SkyWAAtch

An Interesting Galaxy

Olivier Prache captured this image of M106, a spiral galaxy in Canes Venatici (almost 8 hours of exposure with an ML16803 camera and the Hyperion 12.5" astrograph, processed with ccdstack and Pixinsight).

About 23 million light years away, M106 harbors a huge black hole in its center. The black hole generates massive shock waves that roil the galaxy as well as provide an impressive display in the X-ray spectrum. See Chandra X-ray observatory images.

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Events for May 2015

WAA April Lecture

"How Rare Are Earth-like Planets?"
Friday May 1st, 7:30pm
Lienhard Lecture Hall,
Pace University, Pleasantville, NY

The NASA Kepler mission has increased vastly the number of planets we know about around other stars. Dr. David Hogg will review how planets are discovered in this data set, how they are understood physically, and how it is possible to make inferences about the full population of planets in the Galaxy. Some of the key questions revolve around the formation of planetary systems and the typicality of the Earth and our Solar System.

David W. Hogg is a Professor of Physics and Data Science at New York University, and an Adjunct Senior Staff Scientist at the Max Planck Institute for Astronomy in Heidelberg, Germany. His research is on astrophysical problems where engineering, calibration, and data analysis are of paramount importance. Free and open to the public. Directions and Map.

Upcoming Lectures

Lienhard Lecture Hall,
Pace University, Pleasantville, NY

Our June 5th speaker will be Mr. Alan Witzgall. His talk is entitled "Meteorites and the Amateur Astronomer." Free and open to the public.

Starway to Heaven

Saturday May 9th, Dusk.
Ward Pound Ridge Reservation,
Cross River, NY

This is our scheduled Starway to Heaven observing date for May, weather permitting. Free and open to the public. The rain/cloud date is May 16th. **Note**: By attending our star parties you are subject to our rules and expectations as described here. Directions.

New Members. . .

Lawrence C Bassett - Thornwood

Renewing Members. . .

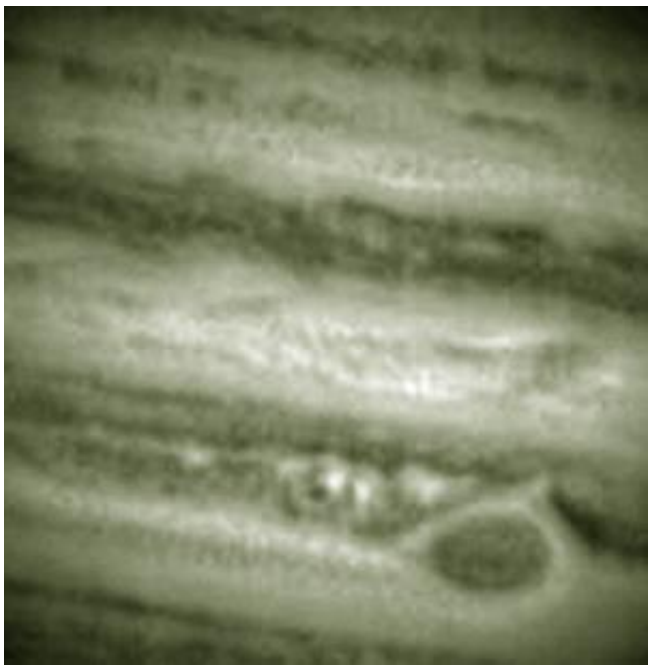
Barbara Matthews-Hancock - Greenwich
Robert Danehy - White Plains
Ruth and Eugene Fischer - Pleasantville
Karen Seiter - Larchmont
Paul Alimena - Rye
Pierre-Yves Sonke - Tarrytown
George Maroulis - Mamaroneck
Jimmy Gondek and Jennifer Jukich - Jefferson Valley
Jeffrey Jacobs - Rye
John & Maryann Fusco - Yonkers
Lori Wood - Yonkers
James Peale – Bronxville

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)
- Hoodies ($20)
- Outerwear ($30)

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



Using a Celestron 9.25 SCT, John Paladini captured this image of Jupiter's Great Red Spot. Notes John: my most close up view of Jupiter's clouds—look close you can see clouds about 1000K wide from 450 million miles.

Astrophotography Exhibition at Pound Ridge Library
May 23rd to July 3rd 2015

Pound Ridge Library will be having an exhibition of the astrophotography of Scott Nammacher, a Westchester based amateur astrophotographer. The exhibition opens May 23rd and extends to July 3rd in the library's Exhibition Hall. It is called "Treasures of the Northern and Southern Night Skies."

There will be an opening reception on Saturday, May 23rd, from 3 pm to 5 pm. Come meet the photographer and see the wonders of the night time skies.

Mr. Nammacher will show his photographs, taken from two remotely operated observatories (one in Australia and the other in New Mexico) and his up-state observatory, Starmere Observatory. He has been photographing nebulas, galaxies, along with cloud and gas regions, and more local solar system targets since the early 2000s. He became more seriously involved after he designed and built an observatory near Catskill, NY in 2008. He has shown earlier works at locations in the Hudson Valley area. The Pound Ridge show will contain many new photos taken in the last several years.

