



SJAA EPHEMERIS

SJAA Activities Calendar

Jim Van Nuland

(late) November

- 29 Dark Sky weekend. Sunset 4:51 p.m., 5% moon sets 6:20 p.m. Henry Coe Park's "Astronomy" lot has been reserved.

December

- 5 Houge Park star party. Sunset 4:50 p.m., 53% moon sets 12:20 a.m. Star party hours: 7:00 until 10:00.
- 13 **General Meeting at Houge Park.** 8 p.m. Our speaker is Dr. Robert Sabin of UCSC on a Comparison of Stellar Characteristics of Red Giant Stars in their Evolutionary Path. Holiday party follows (see page 6).
- 19 Astronomy Class at Houge Park. 7:30 p.m. Topic: Winter Observing
- 19 Houge Park star party. Sunset 4:53 p.m., 41% moon rises 1:05 a.m. Star party hours: 7:00 until 10:00.
- 20 Dark Sky weekend. Sunset 4:54 p.m., 31% moon rises 2:07 a.m.
- 21 Winter begins 4:04 a.m.
- 27 Dark Sky weekend. Sunset 4:58 p.m., new moon sets 5:11 p.m. Henry Coe Park's "Astronomy" lot has been reserved.

January

- 2 Houge Park star party. Sunset 5:01 p.m., 36% moon sets 11:13 p.m. Star party hours: 7:00 until 10:00.
- 10 General Meeting at Houge Park. 8 p.m. Our speaker is Dr. Ruslan Belikov of NASA/Ames, Searching For Other Earths
- 16 Astronomy Class at Houge Park. 7:30 p.m. The topic will be Telescopes & Eyepieces.
- 16 Houge Park star party. Sunset 5:15 p.m., 58% moon rises 11:57 p.m. Star party hours: 7:00 until 10:00.
- 17 Dark Sky weekend. Sunset 5:16 p.m., 48% moon rises 12:57 a.m.
- 24 Dark Sky weekend. Sunset 5:24 p.m., 1% moon rises 6:59 a.m. Henry Coe Park's "Astronomy" lot has been reserved.
- 30 Houge Park star party. Sunset 5:31 p.m., 21% moon sets 10:09 p.m. Star party hours: 7:00 until 10:00.

The Board of Directors meets before each general meeting. Call the hotline for the exact time.

24 hour news and information hotline:

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<http://www.sjaa.net>

December General Meeting

Robert Sabin

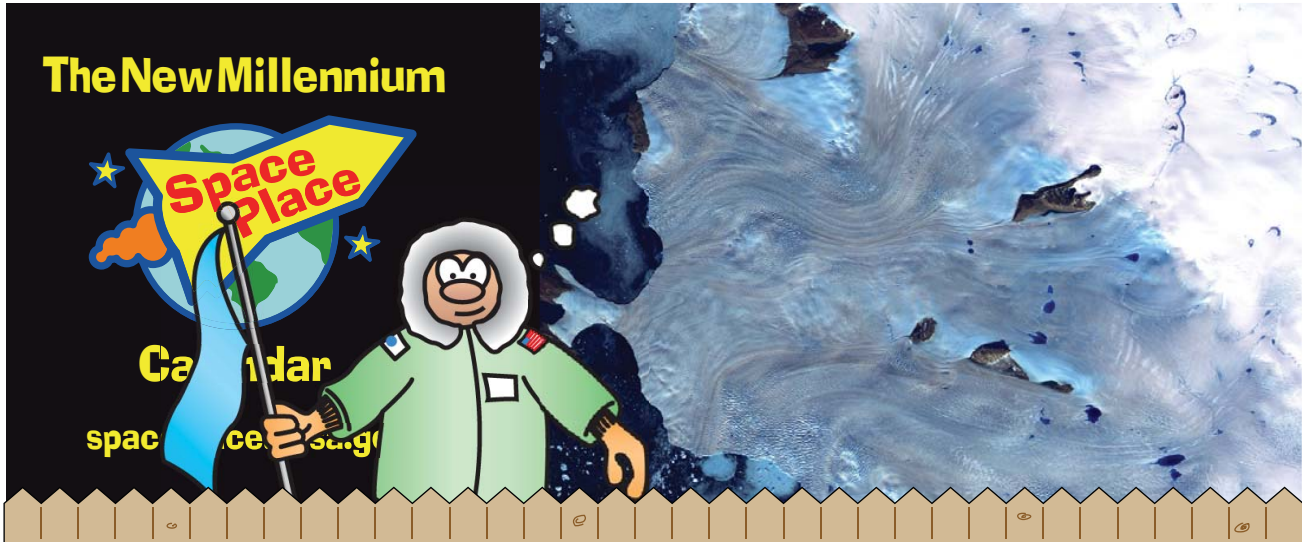
December 13, 2008 – 8 p.m.

