SkyWAAtch

Xmas Comes Early

Olivier Prache took this stunning image of NGC 7331 and Stephan's Quintet in Pegasus (ML-16803 camera, 16 hours total exposure over the last days of August and first week of September).

NGC 7331 (aka Caldwell 30) is the large spiral galaxy in the upper left of the frame. Some 50 million light years distant, the galaxy has been compared to our Milky Way (although currently a central bar is suspected for the Milky Way). The Quintet (five galaxies grouped lower right) was immortalized in the holiday movie "*It's a Wonderful Life*." The Quintet resides some 300 light years distant (only four of the galaxies are thought to be interacting.)

In This Issue . . .

Events for October 2013

WAA October Lecture

"Saving Hubble"
Friday October 4th, 7:30pm
Lienhard Lecture Hall, Pace University
Pleasantville, NY

Saving Hubble, an independent documentary film directed by our speaker, David Gaynes, examines NASA's decision in 2004 to cancel the final Hubble Space Telescope servicing mission, and introduces us to the people who united to save it. Many films have been made about what Hubble teaches us about the universe. This is the first time a film about Hubble has asked "What does this machine say about us?" Mr. Gaynes will discuss the film and show excerpts. In addition, he will bring copies for purchase, as well as some popular Hubble T-shirts. Free and open to the public. Directions and Map.

Upcoming Lectures

Lienhard Lecture Hall,
Pace University Pleasantville, NY

On November 1st, science reporter Andy Poniros will present on his experiences as a science reporter covering Space Shuttle Missions STS-134, STS135 and other Shuttle related topics for WPKN FM radio. Lectures are free and open to the public.

Starway to Heaven

Saturday October 5th, Dusk
Meadow Picnic Area,
Ward Pound Ridge Reservation,
Cross River, NY

This is our scheduled Starway to Heaven observing date for October, weather permitting. Free and open to the public. The scheduled rain/cloud date is October 26th. Participants and guests should read and abide by our General Observing Guidelines and Disclaimer. Directions.

WAA APPAREL

Charlie Gibson will be bringing WAA apparel for sale to WAA meetings. Items include:

- **Caps and Tee Shirts, $10**
- **Short Sleeve Polos, $12**

Call: 1-877-456-5778 (toll free) for announcements, weather cancellations, or questions. Also, don't forget to periodically visit the WAA website.

Renewing Members. . .

Matthew Fiorello - Bedford
Doug Baum - Pound Ridge
Tom Boustead - White Plains
Satya Nitta Cross River

Kopernik AstroFest 2013

This event will be held at the Kopernik Observatory & Science Education Center – Vestal, NY from October 4th through 6th, 2013. Presented by the The Kopernik Astronomical Society, the Kopernik Observatory & Science Center and the Night Sky Network; the Astrofest will feature astronomy workshops, solar viewing, observatory tours and speakers from the amateur and professional communities as well as observing at night. Dry camping is available on-site for a nominal fee. To register and for more information go to the Astrofest website. (Note: This event is not affiliated with the WAA).

Harvest Moon

Bob Kelly took this image on September 19th--four days after perigee with a Canon XS 250mm zoom on a tripod (cropped from the larger original f16 ISO 200, 1/250 second exposure). Notes Bob:What's somewhat interesting is how much the moon is tipped to the 'left' so that the Ocean of Storms is all the way over to the western limb of the moon and how irregular is the eastern limb as the sun is setting there.

Almanac

For October 2013 by Bob Kelly


Oct 4


Oct 11


Oct 18


Oct 26

So, do you have a good view of the southwestern horizon? You'll know if blazingly bright Venus is visible after sunset. Venus is outstanding at magnitude minus 4.4, only a fist's width above the horizon, with fainter Saturn further to the right and Mercury even lower to the right. Bring a chart with their locations; it's easier to tell the players with a scorecard. The Moon glides above them from the 6th through the 9th.

October is my favorite month for Subway Astronomy! Jupiter's so high in the dawn sky, your elevated subway or train platform probably blocks a view of the magnitude –2.3 planet. So look lower toward the brightening horizon where Mars will add emphasis to the backward question mark in Leo with Regulus nearby. They'll be closest at mid-month – just about the same brightness. Compared to terrestrial lights, say traffic lights, the colors of objects in the sky are rather pale. Here's a chance to compare reddish Mars and bluish Regulus. As they get closer do their clashing colors become more noticeable? Does the brightness of the sky appear to change their hues? The pre-dawn sky also gives a preview of Orion and the winter constellations. The Moon rides high in the morning sky to start and end the month.

We experience our darkest morning of the year – the date of our latest sunrise of the year (by our clock time) - on November 2nd at 7:27am **EDT**. On November 3rd, the sun rises at 6:28am **EST** – a Sun partially eclipsed by the Moon until about 7:11am.

Mars also points the way to much talked about, but little seen Comet C/2012 S1 ISON. Here's one time when two objects that look near in the sky are actually near each other! ISON passes about 6.7 million miles above Mars' north pole on October 1st. Mars and ISON appear closest to each other in our skies when Mars joins Regulus at mid-month. Based on recent observations, ISON may be no brighter than +10 magnitude then. It'll be easy to point in the right direction, but hard to pick out ISON without a moderate-sized telescope.

Jupiter rules! High in the morning sky, Jupiter's a glitzy belt buckle on a Gemini twin. With an elongation of 90 degrees away from the Sun, Jupiter's four brightest moons cast their shadows on the giant planet's disk even though they are not in front of the planet from our point of view. Several times this month, two moons' shadows at once are visible on the planet. The best times for us are on the 19th about 2:30am and 26th after 4:30am. Even cooler is when *three* shadows will play on the planet, when Jupiter is low in the sky, around 1am on the 12th. Don't get fooled by the 'extra' moon when Delta Geminorum passes behind Jupiter around the 4th.