His photographs are printed using a unique process involving printing on coated aluminum, which enhances the color and vibrancy of the printed pictures. His website is starmere.smugmug.com.

Pound Ridge Library information:	271 Westchester Ave., Pound Ridge, NY 10576 Phone: 914-764-5085 Marilyn Tinter, Director Website: www.poundridgelibrary.org
Artist Information:	Website: starmere.smugmug.com Email: snammacher@msn.com

Scott's image of NGC 2170, a reflection nebula in Monoceros

Scott with some of his imaging equipment

Almanac
For May 2015 by Bob Kelly


May 3 May 11 May 18 May 25

Jupiter and Venus are the highlight of the evening sky, commanding our attention. But Mercury and Saturn also make a play for our affection with their minor excursions into the evening sky.

Mars is the only bright planet to hide in the glare of the Sun, which must be making it harder to communicate with the many spacecraft exploring the red planet. Mars hung out in the evening sky seemingly forever, so Mars will take its sweet time passing through the bright twilight this summer.

Mercury makes a guest appearance low in the evening sky but it's higher than usual, setting just after the end of evening twilight around the 6th. After the middle of the month, Mercury makes a rapid dive to superior conjunction with the Sun by the end of the month.

Saturn sneaks into the party, rising during evening twilight as we approach opposition with it on the 22nd. Our ringed friend is gorgeous, with the rings spanning the apparent size of Jupiter in our telescopes. Since Saturn is very far south on the ecliptic, it doesn't move more than halfway up to the zenith, unlike Jupiter, which starts off the night almost straight overhead.

Jupiter continues its show of multiple satellite shadows, with double shadow transits on the evenings of the 20th and 27th. With Earth coming to its nearest approach to Saturn for the year, it's a good time to see how many of its moons you can spot in your telescope. This year Saturn's rings are wide open and their brightness makes finding the fainter moons more challenging.

Venus starts off on the horns of the bull, Taurus, far above Hyades, the head of the bull and ends the month passing through the twins.

This is a great month for daytime astronomy, with Mercury, Venus and Jupiter trailing the Sun in the sky. It's best **(and safest)** to block the sun with a solid, fixed object! For the first half of the month, Mercury is 20 degrees to the east of the Sun, growing in size past 8 arc seconds, starting out half lit and narrowing down to a crescent Mercury by the second week in May.

Venus stands off twice as far out from the Sun and twice as large as Mercury. Our brilliant, cloud-covered neighbor is a bit slower at changing phase, a little more than half-lit this month. Jupiter is far off to the east, intermediate in brightness between Mercury and Venus, but larger at 35 arc seconds. It's a good time to compare the surface brightness of our evening planets.

Comet Lovejoy looks smaller every week, as it approaches the pole star, Polaris. Around the 29th, Lovejoy stands next to Polaris as if wanting to take a selfie. Here's an opportunity for those of us who don't have tracking cameras. The stars near Polaris appear to turn very slowly around the pole star, allowing long exposures with little trailing. So we might be able to capture this faint fuzzy on camera with a longer exposure than possible for those stars near the equator, even if Lovejoy is only shining at 9th magnitude as predicted. Give it your best shot and let us know!

The International Space Station is visible in the morning sky starting on the 12th. In early June, the ISS will have many appearances each night, so get ready for the ISS marathon. It's not as easy as it sounds – since it's hard to see all the appearances in a night, with an hour and a half between passes.

Westchester
Amateur Astronomers

David Parmet snapped this photo at the April 11th Starway to Heaven in Pound Ridge. It shows Venus hanging out just below and to the left of the Pleiades.

Strange Brew

Larry Faltz

Back in the day, when amateur astronomers generally had to make their own equipment, all sorts of everyday items were used in telescope construction. Sam Brown's seminal *All About Telescopes* (Edmund Scientific, 1967), which for many newbie astronomy enthusiasts was our first telescope bible, presents a design for a telescope using two Minute Maid frozen orange juice cans and an Air-Wick container. Some of you may have seen the "beer bottle telescope", a device shaped and colored exactly like a Heineken bottle. Perhaps some enterprising amateur with a bottle cutter once figured out a way to mount a short focal-length objective at the bottom end of an actual beer bottle and put a simple eyepiece at the top. Apogee, a maker of useful telescope accessories, took the concept commercial, marketing a beer-bottle-shaped scope. This instrument had a 50 mm diameter objective and a fixed eyepiece of 12 mm on a helical focuser, giving 18 power magnification. Sadly it appears to be out of production. Here's what one British user said about it on a web site review:

An excellent product, well made, and the focusing action is smooth and precise. Nothing can compare to wandering about in a field with your eye pressed to this 'beer bottle'. You get some strange looks off people. I wish these were available in the UK as postage to here is pretty expensive. All in all, I would buy again. And intend for birthdays etc.

Pros: Looks good, quality product.

Cons: No beer.