David Smith

Our December general meeting speaker, Robert Sabin, graduated from UC Santa Cruz in May 2008 with an astronomy major. He will speak on the subject, "Comparison of Stellar Characteristics of Red Giant Stars and their Evolutionary Path." This presentation is based on his senior thesis, which he conducted with guidance from his advisor, Dr. Graeme Smith. Robert is a local product. A graduate of Leigh High School, he resides in west San Jose, near where he grew up. He currently works for Kaiser Permanente, and is looking for an opportunity for employment in astronomy. Robert's abstract is as follows:

A star spends most of its life fusing hydrogen, H, into helium, He, within its core. This stage is known as the main sequence phase. Once a star's core is depleted of H it is rendered dormant for a time until there is a significant enough increase in temperature for He to fuse into carbon, C. With all fusion stopped in the core, there is a shell surrounding the core that continues to fuse H into He. During this time a star goes through many changes both physically and chemically as observed from Earth; the star grows in size, the effective temperature goes down, the star becomes brighter and the chemical composition of the star's outer envelope changes. The star will continue along this path until the core becomes hot enough, through contractions, for what astronomers call the "helium flash", which marks the beginning of fusion of He into C within the core.

Stars that are between the main sequence phase of evolution and the helium flash are known as red giants and are the focus of this thesis. During this time there is a lowering of the 12-carbon to 13-carbon isotope ratio, $^{12}\text{C}/^{13}\text{C}$ ratio, that is caused from a low ratio of 12-Carbon to 13-Carbon being brought from the interior to the surface, while a high ratio of 12-Carbon to 13-Carbon is brought from the surface into the interior. This lowering of the $^{12}\text{C}/^{13}\text{C}$ ratio at the surface of the star is analyzed along with several stellar characteristics to see if any relationships exist that can identify how far along the red giant phase of evolution a star is, and when some of these changes happen. The results yielded possible connections while discounting others.



This is the frozen Greenland coast at Baffin Bay. Snow and ice are white, glaciers are blue and gray. The glaciers flow toward the sea, even though they are frozen solid. Image taken by the LandSat satellite. Water ice is very common in our solar system. See spaceplace.nasa.gov/en/kids/ice.

DECEMBER 2008

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Safe Toy and Gift Month. The Projects page on The Space Place has several fun and safe ideas.	1	2	3	National Cookie Day. If you were going on a long journey to Mars, would cookies be among the items you would take along?	FIRST QUARTER 5	Percy Spencer invented the microwave oven, 1945. See how the universe looks in microwaves in the Land of the Magic Windows.
7	8	9	10	11	FULL MOON 12	Geminids meteor shower at maximum tonight. Meteor showers occur when Earth passes through the path of icy, rocky debris in space left by a comet.
14	15	16	17	18	19	20
21	22	23	24	25	26	27
Winter Solstice (first day of winter)			Galileo, the great scientist, sees the now famous Supernova of 1604 for the first time. What is a supernova?	Christmas Day. When you get tired of playing with your new toys, go play some games at The Space Place.	National Whiner's Day. Stop whining! Listen to some conversations with Dr. Marc on BIG subjects like black holes and time travel.	NEW MOON
28	29	30	31			
			Edmond Halley 31 In 1705 predicts the 1758 return of comet named for him. Deep Impact has now given us an idea of what a comet is made of.			

