Skylights

Newsletter of the Astronomical Society of Northern New England

MAY 2015

Member of NASA's

Astronomical League

ASNNE MISSION

ASNNE is an incorporated, non-profit, scientific and educational organization with three primary goals:

1) To have fun sharing our knowledge and interest with others.

2) To provide basic education in astronomy and related sciences to all who are interested.

3) To promote the science of Astronomy.

What's Up In May

By Bernie Reim

The month of May is named after Maia, the Roman goddess who is the mother of Mercury and the daughter of Atlas. We are halfway into spring already and our landscape is just beginning to be transformed by the hue of the fresh grass and the tender light green leaves beginning to show up on the trees. The spring peepers and wood frogs are getting louder and braver as they add their sonic contributions to the symphony involving all your senses that is the reawakening earth in spring.

The nights will be getting considerably warmer this month, so this will be a good month to spend more time under the night sky to get reacquainted with the celestial treasures residing just above us. The highlights this month include a meteor shower on May 6, three planets putting in their best appearances for the year, and some nice conjunctions.

The Eta Aquarid Meteor Shower peaks on the Tuesday the 5th into Wednesday morning the 6th. The moon will be full just three days before this shower, so the waning gibbous moon will be rising a few hours after sunset to spoil the show. However, you can still try to catch some of these tiny pieces of Halley's Comet for a couple of hours after sunset if it is clear.

Halley's is the only comet that causes two different meteor showers for us on earth each year. The other one is the Orionids on October 21. The earth passes through its debris trail twice every year. After its appearance in 1985 and 1986, this most famous of all comets is still heading farther out into space. It already passed the planet Uranus and it will reach out beyond Neptune by 2024, which marks the half way point of it 76 year orbit. It will return to grace out skies again in 2061 and 2062. That appearance should be brighter than its last one, but not as bright as its 1910 apparition.

All of these tiny flakes of dust from this most famous of all comets will appear to originate in the constellation of Aquarius, just to the east of Capricorn and near Pegasus. They will be smashing into our upper atmosphere at about 40 miles per second, creating brilliant streaks of light lasting for less than one second. Most of them will disintegrate at around 70 miles high. If the moon would not be out during the peak of this shower, you could expect up to 50 meteors per hour, but we will see far less than that because of the nearly full moon. In any case, it is always a thrill to see a meteor and experience something of the real nature of comets and the true nature of our atmosphere at the same time. Remember that this is a roughly 4 and a half billion year old primordial speck of dust that had never encountered our atmosphere before the instant that you see it and become aware of it.

Venus keeps getting higher and brighter and larger in our sky even as it gets less illuminated by the sun. Our sister planet is now catching up with us in its faster orbit around the sun. Venus will be cruising through Gemini this month and the waxing crescent moon will be close to it for three evenings from the 20th through the 22nd.

Mercury will also be at its best early this month. You can see our first planet in Taurus between the Pleaides and Aldebaran, about where Venus was last month. If you look

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What's Up "*Continued from page 1*"

very low in the western sky you might also be able to catch the last vestiges of Mars as it finally sinks below the horizon for the rest of the month before it will reappear in our morning sky next month.

As you watch Venus and Mercury also look for Orion the mighty hunter slowly sinking into the western sky to the left of this pair of planets. You know summer is not far off when Orion finally exits our celestial stage just as it entered our evening stage half a year ago to mark the beginning of autumn.

Saturn will be at its best this month as it reaches opposition on Friday the 22nd. That means it will rise at sunset, reach its highest point at midnight, and not set until sunrise. The ringed planet will still be well placed for viewing all summer long and will rise earlier, which means that it will reach its highest point in the sky earlier at night as we approach summer. Right now it appears as the fourth star in the head of Scorpius. Below it you can easily see Antares, the brilliant orange giant star that is about 700 times larger than our own sun. If you could place Antares where our sun is in the sky, all the planets out to Mars would be orbiting inside this enormous star. The biggest star in our galaxy, Canis Majoris, is about twice the size of Antares, which means that it would engulf the orbits of all of our planets out to Saturn.

