



EPHEMERIS

November 2011

SJAA Activities Calendar

Jim Van Nuland

November

- 4 Houge Park star party. Sunset 6:07 p.m, 74% moon sets 2:56 a.m. Star party hours: 7:00 until 10:00 p.m.
- 5 Houge Park star party. Sunset 6:06 p.m, 81% moon sets 3:52 a.m. Part of the Bay Area Astronomy & Science Festival.
- 6 DST ends at 2 a.m. Retard clocks to 1 a.m.
- 12 General Meeting. Board meeting at 6:30; General Meeting at 8:00. Our speaker is Dr. Lynn Rothschild, on Life at the Edge: Life in Extreme Environments on Earth and the Search for Life in the Universe.
- 13 Astronomical Swap Meet. Noon to late afternoon.
- 18 Astronomy Class at Houge Park. 7:00 p.m. The topic: Amateur telescope making, why, how and where. With members of the Chabot Science Center's Telescope Maker's Workshop.
- 18 Houge Park star party. Sunset 4:56 p.m, 44% moon rises 12:25 a.m. Star party hours: 7:00 until 10:00 p.m.
- 19 Houge Park star party. Star party for students of Live Oak Academy, Conducted by the School star party team. Others welcome too.
- 19 Dark-Sky weekend. Sunset 4:55 p.m, 33% moon rises 1:33 a.m.
- 26 Dark-Sky weekend. Sunset 4:52

p.m, 5% moon sets 6:30 p.m. Henry Coe Park's "Astronomy" lot has been reserved.

December

- 2 Houge Park star party. Sunset 4:50 p.m, 57% moon sets 12:44 a.m. Star party hours: 7:00 until 10:00 p.m.
- 10 General Meeting. Board meeting at 6:30; General Meeting at 8:00. Our speaker is Dr. Bruce Margon, on "Glimpsing the Edge of the Universe: Results from the Hubble Space Telescope".
- 16 Astronomy Class at Houge Park. 7:00 p.m. The topic: The Sun, planets and minor solar system objects.
- 16 Houge Park star party. Sunset 4:52 p.m, 60% moon rises 11:23 p.m. Star party hours: 7:00 until 10:00 p.m.
- 17 Dark-Sky weekend. Sunset 4:52 p.m, 33% moon rises 1:33 a.m.
- 24 Dark-Sky weekend. Sunset 4:55 p.m, 5% moon sets 6:30 p.m. Henry Coe Park's "Astronomy" lot has been reserved.
- 30 Houge Park star party. Sunset 4:59 p.m, 40% moon sets 11:30 p.m. Star party hours: 7:00 until 10:00 p.m.

The Board of Directors meets before each general meeting at 6:30 p.m. All are welcome to attend.

The (Unusual) Making of a Planet

Paul Kohlmeier

When a star of sufficient size explodes in a nova, the remnant can be a pulsar. Pulsars are neutron stars, stars that are so dense that atoms are crushed to the point that only neutrons exist. Imagine shrinking the size of the sun to the size of the city of San Jose. The pulses come from beams that come out from the magnetic poles. These beams of (typically) X-ray or radio electromagnetic radiation sweep around as the star rotates. So from Earth they appear to be flashes.

Pulsars are so consistent they are as accurate as atomic time clocks. This means that when something perturbs them, like another object orbiting the pulsar, it is easy to characterize what must be causing the blips in the data.

Of course, many stars are binary stars. What happens to the companion star? Well, one outcome is that the mass of the second star gets pulled bit-by-bit onto the neutron star. These are called "Black Widow" pulsars. Now, think about what that kind of ablation means. The companion star gets smaller and smaller. It might have started out as a sun-like star but it loses mass. Eventually

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The (Unusual) Making of a Planet
Continued from page 1

it will no longer have the mass necessary to continue nuclear fusion. Then it gets even smaller until it becomes ... Jupiter! Or at least something about that size.

In Science magazine (Sept. 23, 2011), researchers describe finding a planet around a pulsar (PSR J1719-1438) that is spinning very fast - one rotation in 6 milliseconds or less. Its companion can be detected by perturbations in the pulses that can be detected on Earth. As a star the companion probably got to be a carbon white dwarf.