Month of December: spaceplace.nasa.gov/en/kids/projects.shtml
 Dec. 4: spaceplace.nasa.gov/en/kids/mars_rocket.shtml
 Dec. 6: spaceplace.nasa.gov/en/kids/chandra.shtml
 Dec. 11: spaceplace.nasa.gov/en/educators/podcast#aurora
 Dec. 12: spaceplace.nasa.gov/en/educators/teachers_page2.shtml#phases
 Dec. 13: spaceplace.nasa.gov/en/kids/stardust

Dec. 17: spaceplace.nasa.gov/en/educators/teachers_page2.shtml#formation
 Dec. 19: spaceplace.nasa.gov/en/kids/ice
 Dec. 24: spaceplace.nasa.gov/en/kids/phonedrmarc/2003_november.shtml
 Dec. 25: spaceplace.nasa.gov/en/kids/games.shtml
 Dec. 26: spaceplace.nasa.gov/en/educators/podcast
 Dec. 31: spaceplace.nasa.gov/en/kids/deepimpact

The Last Eclipse ... Ever?

Akkana Peck

I was talking about eclipses with someone the other day, and the wonderful coincidence we have here on Earth that the moon and sun both span almost the same angle in our sky — about half a degree — and so when they line up, the moon covers the sun almost exactly, and you get the view you see in those wonderful eclipse photos, with prominences and the corona streaming out from the edge of the moon's silhouette.

And of course, it doesn't always happen. If the moon's near apogee, its farthest point from earth, it won't quite cover the sun. That's called an annular eclipse.

But wait a minute — isn't the moon moving away from us, due to tidal friction? Will there come a day when the moon moves far enough away that all eclipses are annular? I wanted to find out.

For my starting numbers, I used *The Nine Planets* (nineplanets.org) and Rukl's *Atlas of the Moon*, which gives a nice table of moon data early in the book. (I'd been using Rukl's *Atlas* regularly for more than a year before I noticed that there's a lot of really good info there besides just the maps. Check it out!) I calculated the moon's angular size as 29.38" (that's arc minutes, not inches) at apogee and 33.53" at perigee, versus sun sizes of 31.3" at perihelion and 32.6" at aphelion (those sun numbers vary depending on the exact solar radius you use). Then I did a little googling to understand how fast the moon is actually receding. The surprise I found is that most articles on the moon's recession are on web sites debating evolution vs. creationism. What can tidal friction possibly have to do with that?

Well, it turns out that some young-earth creationists in the past have argued that the earth-moon system can't possibly be 4.5 billion years old (the age pointed to by geologic evidence, both on earth and

in rocks from the moon and meteorites recovered on earth). The argument is that at the speed it's receding from us now, if you "run the movie in reverse" the moon would touch the earth long before that. Of course, this argument ignores a lot of research arguing that the rate hasn't always been the same.

Anyway, I could see that I had quite a project ahead of me ... probably lots of biased and conflicting pages, none of them written by astronomers. The first link I clicked on was from the *Talk.Origins Archive*, an article called "The Recession of the Moon and the Age of the Earth-Moon System." And then I saw the author — and stopped worrying. The author was Tim Thompson, a NASA physicist/astronomer who has spoken at the SJAA several times.

Tim's article summarizes all the major research on the complicated gravitational interactions of the earth-moon system. It's fascinating reading if you've ever been curious about the details of how tides slow earth's rotation while they drive the moon into ever-higher orbits, and it offers a detailed bibliography if you want to track down the details. More to the current point, it also gives the figure for the moon's current rate of recession from us as measured by the laser rangefinders planted on the moon by Apollo. Its orbit is increasing by 3.82 cm (± 0.07) per year.

