Axel Mellinger's

Milky Way mosaic

The California Nebula (NGC 1499) glows because of radiation given off by the magnitude 4.0 star Menkib (Xi [ξ] Persei), which sits 0.2° south of the nebula. Conrad Pope

The North America Nebula (NGC 7000) lies only 3° east of Deneb (Alpha [α] Cygni). From a dark site, sharp-eyed observers can see this stunning object with their naked eyes. Neil Fleming

> Omega Centauri (NGC 5139) is our galaxy's largest globular cluster. It appears slightly larger than the Full Moon, shines at magnitude 3.5, and contains some 10 million stars. NASA/ESA/Hubble Heritage Team (STScI/AURA)

< The sky around Antares (the yellow star at the lower left of center) contains globular clusters, wide swaths of dark nebulosity, and the spectacularly colored Rho Ophiuchi region. Jason Ware

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The Pleiades (M45) in Taurus the Bull is the sky's brightest star cluster. More than 300 stars form this group, which lies some 440 light-years away. NASA/ESA/AURA/Caltech

The Andromeda Galaxy (M31) gets its familiar name from the northern constellation where it resides, Andromeda the Princess. M31 lies at the far end of the Local Group of galaxies, which includes the Milky Way. Tony Hallas

The galactic center from Earth's point of view resides in the constellation Sagittarius the Archer. To find the center of our Milky Way's celestial coordinates, look for right ascension 17h45m, declination –28°43′ on a star chart. Bill and Sally Fletcher

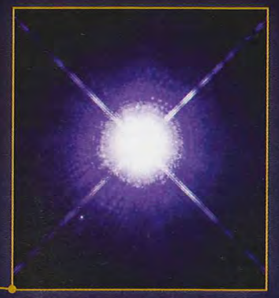
Rigil Kentaurus is a triple star also known as Alpha Centauri. This star is the third-brightest in the sky and the closest system to Earth. Its closest component lies 4.2 light-years away. Marco Lorenzi

< The Small Magellanic Cloud lies in Tucana. It's the sky's second-largest galaxy by apparent size. It measures 5.3° by 3.1°. Its stars combine to give off the light of a magnitude 2.7 star. Thomas V. Davis

> The Large Magellanic Cloud lies in the constellation Dorado the Swordfish. It measures a massive 10.8° by 9.2°. The light we see equals the output of a magnitude 0.4 star. Andreas B'ker and Axel Martin

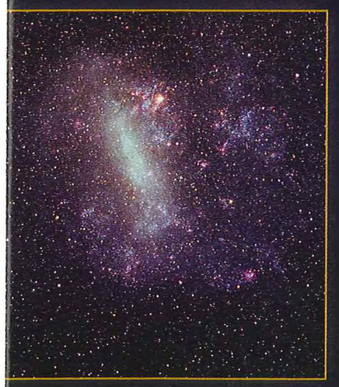
is a dark nebula in the
nstellation Crux the
Dark nebulae are clouds
lar gas and dust. Luke Dodd

The Eta Carinae Nebula (NGC 3372) is a gas cloud, nearly a light-year long, expanding at 1.5 million mph (2.3 million km/h). Within the cloud sits one of the galaxy's most massive stars radiating 5 million times the Sun's energy.
NASA/ESA/N. Smith (Univ. of California, Berkeley)/Hubble Heritage Team (STScI/AURA)/NOAO/AURA/NSF



Sirius (Alpha Canis Majoris) is the brightest star in our night sky. It shines at magnitude –1.47, twice as luminous as the next-brightest star, Canopus (Alpha Carinae). NASA/H.E. Bond and E. Nelan (STScI)/M. Barstow and M. Burleigh (Univ. of Leicester)/J. B. Holberg (Univ. of Arizona)

The Orion Nebula (M42) is the sky's second-brightest nebula. From a dark site, sharp-eyed observers can detect this cloudy patch without optical aid as the central "star" in Orion the Hunter's sword. Telescopes show the full extent of this object, which covers an area 6 times the size of the Full Moon.
NASA/ESA/M. Robberto (STScI/ESA) and the Hubble Space Telescope Orion Treasury Project Team



Axel Mellinger's Milky Way mosaic

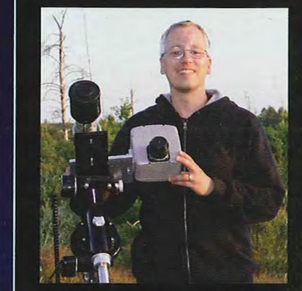
An amateur astronomer captures our galaxy in glorious detail. **by Michael E. Bakich**

This Milky Way image (reproduced to a larger scale on this poster's other side) represents a long-term project by Axel Mellinger, professor of physics at Central Michigan University. Mellinger combined images from 70 different fields of view, each of which measured 40° by 27°. To ensure a seamless mosaic, he overlapped adjacent fields by at least 15 percent.

Mellinger began shooting in October 2007 and finished in August 2009. He shot from two locations in South Africa for the fields centered on declinations –90°, –62°, –32°, and 0°. For the northern fields centered on declinations 32°, 62°, and 90°, he used four locations in Texas and three in Michigan.

He coupled a 50mm Minolta MD f/1.4 lens to a Santa Barbara Instrument Group STL-11000 CCD camera. To improve photographic quality, Mellinger stopped the lens down to f/4 for all exposures. Fields were combinations of photos taken through red, green, and blue filters.

To increase the picture's dynamic range, Mellinger combined three different exposure times: 0.5, 15, and 240 seconds. He took five frames at each exposure time through each filter. A little math shows that's a total of 3,150 photos for the entire panorama. The final image scale is 36" per pixel, the limiting magnitude is 14, and the entire mosaic measures 36,000 pixels by 18,000 pixels, a total of 648 megapixels.



Axel Mellinger displays the photographic system he used to capture more than 3,000 images for his Milky Way panorama. Axel Mellinger

After acquiring the exposures, Mellinger had to process them into a cohesive whole. One problem he faced was removing nearby contributions to night sky brightness. They included light pollution, airglow, and the zodiacal light. Moreover, he had to retain contributions from unresolved stars, diffuse galactic light, and the extragalactic background, which is light from unseen galaxies.

He separated the unwanted light by using space-borne visual photometry data from the Imaging Photopolarimeters aboard the Pioneer 10 and Pioneer 11 space probes. Those instruments provided measurements of the "good" background glow. Mellinger then used simple subtraction to remove the "bad" glow.

Mellinger expects this panorama to be a valuable educational tool. He also recognizes its scientific value, providing high-quality surface photometry (brightness measurements) of the Milky Way. At *Astronomy* magazine, we recognized one other trait: The image is gorgeous — and we're delighted that Mellinger shared it with our readers.

Michael E. Bakich *is an* Astronomy *senior editor.*