

# EPHEMERIS

May 2011

## SJAA Activities Calendar

Jim Van Nuland

### April (late)

- |  |  |
|--|--|
| <p>22 Astronomy Class at Houge Park. 7:45 p.m.</p> <p>22 Houge Park star party. Sunset 7:49 p.m, 70% moon rises 1:05 a.m. Star party hours: 8:45 until 11:45 p.m.</p> <p>23 Dark-Sky weekend. Sunset 7:50 p.m, 60% moon rises 1:45 a.m.</p> <p>30 Dark-Sky weekend. Sunset 7:56 p.m, 4% moon rises 5:04 a.m. Henry Coe Park's "Astronomy" lot has been reserved.</p> | <p>a.m. Star party hours: 9:30 until midnight.</p> <p>28 Dark-Sky weekend. Sunset 8:20 p.m, 20% moon rises 3:06 a.m.</p> |
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### May

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|---|--|
| <p>13 Houge Park star party. Sunset 8:08 p.m, 85% moon sets 3:46 a.m. Star party hours: 9:00 until midnight.</p> <p>14 <b>General Meeting.</b> Board meeting at 6:30; General Meeting at 8:00.</p> <p>27 Astronomy Class at Houge Park. 8:30 p.m.</p> <p>27 Houge Park star party. Sunset 8:19 p.m, 20% moon rises 3:06</p> | <h3>June</h3> <p>4 Dark-Sky weekend. Sunset 8:24 p.m, 11% moon sets 10:58 p.m.</p> <p>10 Houge Park star party. Sunset 8:28 p.m, 73% moon sets 2:21 a.m. Star party hours: 9:30 until midnight.</p> <p>11 <b>General Meeting.</b> Board meeting at 6:30; General Meeting at 8:00.</p> <p>24 Astronomy Class at Houge Park. 8:45 p.m.</p> <p>24 Houge Park star party. Sunset 8:32 p.m, 34% moon rises 1:35 a.m. Star party hours: 9:45 until midnight.</p> <p>25 Dark-Sky weekend. Sunset 8:32 p.m, 25% moon rises 2:07 a.m.</p> |
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*The Board of Directors meets before each general meeting at 6:30 p.m. All are welcome to attend.*

24 hour news and information hotline:  
 (408) 559-1221  
<http://www.sjaa.net>

### The Shallow Sky

## What you didn't know about Luna

Akkana Peck

If you missed Brian Day's talk at the March SJAA meeting, you missed a doozy. In addition to lots of interesting background on LCROSS and other recent NASA moon missions, he peppered his talk with fascinating facts about the moon that contradict what we usually read.

For instance, most anyone will tell you that the moon is dead, geologically. But the seismographs left by the Apollo missions have recorded moonquakes up to magnitude 5 ... some of them lasting for up to 10 minutes! Mag 5 isn't much compared to the disaster in Japan, but it's a healthy enough shake here, even when it only goes on for a quarter of a minute. Imagine 10 minutes of that!

Then there's the moon's atmosphere. Wait, what? Everybody knows the moon doesn't have an atmosphere! But it does — a little. The Apollo 17 astronauts, while orbiting the moon, noticed and sketched the glow on the lunar horizon at sunset/sunrise. They even saw "streamers" or crepuscular rays, those "god-rays" you sometimes see streaming through the clouds on a dusty evening. Of course the rays the astronauts saw weren't produced by clouds, but by shadows of lunar craters and mountains, but they were reflected

*Continued on page 2*

by atmospheric dust just like the ones we see here.

The moon's atmosphere, of course, is nothing like ours — it's just an "exosphere", an atmosphere where the molecules are so far apart they seldom interact with each other. Nobody knows much about what it's made of, though it's most likely tiny electrically charged dust grains kicked up off the lunar surface. But how do they get

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**"...did you know that the permanently shadowed craters at the moon's poles are the coldest places we've measured so far in our solar system? They're colder than the surface of Pluto!"**

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kicked up high enough for the astronauts to have seen streamers in the dust? Does it happen all the time, or only on the terminator? Look for a future NASA mission to try to answer these questions.