So how long before the moon recedes to the point where even at perigee it can't cover the sun's 31.3" size with earth at aphelion? Let's make some simplifying assumptions: that the rate of recession stays constant (it won't), that the sun's diameter also won't change (it eventually will), and that the moon's orbital eccentricity stays the same (I don't know but I wouldn't bet on it). Let's just assume that the moon's perigee distance is going to increase at a steady 3.82 cm/year. Then

the last total solar eclipse will happen in about 664 million years. (There's a NASA eclipse FAQ page online — and a Space.com page that's an exact copy of it — that calculates 1 billion years, but they're using a figure of 1 cm for the moon's recession, which doesn't match the Apollo measurements. Go figure! Literally!) Anyway, it was a fun project, and it looks like eclipse chasers don't have to worry about running out of eclipses for a while.

Meanwhile, what's up in the sky right now? In the early evening, it's Venus and Jupiter, though Jupiter sinks ever lower as the month progresses. On Dec 1, the moon, Venus and Jupiter make an especially close group. Try looking for them in the daytime: since the moon is easy to find, it should easily point you to the two planets. Late in the month, Mercury joins the fun in the early evening, but it doesn't get very far from the sun.

Saturn rises around midnight, with its rings very close to edge-on — they're less than a degree off of edge-on by the end of the year.

The rings' angle to us will remain quite small throughout next year, never bigger than 8° around the middle of the year before finally closing to zero in September.

Uranus, a degree and a half northeast of Phi Aquarii, is up for most of the early evening, setting a little before midnight. At magnitude 5.9 (barely within reach of the naked eye at a dark site), it sits right next to a 5.6 magnitude star: they're separated by a hair under nine minutes of arc, making an interesting small-scope "double star" target a little closer than Mizar and Alcor.

Neptune runs a couple of hours ahead of Uranus, so it's much more borderline this month: try soon after the sky gets fully dark if you want to find it. Mars and Pluto are lost in the sun's glare.

“Sunny tomorrow with highs in the mid-70s. There’s going to be some carbon monoxide blowing in from forest fires, and all that sunshine is predicted to bring a surge in ground-level ozone by afternoon. Old and young people and anyone with lung conditions are advised to stay indoors between 3 and 5 p.m.”

Whoever heard of a weather report like that?

Get used to it. Weather reports of the future are going to tell you a lot more about the atmosphere than just how warm and rainy it is. In the same way that satellite observations of Earth revolutionized basic weather forecasting in the 1970s and 80s, satellite tracking of air pollution is about to revolutionize the forecasting of air quality. Such forecasts could help people plan around high levels of ground-level ozone—a dangerous lung irritant—just as they now plan around bad storms.

“The phrase that people have used is chemical weather forecasting,” says Kevin Bowman of NASA’s Jet Propulsion Laboratory. Bowman is a senior member of the technical staff for the

Tropospheric Emission Spectrometer, one of four scientific sensors on NASA’s Aura satellite.

Aura and other NASA satellites track pollution in the same way that astronomers know the chemical composition of stars and distant planetary atmospheres: using spectrometry. By breaking the light from a planet or star into its spectrum of colors, scientists can read off the atmosphere’s gases by looking at the “fingerprint” of wavelengths absorbed or emitted by those chemicals. From Earth orbit, pollution-watching satellites use this trick to measure trace gases such as carbon monoxide, nitrogen oxide, and ozone.

However, as Bowman explains, “Polar sun-synchronous satellites such as Aura are limited at best to two overpasses per day.” A recent report by the National Research Council recommends putting a pollution-watching satellite into geosynchronous orbit—a special very high-altitude orbit above the equator in which satellites make only one orbit per day, thus seeming to hover over the same spot on the equator below. There,

this new satellite, called GEOCAPE (Geostationary Coastal and Air Pollution Events), would give scientists a continuous eye in the sky, allowing them to predict daily pollution levels just as meteorologists predict storms.