Explorers stationed on the southern half of our Moon would see a partial solar eclipse on Friday evening, the 18th. Since the Sun is not fully eclipsed, as seen from the Moon, the lunar eclipse we see from Earth is only a faint smudge on the southern half of the face of the Moon. It'll be darkest a bit before 8pm.

Earth makes our closest pass at Uranus early in October. Get finder charts for Uranus, up all night at magnitude +5.7, and Neptune, well up after sunset at +7.9, to get your best views of the two ice giants for the year. Are they blue? How blue? Does your perception change with changing magnification?

If you can avoid the streetlights, the cold, clear nights are great for watching the Milky Way. It starts out bisecting the sky from southwest to northeast early in the evening, and stands a little more to west as the night gets later and the month gets longer.

Venus gets 45 degrees out to the left of the Sun, making it easier to see in daylight, although Venus spends most of the day lower in the sky than the Sun. The best time to try is later in the afternoon, after carefully blocking out the Sun. Saturn and Mercury will also be to the left of the Sun, but closer to the Sun and dimmer, making them harder to spot in daylight. Mercury briefly becomes the closest planet to us at month's end, but it's of no use to us as Mercury will be too close to the Sun to see by then. But Venus is gradually appearing larger in a telescope and its phase is decreasing to 50% sunlit by Halloween.

The International Space Station has more company, with the commercially launched Cygnus unmanned supply ship visiting. Cygnus was launched from Wallops Island, Virginia, – a daytime launch, but seen by people over a wide area to our south. Because the ISS is in a highly inclined orbit, launch sites further north than the Kennedy Space Center in Florida are usable. Go out and wave at the ISS in the mornings through the 4th, and in the evenings starting on the 6th. Also, could the ISS become the human-made object seen by the most humans with their own eyes? Think about it and let me know if there are other 'manmade' objects spied live by more people.

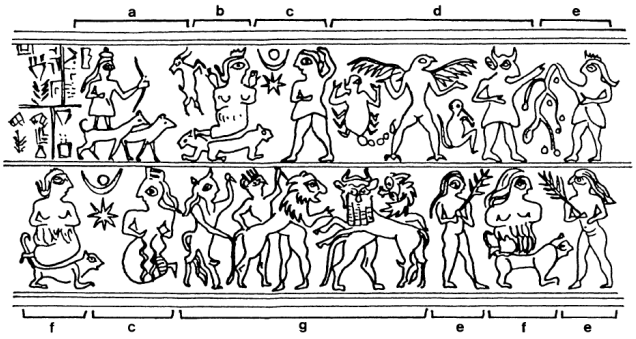
Articles and Photos

A History of Star Maps
by Larry Faltz

We've become jaded. Or, more exactly, we've lost our innocence. We understand so much about the universe (which is not to say we understand the most important or fundamental things) that the *mystery* of the night sky is almost an afterthought. Not that the heavens have lost their glory, but the mysterious has been driven into the realm of detail. It's almost routine for many amateur astronomers, when showing an object to a newbie, to confidently explain something about galactic structure, stellar evolution, nuclear fusion, basic supernova physics, black holes, spectroscopy or the Doppler shift. We leave mystery for the arcane questions: What's the source of cosmic rays? What is dark matter? What is dark energy? Is there a multiverse? We no longer have to ask such basic questions as "Where are the stars?" or even "What are the stars?" But our forbearers did. Until Galileo, they were almost the only questions that they could ask.

The stars inevitably entice us to make figurative sense of their arrangement. For the ancients, who believed that the Earth was the center of the universe, the immobile and immutable stars had to be put there by a divine hand and in doing so the deities must have wanted to send us a message. That's what deities do, right? Why would they waste such an impressive, constant and obvious canvas? So all cultures, going back to the earliest ones for which we have records, recorded their mythologies in the sky, and perhaps their prejudices and taboos as well. Where better to write the common story of a culture, than up overhead where everyone can see it? Because cultures have always been entangled, through commerce, migration and, sadly, war, there's been a remarkable consistency in the names and stories of many of the constellations across what might otherwise be considered rather vast geographic, cultural and temporal distances.

Accompanying these stories are the images of the constellations themselves. The earliest ones are in scribed in stone on temple walls in Mesopotamia, Egypt, China and India. The Zodiac, the constellations that the sun passes through on its annual circumnavigation of the heavens along the ecliptic, seems to have been codified around 1000 BC in Mesopotamia, but some of its constellations are much older. An interesting article by John H. Rogers, Origin of the Ancient Constellations: The Mesopotamian Traditions (*J. Br Astron Assoc* 1998; 108:1-24) argues that the earliest constellations were designated as long ago as 3200 BC, by the Sumerians.



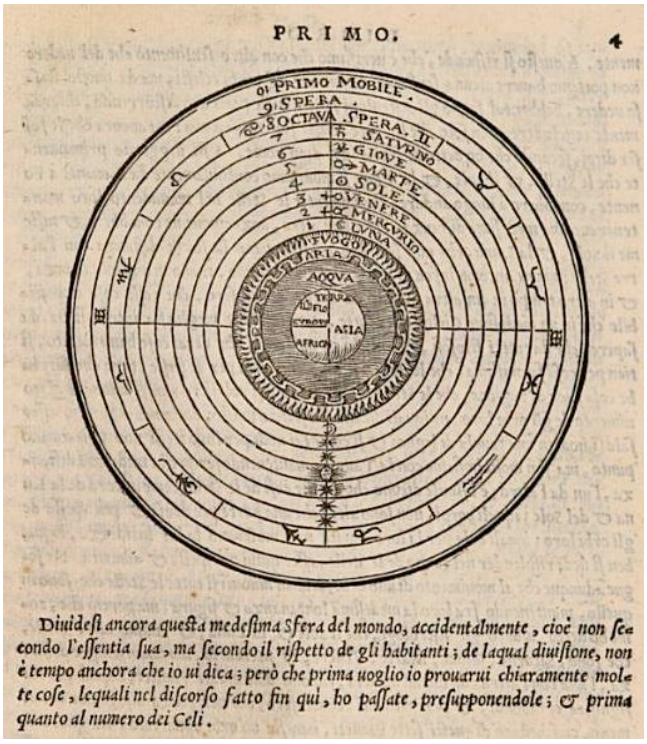
Cylinder seal from Susa (currently in the Louvre), ~2500 BC, thought to show signs of the Zodiac (From Rogers)

The Mesopotamian star catalog and constellation list is given in a set of 3 tablets known as the MUL.APIN, now in the British Museum. In addition to indentifying celestial objects, the text gives information on the movements of the moon and planets and calculations for the equinoxes, solstices and other celestial phenomena.

