

EPHEMERIS

March 2011

Kepler's Big News
Paul Kohlmeier

SJAA Activities Calendar

Jim Van Nuland

February (late)

- 25 Astronomy Class at Houge Park. 7:00 p.m.
- 25 Houge Park star party. Sunset 5:58 p.m., 38% moon rises 2:42 a.m. Star party hours: 7:00 until 10:00 p.m.
- 26 Dark-Sky weekend. Sunset 5:59 p.m., 28% moon rises 3:30 a.m.

March

- 5 Dark-Sky weekend. Sunset 6:06 p.m., 2% moon sets 7:14 p.m. Henry Coe Park's "Astronomy" lot has been reserved. **This is the primary weekend for a Messier Marathon.**
- 11 Astronomy Class at Houge Park. 7:00 p.m. The topic: our moon.
- 11 Houge Park star party. Sunset 6:11 p.m., 42% moon sets 12:58 a.m. Star party hours: 7:00 until 10:00 p.m.
- 13 **DST Starts at 2 a.m.** Advance clocks one hour.
- 19 **General Meeting.** Board meeting at 6:30; General Meeting at 8:00.
- 25 Houge Park star party. Sunset 7:24 p.m., 54% moon rises 2:26 a.m. Star party hours: 8:15 until 10:15 p.m.

- 26 Dark-Sky weekend. Sunset 7:25 p.m., 43% moon rises 3:10 a.m.

April

- 2 Dark-Sky weekend. Sunset 7:31 p.m., 1% moon sets 7:05 p.m. Henry Coe Park's "Astronomy" lot has been reserved. **This is the secondary weekend for a Messier Marathon.**
- 8 Houge Park star party. Sunset 7:36 p.m., 27% moon sets 12:45 a.m. Star party hours: 8:30 until 11:30 p.m.
- 17 **Annual Auction (replaces General Meeting this month).** Open at noon, Auction starts at 1:30.
- 22 Astronomy Class at Houge Park. 7:45 p.m.
- 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.
- 23 Dark-Sky weekend. Sunset 7:50 p.m., 60% moon rises 1:45 a.m.
- 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.

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

At the beginning of February, NASA's Kepler mission finally spilled the beans on their big news. It wasn't like they were withholding information on exoplanet discoveries. But it takes a while to get enough data to make sure-footed announcements. And although Kepler was launched mid-2009, the scientists have only been able to analyze 4 months worth of scientific data. Think about that for a moment. Kepler is detecting planets by measuring the drop in a star's apparent magnitude caused by the planet passing between its star and us. That requires that three points, the star, the planet, and us be close to colinear. And the timing has to be right. You would need 2-3 years in order to see Earth pass in front of the Sun 3 times. If, so far, you see it transit 2 times you could call it a "candidate".

And that was the big news: 1235 planetary candidates around 997 stars based on observations taken between May 2, 2009 and September 16, 2009. 68 of these candidates are 1.25 Earth's radius or less. 288 are called super-Earth size, between 1.25 and 2 Earth radii. Most of the candidates are in the category of Neptune-size (2-6 Earth radii) but 74% are less than the actual size of Neptune. 17% of the stars have more than 1 planet. Indeed, at the same time as this announcement, NASA also announced the discovery of a 6 planet system that is surprisingly compact. Please see the diagrams on page 3 and more information in our Astronomy news section on page 6.

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

Worlds of Controversy

Akkana Peck

Controversy is alive in the shallow sky, and we got a good taste of it in local talks in January.

First, Dr. Jeff Moore, of NASA Ames, was the featured speaker at the monthly SJAA meeting. His topic: ice volcanoes on Saturn's moon Titan. Or rather, a lack of ice volcanoes. Volcanoes of methane, ammonia and water ice erupting in slow motion may sound cool — but it turns out the evidence for them isn't as convincing as the news stories might have you believe.