But it gets better. The moon's tenuous exosphere glows faintly on its own, mostly from sodium. If we could see just the moon's atmosphere, without the glow of the moon itself, in dark

skies we'd be able to see that faint light, barely, with the naked eye. Of course this is something we'll never be able to see in practice ... but what a mind-blowing idea!

Brian stressed that exospheres are the norm in bodies in the solar system; thick atmospheres like ours, dominated by collisions between molecules, are relatively rare. So this is a great chance to study one right here in our own backyard.

Do we really need that argument, though? Isn't it enough that it's our moon's atmosphere — and that's just really cool? It makes me a little sad to think that Luna isn't considered interesting enough to be worth studying in its own right, but needs to be justified by comparing it with Mars or asteroids or Jovian moons. Walk outside on a nice clear evening, look up — and you can see a planet! Right there, so close to us that I've had cars that have gone more distance. A little planet complete with volcanic domes, huge ancient lava flows, thousands of impact structures ... and an atmosphere. And it's so close we can see a lot of these surface details with small amateur telescopes. How cool is that?

Speaking of cool, another great fact from Brian's talk: did you know that the permanently shadowed craters

at the moon's poles are the coldest places we've measured so far in our solar system? They're colder than the surface of Pluto!

Enough fun facts. Want to help out with the discoveries? There are quite a few ways these days that amateurs can help lunar research. First, anyone with a computer can go to [MoonZoo.org](http://MoonZoo.org), where you can help classify craters and other lunar features in photos from NASA's Lunar Reconnaissance Orbiter (LRO). Away from the computer, you can contribute to meteor counts and observing the zodiacal light. If you have an 8" or larger telescope, a video camera and Windows XP, you can help watch for impacts on the moon (google for "Lunar Impact Monitoring" to find NASA's page on that).

After Brian's formal talk, we all crowded around to look at a tiny sample of moon rock, plus a few interesting books. There was one on observing lunar impacts, plus the Kaguya Lunar Atlas, a new compendium of high resolution, low angle photos of select lunar features, taken by the Japanese spacecraft officially called Selene, but unofficially called Kaguya after a moon princess of



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## Future Planetary Missions

Paul Kohlmitter

Japanese legend. It's not an atlas you can use for orienting yourself in a telescope, in the sense of Rukl's, but it's certainly a beautiful collection of photos of your favorite lunar features.

Overall, a great talk, full of fascinating information for anyone with any interest in the moon.

On May evenings, of course, the moon won't always be there. There isn't that much else to look at in the shallow sky this month, but don't miss Saturn, already near transit by nightfall with its rings tilted at about 7 degrees. It never gets exceptionally high in the sky, just 50°, but that's enough to see plenty of ring detail. All other planets are still in the morning sky except Pluto: it rises in early evening, so if you're ambitious you could catch it by midnight. Otherwise ... time to go back to observing the moon!



*The photo on page 2 was taken by the Clementine spacecraft. This mission was launched January 25, 1994 with the intention to image the moon and also the near earth asteroid 1620 Geographos. a malfunction caused the total depletion of the onboard fuel and the part of the mission to 1620 Geographos was never started. The photo is from the NASA Goddard Space Flight Center.*

*Brian Day was our speaker during the March General Meeting. The picture of Brian above was taken on a different day and is from NASA.*

Steven Squyres, you know him from the Mars Rovers, is the chair of the U.S. National Research Council committee. That group has come up with a set of recommendations for the next decade's (2013-2022) planetary science space missions. Unlike previous surveys, outside consultants were used to come up with realistic mission costs. The result is a handful of missions with large price tags. Squyres said "sticker shot hit us".

Previous cost estimations had the upcoming Mars Science Laboratory (Curiosity) pegged at \$650 million. But the actual cost will be \$2.3 billion. Curiosity is set to launch later this year and is not part of this committee's work.

One problem that affects costs is the tyranny of doing "firsts". The first flyby, orbiter, or lander will be costly because the first mission requires new technology. On the other hand, a mission that is not a first generates little interest, from the public and from congress.

