SJAA EPHEMERIS

SJAA Activities Calendar

Jim Van Nuland

(late) January

16 Dark Sky weekend. Sunset 5:15 p.m., 3% moon sets 6:52 p.m. Henry Coe Park's "Astronomy" lot has been reserved.

22 Houge Park star party. Sunset 5:22 p.m., 49% moon sets 12:44 a.m. Star party hours: 7:00 until 10:00.

30 **General Meeting** at 8 p.m. Our speaker is Dr. Peter Jenniskens, speaking on "Catch a Fallen Star", his recovery of pieces of a freshly-fallen meteor.

February

5 Astronomy Class at Houge Park. 7:30 p.m. Topic is TBA

5 Houge Park star party. Sunset 5:37 p.m., 47% moon rises 1:31 a.m. Star party hours: 7:00 until 10:00.

6 Dark Sky weekend. Sunset 5:38 p.m., 37% moon rises 2:33 a.m.

13 Dark Sky weekend. Sunset 5:45 p.m., No moon, really. Henry Coe Park's "Astronomy" lot has been reserved.

19 Houge Park star party. Sunset 5:52 p.m., 32% moon sets 11:28 p.m. Star party hours: 7:00 until 10:00.

27 **General Meeting** at 8 p.m. Our speaker is Rogelio Bernal Andreo, speaking on astrophotography from local skies.

March

5 Houge Park star party. Sunset 6:06 p.m., 64% moon rises 12:21 a.m. Star party hours: 7:00 until 10:00.

6 Dark Sky weekend. Sunset 6:07 p.m., 54% moon rises 1:20 a.m.

13 Dark Sky weekend. Sunset 6:13 p.m., 3% moon rises 6:31 a.m. Messier Marathon at Coe Park, dusk to dawn. Henry Coe Park's "Astronomy" lot has been reserved.

14 DST returns, 2 a.m. Advance clocks one hour.

19 Astronomy Class at Houge Park. 7:30 p.m. Topic is Moon?

19 Houge Park star party. Sunset 7:19 p.m., 19% moon sets 11:34 p.m. Star party hours: 8:15 until 11:15.

27 **General Meeting** at 8 p.m. Our speaker is Dr. Constance Rockosi of UC Lick, speaking on The Structure of the Milky Way.

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

Publicizing the SJAA

Your Club's board of directors has created an exciting new opportunity to get the word out about SJAA happenings, such as meetings, speakers, public star parties, swap meets and other events. Rob Jaworski is leading this task force and is looking for others to help. The areas we will be focusing on are web/social networking, print publications, schools, and even creating video content. If you are interested in helping to promote the SJAA in any capacity, or simply have some great ideas we can use, please drop Rob a line at publicity@sjaa.net.

January General Meeting

Peter Jenniskens

January 30, 2009 8 p.m.

We don't usually put January news in the February newsletter but we are hoping that you read this in time to come to the January General Meeting where our speaker will be the Astronomer, Dr. Peter Jenniskens (pronounced "Yenniss-kinss"), a long time friend and member of the SJAA. He will talk about his hunt for meteorites in Sudan and other related adventures. For more information about Dr. Jenniskens, see his CV at http://leonid.arc.nasa.gov/pjenniskens.html . Photo courtesy of NASA.

Volume 21 Number 2 Official publication of the San Jose Astronomical Association, February 2010

Do the Math

Paul Kohlmiller

Whenever I talk to 6th graders about astronomy, I can always elicit a groan by talking about anything that sounds like mathematics. When I talk to adults, it's really the same reaction, just silently. But if you are interested in astronomy, some math is indeed required. But hey, it's not too bad. A lot of the math is pretty simple. Here are a few simple "maths" that are key to understanding astronomical concepts.

The Kelvin Scale

K = C + 273.15 (usually just 273 is good enough).

This translates Celsius (or Centigrade) temperatures into kelvins. Although Kelvin is someone's name (Lord Kelvin) we type it in lowercase if it doesn't start a sentence as in "the temperature of the sun is about 5800 kelvins." Note that the word degree is not use with kelvins. That's because kelvins are on an absolute scale while Celsius and Fahrenheit are relative scales. Think of it this way, 50 degrees Fahrenheit or 10 degrees Celsius (which do represent the same temperature) is not twice as hot as 25 degrees Fahrenheit or 5 degrees Celsius (which do not represent equal temperatures). But 6000K is twice as hot as 3000K thanks to the fact that 0K is an absolute number, absolute zero. http://en.wikipedia.org/wiki/Kelvin

Wein's Law

2898000 nm/Temp(K) = Wavelength of peak emission

Let's see how that works. Your body temperature is 310K (273 + 37 Celsius). That means that you radiate at 2898000/310 or about 9350 nm. This puts you far into the infrared. This shouldn't be a surprise. You don't glow in visible light unless you think you have an aura. On the other hand, you have seen infrared cameras that make humans glow in a ghostly fashion. The sun appears to be nearly white which means it radiates across the visible spectrum somewhat equally. If we take the middle of that spectrum to be 500 nm and reorder this equation to solve for the temperature, we compute that the temperature of the sun is 5800 K. Remember that's the temperature of the surface. The internal temperature is quite a bit different. Ref: http://feps.as.arizona.edu/outreach/bbwein.html