In contrast to the trio of planets at their best this month, Jupiter is slowly getting dimmer and smaller as it falls farther behind our orbit. The king of the planets is about 7 times fainter than Venus, but it certainly holds its own for its part of the sky in Leo, two constellations over to the east of Venus. These two bright planets are now 50 degrees apart, but watch as Venus will catch up with Jupiter at the rate of almost one degree per day. There will be a spectacular conjunction of this pair on July 1st.

The waxing crescent moon will pass just below Jupiter on Saturday, May 23rd.

May 1. This is National Space Day. On this day in 1949 Gerard Kuiper discovered Nereid, the third largest moon of Neptune. The Kuiper belt consists of trillions of icy objects, similar to the asteroids in the asteroid belt between Mars and Jupiter. However, Kuiper belt objects tend to be icier than the rocky asteroids. There are thousands of Kuiper belt objects up to 100 km in diameter. Many more of these will probably be found soon and they will be classified as icy dwarf planets or Kuiper Belt Object. Pluto is now the largest and closest Kuiper belt object and no longer a full- fledged planet. Most of the Kuiper belt is about 50 astronomical units from the sun, or 50 times the earth-sun distance. By comparison, the Oort cloud of trillions of potential comets stretches all the way out to 100,000 astronomical units forming a giant sphere all the way around our solar system. Look for Venus, Mercury and Mars in the western sky. Spica, the brightest star in Virgo, is about 6 degrees from the nearly full moon.

May 3. Full moon is at 11:42 pm. This is also called the Flower, Milk or Planting Moon.

May 4. The waning gibbous moon appears 5 degrees from Saturn tonight.

May 5. On this day in 1961 Alan Shepard became the first American in space in a sub-orbital flight aboard Freedom 7. Yuri Gagarin became the first human in space on April 12 of 1961 when he completed one full orbit of the earth in about 100 minutes.

May 6. The Eta Aquarid Meteor shower peaks this morning.

May 11. On this day in 2009, STS-125, the Atlantis, is launched with the fifth and final servicing mission to the Hubble Space Telescope. Last quarter moon is at 6:36 a.m. EDT.

May 12. On this day in 1930, The Adler Planetarium in Chicago opens the first planetarium in the western hemisphere.

May 14. On this day in 1973 Skylab is launched. On this day in 2009 the Herschel and Planck space observatories are launched.

May 15. On this day in 1958, Sputnik 3 is launched.

May 18. New moon is at 12:13 a.m.

May 21. The waxing crescent moon is near Venus tonight.

May 23. Jupiter is 6 degrees from the moon tonight.

May 27. A double shadow transit occurs on Jupiter tonight.

May 29. On this day in 1919 Einstein's General Theory of Relativity passed its first major test. Eddington proved this during a total solar eclipse.