Interest in accurately mapping the heavens owes much to astrology, another Mesopotamian invention. To make accurate forecasts based on the location of planets among the stars, astrologers needed ever-better maps and prediction rules that in turn depended on those maps. Astronomy did not really differentiate itself from astrology until the 17th century.

The constellations outside the Zodiac in the northern hemisphere as we know them today are primarily of Greek construction, and many are associated with stories from Greek mythology, particularly the tale of Perseus' rescue of Andromeda. This story features a large cast of characters including her father Cepheus, her mother Cassiopeia, Perseus' flying horse Pegasus, and some sea creatures, such as the whale Cetus. The tale is recounted in Book IV of Ovid's Metamorphoses. We know that the Greeks had deep theoretical and practical interests in astronomy. Pythagoras (~572-500 BC), the father of science and mathematics, is credited as being the first person to believe the Earth was round, and some of his successors believed the Earth was not the center of the universe but revolved around a "central fire." Plato's

cosmology is expounded in the *Timaeus* (c. 360 BC). He influenced subsequent philosophers, particularly his student Aristotle, whose authority on all matters scientific and philosophical held sway until the 16th century. In the Middle Ages, Aristotle was referred to simply as *The Philosopher*. Plato and Aristotle's understanding of the universe was fanciful, primitive and arbitrary, arising from abstract philosophical arguments and assumptions (such as that the circle is "perfect", so all celestial motions must be circular) and observation without measurement. Nevertheless, their curiosity was boundless.

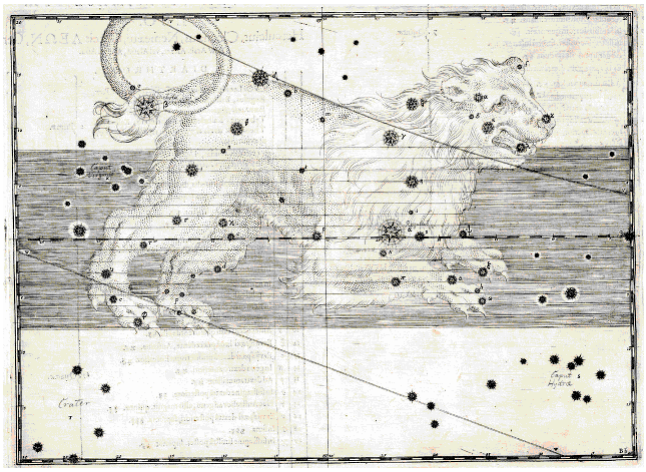


The Aristotelian/Ptolemaic system, illustrated in a woodblock from an important text and atlas, Alessandro Piccolomini's *De la Sphera del mondo* (1579)

Human ingenuity managed to make fairly accurate mathematical predictions of planetary movements by imagining epicycles and deferents, first suggested by the Greek Apollonius around 200 BC and refined in the *Almagest*, written in Alexandria by Claudius Ptolemy, a Greek citizen of Rome, around 150 AD. This work had vast influence right up to the time of Copernicus and even beyond. Nevertheless, some Greeks got the mathematics and cosmology right: Eratosthenes accurately calculated the circumference of the earth, Aristarchus proposed the heliocentric model of the universe 1700 years before Copernicus and made reasonable estimates of the distances to the sun and the moon, and Hipparchus discovered the precession of the equinoxes.

Arabic astronomers preserved a number of Greek texts, adopted their constellations but named or renamed many of the stars. The Arabs didn't extend theoretical astronomy that much, but we have to thank them for some beautiful star names and accurate celestial descriptions, as well as for the flourishing of algebra and trigonometry.

Although rare hand-drawn representations of the night sky from early eras are preserved, the invention of the printing press in the mid-15th century resulted in a proliferation of atlases and diagrams illustrating the heavens. They were first printed using woodcuts, but the invention of etching, engraving and then lithography gave these maps increasing detail, accuracy and beauty. Over time they reflected the growing knowledge of the night sky and the impact of more accurate instrumentation, and they satisfied the desires of a more educated citizenry for information.

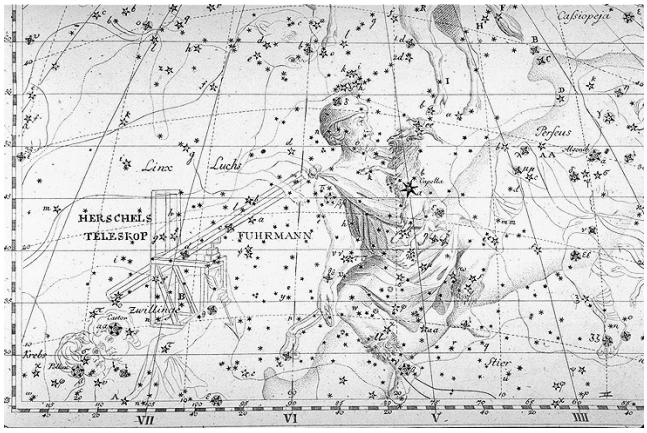


Leo, from Johannes Bayer's *Uranometria* (1603)

At the same time, they reflected human imagination and artistry, as constellation figures were rendered with clever invention and even sometimes charming inaccuracy (Bayer's Leo the Lion looks to me more like a happy golden retriever than a fearsome wild beast). Until the late 19th century, almost all celestial maps were illustrated with figures depicting the constellations. Some of the maps were hand colored, enhancing their beauty and artistic effect. Although we might expect them always to have a geocentric perspective (the sky as seen from the Earth), early maps were often drawn in reverse, as if you were looking from outside the celestial sphere, as a deity might. Like other ancient maps they now entice collectors, and one of the finest collections in private

hands belongs to Nick Kanas, an amateur astronomer and Professor of Psychiatry at University of California San Francisco, who has detailed his interest in a scholarly and lavishly illustrated book, *Star Maps: History, Artistry and Cartography*, the 2nd edition of which was published in 2012 by Springer-Verlag.