The result of the committee's survey is 4 missions in the "flagship" category. They are listed here in priority order.

First up is the Mars Astrobiology Explorer-Cacher (MAX-C) estimated at \$3.5 billion dollars in 2015. This spacecraft would land on Mars and look for signs of life, present or past. The "cacher" part of the mission is that this new rover would seek out sedimentary rocks and save them for a later mission. This later mission would rendezvous with MAX-C on the Martian surface and put the samples into a Martian orbit. Then a third mission would rendezvous with the Martian orbiter and return the samples to Earth. But that price tag was too much for the committee. Squyres thinks it is possible to cut \$1 billion from the price tag and share cost with the European Space Agency. Otherwise he says the mission should be deferred.

Second is Jupiter Europa Orbiter (JEO). This mission would take a long, close look at this ice covered moon. It's projected cost is \$4.7 billion so once again the recommendation is that the mission should only fly in the next decade "if changes to both the mission and the NASA planetary budget make it affordable."

The third priority is a Uranus Orbiter and Probe mission. It could be similar to Cassini/Huygens. The projected cost is \$2.7 billion with a similar recommendation, if the price gets any higher, cancel it.

The last priority in the flagship category is an either-or proposition. The two choices are a Venus climate study mission (\$2.4 billion) or a spacecraft to orbit Enceladus (\$1.9 billion).

After the flagship category, the next set of missions are medium size. The committee defines these missions to be \$1 billion or less but that does not include the cost of the rocket. The committee had more than 20 proposals in this category and they whittled that down to 7. These 7 cover a wide range of planetary studies: cometary sample return, probe to Saturn, Venusian surface exploration, sample return from an impact basin on the moon, study Trojan asteroids (in Jupiter's orbit), multiple flybys of Io, observatories on the moon. The committee says that 2 of these should be funded in the coming decade.

The committee's report doesn't guarantee anything. The federal budget may mean that no flagship category mission flies during the 2013-2022 decade. Squyres is hoping that the scientific community will help make the push for funding these planetary missions.



## Cosmic Recount

Dr. Tony Phillips

News flash: The Census Bureau has found a way to save time and money. Just count the biggest people. For every NBA star like Shaquille O’Neal or Yao Ming, there are about a million ordinary citizens far below the rim. So count the Shaqs, multiply by a million, and the census is done.

Could the Bureau really get away with a scheme like that? Not likely. Yet this is just what astronomers have been doing for decades.