Moon Phases

May 3
Full

May 11
Last Quarter

May 18
New

May 25
First Quarter

Moon Data

May 5
Saturn 2° south of Moon

May 12
Neptune 3° south of Moon

May 14
Moon at perigee

May 15
Uranus 0.2° north of Moon

May 19
Mercury 6° north of Moon

May 21
Venus 8° north of Moon

May 24
Jupiter 5° north of Moon

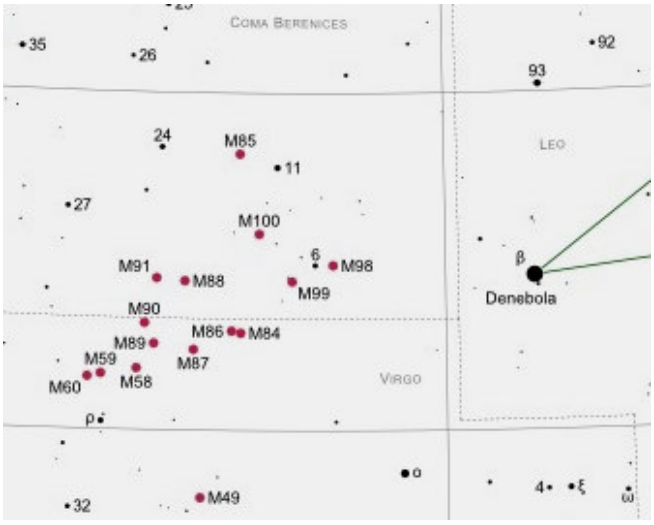
May 26
Moon at apogee

Sky Object of the Month – May 2015
Messier 98 (NGC 4192) – Spiral Galaxy in Coma Berenices
by Glenn Chaple

This month, we journey to the edge-on spiral Messier 98, located near the westerly border of the Coma-Virgo Galaxy Cluster. M 98 and its neighbor galaxies M 99 and M 100 were discovered by Pierre Mechain on the night of March 15, 1781 and confirmed by Messier a month later. While the latter two are roundish face-on spirals, M 98 is more edge-on with apparent dimensions of 9 by 3 arc-minutes. At magnitude 10.1, it's one of the fainter Messier objects, but is still visible with small-aperture scopes. The accompanying sketch shows its appearance through a 4.5-inch reflecting telescope on an evening when the limiting magnitude was 5.0. Patience and averted vision were requisite!

Finding galaxies in this part of the sky can be a daunting task, but M 98 is relatively easily picked up just one-half degree west of 6 Comae Berenices. This 5th magnitude star forms an isosceles triangle with Denebola (beta Leonis) and omicron Virginis (see finder chart).

M 98 is somewhat of an oddball as galaxies go. While a vast majority of galaxies are moving away from us as the universe expands, this one is actually heading our way at a 125 mile per second clip. Don't expect M 98 to loom larger as the years go by. It's a whopping 55 million light-years away!



freestarcharts.com

Sketch by author

Principal Meteor Showers in 2015

January 4
Quadrantids

April 22
Lyrids

May 6
Eta Aquarids

July 30
Delta Aquarids

August 12
Perseids

October 9
Draconid

October 21
Orionids

November 9
Taurids

November 18
Leonids

November 26
Andromedids

December 14
Geminids

December 22
Ursids

Note: Dates are for maximum

Lightning-snap!

We usually only see lightning when it travels from a cloud to the ground, but before that happens, there might be lots of in-cloud and cloud-to-cloud lightning. What are these? How can we monitor this activity and learn more about violent storms? Find out in a new SciJinks in a Snap Video!

http://scijinks.gov/lightning-snap

The latest issue of the Space Place Newsletter: News and Notes for Formal and Informal Educators can be found at:

http://spaceplace.nasa.gov/educator-newsletter

Check out our great sites for kids:

The Space Place website (http://spaceplace.nasa.gov)

The *SciJinks Weather Laboratory* at http://**scijinks.gov**

NASA Climate Kids at http://**climate.nasa.gov/kids**

Our club has merchandise for sale at:

www.cafepress.com/asnne

All money raised goes to our operating fund.
Any design can be put on any item.

Is the Most Massive Star Still Alive?

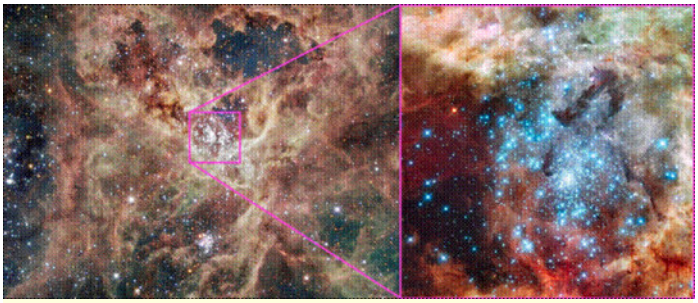
By Dr. Ethan Siegel

The brilliant specks of light twinkling in the night sky, with more and more visible under darker skies and with larger telescope apertures, each have their own story to tell. In general, a star's color correlates very well with its mass and its total lifetime, with the bluest stars representing the hottest, most massive and *shortest-lived* stars in the universe. Even though they contain the most fuel overall, their cores achieve incredibly high temperatures, meaning they burn through their fuel the fastest, in only a few million years instead of roughly ten billion like our sun.