After a detailed review of astronomy and constellation lore up to the Copernican era, Kanas describes nearly every printed star map, detailing how they reflected our growing knowledge of astronomy. He details how the various authors and cartographers influenced each other. He also reviews the most important textbooks of the 16th and 17th centuries. We can trace the increasing accuracy of star positions and the entering and leaving of constellations. Since there was no International Astronomical Union to fix the constellations (this didn't happen until 1922), mapmakers were free to imagine some on their own. Although they dared not eliminate traditional constellations, fainter stars were often configured to create new constellations, with images generally of animals or tools, particularly in the southern hemisphere, whose stars hadn't been observed by the ancients. In the 17th century, celestial cartographers started showing the constellation Antinous, near Aquila. Antinous was the boy lover of Emperor Hadrian, who deified him after his death. This constellation was widely mapped only to disappear later on. Similarly the constellation Herchel's Telescope (his 6" model) was placed near Auriga by the influential Bode to honor Sir William's discovery of Uranus, but it didn't survive (there's only a generic Telescopium in the southern hemisphere.)



Auriga, with the new constellation *Herschel's Telescope*, from Johann Bode's *Vorstellung der Gestirne* (1805 edition). The constellation is not present in the 1782 edition.

It's remarkable to me that constellations haven't been subject to political manipulation. One could imagine a totalitarian regime redrafting the sky for its own propaganda purposes…the constellation *Great Leader Kim Jong- Il*, or the star *Lenin,* or the *Haile Selassie Cluster*. But thankfully the heavens seem out of bounds for such trivialities with a few minor exceptions in the 17th and 18th centuries (and those always by cartographer's choice, not government ukase).

Aquila and Antinous, from Johannes Hevelius' *Firmamentum Sobiescianum sive Uranographia* (1690)

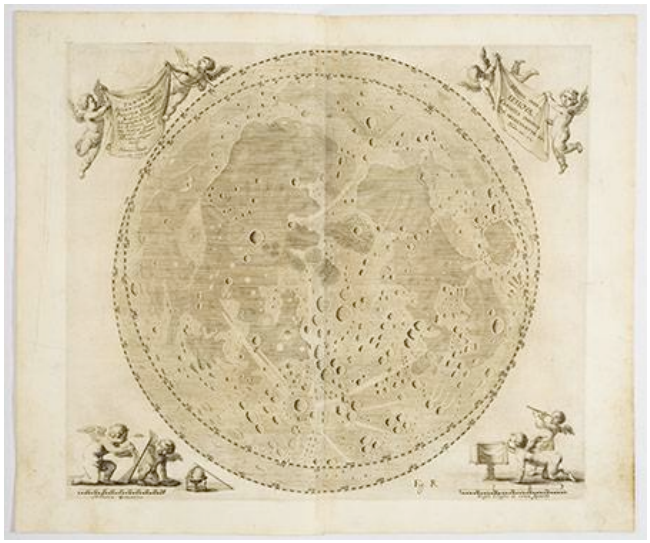
Many of the earliest maps were full-hemisphere renditions of one half of the night sky. Often, the corners had artwork illustrating some aspect of astronomy or mythology.

Northern Hemisphere, from Christoph Cellarius' *Coeli Stellati Christiani Haemisphaerium Prius* (1660)

In Hevelius' *Emisfero boreale* (Northern Hemisphere), from his important 1690 celestial atlas commonly called the *Uranographia*, the lower corners have

images of cherubs working astronomical sighting instruments, on the left a sextant and the right a quadrant. These devices were used to measure stellar angles in order to fix the positions of the stars relative to each other. Many atlases of the 17th and 18th century are true works of art, with complex frontispieces of allegorical and symbolic content.

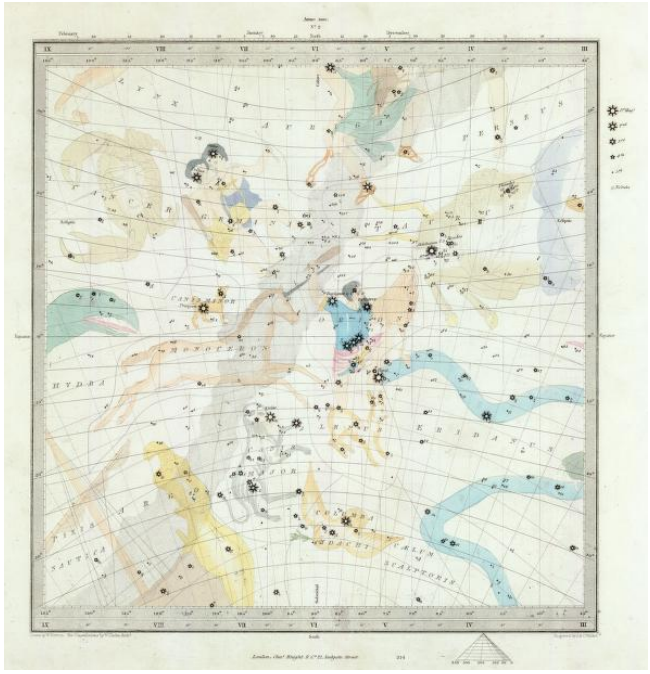
Northern Hemisphere, from Johannes Hevelius' *Firmamentum Sobiescianum sive Uranogaphia* (1690)



Lunar Map in Hevelius' *Selenographia*, 1647

Celestial cartographers didn't neglect non-stellar objects. Maps of the moon became increasingly accurate as telescope technology improved. Unlike the constellations, the naming of lunar features couldn't rely on tradition, and so cartographers began making up their own names. For about 140 years, the systems of Johannes Hevelius and Giovanni Riccioli competed, but over time Riccioli's system won out and is the basis of what we use today.