Astronomers are census-takers, too. They often have to estimate the number

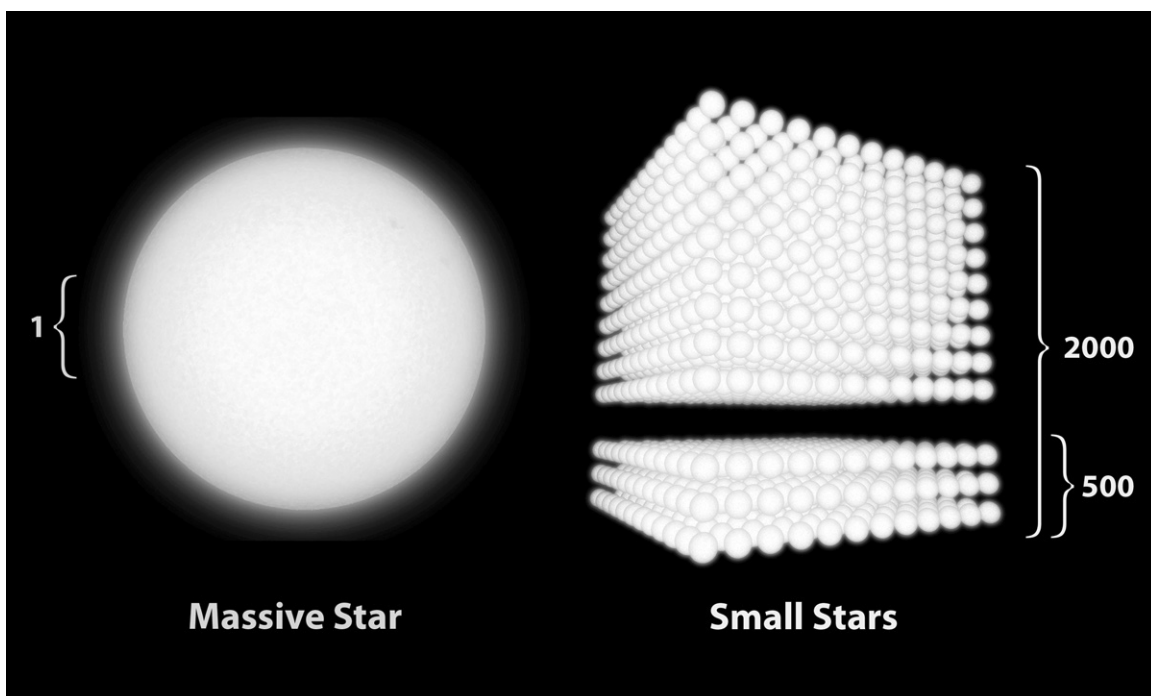
and type of stars in a distant galaxy. The problem is, when you look into the distant reaches of the cosmos, the only stars you can see are the biggest and brightest. There’s no alternative. To figure out the total population, you count the supermassive Shaqs and multiply by some correction factor to estimate the number of little guys.

The correction factor astronomers use comes from a function called the “IMF”—short for “initial mass function.” The initial mass function tells us the relative number of stars of different masses. For example, for every 20-solar-

mass giant born in an interstellar cloud, there ought to be about 100 ordinary sun-like stars. This kind of ratio allows astronomers to conduct a census of all stars even when they can see only the behemoths.

Now for the real news flash: The initial mass function astronomers have been using for years might be wrong.

NASA’s Galaxy Evolution Explorer, an ultraviolet space telescope dedicated to the study of galaxies, has found proof that small stars are more numerous than previously believed.



*Astronomers have recently found that some galaxies have as many as 2000 small stars for every 1 massive star. They used to think all galaxies had only about 500 small stars for every 1 massive star.*

"Some of the standard assumptions that we've had—that the brightest stars tell you about the whole population—don't seem to work, at least not in a constant way," says Gerhard R. Meurer who led the study as a research scientist at Johns Hopkins University, Baltimore, Md. (Meurer is now at the University of Western Australia.)

Meurer says that the discrepancy could be as high as a factor of four. In other words, the total mass of small stars in some galaxies could be four times greater than astronomers thought. Take that, Shaq!

The study relied on data from Galaxy Evolution Explorer to sense UV radiation from the smaller stars in distant galaxies, and data from telescopes at the Cerro Tololo Inter-American Observatory to sense the "H-alpha" (red light) signature of larger stars. Results apply mainly to galaxies where stars are newly forming, cautions Meurer.

"I think this is one of the more important results to come out of the Galaxy Evolution Explorer mission," he says. Indeed, astronomers might never count stars the same way again.

Find out about some of the other important discoveries of the Galaxy Evolution Explorer at <http://www.galex.caltech.edu/>. For an easy-to-understand answer for kids to "How many solar systems are in our galaxy?" go to The Space Place at: <http://tiny.cc/12KMa>

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

## Board of Directors

At the February General Meeting, the incumbent board of directors were all reelected. At the March board meeting, new officers were elected. They are:

President - Mark Wagner  
Vice President - Greg Claytor  
Secretary - Rob Jaworski  
Treasurer - Robert Armstrong

Chair positions:

School Star Parties: Jim Van Nuland  
Membership: Rob Jaworski  
Publicity: Rob Jaworski  
Monthly Program: Greg Claytor  
Loaner Telescopes: Lee Hoglan  
Beginner Classes: Gordon Reade  
Website: Mark Wagner

## 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.

## SJAA Yosemite Public Star Party 2011

Jim Van Nuland

The annual SJAA Yosemite star party will be held on August 26 and 27, at Glacier Point in Yosemite National Park. Up to 30 people will be given free admission and camping, in exchange for two public events on Friday and Saturday evenings. The rest of the time we can be tourists.