Because of this, it's only the youngest of all star clusters that contain the hottest, bluest stars, and so if we want to find the most massive stars in the universe, we have to look to the largest regions of space that are actively forming them right now. In our local group of galaxies, that region doesn't belong to the giants, the Milky Way or Andromeda, but to the Large Magellanic Cloud (LMC), a small, satellite galaxy (and fourth-largest in the local group) located 170,000 light years distant.

Despite containing only one percent of the mass of our galaxy, the LMC contains the Tarantula Nebula (30 Doradus), a star-forming nebula approximately 1,000 light years in size, or roughly seven percent of the galaxy itself. You'll have to be south of the Tropic of Cancer to observe it, but if you can locate it, its center contains the super star cluster NGC 2070, holding more than 500,000 unique stars, including many hundreds of spectacular, bright blue ones. With a maximum age of two million years, the stars in this cluster are some of the youngest and most massive ever found.

At the center of NGC 2070 is a very compact concentration of stars known as R136, which is responsible for most of the light illuminating the entire Tarantula Nebula. Consisting of no less than 72 O-class and Wolf-Rayet stars within just 20 arc seconds of one another, the most massive is R136a1, with 260 times the sun's mass and a luminosity that outshines us by a factor of *seven million*. Since the light has to travel 170,000 light years to reach us, it's quite possible that this star has already died in a spectacular supernova, and might not even exist any longer! The next time you get a good glimpse of the southern skies, look for the most massive star in the universe, and ponder that it might not even still be alive.



Caption:

Images credit: ESO/IDA/Danish 1.5 m/R. Gendler, C. C. Thöne, C. Féron, and J.-E. Ovaldsen (L), of the giant star-forming Tarantula Nebula in the Large Magellanic Cloud; NASA, ESA, and E. Sabbi (ESA/STScI), with acknowledgment to R. O'Connell (University of Virginia) and the Wide Field Camera 3 Science Oversight Committee (R), of the central merging star cluster NGC 2070, containing the enormous R136a1 at the center.

The University of California High-Performance AstroComputing Center

AGORA: Seeing the Invisible Elephant

You know the familiar fable about the blind men trying to discern the nature of an elephant simply from feeling the animal with their hands: one at the side of the elephant thought it was like a wall, one at the trunk thought it was like a snake, and one at the tail thought it was like a rope. Each accurately perceived the elephant in part, but their tactile observations were inconsistent with one another.

Astronomers are much in the same position in trying to discern the nature of the Universe. Most of the gravitating mass in the cosmos is cold dark matter—a slowly moving, weakly interacting elementary particle that holds together both individual galaxies such as our own Milky Way as well as entire clusters of hundreds of galaxies. But humans are blind to it: dark matter does not emit light or other electromagnetic radiation.

Thus, astrophysicists must rely on two tools to discern dark matter's nature: 1) observations of visible ordinary matter (which scientists call baryonic matter) that reveal dark matter's effects, and 2) supercomputer simulations to "reverse engineer" and test ideas of how dark matter might interact with ordinary matter to form galaxies.

Just one big problem: like the blind men studying only parts of the elephant but whose observational results are not consistent for the entire animal, astrophysicists have been able to model only parts of the universe because of limits to computational power. And the computer models have been inconsistent. Yet reproducibility is a fundamental principle of the scientific method: only if a result from an experiment can be independently reproduced by other scientists can it be regarded as robust.

Now, a new ambitious multiyear international project AGORA is figuring out how to reveal the entire elephant—and also discern which of the inconsistencies are due to complexities of astrophysics versus computational issues.