The early Cassini photos did look promising, with what looked like flow patterns on the flanks

of a low mountain. But measurements with Cassini's altimeter showed that they weren't at all what they seemed: what looked like the summit of a volcano in the visual image wasn't the highest point at all, and most of the mountainous region was a relatively flat plain. It was all a trick of the light.

JPL clings to the story — Jeff played us a pro ice volcano infomercial they made after he first questioned the data. But he demonstrated how every ice volcano candidate so far can be explained as a product of erosion by Titan's wind and methane rain. Jeff compared Titan's surface to the surfaces of several Galilean moons, and to various types of erosion on Earth, concluding that Titan may be, in effect, "Callisto with weather."

Jeff's colleague at NASA Ames, Dr. Kevin Zahnle, has been in the news as well — on the cover of *The Economist* for a paper he wrote questioning common assumptions about methane in Mars'

atmosphere.

I'm sure you've seen articles on Martian methane. Methane doesn't last long in the atmosphere — only a few hundred years — so if it's there, it's being replenished somehow. On Earth, one of the most common ways to produce methane is through biological processes. Life on Mars! Whoopee! So everyone wants to see methane on Mars, and it makes for great headlines.

The problem, according to Kevin, is that the Mars measurements show changes on a scale much shorter than hundreds of years: they fluctuate on a seasonal basis. That's tough to explain.

Known atmospheric oxidation processes wouldn't get rid of methane fast enough, so you'd need to invent some even more exotic process — perhaps methane-eating bacteria in the Martian soil? — to account for the drops.

Worse, the measurements showing methane aren't very reliable. The evidence is spectroscopic: methane absorbs light at several fixed wavelengths, so you can measure methane by looking for its absorption lines.

But any Earth-based measurement of Martian methane has to cope with the fact that Earth's atmosphere has far more methane than Mars. How do you separate possible

Mars methane absorption lines from Terran ones? There's one clever way: you can measure Mars at quadrature, when it's coming toward us or going away from us, and any methane spectral lines would be red- or blue-shifted compared to the Terran ones. But then the lines overlap with other absorption lines from Earth's atmosphere. It's very difficult to get a reliable measurement. Of course, a measurement from space would avoid those problems, so the spectrograph on the ESA Mars orbiter has been pressed into service. But there are questions about its accuracy.

The published evidence so far for Martian methane just isn't convincing, especially with those unlikely seasonal fluctuations. That doesn't mean there's no methane there; it means we need better data. The next Mars Rover, dubbed "Curiosity", will include a laser spectrometer which can give us much more accurate methane measurements. Curiosity is set to launch this fall and arrive at Mars in August of next year.

Good stuff! But there was one more planet controversy in January. Just a few days after the SJAA meeting, San Joseans were treated to two talks on Pluto. On Jan 18, Dr. Alan Stern, principal investigator of the New Horizons mission to Pluto, spoke at the SETI institute about Pluto and the mission. Then the next day, Mike Brown spoke at Foothill College about his new book, "How I Killed Pluto

and Why It Had it Coming!" It was an entertaining pair of talks. Dr. Stern couldn't resist adding a few jibes at Brown while explaining why Pluto's

"Life on Mars! Whoopee! So everyone wants to see methane on Mars, and it makes for great headlines."

"But any Earth-based measurement of Martian methane has to cope with the fact that Earth's atmosphere has far more methane than Mars."

importance in the solar system shouldn't be underestimated. Brown's talk was less technical and told the story of the discovery of Eris and other Kuiper-belt objects. Both talks were recorded, though neither video seems to be online yet as I write this.

Sick of controversy and just want to look at some planets?

Saturn rises in the early evening in March and is at its best a few hours after midnight. The ring tilt is a bit less than ten degrees. Take a look at Saturn and at Titan — bet you don't see any ice volcanoes!