Some years ago, I bought a hand-colored map of the winter Milky Way, with figures of Gemini, Orion, Taurus and Canis Major in pastel watercolor shades. It was published by the Society for the Diffusion of Useful Knowledge, a London organization active from 1828 to 1848 (a branch in the US had a longer life, lasting until the end of the 19th century). This publisher printed vast numbers of inexpensive maps and books for the growing population of ordinary citizens in England seeking education. The demand for scientific information grew dramatically in the early 19th century. Astronomy was a common avocation and William Herschel a national hero in England. Many of SDUK's celestial and terrestrial maps are available today for very reasonable prices.



Hand-colored SDUK chart of the winter Milky Way (1830)

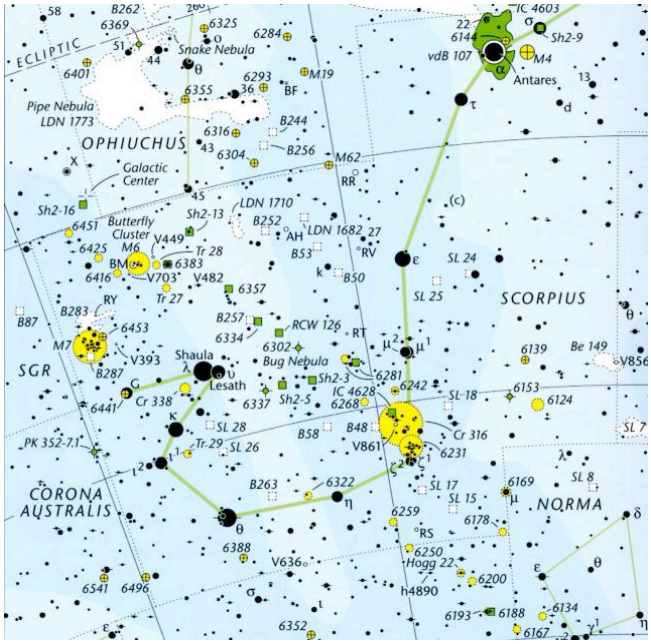
As you would expect, a book about star maps has to contain images, and Kanas provides them in abundance, along with measurements of every map down to the millimeter. In addition to the vast number of black-and-white images in the book, Kanas reproduces fully 91 (!) of them in color in an appendix. He also catalogs the contents of the most important celestial atlases, provides biographies of the cartographers (including an appendix of really obscure individuals) and adds a glossary with familiar and unfamiliar terms.

Southern Hemisphere, from Jean Fortin's revision (1776) of John Flamsteed's *Atlas Coelestis* (1729)

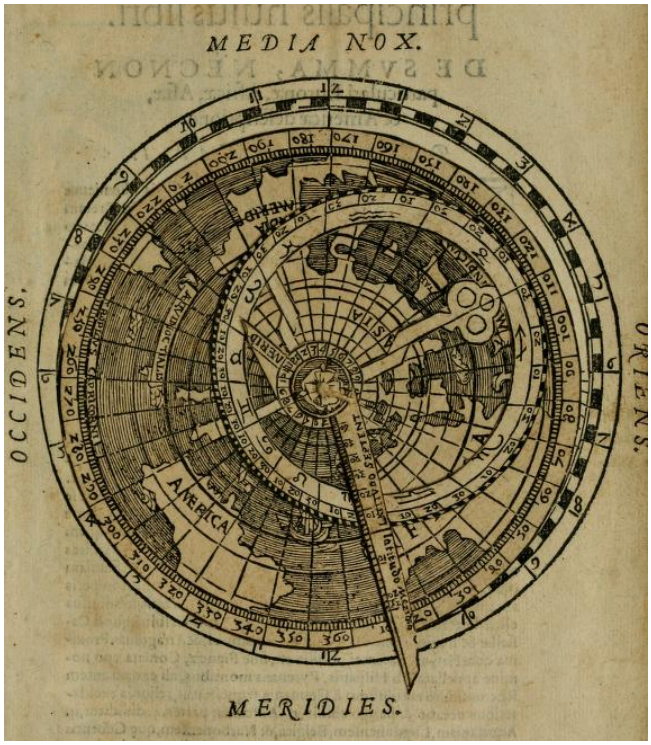
All of the historically important celestial atlases are discussed in detail, including those by Apian (1524), Piccolomini (1579), Bayer (1603), Cellarius (1660), Hevelius (1687) Flamsteed (1729), Doppelmayr (1742), Fortin (1776), and Bode (1801), as well as many minor editions and reprintings. He doesn't neglect the 19th and 20th centuries, highlighting the important atlases by Flammarion (1904), Norton (1910), Becvar (1948) and Tirion (1981). Current *Sky & Telescope* editor and cartographer Roger Sinnott, who's turned out some important reference works in common use today, is included.

Kanas discusses a number of other map-related topics. One of the most interesting is the volvelle, a kind of "pop-up" feature of many early astronomical reference books. A volvelle uses rotating paper cut-outs and sometimes string to allow the reader to make analog calculating engines, essentially circular slide rules. Some of them have multiple rotating elements. He also discusses sextants, quadrants, astrolabes, armillary spheres, celestial globes, planispheres, gores (the orange-slice segments of maps that preserve local geometry) and lunar and planetary maps. He even discusses some early surface maps of the sun, which was thought to be covered with volcanoes.

This is a scholarly catalog with intense focus on details as much as it is an account of astronomical history, and so at times the prose is academic rather than truly narrative. Nevertheless, Kanas' introductory material on the history of astronomy and the constellations is superb and worth reading in its own right. The text is very organized and internally cross-referenced, which is useful when trying to follow the relationships that Kanas elucidates among the works of the various cartographers. I did find a couple errant internal references to the figures, which I suspect arose in the transition from the first to the second edition. They are trivial and don't detract from the enjoyment or utility of the book.