Another beer-themed telescope is imagined in *The Simpsons* "Waiting for Duffman" episode (Season 26 Episode 18, aired March 15, 2015). Homer temporarily becomes the new Duff Man, the bizarre spokesman for his favorite brew, Duff Beer (the secret recipe, locked in a safe, is revealed to be "Schlitz plus water"). He flies in the Duff Blimp, where he looks through a scope made from a large can of Duff Beer.

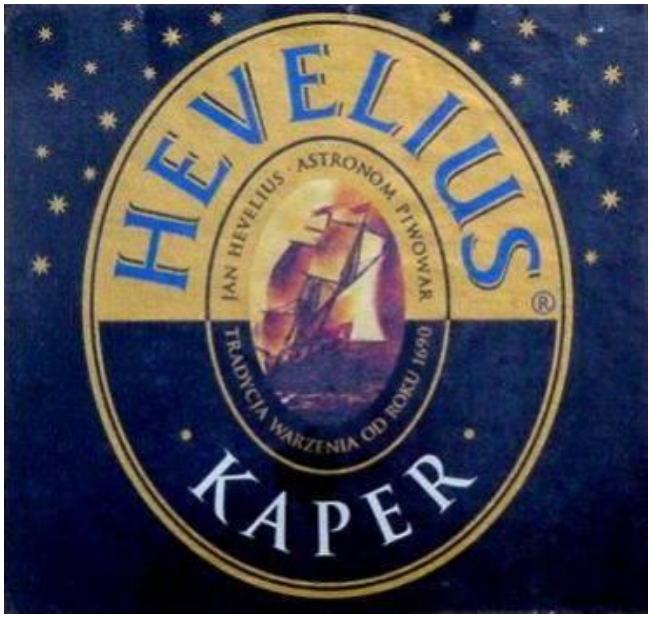
Homer using the Beerscope on the Duff Blimp.

Scope branding has been done before: William Optics made some Ferrari refractors a couple of years ago, painted Italian racing red (the color all Ferraris should be) with the prancing horse logo on the tube. Like Ferraris, they were pretty, well-made and expensive.

We recall Benjamin Franklin's famous adage, "Beer is proof that God loves us, and wants us to be happy." Since its invention (discovery?) beer has helped keep the human race alive until advances in plumbing and public health figured out how to make the water supply non-toxic. Up until recent times, it was fatal to drink water from the public supply because of bacterial contamination, primarily from coliform organisms, which is a nice way of saying that water was polluted with human feces. The great Russian composer Peter Ilyich Tchaikovsky died of cholera, a disease transmitted through human waste, 6 days after drinking tap water he was warned not to imbibe, suggesting to some that the chronically depressed musician was trying to commit suicide. And this was in a major world capital (St. Petersburg) and in 1893.

So we were intrigued when inventive WAA member John Paladini, who can make a telescope out of anything, sent us a photo of a beer label honoring the 17th century Polish astronomer Johannes Hevelius (1611-1687). The Polish language label shown below (there's an English version on imported bottles) says "Jan Hevelius-Astronomer-Brewmaster." Under the picture of a sailing ship (a reference to the important Baltic port city of Gdansk, not far from the Hevelius brewery in Elblag, Poland) is the line "Brewing tradition since 1690." That seems odd, since the Hevelius

family was in brewing for several generations before Hevelius' birth, and Hevelius died 3 years before that date.



The mixed German-Polish city of Gdansk was famous twice in the 20th century. Under its German name Danzig, it was one of the provocations cited by Hitler to justify the German invasion of Poland in 1939. In the 1980's it was the site of Lech Walesa's Solidarity labor union movement that helped undermine Soviet control of Poland, leading to its adoption of democracy when the Soviet Union disbanded.

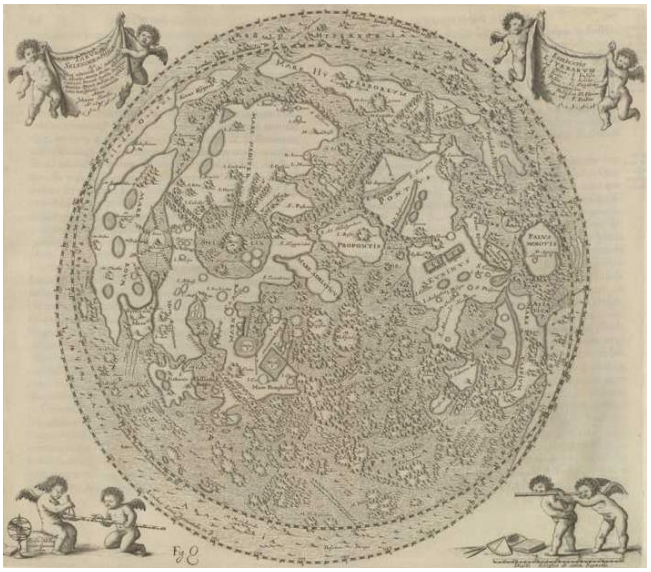
Although his family originally was German-speaking, (Hevelius is the German spelling; in Polish his name is Jan Heweliusz) Hevelius was educated in Polish and thought of himself as a Pole. He excelled in mathematics and astronomy as a young student. After studying law, he travelled to England and France in the early 1630's, meeting many astronomers, among them Pierre Gassendi, Marin Mersenne and Althanasius Kircher. Upon returning to Gdansk, he married and joined the beer-brewing guild, later becoming its chief. He also became a councilor and later mayor of the city. Like most early astronomers, Hevelius initially derived no income from his celestial interests. Later in life, after his fame as an astronomer grew, he received pensions from the Polish and French kings.