We are expected to have at least one scope per two people, and to attend both star parties, not just Friday or Saturday. For these reasons, this is probably not suitable for a family camping trip.

The camping is rough by modern standards: no dining room, no showers, no hot water. Read about it on the SJAA Yosemite page <<http://www.sjaa.net/yosemite.shtml>> and the FAQ page at <<http://www.sjaa.net/yosefaq.shtml>>. Then contact me with remaining questions. That first page also has sun and moon rise and set times.

We will again have scheduled times to drive up to remove our gear.

The first "leaving window" will start at midnight. The next time window will be 3:00 am or by general agreement.

If you can tolerate the limitations, tell me the number of people you'll have, and the number of scopes that will be set up for the public. E-mail me at [jvn@sjpc.org](mailto:jvn@sjpc.org), or phone 408-371-1307 11 a.m. to 11 p.m. Priority is given to SJAA members.

Clear Skies!

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## The Last Month In Astronomy

APR-07-2011 **Star Discovery** What do you call a spacecraft that detects stars that are close and faint? The Galaxy Evolution Explorer! Wait, what? Turns out that clever astronomers have found a way to identify close, faint stars using the spacecraft using the space-based observatory that was meant to look at galaxies. The Galaxy Evolution Explorer does a particularly good job of detecting UV. David Rodriguez, a graduate student at UCLA, says "We've discovered a new technique of using ultraviolet light to search for young, low-mass stars near the Earth ... These young stars make excellent targets for future direct imaging of exoplanets." <http://www.jpl.nasa.gov/news/news.cfm?release=2011-110>

APR-07-2011 **Titan Really Cold** Jeff Moore of NASA Ames and a SJAA member has a new paper out where he says Titan doesn't have a lot of volcanism. "It would be fantastic to find strong evidence that clearly shows Titan has an internal heat source ... but we find the evidence presented to date is unconvincing ..." Indeed, Titan surface features that have been clearly identified are the result of external forces: meteorites, wind, methane rain. There is one area of Titan, named Sotra Facula, that might be the result of icy volcanism but the analysis of the area is incomplete. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-111>

APR-06-2011 **Curiosity Nearly Ready** The Mars Science Laboratory is nearing its final configuration. By June the spacecraft, now called Curiosity, will be sent to the Kennedy Space Center. Launch is set for NET Nov. 25. The landing site for Curiosity is still TBD. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-108>

APR-04-2011 **Pioneer Anomaly Solved** The Pioneer spacecraft spent the 70's giving us a close up look at Jupiter and Saturn. They (10 and 11) continue to head out of the solar system. They have been tracked ever since and there was something that just wasn't right. They slowed down. Why? Speculation included propellant leaks, measurement errors, even a kind of friction related to some unknown dust. The latest explanation might be right: waste heat reflecting off of the paraboloidal antenna. <http://www.skyandtelescope.com/news/home/119226989.html>

MAR-31-2011 **Ring Ripples** Some perturbations in the rings of Jupiter and Saturn have been traced back to collisions. In the case of Jupiter, the collision is a familiar one. Shoemaker-Levy 9 hit in 1994. The debris cloud surrounding the fragments of that comet led to ripples in Jupiter's thin rings. Another debris cloud led to ripples in Saturn starting in 1983. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-102>

MAR-24-2011 **Stardust Retires** The Stardust mission is finally over. The spacecraft finished its latest mission by doing a rocket burn to depletion. This burn, in particular how long it lasted (146 seconds), tells scientists how much fuel was left on board. Fuel gauges on spacecraft are unreliable at best so this test was a good measure. "This will be a great data set to have in our back pocket when we plan for future missions" said Allan Cheuvront, Lockheed Martin Space System Company program manager for Stardust-NExT. Stardust was launched Feb. 7, 1999. Since then it has flown past asteroid Annefrank, collected particle samples from comet Wild 2, dropped off a sample return capsule to Earth, and then flew past comet Tempel 1 taking images and other measurements. Total travel distance is more than 3.5 billion miles. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-095>