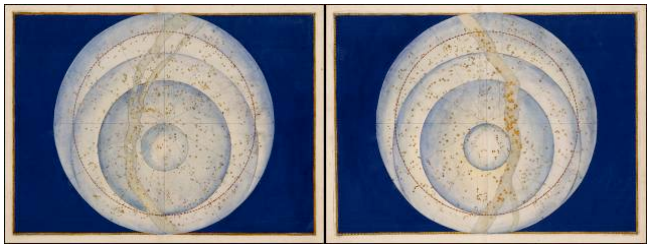


Part of map 58 from the *Sky & Telescope Pocket Sky Atlas* by Roger Sinnott (2010). Modern beauty, clarity and maximum information.



A volvelle from Peter Apian's Cosmographia (1524)

Modern star maps eliminate the constellation figures, for obvious reasons. They undermine the clarity we need to identify fainter telescopic objects and they distract from our scientific approach to the subject. Although I have a number of modern star maps on paper, I almost exclusively use computer cartographic programs for their speed, depth of information and search capabilities, as well as their ability to link to a computerized telescope for real-time navigation. Although some of these "planetarium" programs allow you to overlay classical drawings of the constellation figures (the ones I've seen for PDAs all seem to do that), the software I use the most, *Cartes du Ciel*, doesn't. When you click on "Show Pictures" in this program, you don't get an overlay of a fanciful engraving of Orion the Hunter, you get an actual Slone Digital Sky Survey image, something more likely to be useful.



The final plate in Bayer's *Uranometria*, showing the two celestial hemispheres without constellation figures. The orientation is external (outside the celestial globe).

So we've dispensed with the romance of the night sky in exchange for accuracy and detail far beyond what ancient cartographers could even dream about. Sky maps today are truly functional, and even inexpensive ones, like the *Sky & Telescope Pocket Sky Atlas* by Roger Sinnott, have their own elegance and artistry. The definition "beauty" in a star map has changed, just like in art, where beauty is no longer identified only with the works of, say, Fragonard and Rubens but now includes Mondrian, Leger and Rothko. We've lost the innocent, credulous view of the night sky in which we are free to imagine beasts and heroes, figures that helped drive our curiosity, without which our culture would be at a lesser place today. We've replaced that naïve wonder with another kind: scientific wonder, which by definition can't be thought of as "innocent" and is unattached to any cultural content beyond itself (which of course is as science should be). You will get some sense of the romance of the mysterious, barely known (and definitely not understood) sky of the early world of astronomy by reading Nick Kanas' *Star Maps*.

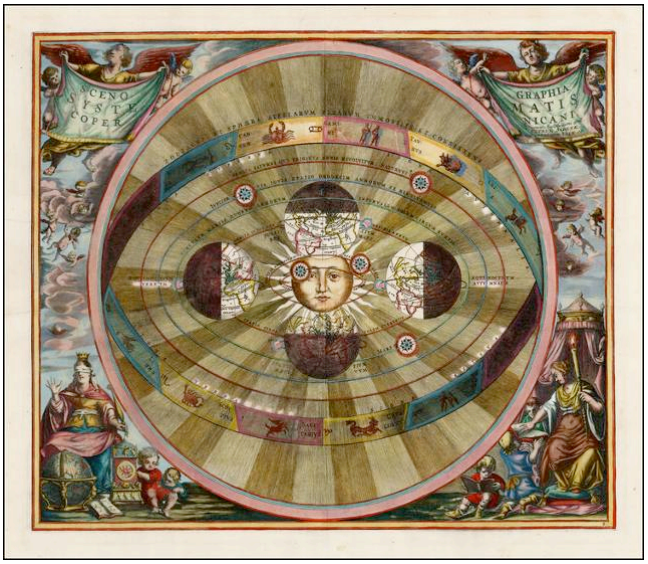
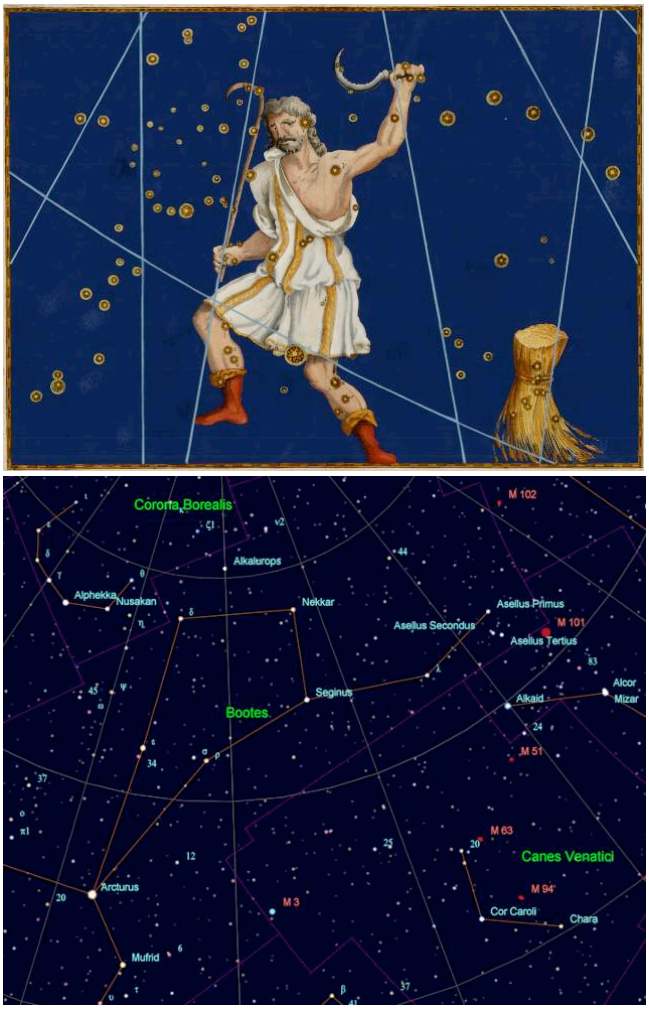