Being wealthy from his commercial and public activities, he had three contiguous houses in town and in 1641 built an observatory atop them, which he named *Gwiezdny Zamek* (German *Sternenburg*, "Star Castle"). From this perch, he made many celestial observations, preferring at first naked eye examinations using instruments that would be familiar to Tycho Brahe half a century earlier, but later building capable telescopes. Hevelius was particularly interested in the moon. He discovered lunar libration and published the first detailed lunar surface charts in *Selenographia, sive Lunae descripto* (1647). You can browse a copy owned by the ETH Zurich (Eidgenössische Technische Hochschule Zürich), the Caltech of Austria, famous for its graduate and later professor Albert Einstein. The Huntington Library in Pasadena has a fine copy on display that I saw in late March 2015.

The *Selenographia* is much more than just a narrative description of the moon with many drawings of the lunar surface. It contains a large amount of explanatory material, observations of all the then-known planets, documentation of planetary conjunctions, descriptions of star fields, explanations and diagrams of the Ptolemean, Tychonic and Copernican systems of the heavens, observations of the moons of Jupiter over many nights and numerous drawings of sunspots parading across the face of the sun. Hevelius was the first astronomer to determine the sun's rotation rate. He also observed, described and timed the solar eclipse of August 21, 1645, which was only partial in Gdansk, the path of totality crossing central Russia to the east. There are even descriptions and drawings of his instruments and his fabrication techniques.

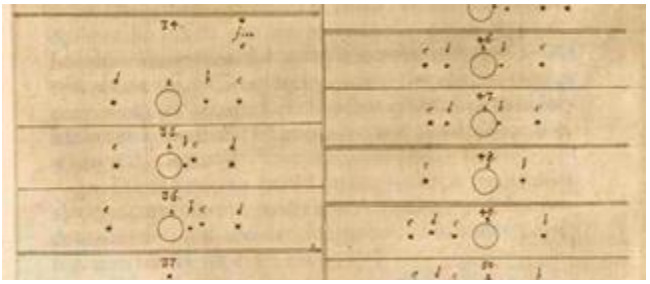
Observing through a small refractor, from the *Selenographia*

Hevelius discovered 4 comets, which he called *pseudoplanetae*, and noted that they had curved orbits, correcting Kepler in that regard. He apparently did not specify the exact formula for their orbital curvatures. Willy Ley, in his wonderful book *Watchers of the Skies* (Viking, 1963), says that Hevelius "made a step in the right direction, but a very short one." Shortly thereafter, Newton came up with the correct parabolic answer. He also observed and drew Saturn's rings, but like Galileo was unable to discern their true nature, that discovery finally being made by Christian Huygens in 1655.