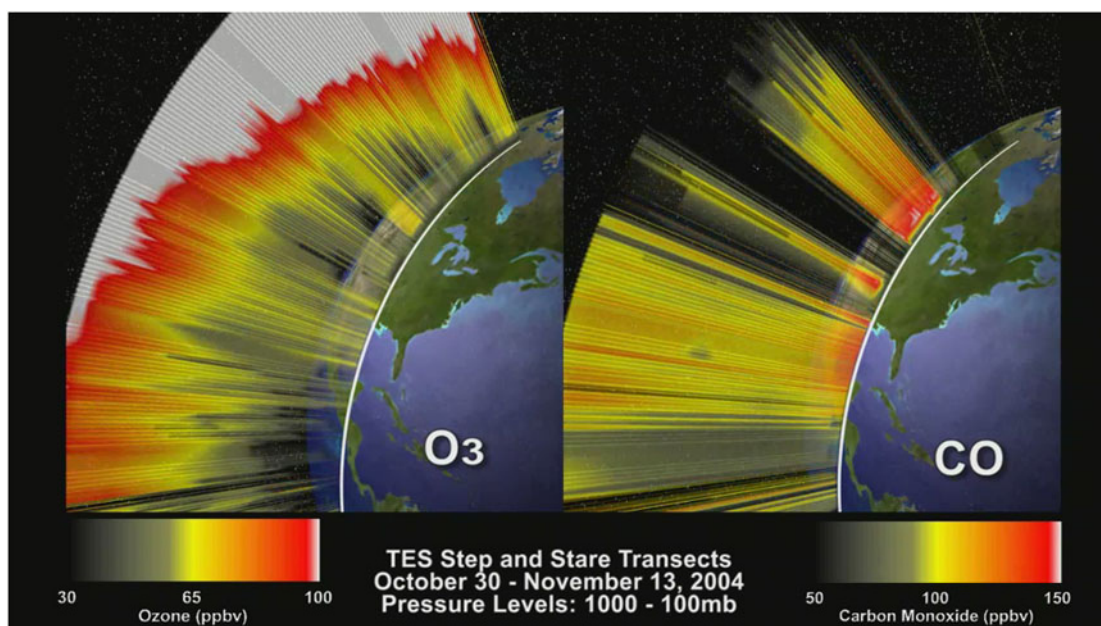
“NASA is beginning to investigate what it would take to build an instrument like this,” Bowman says. Such a chemical weather satellite could be in orbit as soon as 2013, according to the NRC report. Weather forecasts might never be the same.

Learn more about the Tropospheric Emission Spectrometer at <http://tes.jpl.nasa.gov>.

Kids can learn some elementary smog chemistry while making “Gummy Greenhouse Gases” out of gumdrops at

<http://spaceplace.nasa.gov/en/kids/tes/gumdrops>

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



Example of visualization of data from the Tropospheric Emission Spectrometer. These frames are from an animation that steps through transects of the atmosphere profiling vertical ozone and carbon monoxide concentrations, combining all tracks of the Aura satellite during a given two week period.

Barack Obama and Science

Paul Kohlmler

If you are a voter in Santa Clara County then the odds are about 7 out of 10 that you voted for Barack Obama for president. Those reading this newsletter can rightly wonder what effect this election may have on science and science education in this country. Therefore I think it is appropriate to discuss the president-elect's feelings about science in this newsletter.

Certainly this election was historic in many ways. Despite the large difference in the results, Senator McCain still got 4 million more votes than Ronald Reagan did in the landslide election of 1984. It was also probably the election that garnered the most science attention. Stem cell research at least got a mention. Climate change got a terse recognition. NASA was mentioned most often when the candidates were in Texas or Florida — no surprise there.