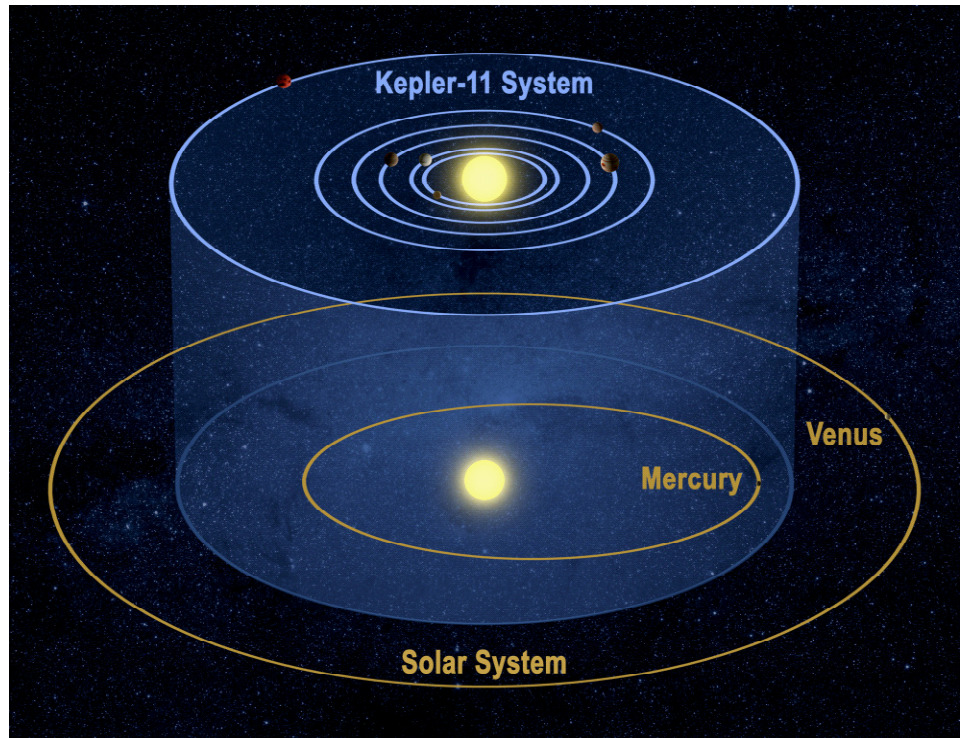
Mercury becomes visible in the evening sky in the second half of March, joining Jupiter in the evening twilight. Mercury reaches greatest elongation from the sun on the 23rd, and then closes rapidly, shrinking to a crescent by month's end as it grows in size.

Mars, Uranus and Neptune aren't well positioned for observing this month. Pluto is a morning object, rising a few hours after midnight, so it doesn't get very high before dawn overtakes it.

Venus is a morning object, as is Neptune. On the mornings of the 26 and 27, look for Venus and Neptune less than half a degree apart. They'll pass much closer than that, only a tenth of a degree apart — but it happens during daylight here, when Neptune is invisible.

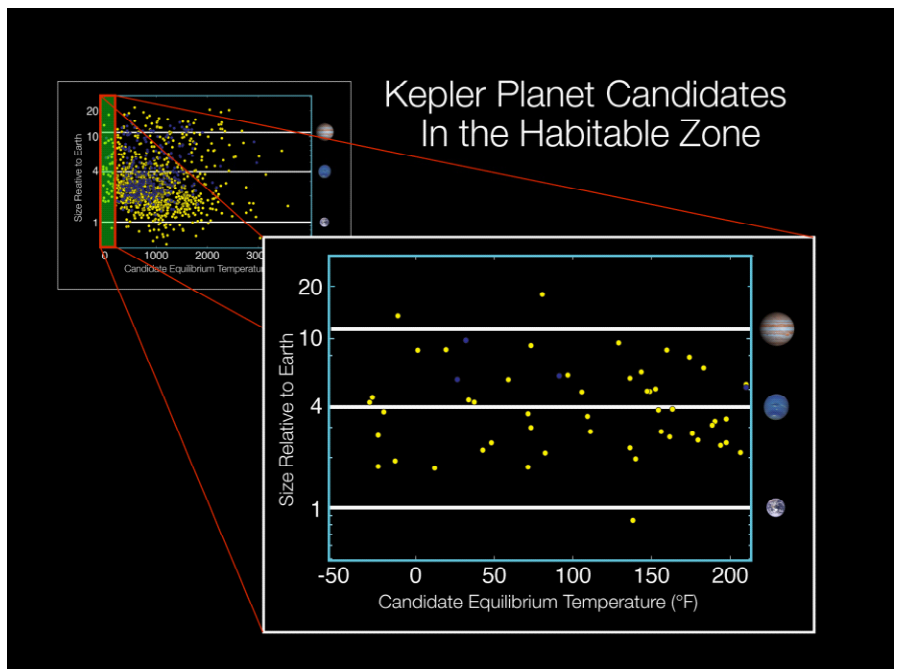
Daylight savings time begins on March 13.