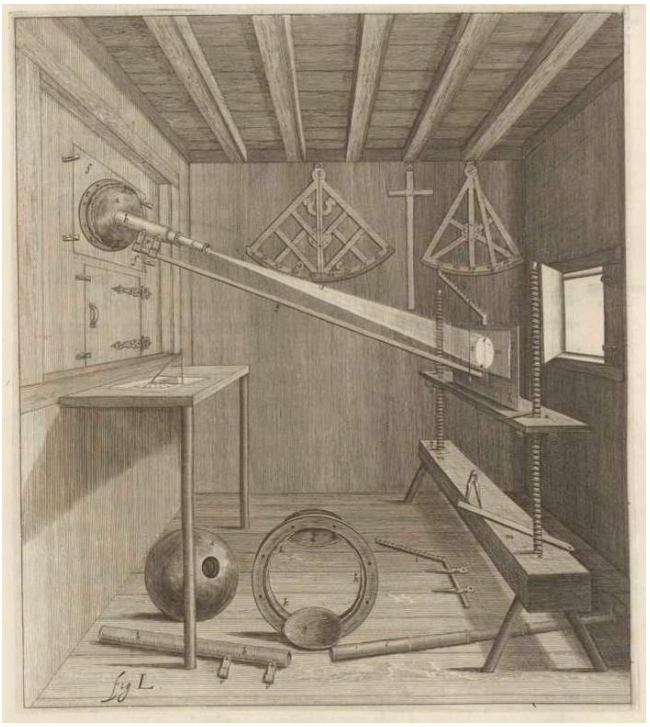


Lunar map with place names and libration (a 2-page spread), from *Selenographia*

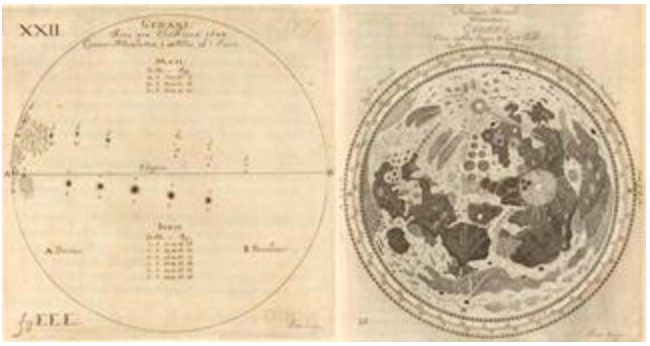
Ley states that Hevelius discovered that Alpha Capricorni and 61 Cygni were double stars. Alpha Capricorni (Prima and Secunda Geidi, magnitudes 4.3 and 3.6 respectively) might be resolvable with the naked eye, having a separation of about 6.6 arc-minutes, about half of the Alcor/Mizar pair (very good eyesight should resolve about 4-5 minutes of arc). The components of 61 Cygni (magnitude 5.2 and 6.0), famous as "Piazzi's Flying Star" because of its large proper motion, are only 0.5 arc-minutes apart, so Hevelius' observations must have been telescopic. Hevelius gave the name *Mira*, meaning "wonderful," to the variable star Omicron Seti, although he was not its discoverer. For solar observations, he used eyepiece projection, thus saving his vision, unlike Galileo, whose blindness later in life has been attributed to direct, unfiltered solar observing. Hevelius was made a fellow of England's Royal Society in 1664, just 4 years after its founding, the first Pole to be named to that remarkable organization.



A small selection of Hevelius' Jupiter observations



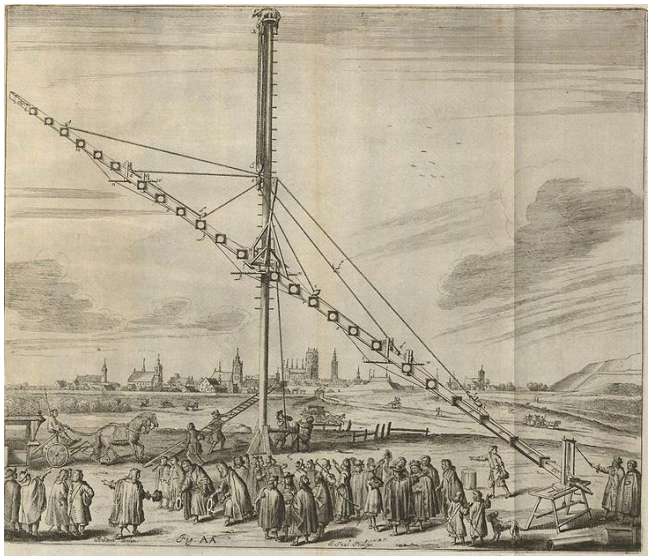
Hevelius' solar projection apparatus, from the *Selenographia*



Solar and lunar drawings from the *Selenographia.* These are each full pages in the book.

I know John Paladini was titillated by finding Hevelius beer, but he admitted to me that he was even more captivated by Hevelius' improbable 150-foot long refracting telescope, which was completed in 1673. Hevelius created this instrument after having observed with 12-foot, 60-foot and 70-foot refractors.

Given the quality of singlet lenses in the 17th century, chromatic aberration could be reduced only by making very long focal length objectives. Being a wealthy brewer and an important town official, Hevelius could manage the complex and costly building and operation of this telescope, but in practice it was almost impossible to use because of its size and the impact of even the smallest breeze. Bigger is not always better. William Herschel completed his famous 40-foot (focal length) reflector in 1789 but preferred smaller instruments for observing, making the majority of his deep sky observations with a 20-foot reflector (16" mirror).



Hevelius' 150-foot refractor, erected on the Baltic shore near Gdansk, shown in the background.

After the Battle of Vienna in 1683, in which the forces of the Holy Roman Empire under Polish King John Sobieski vanquished the Muslim Ottoman army led by Grand Vizier Kara Mustafa Pasha, effectively ending Ottoman designs on central Europe, Hevelius marked out stars for a new constellation, *Scutum Sobiescianum*, which has persisted as Scutum. In fact, 7 of the constellations we use today were created by Hevelius: Canes Venatici, Lacerta, Leo Minor, Lynx, Scutum, Sextans, and Vulpecula. Several others that he marked out haven't survived to the modern era.

Hevelius' first wife died in 1662, and his second wife Elisabeth supported his astronomical activities, including publishing two of his works after his death. She is considered by some to be the first female astronomer, antedating Carolyn Herschel by over 100 years, although her role as an observing assistant to Hevelius is hardly that of Carolyn's to William Herschel and she did not make as many independent observations. Sadly, Hevelius' observatory was destroyed by fire in 1679 and nothing from it remains, except in a sense through memorialization of his instruments in the constellation Sextans and in his now very rare book *Machina coelestis* (1673 & 1679). He did build another observatory and was able to observe the Comet of 1680, one of the most spectacular comets of all time.