Planets around pulsars are not new. The very first exoplanets were detected around pulsar PSR B1257+12. They are often considered to be "not real planets" because of the strange nature of their


planetary system. On the other hand, these strange exoplanets are the lowest mass exoplanets discovered to date, as small as the Moon.

Although the planetary companion of PSR J1719-1438 is about the size of Jupiter, its mass is about 20 times that of Jupiter. This suggests it is not made up of hydrogen and helium, the best guess is carbon. At these pressures, the carbon would be in a crystallized form, hence this planet's nickname "The Diamond Planet".

In Science magazine, one article is a summarization of a more technical paper. In this case the technical paper is written by M. Bailes et. al. (where the "al" consists of 17 coauthors). A question raised in the technical paper is why should some millisecond pulsars (MSP)

have companions and some do not. The distinction, as you might expect, is how close the companion is when it starts losing mass to the larger star. If it is far enough away, say several solar radii, the companion will survive.

But should this pulsar companion be considered a planet at all. You will recall the 2006 attempt to restrict the definition of "planet" which excluded Pluto, to the horror of school kids around the world. The article for Science was written by Frederic Rasio from Northwestern. He says "The lesson here is perhaps that, as our rapidly improving astronomical instruments make it possible to detect objects of smaller and smaller mass in distant and, sometimes, very exotic environments, any narrow definition of planet will soon become obsolete."



Contact (The Reel and the Real): Humanity's Search for Extra-terrestrial Intelligence

**A film and talk with Dr. Jill Tarter of the SETI Institute
Wednesday evening, Nov. 2, at 6 - 9:30 p.m.**

Andrew Fraknoi

McKenna Theater at San Francisco State University,
Holloway Avenue and Tapia Drive, San Francisco, CA
94132 (For a map and parking links, see: <http://www.sfsu.edu/~sfsuemap/>)

Co-sponsored by the SF State Department of Physics
and Astronomy. Free and Open to the Public (seats are
available first come, first served)

Join astronomer Jill Tarter, whose work and life was a key model for the character Jodie Foster plays in the film Contact, for a very special evening of science fiction and cutting-edge science. We will screen the full-length film about the discovery of intelligent life among the stars, and then hear Dr. Tarter discuss her ongoing work at the SETI Institute to find radio signals from alien civilizations. After her film and the talk, there will be time for questions from the audience.

Directions to Houge Park

Houge (rhymes with "Yogi") Park is in San Jose, near Campbell and Los Gatos. From Hwy. 17, take the Camden Avenue exit. Go east 0.4 miles, and turn right at the light, onto Bascom Avenue. At the next light, turn left onto Woodard Road. At the first stop sign, turn right onto Twilight Drive. Go three blocks, cross Sunrise Drive, then turn left into the park.

From Hwy. 85, take the Bascom Avenue exit. Go north, and turn right at the first traffic light, onto White Oaks Road. At the first stop sign, turn left onto Twilight Drive. You will now be passing the park. Turn right at the first driveway, into the parking lot.

Flooded craters

Akkana Peck

Daylight Savings Time ends on November 6: it's time to set your clocks back again (those that aren't set by radio or internet signals). So we'll get a little more evening time to observe this month.

And that's handy, because Mercury hangs in the early evening sky most of the month — and it's not alone there. It sits near Venus for the first two weeks, with Antares joining the pair on the 9th and 10th.

Mercury's been in the news lately: the Messenger spacecraft team published an article last month revealing that the smooth plains covering 6% of the planet's surface are flood basalts, volcanic features much like the dark maria we see on the moon's near side. They were most likely caused by lava oozing rapidly out of cracks in the planet's crust. The lava flows fill craters more than a mile deep in some spots, and their total area corresponds to about 60% of the area of the United States.

Curiously, last month also saw reports from the Dawn mission team of basalt lava flows on the surface of asteroid (4) Vesta. Some people are calling Vesta "the smallest known terrestrial planet" as its structure and geology seems increasingly earth-like.