Finally, look for the Zodiacal Light as a faint band rising up along the ecliptic as the sky darkens after sunset in the last two weeks of March.



The diagram above shows the newly discovered planetary system Kepler-11. It is surprisingly compact and it is very flat. This diagram is from Jack Lissauer's presentation February 1, 2001 and the article is in Nature's 2011 Feb 3 issue. All of these planets are low-mass and low-density planets and their sizes range from 2-5 Earths, so-called "super earths".

The diagram below shows the segment of the planetary candidates that are in the habitable zone, roughly in the area where liquid water might be present. On the far right the legend shows Jupiter-sized planets on the top, then Neptune-size planets and finally Earth-sized planets. If you would like to see both PowerPoint presentations they can be found at <http://kepler.nasa.gov/news/index.cfm?FuseAction=ShowNews&NewsID=98>.





Thank Goodness the Sun is Single

Trudy E. Bell

It's a good thing the Sun is single. According to new research, Sun-like stars in close double-star systems "can be okay for a few billion years—but then they go bad," says Jeremy Drake of the Harvard-Smithsonian Astrophysical

Observatory in Cambridge, Mass.

How bad? According to data from NASA's Spitzer Space Telescope, close binary stars can destroy their planets along with any life. Drake and four

colleagues reported the results in the September 10, 2010, issue of *The Astrophysical Journal Letters*.

Our Sun, about 864,000 miles across, rotates on its axis once in 24.5 days.



Planetary collisions such as shown in this artist's rendering could be quite common in binary star systems where the stars are very close.

“Three billion years ago, roughly when bacteria evolved on Earth, the Sun rotated in only 5 days,” explains Drake. Its rotation rate has been gradually slowing because the solar wind gets tangled up in the solar magnetic field, and acts as a brake.

But some sun-like stars occur in close pairs only a few million miles apart. That’s only about five times the diameter of each star—so close the stars are gravitationally distorted. They are actually elongated toward each other. They also interact tidally, keeping just one face toward the other, as the Moon does toward Earth.

Such a close binary is “a built-in time bomb,” Drake declares. The continuous loss of mass from the two stars via solar wind carries away some of the double-star system’s angular momentum, causing the two stars to spiral inward toward each other, orbiting faster and faster as the distance shrinks. When each star’s rotation period on its axis is the same as its orbital period around the other, the pair effectively rotates as a single body in just 3 or 4 days.

Then, watch out! Such fast spinning intensifies the magnetic dynamo inside each star. The stars “generate bigger, stronger ‘star spots’ 5 to 10 percent the size of the star—so big they can be detected from Earth,” Drake says. “The stars also interact magnetically very violently, shooting out monster flares.”

Worst of all, the decreasing distance between the two stars “changes the gravitational resonances of the planetary system,” Drake continued, destabilizing the orbits of any planets circling the pair. Planets may so strongly perturbed they are sent into collision paths. As they repeatedly slam into each other, they shatter into red-hot asteroid-sized bodies, killing any life. In as short as a century, the repeated collisions pulverize the planets into a ring of warm dust.

The infrared glow from this pulverized debris is what Spitzer has seen in some self-destructing star systems. Drake and

his colleagues now want to examine a much bigger sample of binaries to see just how bad double star systems really are.

