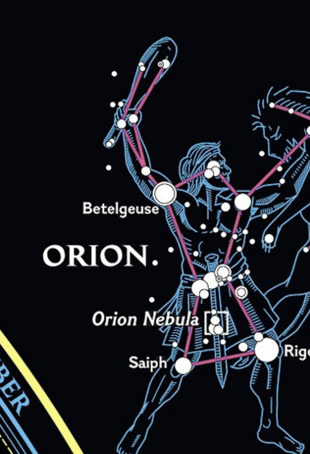
In order of apparent magnitude with the constellations in which they appear

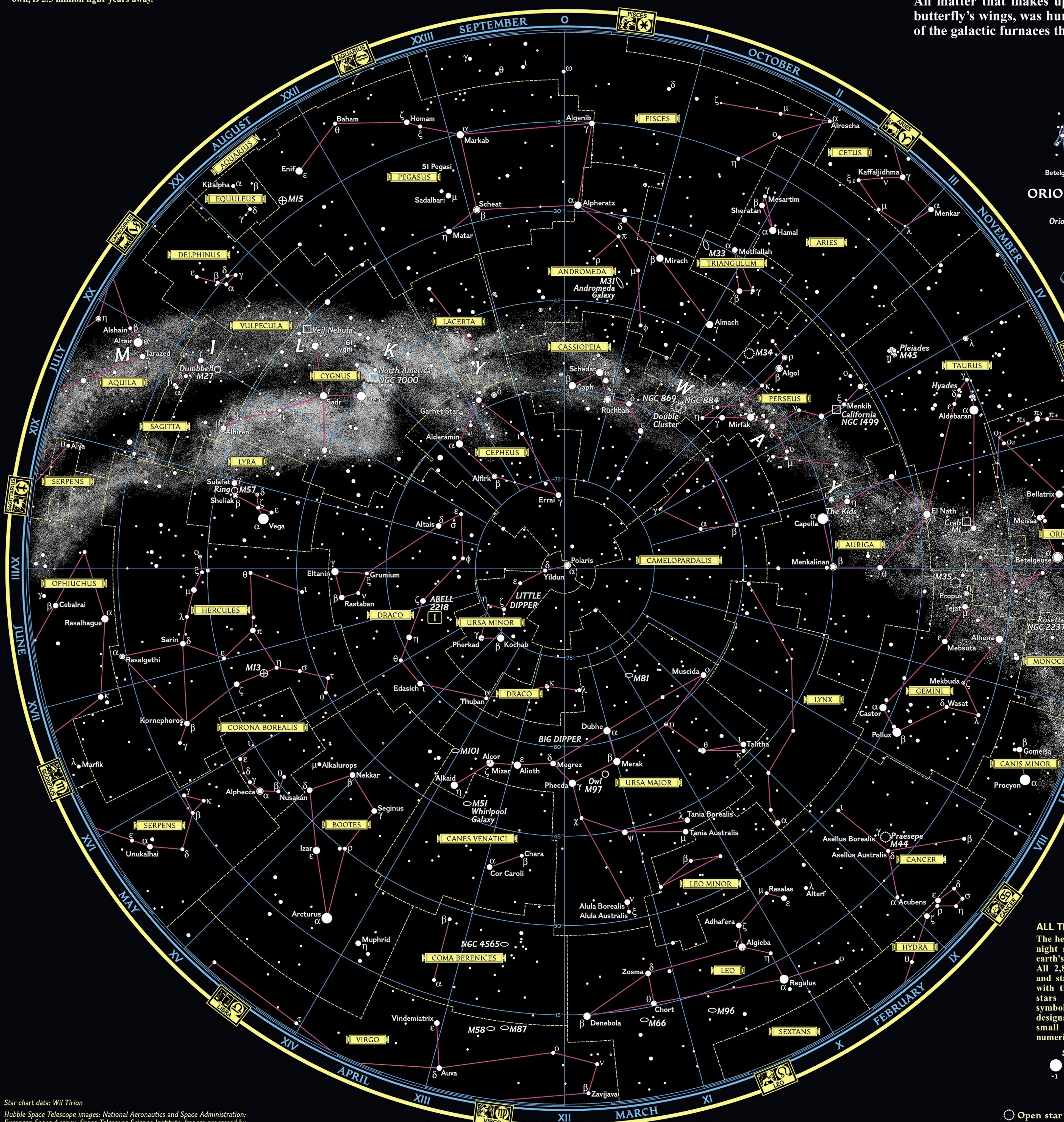
-1.46 SIRIUS (Brightest star in the sky)	Canis Major	0.46 ACHERNAR	Eridanus
-0.72 CANOPUS	Carina	0.61 HADAR (BETA CENTAURI)	Centaurus
-0.27 RIGIL KENTAURUS (ALPHA) (Nearest bright star)	Centaurus	0.87 ACRUX (ALPHA CRUCIS)	Crux
0.12 RIGEL	Orion	0.96 ANTARES	Scorpius
		0.98 SPICA	Virgo
		1.16 FOMALHAUT	Piscis Austrinus