Late in 2007, Popular Mechanics rated a dozen presidential candidates on their stands on issues they felt were relevant to their readers including Space, the environment, technology and science education. Obama scored in 7 of 8 issues. No other candidate did better than 6. <http://www.popularmechanics.com/science/research/4236740.html> But it isn't all rosy. In April of 2008 Popular Mechanics said of all the candidates "don't get your hopes up ... none ... are likely to fund the current plan" for manned spaceflight because of budgetary pressures. That was months before the September meltdown. But Obama advisor Sharon Long (Stanford University biologist) when asked if Obama would stand by earlier promises to increase science funding said "The answer is, how can we afford not to?". In the November 14 issue of Science in an article entitled "Obama Victory Raises Hopes for New Policies, Bigger Budgets" it was stated that scientists hope for an "era of sustained, healthy increases" for research but because of deficits and the economy it "may not happen anytime soon."

Governor Palin took a lot of hits for dismissing research concerning fruit flies, apparently not aware of all of the science done with *Drosophila*. John McCain, looking for an earmark that he thought would sound ridiculous, attacked the \$3 million spent on the Adler Planetarium. Jules Siegel of the Huffington Post wrote "The Planetarium item dramatizes the know-nothing, anti-science, anti-education attitudes of the McCain voter base". If any SJAA member voted for McCain, this doesn't apply to you.

One litmus test to see how scientifically minded a candidate is would be to ask about the teaching of creationism. Obama and McCain both accept evolution but the selection of Sarah Palin, someone who advocates teaching creationism in public schools (in a 2006 gubernatorial debate she said "teach both") raised some concerns. However, the quote attributed

to Governor Palin offering that the moose could not be the result of evolution ("is evolution a committee?"), is false according to Snopes.com.

One group made an attempt to have the candidates participate in a debate that would focus on science related issues alone. This failed but both candidates did answer some questions (see <http://www.sciencedebate2008.com>). The Obama team of science advisors included Long, NASA researcher Donald Lamb, Peter Agre — a Nobel prize winner, Gilbert Ommen — former president of the AAAS, and Harold Varmus — former head at the NIH. A small part of team Obama's response regarding space research said in an Obama administration "NASA not only will inspire the world with both human and robotic space exploration, but also will again lead in confronting the challenges we face here on Earth".

In an article by Brandan Keim (Wired) Obama was described as someone who appreciates the process of science and that he "pledges to reverse the ideologically motivated science-skewing that has thrived under the Bush administration." From UsInnovation.Org there is this from then candidate Obama, "STEM education is no longer only for those pursuing STEM careers; it should enable all citizens to solve problems, collaborate, weigh evidence, and communicate ideas." Actions speak louder than words but evidence of action is available. Silicon Valley congressman Michael Honda joined Barack Obama and Indiana Republican Richard Lugar in introducing a bill on STEM education improvements. STEM is the common acronym for Science, Technology, Engineering and Mathematics. <http://honda.house.gov/legislation/2008/stem.shtml>

In a recent article in Space.com, Brian Berger says that Obama will take office "having offered more specifics about his plans for NASA than any U.S. presidential candidate in history". The U.S. Government Accountability Office (GAO) lists making a decision on the shuttle's retirement (now planned for 2010) as one of the 13 most urgent issues for the new president. But those considerations include economics, politics and foreign policy (e.g. do we want to depend on Russia given recent events with Georgia) rather than science.

Finally, there is this comment on science investment on the barackobama.com website. "Barack Obama and Joe Biden support doubling federal funding for basic research over ten years, changing the posture of our federal government from being one of the most anti-science administrations in American history to one that embraces science and technology. This will foster home-grown innovation, help ensure the competitiveness of US technology-based businesses, and ensure that 21st century jobs can and will grow in America."