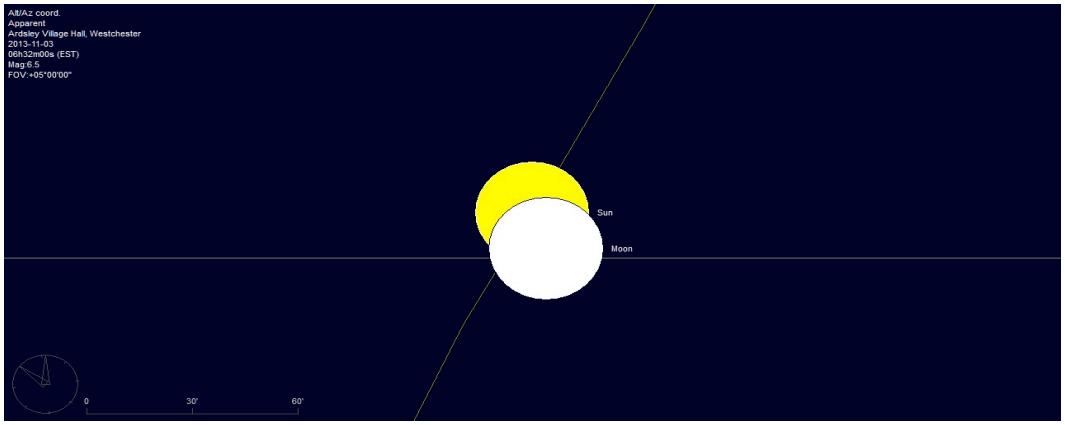
Illustration of the Copernican system from Cellarius' *Harmonia Macrocosmica* (1708).



Bootes then and now: Bayer (1603) (top), Patrick Chevalley (*Cartes du Ciel*), 2013 (bottom)

Lunar Atmosphere and Dust Environment Explorer

Mamaroneck High School senior Haley Karow captured the ascent of the LADEE lunar mission, which launched from Wallops Island, Virginia at 11:27 pm on September 6th. The photo was taken from the end of Orienta Ave. on Long Island Sound in Larchmont.

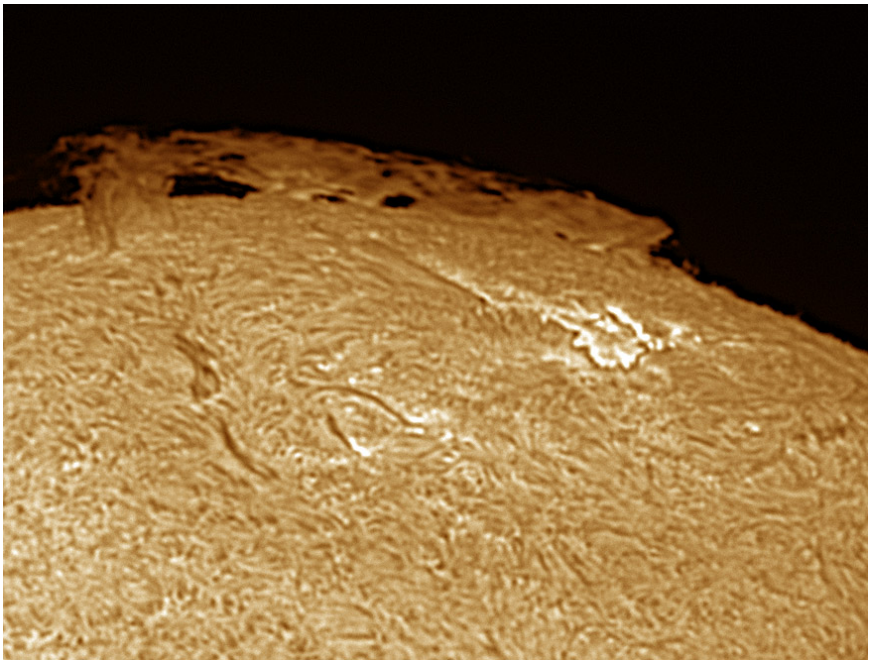


A Partial Sunrise on Sunday, November 3rd, 2013

Watchers of the sunrise along coastal sections of the eastern United States on November 3rd, 2013 will see the Sun partially blocked by the Moon.

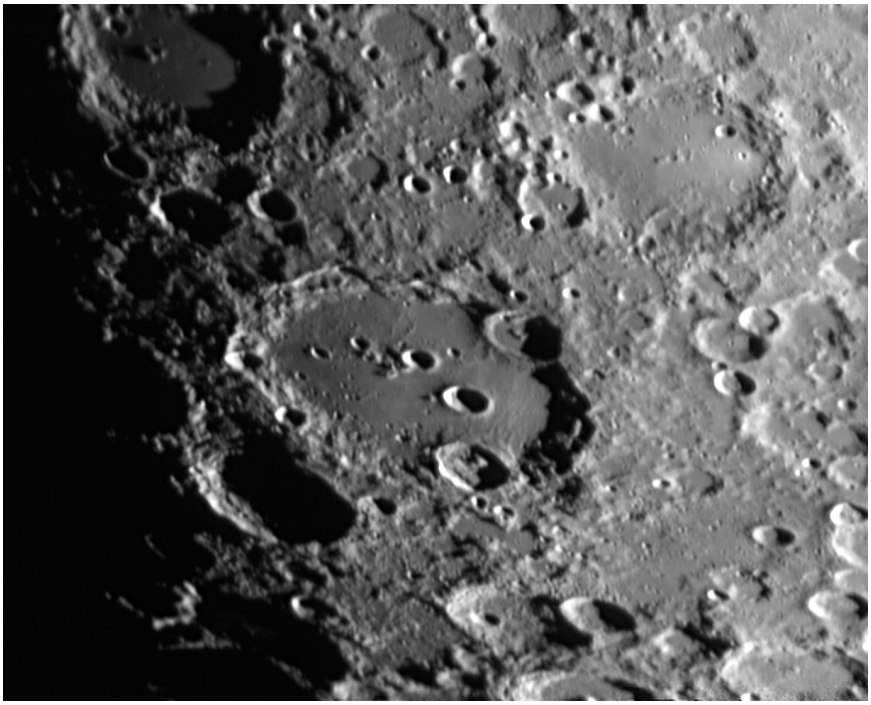
Above is the Cartes du Ciel planetarium software's view of the event at sunrise, about 6:30am Eastern Standard Time on Sunday, November 3rd, 2013. The yellow disk is the Sun – which is all you'll see. The Moon (white in this simulation) will not be visible, except as a silhouette against the Sun. The horizontal line is the horizon.