Hevelius' lunar maps included many surface features with names based on Earthly geography. Many of his appellations for mountains and what he and most other astronomers thought were bodies of water remain today: Alps, Apennines, Mare Serenitatis (we translate that today as "serenity" but he meant "pacific" as in "peaceful") among others. The names of craters, however, were supplanted just four years later by Giovanni Battista Riccioli, whose *New Almagest*, published in 1651, assigned crater names to famous astronomers past and present (that is, as of 1651). He gave the most prominent lunar crater the name "Tycho," which tells us something about the Astronomer Hall of Fame pecking order in the mid-17th century. Hevelius is honored on the lunar surface by Riccioli with a small, somewhat indistinct crater on the moon's western limb near the equator, just north of the more distinct Grimaldi. A lunar astronomer of Hevelius' creativity and achievements might have warranted a more distinct and central feature, but perhaps Riccioli was envious that Hevelius beat him to press with his lunar atlas. At least Hevelius has a beer named after him, and you can't say that about Tycho. Or Riccioli.

We searched for Hevelius Beer at Half Time, the mammoth beer emporium in Mamaroneck (there's also one in Poughkeepsie) that bills itself as having the "World's Largest Selection of Beer." After combing through hundreds of European beverages on the shelves, Hevelius was not to be found. Our search was not fruitless because we came upon some bottles of Jupiter Brown Ale, a product of Bell's Brewery in Comstock, Michigan. Comstock is a town halfway between the cities of Kalamazoo, the original home of Gibson Guitars and the now-defunct Checker Motor Company, makers of the iconic Checker Cab once ubiquitous on Manhattan streets (remember those flip-up rear seats?), and Battle Creek, where the headquarters of the Kellogg cereal company is located.

Larry Bell, the founder and owner of Bell's Brewery, must enjoy classical music, because Bell's "Planets Series" of craft beers is based the famous orchestral composition *The Planets*, written between 1914 and 1916 by English composer Gustav Holst (1874-1934).

This suite of 7 movements for large orchestra is based more on ideas astrologic than astronomic, attributing emotional qualities to each planet. Classical astrologers didn't know about Uranus and Neptune, which each get a movement anyway, and no one before 1930 knew about Pluto, so it's not included at all. If it had been, one wonders whether the IAU's decision to kick Pluto out of the planet club would have required a shortened concert version of *The Planets*, or maybe someone would have commemorated its reclassification as a dwarf planet by re-scoring the Pluto movement for a dwarf orchestra, perhaps 3 violins, an oboe, a tuba and a triangle. At least now the concert program notes don't have to explain why there's no Pluto movement, as they must have had to from 1930 to 2006. Not satisfied with making excuses, in 2000 the Hallé Orchestra (based in Manchester, England) commissioned English composer and Holst authority Colin Matthews to write a movement called "Pluto, the Renewer," which was dedicated to Holst's musician-composer daughter Imogen Holst (1907-1984). The IAU's 2006 decision has probably consigned this composition to the music library basement forever.

The movements of *The Planets* are not in proper solar system order until we get to the gas giants:

1. Mars, the Bringer of War
2. Venus, the Bringer of Peace
3. Mercury, the Winged Messenger
4. Jupiter, the Bringer of Jollity
5. Saturn, the Bringer of Old Age
6. Uranus, the Magician
7. Neptune, the Mystic

Mars is famous for being in unusual quintuple (5/4) time, like the second movement of Tchaikovsky's Sixth Symphony ("Pathetique") and the influential jazz composition "Take Five" by Paul Desmond that made Dave Brubeck a jazz legend by its inclusion on his 1959 album *Time Out*. The rhythmic, slightly irregular hammering of the Mars movement is the inspiration for countless movie battle soundtracks.

The Planets became popular as a concert piece in the early 1960's after a famous recording by Eugene Ormandy and the Philadelphia Orchestra. Undoubtedly the space race had something to do with its appreciation by the generally classical music-avoiding public. It helps that it's a dynamic and creative score that makes effective use of a very large orchestra. The traditional winds and strings are augmented with extra woodwinds, 15 brass instruments, two tympani players, a gong, cymbals, side drum, bass drum, two harps, an organ and a choir singing a wordless *vocalise* to conclude the Neptune movement. Many fine recordings have been released, but in spite of the vast sonic

palette from the huge symphonic forces, some people were not satisfied. At least two electronic synthesizer versions were made, one of which provoked a lawsuit by the Holst estate. Most of the album covers show photos or drawings of the planets, as you'd expect, but some show deep sky objects (why?). One cover was clearly inspired by the campy 1968 space movie *Barbarella*, and was nominated as being among the "worst classical music album covers of all time." Check it out if you dare.

The Jupiter Brown Ale is a very malty, smooth, somewhat aromatic ale with an interesting finish, something you'd expect from an artisanal beer trying to impress. The Planets Series beers are being released in the order of the movements. Sadly, we probably missed Mars, Venus and Mercury, but maybe we'll be able to follow up Jupiter and try out the Saturn, Uranus and Neptune brews.