They’re already sure of one thing: “We’re glad the Sun is single!”

Read more about these findings at the NASA Spitzer site at www.spitzer.caltech.edu/news/1182-ssc2010-07-Pulverized-Planet-Dust-May-Lie-Around-Double-Stars. For kids, the Spitzer Concentration game shows a big collection of memorable (if you’re good at the game) images from the Spitzer Space Telescope. Visit spaceplace.nasa.gov/en/kids/spitzer/concentration/.

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

Silicon Valley Astronomy Lectures

Chris McKay on March 9, 2011 at 7 p.m.

Andrew Fraknoi

On Wednesday, Mar. 9th, 2011, at 7 pm, Astronomer Chris McKay, from NASA’s Ames Research Center, will give a non-technical, illustrated talk on: Saturn’s Moon Titan: A World with Rivers, Lakes, and Possibly Even Life as part of the Silicon Valley Astronomy Lectures in the Smithwick Theater, Foothill College, El Monte Road and Freeway 280, in Los Altos Hills, California. Free and open to the public. Parking on campus costs \$2. Call the series hot-line at 650-949-7888 for more information and driving directions. No background in science will be required for this talk.

Titan, Saturn’s largest satellite, is the only moon with a thick atmosphere. The Cassini mission, now orbiting Saturn, has sent back remarkable images and information from Titan, revealing one of the most intriguing and surprising worlds in the entire solar system. In many ways, Titan is a cold twin of the Earth, with liquid methane (swamp gas) playing the same role there as water plays on our planet. Life on Earth is based on liquid water; could there be life on Titan based on liquid methane?

Dr. McKay will discuss the new picture we have of Titan, with its lakes, its rivers, and its rocks made of water ice. He’ll show you a world unlike any that astronomers have seen so far.

Chris McKay is a planetary scientist with NASA whose research focuses on the evolution of the solar system and the origin of life. He has been a co-investigator on the Huygens probe (that Cassini landed on Titan), the Phoenix Mars lander, and the upcoming Mars Science Laboratory mission. He has a wonderful knack for explaining scientific results in plain language and with a touch of humor.

Past Silicon Valley Astronomy Lectures are now available in MP3 format at: <http://www.astrosociety.org/education/podcast/index.html>.

These talks are sponsored by NASA Ames, Foothill College, the Astronomical Society of the Pacific, and the SETI Institute.

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.

The Last Month In Astronomy

10-FEB-2011 **3 Shuttles** Shuttle flights 133, 134 and 135 are upcoming. Discovery flies STS-133 taking spare parts to the ISS in late February. STS-134 (Endeavour) will be commanded by Mark Kelly and it will deliver the Alpha Magnetic Spectrometer. Atlantis may launch as early as June 28. It is the last shuttle launch and it will deliver the Raffaello module. Wait a minute? Haven't we said "last shuttle launch" before? Well, STS-135 might not be the last launch either. At least one speculation has it that Endeavour will be kept in launch ready condition and it will be used once a year by a non-government company until 2017 when NASA will once again have a method for putting astronauts into orbit. http://www.nasa.gov/mission_pages/shuttle/main/index.html <http://www.aviationweek.com/aw/blogs/space/index.jsp?plckController=Blog&plckScript=blogScript&plckElementId=blogDest&plckBlogPage=BlogViewPost&plckPostId=Blog%3A04ce340e-4b63-4d23-9695-d49ab661f385Post%3Ac0247150-84d8-4316-ae61-94de85600f79>

FEB-08-2011 **Stardust at 12** Not many spacecraft get to celebrate their 12th anniversary at all. But fewer still celebrate by firing up the rockets. That's what Stardust did on its way to a rendezvous with Tempel 1. Does the comet name sound familiar? Deep Impact flew by Tempel 1 in 2005. Scientists are hoping to see changes that have occurred in the intervening years. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-042&rn=news.xml&rst=2903>