MAR-23-2011 **Cold Stars** You already know that you are made of star stuff. But did you know you are the same temperature as stars. Well, not most stars. But brown dwarfs can be really cool, thermometer wise. The spectra from WD 0806-661b, a companion of a faint white-dwarf 63 light-years away in the constellation Volans. Using the spectra and other measurements they computed a temperature of 300 K. Body temperature is 310 K (311 K if you have a fever). <http://www.skyandtelescope.com/news/118538359.html>

MAR-22-2011 **NASA with a Wallop** NASA opened a new facility to help ready commercial rockets for launch located on Wallops Island, VA. The first customer will be Orbital Sciences which will use the new facility to process Taurus 2 launches. <http://www.space.com/11208-nasa-wallops-rocket-facility-commercial-space.html>

MAR-22-2011 **Tracking launch from space** Doug Young of Northrup Grumman says that a ballistic missile launch was tracked from low Earth-orbit for the first time. "It's the Holy Grail for missile defense" he said. <http://www.space.com/11206-missile-defense-satellites-successful-test.html>

MAR-20-2011 **Kepler Glitch** The Kepler spacecraft went into safe mode for 6 days apparently caused by an attempted software upgrade. It then returned to its science mission apparently in good shape. <http://www.space.com/11201-nasa-kepler-planet-hunting-telescope-malfunction.html>

# It Must Be Astronomical ...

## 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>

*Some say the world will end in fire,  
Some say in ice.  
From what I've tasted of desire  
I hold with those who favor fire.  
But if it had to perish twice,  
I think I know enough of hate  
To say that for destruction ice  
Is also great  
And would suffice. – Robert Frost*

## School Star Parties

### Completed Events

|              | Total Sched. | Good Sky  | Partial Success | Cloudy Fail | Cancel at noon |
|--------------|--------------|-----------|-----------------|-------------|----------------|
| Jul          | 1            | 1         |                 |             |                |
| Aug          | 4            | 4         |                 |             |                |
| Sep          | 0            |           |                 |             |                |
| Oct          | 7            | 5         | 1               |             | 1              |
| Nov          | 13           | 9         | 3               |             | 1              |
| Dec          | 8            | 1         | 2               | 0           | 5              |
| Jan          | 8            | 2         | 2               | 0           | 4              |
| Feb          | 6            | 6         |                 |             |                |
| Mar          | 11           | 3         | 1               |             | 7              |
| Apr          | 3            | 1         | 1               | 1           |                |
| <b>Total</b> | <b>61</b>    | <b>32</b> | <b>10</b>       | <b>1</b>    | <b>18</b>      |

### Scheduled Events

|              | Total    | Firm     | Workin'  |  |  |
|--------------|----------|----------|----------|--|--|
| Apr          | 1        | 1        |          |  |  |
| May          | 1        |          | 1        |  |  |
| <b>Total</b> | <b>2</b> | <b>1</b> | <b>1</b> |  |  |

*As of mid-April*

### Officers and Board of Directors

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- Sec** Rob Jaworski
- Tres** Robert Armstrong
- Dir** Lee Hoglan
- Dir** Gordon Reade
- Dir** Rod Norden
- Dir** Kevin Roberts
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### Ephemeris Staff

- Editors** Paul & Mary Kohlmiller
- Circulation** Gordon Reade
- Printing** Accuprint (408) 287-7200

### School Star Party Chairman

Jim Van Nuland (408) 371-1307

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- School Star Parties [schools@sjaa.net](mailto:schools@sjaa.net)
- Ephemeris [ephemeris@sjaa.net](mailto:ephemeris@sjaa.net)

Other e-mail contacts are available at  
<http://www.sjaa.net/contacts.html>

Members Email Lists:  
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### Publication Statement

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## San Jose Astronomical Association Membership Form

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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.)

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

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