The challenge of scales

One major challenge, for example, has been numerically modeling astrophysical processes over the vast range of size scales in the Universe—all the way from the formation of individual stars to the formation of galaxies to the formation of the cosmic web of large-scale structure in the cosmos. At small scales, computational models can calculate such details as shock waves from supernova explosions, turbulence, and chemical composition of gas and dust with a resolution (ability to discern details) the size of our solar system. At gigantic scales, cosmological simulations trace the evolution of the cosmic web in volumes hundreds of millions of lightyears across. At such scale, even the biggest supercomputers have been limited to handling just gravitational interactions of dark matter, if calculations are to be completed in reasonable time (months) and at affordable cost.

And in the real Universe, both size scales interact: local star formation within individual galaxies is activated or quenched by the way galaxies "breathe" in and out the gaseous intergalactic medium. Often computational simulations do not create realistic-looking galaxies with the right proportion of stars in the central bulge compared with the flat disk or the right amount of clumpiness.

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AGORA: Seeing the Invisible Elephant
"Continued from page 6"

Major international collaboration

Now supercomputers are starting to have the computational power to simulate large regions of the cosmos with sufficient resolution and realism to create galaxies that look like ones actually observed. AGORA—an ancient Greek word for meeting place, and an acronym for Assembling Galaxies of Resolved Anatomy—aims to understand and resolve inconsistencies revealed among simulations.

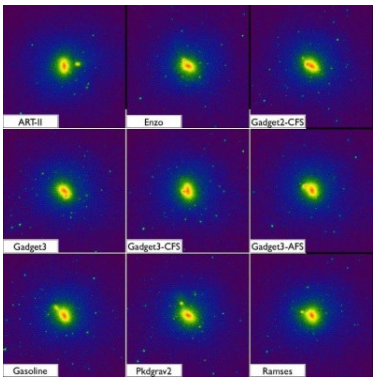
AGORA got its start in a kick-off workshop at the University of California, Santa Cruz, in August 2012, under the sponsorship of the University of California High-Performance AstroComputing Center (UC-HiPACC). A second workshop was held at UCSC in August 2013.

AGORA, a collaboration of more than 90 astrophysicists and computational modelers in over 40 institutions in eight nations, is described in a flagship paper by Ji-hoon Kim and 45 co-authors that has been accepted for publication in *The Astrophysical Journal Supplement*. The collaborators have set up methodology to compare and contrast the results with nine variants of different codes (programs for computer simulations), which numerically handle the physics and the computation in significantly different ways. Although not the first comparison of supercomputer simulations of galaxy evolution, AGORA is the most comprehensive and the highest-resolution (finest detail). The project is expected to be completed in 2015 and result in many papers. Stay tuned! *–Trudy E. Bell, M.A.*

***Further reading*:** The AGORA website is at https://sites.google.com/site/santacruzcomparisonproject/. A UC-HiPACC press release is at http://hipacc.ucsc.edu/PressRelease/AGORA.html. A UC Santa Cruz press release at http://news.ucsc.edu/2013/12/agora-project.html.

The flagship paper preprint "The *AGORA* High-Resolution Galaxy Simulations Comparison Project," for *Astrophysical Journal Supplement,* is at http://arxiv.org/abs/1308.2669/.

The University of California High-Performance AstroComputing Center (UC-HIPACC), based at the University of California, Santa Cruz, is a consortium of nine University of California campuses and three Department of Energy laboratories (Lawrence Berkeley Laboratory, Lawrence Livermore Laboratory, and Los Alamos National Laboratory). UC-HiPACC fosters collaborations among researchers at the various sites by offering travel and other grants, co-sponsoring conferences, and drawing attention to the world-class resources for computational astronomy within the University of California system. More information appears at http://hipacc.ucsc.edu .



Differences in supercomputer simulations to be compared in the AGORA project are clearly evident in this test galaxy produced by each of nine different versions of participating codes using the same astrophysics and starting with the same initial conditions. The goal of AGORA is to analyze such differences to improve the realism and predictive power of supercomputer simulations, and thus astronomers' understanding of astrophysical processes.