The moment of sunrise is when the eclipse will be greatest here. Then, the moon will appear to slip downward off the solar disk as the Sun rises higher. The eclipse will end about 7:12am EST, with the Sun only about 7 degrees above the horizon. Note that we 'fall back' to Eastern Standard Time on the morning of the eclipse. The total eclipse will occur over a narrow path across central Africa.



◀Solar Prominence

John Paladini used a Chameleon Point Grey camera and a 60mm Lunt solar scope (etalon filter double stacked, 150 exposures stacked in registax) to take this picture of a solar prominence.



◀Clavius Crater

Larry Faltz captured this image of the crater Clavius emerging from the lunar terminator of an 8-day moon (Orion 127mm Maksutov, Celestron NexImage 5, best 250 of 2000 frames).

The crater is 225 kms in diameter and is thought to be one of the moon's older features (estimates run to 4 billion years).

How to hunt for your very own supernova!

by Dr. Ethan Siegel

In our day-to-day lives, stars seem like the most fixed and unchanging of all the night sky objects. Shining relentlessly and constantly for billions of years, it's only the long-term motion of these individual nuclear furnaces and our own motion through the cosmos that results in the most minute, barely-perceptible changes.

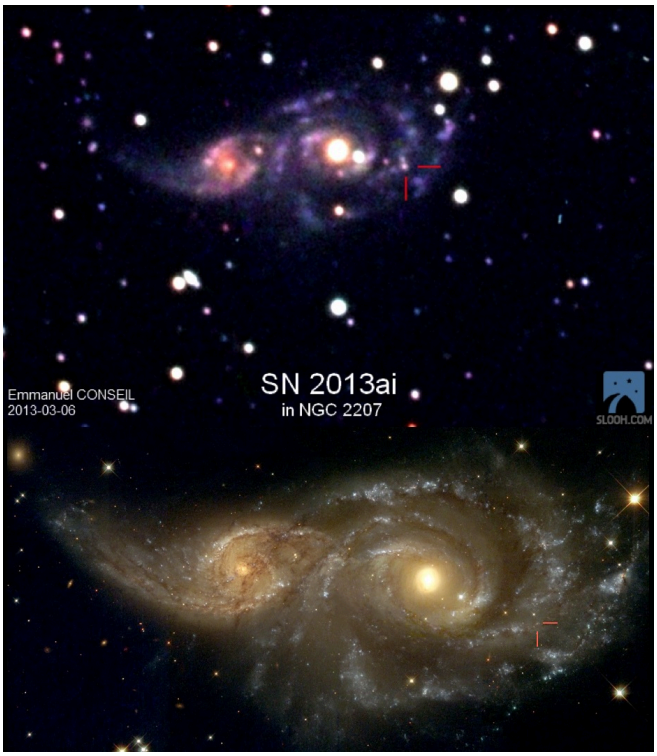
Unless, that is, you're talking about a star reaching the end of its life. A star like our Sun will burn through all the hydrogen in its core after approximately 10 billion years, after which the core contracts and heats up, and the heavier element helium begins to fuse. About a quarter of all stars are massive enough that they'll reach this giant stage, but the *most* massive ones -- only about 0.1% of all stars -- will continue to fuse leaner elements past carbon, oxygen, neon, magnesium, silicon, sulphur and all the way up to iron, cobalt, and, nickel in their core. For the rare ultra-massive stars that make it this far, their cores become so massive that they're unstable against gravitational collapse. When they run out of fuel, the core implodes.

The inrushing matter approaches the center of the star, then rebounds and bounces outwards, creating a shockwave that eventually causes what we see as a core-collapse supernova, the most common type of supernova in the Universe! These occur only a few times a century in most galaxies, but because it's the most massive, hottest, shortest-lived stars that create these core-collapse supernovae, we can increase our odds of finding one by watching the most actively star-forming galaxies very closely. Want to maximize your chances of finding one for yourself? Here's how.

Pick a galaxy in the process of a major merger, and get to know it. Learn where the foreground stars are, where the apparent bright spots are, what its distinctive features are. If a supernova occurs, it will appear first as a barely perceptible bright spot that wasn't there before, and it will quickly brighten over a few nights. If you find what appears to be a "new star" in one of these galaxies and it checks out, report it *immediately*; you just might have discovered a new supernova!

This is one of the few cutting-edge astronomical discoveries well-suited to amateurs; Australian Robert Evans holds the all-time record with 42 (and counting) original supernova discoveries. If you ever find one for yourself, you'll have seen an exploding star whose light traveled millions of light-years across the Universe right to you, and you'll be the *very first* person who's ever seen it!

SN 2013ai, via its discoverer, Emmanuel Conseil, taken with



the Slooh.com robotic telescope just a few days after its emergence in NGC 2207 (top); NASA, ESA and the Hubble Heritage Team (STScI) of the same interacting galaxies prior to the supernova (bottom).

Read more about the evolution and ultimate fate of the stars in our universe: http://science.nasa.gov/astrophysics/focus-areas/how-do-stars-form-and-evolve/.

While you are out looking for supernovas, kids can have a blast finding constellations using the Space Place star finder: http://spaceplace.nasa.gov/starfinder/.

Westchester Amateur Astronomers