FEB-08-2011 **Europa Adaptive Optics** Franck Marchis and other astronomers using the high resolution infrared camera at the Keck Observatory wanted to make use of the adaptive optics - the technology that allows a telescope to handle atmospheric aberrations by making up to 2,000 changes per minute. But that technology needs a guide star usually created with a laser. But Marchis et. al. wanted to look into the clouds of Jupiter and the laser-created guide star was not bright enough compared to Jupiter. The solution? Use Europa as the guide star. The result is high resolution infrared images of Jupiter that exceed what Hubble can do. http://keckobservatory.org/news/europa_helps_astronomers_penetrate_jupiters_lost_belt/

FEB-03-2011 **Mars Changing** The Mars Reconnaissance Orbit has taken notice of the changes in Northern Mars. The dunes were once thought to be fairly static but changes, both sudden and gradual, can be seen. Some changes are the result of sand avalanches. Why in the North? It might be that winds are stronger near the poles. Over a 2 Mars-year period, 40% of the sites monitored showed major changes. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-039>

FEB-02-2011 **Exoplanets Abound** In what might already be the biggest astronomical news story of 2011, NASA's Kepler mission announced that more than 1200 planet candidates have been found. Note that these candidates are only from the first 4 months worth of data. They are called "candidates" because their transit of their star has been seen just twice. If the next transit occurs as expected the candidates will be confirmed. It is expected that at least 80% of the candidates will be confirmed. At least 5 of these planets appear to be Earth-sized planets located in the goldilocks zone (not too hot, not too cold). Furthermore, there is now clear evidence that Jupiter and larger planets are rare. Most of the new candidates are around Neptune-size and the discovery-bias is still pointing to larger planets. Most of the planet candidates are around Sun-like stars, stars with surface temperatures near 6000K. Since this is based on 4 months of data, the longest orbits take about 120 days. At this rate, it will take until late 2012 before Earth-sized planets in an Earth-sized orbit will be discovered. At the same time, NASA announced the discovery of a 6 planet system around a star now called Kepler-11. The planet furthest from Kepler-11 is much closer than Venus is to the Sun. This is interesting because it wasn't known that so many planets could be found in such a compact system. See the diagrams on page 3. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-036>

JAN-20-2011 **Black holes <> Dark matter** One theory has it that a black hole at the center of a galaxy is related to a dark matter halo. Well, maybe not. Scientists at the Max Planck Institute in Germany have shown the black hole is related to the bulge in the galactic center. They found that galaxies without a central bulge even with a massive dark matter halo can have low mass black holes at best. Ralf Bender said "It is hard to conceive how the low-density, widely distributed non-baryonic dark matter could influence the growth of a black hole in a very tiny volume deep inside a galaxy." <http://www.astronomy.com/News-Observing/News/2011/01/No%20direct%20link%20between%20black%20holes%20and%20dark%20matter.aspx>

JAN-12-2011 **(Not so) Standard Candle** Cepheids, the variable stars that are used as a standard candle to estimate distances to deep sky objects, may not be so standard after all. The problem is that Cepheids lose mass through stellar winds. Cepheids were used to determine that galaxies are not "spiral nebulae" within our own galaxy. They were also used by Hubble to determine that the universe is expanding. The drop in mass was determined using the Spitzer Space Telescope studying the "original" Cepheid, Delta Cephei. The result doesn't mean that past discoveries are void but it does mean the future Cepheid measurements could be more accurate, i.e. reduce the error bar. <http://www.jpl.nasa.gov/news/news.cfm?release=2011-012>

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>

Dues Change

Effective January 1, 2011, the SJAA membership dues changed. The regular dues are still \$20 but only for members choosing the electronic version of this newsletter. Those who want to continue with the print version will find that their dues are \$30.

“The only way of discovering the limits of the possible is to venture a little way past them into the impossible.” – Arthur C. Clarke’s Second Law

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			
Total	47	28	8	0	11

Scheduled Events

	Total	Firm	Workin'		
Feb	0	0	0		
Mar	8	6	2		
Total	15	12	3		

As of mid-February

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

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 Junior (under 18) — \$10
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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>
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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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