The Last Month In Astronomy

NOV-14-2008 **Endeavour Launched** The shuttle Endeavour was launched on November 14. It's mission: plumbing. The astronauts say they will be there between noon and 6. <http://www.spaceflightnow.com>

NOV-13-2008 **Extrasolar Planets Imaged** The Hubble telescope has apparently obtained the first visible-light image of an extrasolar planet. Images were taken in 2004 and 2006. <http://antwrp.gsfc.nasa.gov/apod/ap081114.html>

NOV-10-2008 **Phoenix Finished** The Mars Lander Phoenix has completed its mission. The spacecraft was always going to stop functioning when "Mars freezes over" and it was last heard from on November 2. Keeping the spacecraft alive required heaters that had to be powered by solar cells. Its location in the Martian equivalent of the Yukon territory means that daylight hours per sol (Martian days) is sharply reduced. The last soil dig was announced on October 21. Analysis of the data from Phoenix will continue for years. <http://jpl.nasa.gov/news/news.cfm?release=2008-205>

NOV-06-2008 **Alaska Glacier Melt Measured** NASA scientists used data gathered with the twin GRACE (Gravity Recovery and Climate Experiment) satellites. The annual ice mass loss in the period studied was 84 billion tons. http://www.nasa.gov/topics/earth/features/glacier_tech.html

OCT-30-2008 **Hubble back in business** The Hubble telescope is working once again thanks to some backup hardware that had not been tested since the spacecraft was still on Earth. The new image of Arp 147 is fantastic. <http://hubblesite.org/newscenter/archive/releases/2008/37/image/a/>

OCT-27-2008 **Two ply belted** Epsilon Eridani is the closest known planetary system to our own. Spitzer recently determined that this system has two asteroid belts compared to our one. However, we probably still own the record for the most coffee shops. <http://jpl.nasa.gov/news/news.cfm?release=2008-197>



NOV-01-2008 **New Enceladus Pix** A Halloween flyby of Enceladus by the Cassini spacecraft focused on some new geyser sites. Check Carolyn Porco's November 1 posting at this website. <http://blogs.nasa.gov/cm/blog/enceladus/posts/index.html>. This photo shows the Baghdad Sulcus on Enceladus. Photo courtesy of JPL/NASA.

Holiday Party - Dec. 13

Bring your favorite dessert or appetizer to share. Contributions of food or drink are appreciated but not necessary. No alcohol, please.

We will again be running the "white elephant" gift drawing. To participate, please anonymously wrap (no name tag) an astronomical item of small value and/or large humor and bring it along. It can be a used item you no longer want, an inexpensive new item, and can be either useful or funny. We'll do the exchange as a "draw or steal" lottery, which is always great fun.

Telescope Loaner Program

The loaner program offers members a means to try scopes of various sizes and technologies before you buy. It is one of the real jewels of being a member of the club. Scopes are available for all experience levels.

The inventory is constantly changing. As of this writing (early November) these scopes were available.

Scope Number	Scope Description
42	11x80 Binoculars
49	3.5" Orion StarBlast
43	4.5" f/8 Orion XT Dob
44	4.5" f/8 Orion Skyview Newt
37	4" Celestron Flourite Refractor
51	120mm Orion 120ST
13	6" f/8 Orion XT Dob
34	8" f/10 Dynamax S/C
14	8" f/8.5 Homemade Dob
35	8" f/6 Meade Newt on EQ Mount
40	8" Celestron Super C8+ S/C
12	8" f/6 Orion XT Dob
45	10" f/5 Dob (Earletron)
33	10" f/4.5 Orion DSE Dob
47	12" Meade Lightbridge
7	12.5" f/7 Homemade Dob
39	17" f/4.5 Zeiders Truss Dob
10	Star Spectroscope

For up to date information please see the loaner program web page: <http://www.sjaa.net/loaners>

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<http://ephemeris.sjaa.net> Questions?

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- Regular — \$20
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