So you've read the news reports, you've got your magnification cranked up on Mercury and all you can see is a little gibbous disk? Or you're looking at Vesta and all you can see is a point of light? Wish you could see what those lava flows really look like? Fortunately, you can! You can see some great examples of "ghost craters", once-deep craters now filled nearly to the brim with flood basalt lava, in quite a few places on our moon. Mare Humorum is a good place to start looking. It's on chart 52 of Rukl's Atlas of the Moon, and should be visible on the night of November 6. And

while you're in the area, just south of there is Capuanus, the "bear paw" (Rukl chart 63), another interesting filled-in "ghost crater". It's called the "bear paw" because of the claws extending from it. Take a look — you'll see!

Another excellent flooded lunar crater is Fracastorius (Rukl chart 58), a lovely horseshoe crater rim with a smoothly filled floor. It makes a nice sight at sunrise with its neighbor Piccolomini. Try them on Halloween or on November 29, then check again the following day and see how the view has changed.

If that's not close enough, pack a bag, get in the car and head north. The nearest examples of flood basalts are much closer than the moon: the Modoc plateau, in far northwestern California, with its flood basalts from 17 to 6 million years ago. Or go a little farther north and explore the huge "scablands" of the Columbia plateau of eastern Washington state. The Columbia river carves its gorge through layers of flood basalts, and as you follow the river upstream you can see more evidence of those flood basalts, and how they were scoured and carved by later floods of water when the ice age glaciers melted.

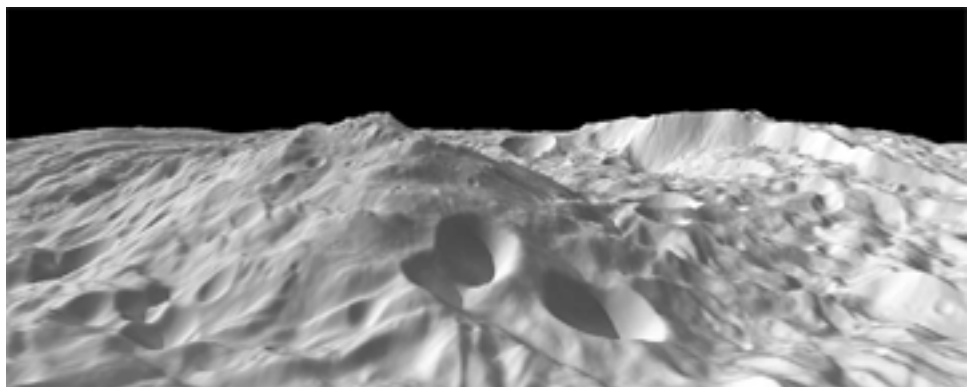
Meanwhile, back on Earth: Mars and Saturn are visible at dawn, while Uranus and Neptune are both well placed for evening observing. Pluto has gotten too

low for anyone but the most dedicated Plutocrat.

But the real star of November nights is Jupiter. I wrote last month that this should be an excellent Jupiter year (weather permitting, of course). The giant planet is only a few days past opposition as we move into November, and since it's relatively far north — transiting as high as 65 degrees — maybe some of you were able to show it to the kiddies on Halloween.

But for your best views, you'll want to stay up later in the evening, past when the trick-or-treaters go to bed — around midnight or a little before, when Jupiter is near its transit. This year we're lucky to have Jupiter unusually close, and its disk will span almost 50". In comparison, less favorable oppositions may show Jupiter under 30".

The mysterious South Equatorial Belt (SEB), which went missing sometime last year, seems to be back now, and Jupiter looks much more normal now. It looks like this year there's plenty of turbulence in the wake of the Great Red Spot, plus some very prominent dark "barges" in the NEB, and some smaller, flatter barges farther from the equator in the Northern Temperate Belt. Lots of detail to see this winter, if you manage to get steady skies.



This photograph of Vesta was taken by the DAWN spacecraft and shows a mountain much taller than Everest. It has been enhanced by removing the curvature of the asteroid. Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/PSI



The Gray Cubicle You Want to Work In

Dr. Tony Phillips

It's another day at the office.

You're sitting in a gray cubicle, tap-tap-tapping away on your keyboard, when suddenly your neighbor lets out a whoop of delight.