Credit: Simulations performed by Samuel Leitner (ART-II), Ji-hoon Kim (ENZO), Oliver Hahn (GADGET-2-CFS), Keita Todoroki (GADGET-3), Alexander Hobbs (GADGET-3-CFS and GADGET-3-AFS), Sijing Shen (GASOLINE), Michael Kuhlen (PKDGRAV-2), and Romain Teyssier (RAMSES)

Club Meeting & Star Party Dates

Date	Subject	Location
May 1	**ASNNE Club Meeting:** **6:45-7:30PM:** Joan's Beginner Astronomy Class (Public walk-ins welcome). **7:30-9:30PM:** Club Meeting **Meeting Agenda** **Guest Speaker/Topic: TBD** **Bernie Reim** - What's UP **Astro Shorts:** (news, stories, jokes, reports, questions, observations etc.) **Where's Pluto** - Update on the New Horizons Mission and "Planet" status. Mission 5 phases 1, Pre-encounter (now through October 2014), Immediate approach (April-May 2015), Encounter (June-August 2015), Immediate post-encounter (September-October 2015) and later post-encounter (April-December 2016).	The New School, Kennebunk, Me.
May 15	Club/Public Star Party (*Visit website for updates and or cancellations*)	Starfield Observatory, West Kennebunk, Me.

Directions to ASNNE event locations

Directions to The New School in Kennebunck [38 York Street (Rt1) Kennebunk, ME]

For directions to The New School you can use this link to the ASNNE NSN page and then click on "get directions" from the meeting location. Enter your starting location to generate a road map with complete directions. It works great. http://nightsky.jpl.nasa.gov/club-view.cfm?Club_ID=137

Directions to Starfield Observatory [Alewive Road, Kennebunk, ME]

From North:
Get off turnpike at exit 32, (Biddeford) turn right on Rt 111. Go 5 miles and turn left on Rt 35. Go 2 miles on Rt 35 over Kennebunk River to very sharp 90 degree left turn. The entrance to the Starfield Observatory site is at the telephone pole at the beginning of the large field on the left. Look for the ASNNE sign on the pole.

From South:
Get off the turnpike at exit 25 in Kennebunk. After toll both turn right on Rt 35. Go up over the turnpike and immediately turn right on Rt 35. About 4 miles along you will crest a hill and see a large field on your right. Continue until you reach the end of the field. Turn right into the Starfield Observatory site at the last telephone pole along the field. Look for the ASNNE sign on the pole. If you come to a very sharp 90 degree right turn you have just passed the field.

To join **ASNNE**, please fill out the below membership form. *Checks should be made payable to: Astronomical Society of Northern New England (A.S.N.N.E).* For more details, please visit our website: **http://www.asnne.org**

Astronomical Society of Northern New England
P.O. Box 1338
Kennebunk, ME 04043-1338

2015 Membership Registration Form

(Print, fill out and mail to address above)

Name(s for family): _____

Address: _____
City/State: _____ Zip code: _____

Telephone # _____

E-mail: _____

Membership (check one):
Individual $35 _____ Family $ 40 _____ Student under 21 years of age $10 _____ Donation_____

Total Enclosed_____

Tell us about yourself:
1. Experience level: Beginner____ Some Experience ____ Advanced_____

2. Do you own any equipment? (Y/N) And if so, what types?

_____
3. Do you have any special interests in Astronomy?

_____
4. What do you hope to gain by joining ASNNE?

_____
5. How could ASNNE best help you pursue your interest in Astronomy?

_____
6. ASNNE's principal mission is public education. We hold many star parties for schools and the general public for which we need volunteers for a variety of tasks, from operating telescopes to registering guests to parking cars. Would you be interested in helping?
Yes_____ No_____

7. ASNNE maintains a members-only section of its web site for names, addresses and interests of members as a way for members to contact each other. Your information will not be used for any other purpose. Can we add your information to that portion of our web site?

Yes_____ No_____