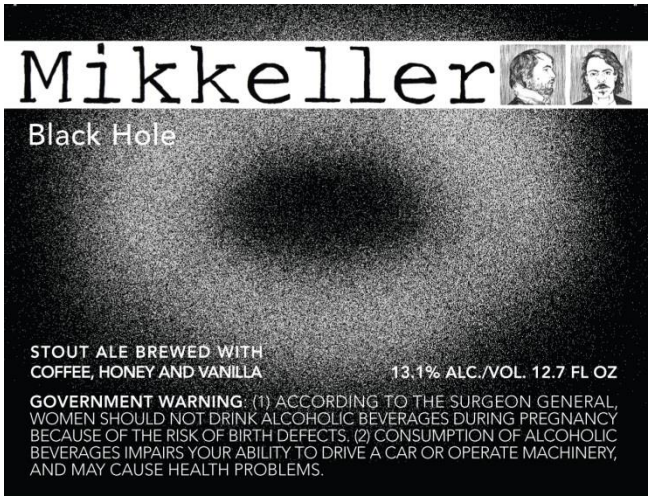
It seems these days that there are more beers than objects in the Oort Cloud. Craft brewing appears to be a national craze, with microbreweries popping up everywhere, making special beers for a short time and moving on to new recipes as it suits them. John Harris, an amateur astronomer, runs Ecliptic Beer in Portland, Oregon. His brewery features a light fixture in the shape of the analemma. In a YouTube video, he likens the bubbles in the head of a glass of beer to stars and says that the bubbles express "the infinity of the universe and the infinity of beer." He's an enthusiast for both astronomy and beer, that's for sure, if a somewhat uncertain metaphorist. The video shows him with his first telescope, something that looks home-made right out of *All About Telescopes*. Ecliptic makes Spica Pilsner, Procyon Pale Ale, Phobos Single Hop Red Ale, Tarantula (the southern hemisphere nebula, not the spider) Belgian Dubbel, Lacerta Frambuesa, Orbiter IPA, and other brews referencing Izar, Capella and Rigel, in addition to a Cosmic Storm Belgian Sour.

Another beer-astronomy relationship is evident on cans of the iconic Australian beer Foster's, where the stars of the Southern Cross are depicted (next page).

Black holes are big in the beer business. The Black Market Brewing Company of Temecula, California, makes a "super high gravity" (15% alcohol) "Black Hole Sun Imperial Stout" that comes with the admonition that "because of the gravitational pull of Black Hole Sun, no light can escape." Presumably you can't shine a light through a glass of this stuff. But they're not the only brewer to seize on the black hole concept.

There's a Black Hole Brewery in the West Midlands of England, not far from Nottingham of Robin Hood fame. Not only do they brew a Black Hole Bitter, they have beers named Red Dwarf, Cosmic, Milky Way, Super Nova and Cyborg, and a series of seasonal ales named Asteroid, Apollo, No Escape, Orbit and Starry Night. Their tag line is that they make "beers that are out of this world!" and their web site cheekily claims "From the far reaches of the universe something wonderful has happened. Following the collapse of a distant star, the Black Hole Brewery has emerged. The first intergalactic brewery to offer flavours that the human race could only dream of before." There's also the Black Hole Beer Company of Prescott, Arizona, makers of Star Dust, a wheat beer, Binary System, a Belgian dubbel, Stellar Saison, Ryezing Sun (I kid you not) and Porter 9 from Outerspace (I kid you not even more), a "Chocolate Orange Imperial Porter."

Mikkeller, a brewer in Copenhagen, Denmark, makes a Black Hole Stout. Perhaps the government warning should also include a reminder to stay away from the black hole's event horizon.



I found brews named "Dark Matter" by many makers, including Hoyne (Victoria, BC), Vale of Glamorgan (Cardiff, Wales), Saltaire (Shipley, UK), Kinver (Staffs, UK), Baseline (Sussex Downs, UK), Chorlton (Ardwick, UK), Element (Millers Falls, MA), Logboat (Columbia, MO), Strike (San Jose, CA) and MKE (Milwaukee, WI). The Brooklyn Brewery has just released their version of "Dark Matter". Their web site notes "Cosmologists tell us that the universe was made by a massive explosion called the Big Bang. And in this Big Bang was created a material called "dark matter", which accounts for 95% of the mass of the universe and actually binds the universe together. Well, that sounds pretty heavy. But it's theoretical. Here in Brooklyn, our cosmology is a bit different." I discovered that Brooklyn *is* an alternative universe. It's reached from Westchester via a mysterious wormhole called the Brooklyn-Queens Expressway, where the density is infinite and time has been known to stop (at least when I've been on it).

In 2008, Japanese maker Sapporo brewed a small amount of beer made from the third generation of barley seeds that had been grown on the International Space Station. The main purpose of putting the grain on board the ISS in the first place was to try to grow plants in space in preparation for long space voyages. Space travel is stressful. Alcoholic beverages would be helpful on a long space trip, something akin to the grog given to crews on British sailing vessels. In *Packing for Mars* (WW Norton, 2010), author Mary Roach reviews the physical and psychological stresses that inevitably occur during space travel, and notes how magnified they could be on a 5-month (each way) Mars trip. Russian space crews apparently smuggled and liberally imbibed vodka on board their spacecraft, and some psychological conflicts were apparently mollified as a result. Roach suggests that alcohol might be a helpful tool to control behavior in the depths of space. Whether it should be beer or something more concentrated (to reduce payload weight) is undoubtedly a matter for intense NASA study.