Over the top of the carpeted divider you see a star exploding on the computer screen. An unauthorized video game? No, this explosion is real. A massive star just went supernova in the

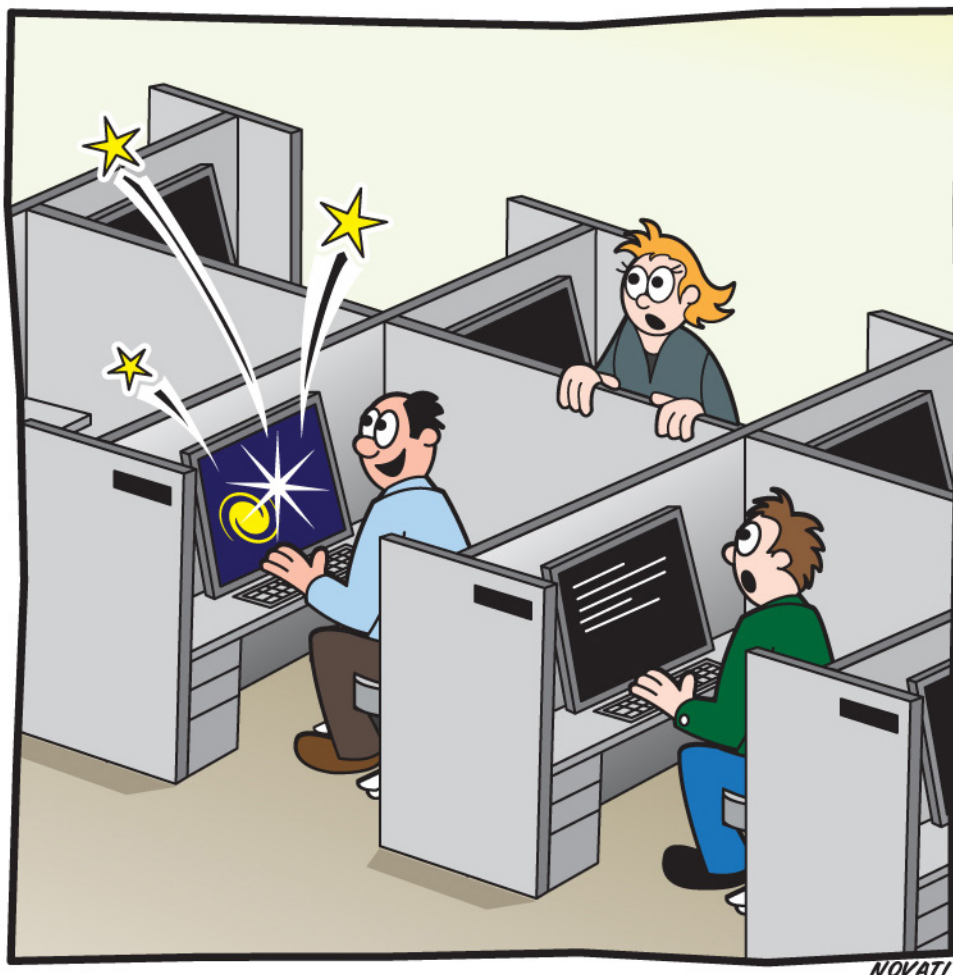
Whirlpool Galaxy, and the first images from Hubble are popping up on your office-mate's screen.

It's another day at the office ... at NASA.

Just down the hall, another office-mate is analyzing global temperature trends. On the floor below, a team of engineers gathers to decode signals from a spaceship that entered "safe mode" when it was hit by a solar flare. And

three floors above, a financial analyst snaps her pencil-tip as she tries to figure out how to afford just one more sensor for a new robotic spacecraft.

These are just a few of the things going on every day at NASA headquarters in Washington DC and more than a dozen other NASA centers scattered around the country. The variety of NASA research and, moreover, the variety of NASA people required to carry it out often comes as a surprise. Consider the following:



Some of the employees of NASA's Science Mission Directorate may work in gray cubicles, but their jobs are anything but dull. They get to study Earth, the Sun, the Solar System, and the Universe!

NASA's Science Mission Directorate (SMD) supports research in four main areas: Earth Science, Heliophysics, Astrophysics, and Planetary Science. Read that list one more time. It includes everything in the cosmos from the ground beneath our feet to the Sun in the sky to the most distant galaxies at the edge of the Universe. Walking among the cubicles in NASA's science offices, you are likely to meet people working on climate change, extraterrestrial life, Earth-threatening asteroids, black holes or a hundred other things guaranteed to give a curious-minded person goose bumps. Truly, no other government agency has a bigger job description.