THE GREEK ALPHABET

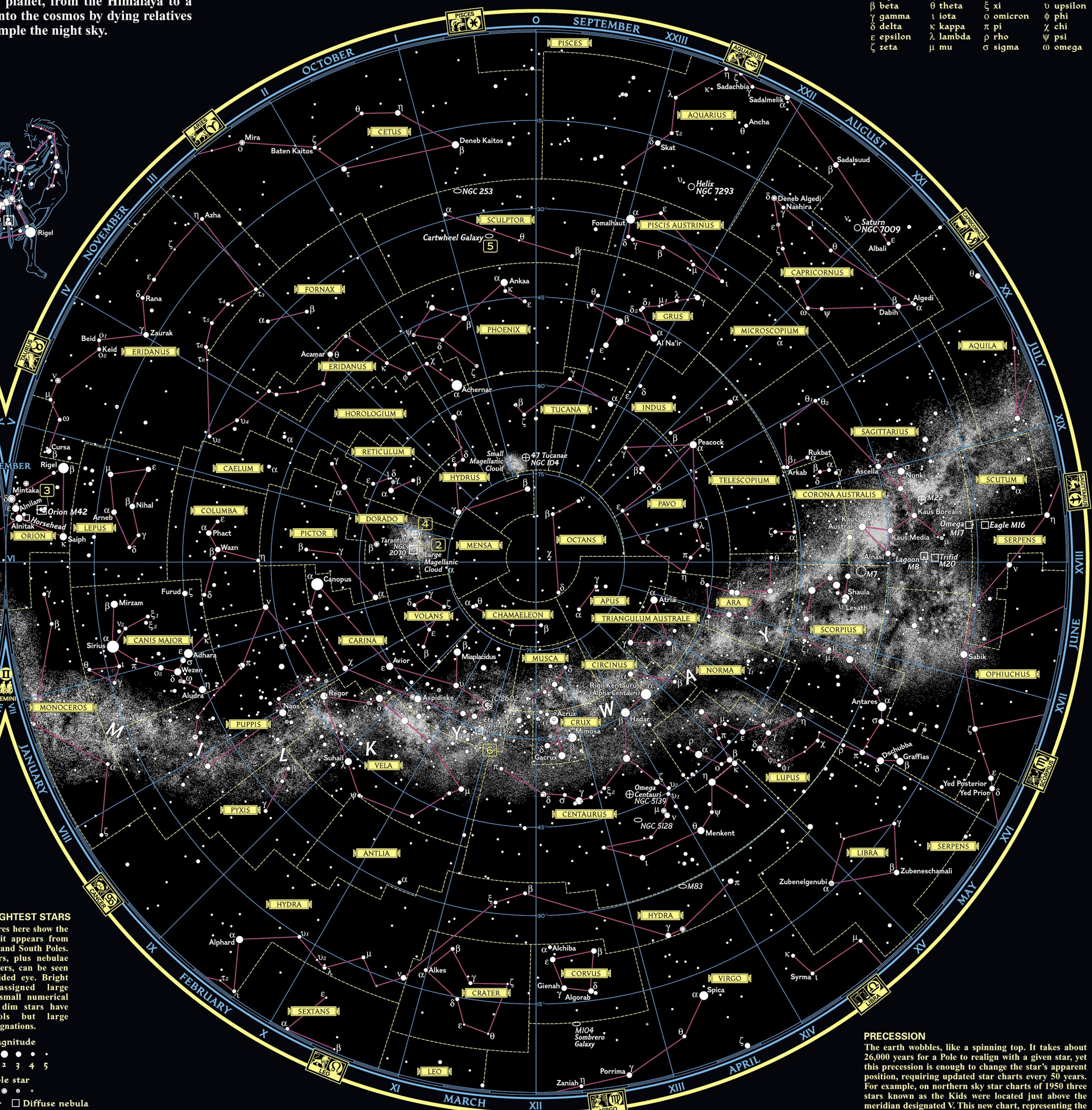
Greek letters on the chart indicate a star's level of apparent brightness compared with other stars within its constellation (α usually appears as the brightest, β the next brightest, and so on).

α alpha	η eta	ν nu	τ tau
β beta	θ theta	ξ xi	υ upsilon
γ gamma	ι iota	ο omicron	φ phi
δ delta	κ kappa	π pi	χ chi
ε epsilon	λ lambda	ρ rho	ψ psi
ζ zeta	μ mu	σ sigma	ω omega





NORTHERN HEMISPHERE



SOUTHERN HEMISPHERE

ALL THE BRIGHTEST STARS

The hemispheres here show the night sky as it appears from earth's North and South Poles. All 2,844 stars, plus nebulae and star clusters, can be seen with the unaided eye. Bright stars are assigned large symbols but small numerical designations; dim stars have small symbols but large numerical designations.

Star magnitude: -1 0 1 2 3 4 5

Variable star

Open star cluster
Diffuse nebula
Globular star cluster
Planetary nebula
Galaxy
Constellation boundary

PRECESSION

The earth wobbles, like a spinning top. It takes about 26,000 years for a Pole to realign with a given star, yet this precession is enough to change the star's apparent position, requiring updated star charts every 50 years. For example, on northern sky star charts of 1950 three stars known as the Kids were located just above the meridian designated V. This new chart, representing the sky in the year 2000, places them below that line.

For information regarding available maps call 1-800-962-1643 or write to National Geographic Maps, PO Box 4357, Evergreen, CO 80437-4357. You can find us on the Internet at **nationalgeographic.com/maps**.

Star chart data: Wil Tirion

Hubble Space Telescope images: National Aeronautics and Space Administration; European Space Agency; Space Telescope Science Institute. Images processed by Warrick J. Couch, University of New South Wales (1); Robert P. Kirshner, Harvard University (2); Jeff Hester, Arizona State University (3 and 6); Roberto Gilmozzi, European Southern Observatory (4); Kirk Borne, NASA Goddard Space Flight Center (5)

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