On April 13, 2015, the Ninkasi Brewing Company of Eugene, Oregon released "Ground Control Imperial Stout," made with yeast flown into space. The "Ninkasi Space Program" made a sub-orbital flight in July 2014, but after re-entry the capsule was lost in the desert for a month. When finally recovered, the yeast cells had been baked in the sun so long they were useless. Ninkasi's second try, in October 2014, was launched from Truth or Consequences, New Mexico. The SpaceLoft-9 rocket, made by UP Aerospace of Denver, carried six vials of yeast 77.3 miles above the earth. This time they were successfully recovered and used for brewing. Only 55 barrels are being made. A 22-ounce bottle will cost $20. Ninkasi is sponsoring some space-related events, mostly on the west coast but possibly one in New York.

Successful launch by the Ninkasi Space Program in October 2014

Speaking of events, it turns out that there is an organization, Astronomy on Tap, which sponsors talks on astronomy in welcoming bars around the country (and even did one in Santiago, Chile in October 2014) under the mantra "Science is even better with beer!" Astronomy on Tap was founded in New Haven by Megan Schwamb, a planetary astronomer who is currently a post-doc at the Institute of Astronomy & Astrophysics at Academia Sinica in Taiwan. She got her degree at Caltech under the famous Kuiper belt observer and author of *How I Killed Pluto* Mike Brown

(see the review of his book in the March 2011 WAA SkyWAAtch newsletter). New York events (most of them seem to be in the Brooklyn universe) are organized by astronomer Emily Rice, a research associate at the American Museum of Natural History and assistant professor at the College of Staten Island, with the help of Brian Levine, an astrophysics educator at the American Museum of Natural History. The events feature presentations by astronomers and other scientists. Interaction among the attendees is encouraged. There are even a variety of quizzes and contests with winners receving something called "Neil Tyson's ~~Trash~~ Treasures™" (*sic*). I spoke with Dr. Rice, who told me that the prizes are some of the many unsolicited promotional items, samples, trinkets and books that are sent to Dr. Tyson, presumably for his endorsement or potential sale in the planetarium's gift shop. Trash or treasure? A little of both.

Dr. Rice said that the group's first events were in a wine bar under the name "Astronomy Uncorked," but the hospitality of several local watering holes made "Astronomy on Tap" more apt. Programs gather as many as 80 attendees, and an event in the Intrepid Sea, Air and Space Museum's Space Shuttle Pavilion drew 300 enthusiasts. You can get on their email list (on the web site) or use social media to keep in touch.

Inside the Sky Bar, Tucson, April 2011 (LF)

One place to really encounter astronomy on tap is at the Sky Bar in Tucson, Arizona. Located just a few blocks west of the University of Arizona campus, the Sky Bar has rooftop telescopes that send images into the bar area, where there's also live music. They currently have an 8″ Celestron SCT with Hyperstar (making the scope an f/2 astrograph) and Starlight Express CCD imager, a 12″ Meade dobsonion reflector and a 14″ Meade LX 200. Although Tucson has a lighting ordinance to help out nearby research observatories (Kitt Peak, Mt. Hopkins, Mt. Lemmon and Mt. Graham) it's still pretty bright in town. When we were there in April 2011, the Sky Quality Meter read 18.40, which is in the Bortle red zone (urban-suburban transition, in other words the north Bronx). Nevertheless, a local astronomer had set up a 12" Meade SCT in the patio outside the bar, and we observed a variety of objects including Saturn and the nucleus of M51, chatting with several other amateur astronomers who frequent the place.

Outside the Sky Bar in Tucson, April 2011 (LF)

There is another historical linkage of beer and astronomy, in the person of Wilhelm Beer (1797-1850), a Prussian banker who was a serious amateur astronomer. Beer worked with professional astronomer Johann Mädler to produce a superb map of the moon (1836) that was the lunar reference chart for many years afterwards. He and Mädler made the first Mars globe and accurately measured the planet's rotation, just a tenth of a second off of the modern value. He's honored with Beer craters on Mars and the Moon and asteroid 1896 Beer, which might be confusing if you encounter it unexpectedly. In another musical relationship, he was the half-brother (note the name similarity) of opera composer Giacomo Meyerbeer (1791-1864), a German Jew who composed his greatest operas in French (the most famous of which are *Les Hugenots*, *Le Prophète*, and *L'Africaine*). Meyerbeer's tuneful dramas were incredibly popular in his time (sadly much less so now), and during his life he was probably more famous than Giuseppe Verdi. He wrote a comic opera in 1854 called *L'étoile du Nord* (The North Star), but alas it has nothing to do with Polaris, astronomy, or beer.