And it's not just scientists doing the work. NASA needs engineers to design its observatories and build its spacecraft, mathematicians to analyze orbits and decipher signals, and financial wizards to manage the accounts and figure out how to pay for everything NASA dreamers want to do. Even writers and artists have a place in the NASA scheme of things. Someone has to explain it all to the general public.

Clearly, some cubicles are more interesting than others. For more information about the Science Mission Directorate, visit science.nasa.gov. And for another way to reach the Space Place, go to <http://science.nasa.gov/kids>.

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



Last General Meeting

On October 8, 2011, the SJAA General Meeting featured Dr. Puragra Guhathakurta of Lick Observatory, on "Our Place In The Cosmos". The audience was very appreciative of his explanations of galaxy formation. One feature of his talk involved a computer simulation of two interacting galaxies. The simulation would pause, rotate to a particular orientation, then show an actual picture showing two galaxies looking like a dead ringer for the simulation.

Upcoming speakers scheduled include:

November 12 - Dr. Lynn Rothschild, on "Life at the Edge: Life in Extreme Environments on Earth and the Search for Life in the Universe."

December 10 - Dr. Bruce Margon, his topic: "Glimpsing the Edge of the Universe: Results from the Hubble Space Telescope".

January 7 - Dr. Alex Filippenko on "The Birth and Early Evolution of the Universe"



The Last Month In Astronomy

OCT-10-2011 **Neptune 16 hour day** Neptune's day has been calculated to be 15 hours, 57 minutes and 59 seconds. A quick Google search finds estimates like 19.1 hours, 16.11 hours, 16 hours plus 6 minutes. This new estimate was done by Erich Karkoschka of the University of Arizona. He used 500 images from Hubble taken over the 20 year history of the HST. He found 2 objects that appear to be consistent, the South Polar feature and the South Polar Wave. He found 6 more objects on the more detailed images from the 1989 Voyager flyby of Neptune. http://www.msnbc.msn.com/id/44847508/ns/technology_and_science-space/

OCT-07-2011 **Uranus many hits** New simulations suggest that Uranus must have been hit by multiple large objects. Previously it was thought that one large object might have knocked Uranus so that its rotational axis is knocked over 90 degrees from what other planets are. "Having shown that giant collisions had to happen frequently on these planets (Uranus and Neptune) is an important piece of information on the way to understanding their origin" according to Alessandro Morbidelli from the Observatory of Cote d'Azur in Nice, France. But others like Steven Desch of ASU thinks it is unlikely that two large objects could be created and then slammed into Uranus. http://www.msnbc.msn.com/id/44820483/ns/technology_and_science-science/

OCT-06-2011 **Old photos show planets** A reanalysis of Hubble images from 1998 show large planets around HR 8799. These planets were not noticed earlier. Two things made it easier to find them now. First, the planets were detected by earlier methods in 2007 and 2008. Second, new processing abilities improve resolution by a factor of 10. This is the first multi-exoplanet system to be directly imaged - unless some other pictures are waiting to be reanalyzed. <http://hubblesite.org/newscenter/archive/releases/2011/29/full/>

OCT-05-2011 **Kuiper Belt Oceans** The Herschel Space Observatory has analyzed the hydrogen isotopes on comet Hartley 2. The ratio of deuterium to normal hydrogen atoms is the same as it is in the oceans. This suggests that Kuiper Belt objects like the short period Hartley 2 probably played a major role in the delivery of water to Earth. Other comets that have been studied have longer orbits and are therefore more likely to be from the Oort Cloud. These Oort cloud objects have more deuterium. When water has higher ratios of deuterium it is called "heavy water". <http://www.jpl.nasa.gov/news/news.cfm?release=2011-312>

OCT-04-2011 **Nobel Winners** The discovery that the expansion of the universe is accelerating resulted in a Nobel Prize for Saul Perlmutter (Berkeley), Brian Schmidt (Australian National University), and Adam Riess (Space Telescope Science Institute). Riess said "My involvement in the discovery of the accelerating universe and its implication for the presence of dark energy has been an incredibly exciting adventure. I have also been fortunate to work with tremendous colleagues and powerful facilities." Alex Filippenko, our scheduled speaker for January 7, 2012, was also heavily involved with this research. <http://hubblesite.org/newscenter/archive/releases/2011/33/full/>

OCT-03-2011 **ALMA First Light** The Atacama Large Millimeter/submillimeter Array (ALMA) is only one-third complete but images are already being released. According to Tim de Zeeuw, the Director General of ESO (the European partner in ALMA) "Even in this very early phase ALMA already outperforms all other submillimeter arrays." The online versions of this newsletter include some images from ALMA. http://www.eso.org/public/news/eso1137/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+EsoTopNews+%28ESO+Top+News%29

SEP-29-2011 **Shrinking Asteroids** The Wide-field Infrared Survey Explorer (WISE) spacecraft has found that there are fewer than 20,000 near-Earth asteroids of the mid-size variety (330-3300 feet wide). Previous estimates suggested that 35,000 such objects exist. Are we safer than we thought? Not necessarily. It is not clear that the number of hazardous asteroids (the closest to Earth) is less than expected. The WISE spacecraft was also used to rule out the possibility that a piece of an asteroid named Baptistina was the impactor that led to the demise of the dinosaurs. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-304>

SEP-15-2011 **Tatooine** The Kepler research team has found a planet that orbits two stars (called a circumbinary orbit). Lawrence Doyle (SETI Institute) said "Most of what we know about the sizes of stars comes from such eclipsing binary systems, and most of what we know about the sizes of planets comes from transits. Kepler-16 combines the best of both worlds." The planet (Kepler-16b) is very cold and about the size of Saturn. The planet completes an orbit in 229 days, about the length of a Venusian year. The binary stars are in an eccentric orbit of 41 days but the planet's orbit is nearly circular. The two stars are .2 and .69 solar masses. The reference to Tatooine is from Star Wars, the home planet of Luke Skywalker. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-292>

It Must Be Astronomical ...

Thanks

Trust us, we are trying not to pull something while patting ourselves on the back. At the October General Meeting, the Ephemeris was praised by many. At about the same time, we got a copy of a children's book "Annie Jump Cannon, Astronomer" by Carole Gerber. The SJAA Newsletter is mentioned in the inside flap. Your editors want to acknowledge those that make us look good:

Gordon Reade who manages the circulation of the print version.

Akkana Peck whose Shallow Sky columns have been a consistent feature of the Ephemeris for years.

Laura Lincoln and her friends for providing the NASA SpacePlace articles.

School Star Parties

Completed Events					
	Total Sched.	Good Sky	Partial Success	Cloudy Fail	Cancel at noon
Jul	0				
Aug	1	1			
Sep	1	1			
Oct	4	1			3
Total	6	3			3
Scheduled					
Oct	2				
Nov	14				
Dec	2				
Jan	3				
Feb	4				
Mar	2				
Apr	1				
Total	28				

As of mid-October

SVALS Hiatus

Andrew Fraknoi says the Silicon Valley Astronomy Lecture Series is taking a year off while the Foothill College's Smithwick Theatre is being renovated. The Series will resume with the 2012-2013 school year.

Loaners

The loaner program offers members a means to try scopes of various sizes and technologies before you buy. For more information please see the loaner program web page: <http://www.sjaa.net/loaners.shtml>

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Publication Statement

SJAA Ephemeris, newsletter of the San Jose Astronomical Association, is published monthly.

San Jose Astronomical Association,
 P.O. Box 28243
 San Jose, CA 95159-8243

The SJAA Ephemeris is published in three formats: hardcopy, Adobe Acrobat PDF, and HTML. The PDF and HTML versions are found at <http://ephemeris.sjaa.net>.

Articles for publication should be submitted by the 10th of the previous month. The PDF version is generally available by the 24th of the previous month and the HTML version by the last day of the previous month.

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New **Renewal** (Name only if no corrections)

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Subscribing to Sky & Telescope magazine through the SJAA saves you \$5 off the regular rate. (S&T will not accept multi-year subscriptions through the club program. Allow 2 months lead time.)

I prefer to get the Ephemeris newsletter in print form (Add \$10 to the dues listed on the left). The newsletter is always available online at <http://ephemeris.sjaa.net>
Questions?

Send e-mail to membership@sjaa.net

Bring this form to any SJAA Meeting or send to the club address (above). Please make checks payable to "SJAA".

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