Kepler's 3rd Law

P^2 relates to A^3

Without dissing Kepler's first 2 laws, the third law of planetary orbits is the one you need to know. It is simply this: if you take the ratio of a planet's orbital period squared and the radius of the planet's orbit cubed, that ratio will be the same for all planets around the same star. Let's see if that works. If we use 1 AU as the earth's orbital radius around the sun and 1 year as the orbital period, we get a ratio of 1. Well, that seems too easy doesn't it? How could all of the other planets end up with the same ratio? Well, the orbital radius of Venus expressed in AU is .72 and cubed that is .373. The orbital period is .6156 years and squared that is .378. Pretty darn close. In rough terms, the orbit of Jupiter is 5 AU which cubed is 125 and each Jovian orbit takes 12 years which squared is 144. Close but if you use more exact terms (like 11.86 years for the orbital period and 5.2 AU for the radius) you get a ratio very close to 1. The same will be true no matter how elliptical the orbit is. To be specific the orbital radius described here is actually the semimajor axis of an elliptical orbit. http://www-istp.gsfc.nasa.gov/stargaze/Skepl3rd.htm

Distance Modulus

d = 10 ^ (m-M+5)/5

The most important usage of the distance modulus is to determine the distance (d) to an object if you know it's apparent magnitude (m) and it's absolute magnitude (M). The light curve of variable stars is one way to determine the absolute magnitude of an object. The distance is given in parsecs (1 parsec = 3.26 light years). Let's try one. The absolute magnitude of Deneb is -7 and the apparent magnitude is 1.25. That gives 10 to (13.25/5) power. That gives 446 parsecs. http://www.daviddarling.info/encyclopedia/D/distance_modulus.html

Telescope Magnification

mag = focal length obj. / focal length eyepiece

Whenever you are at a star party and the first question someone asks is about how much magnification your scope can do, you immediately know that you are talking to an unsophisticated astronomer. But that's because we know that magnification is just not that important for most applications and that department store ads for telescopes with 1000x magnification are probably talking about really awful telescopes. Still, you need to know how to compute the magnification of a telescope. If you know the distance of your telescope's light path (from lens or mirror to eyepiece, in a refractor this is the focal length of the objective lens, in a Cassegrain design the light path is folded) and divide by the focal length of the eyepiece, you get the magnification. So you can improve magnification by using an eyepiece with a shorter (often cheaper) focal length. Hence the literally low value of higher magnification made more so by the fact that magnification takes a little bit of light and stretches it out so that the object appears dimmer.

Roving, or wasting away?

Akkana Peck

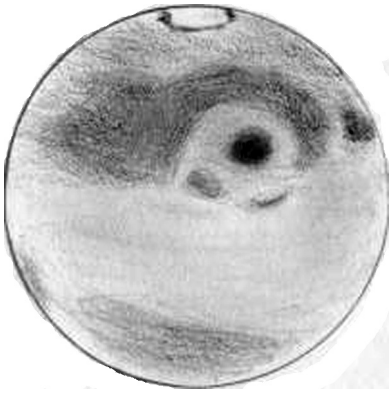
This February's skies don't have a lot of planets, but what's there is worth watching. Saturn is there for the looking, showing a ring tilt of 4.5 degrees. Most of the other planets are too close to the sun to observe right now. But that's okay ... because this is the month to look at Mars! It's just past its January 27 opposition and visible high in the sky all night, transiting at over 75 degrees. That's much higher than we've seen it for a long time, so if you get lucky with the weather you should be able to get very crisp, steady views. Dust off those short-focus eyepieces and crank up the power!

As February opens, Mars is showing an interesting area around 8 p.m. PST: the area around Sinus Meridiani and Lacus Solis, the "Eye of Mars". Lacus Solis is a dark circle surrounded by lighter areas — it really does look like an eye if you catch it at the right angle. It's south of the equator, and since Mars has its northern hemisphere tilted toward us, the "eye" may be a bit more foreshortened and not quite as easy to see as in some past oppositions.

To the north, the Tharsis plateau presents a blank, nearly featureless view to most earthbound observers. You may occasionally be able to see a white haze from the clouds blown up the slopes of the three huge Tharsis volcanoes. But the western limb of the planet shows some interesting dark areas, and by the first weekend in February they'll be showing well. In the north, dark Mare Acidalium is dead center at around 9 p.m. PST, with Niliacus Lacus nearer the equator and the more subtle Nilokeras hanging off to the east. How much detail can you see in the shape of Nilokeras?

Look, too, at the polar area. Mars' north pole is pointed slightly toward us, and it's spring there, so you might still be able to see a fair amount of the northern polar cap. Not sure which way north is? Mars' north is pretty much the same as ours, so nudge your telescope to the north while looking in the eyepiece to see which way it moves.

The southern hemisphere on that first February weekend is even better, showing Margaritifer ("Wastin' away in Margaritifer") and Mare Erythraeum. Look for lots of dark "fingers" extending northward — how many can you count? On a steady night you can spend a lot of time exploring the complicated shapes of northern Erythraeum, especially if you try sketching what you see (regular readers will know I'm a huge sketching advocate, especially for subtle and changing planets like Mars and Jupiter).



Eye of Mars as sketched by the author.

By 9 p.m. on the following weekend, Feb 13 — or just after dark the weekend before — Sinus Sabaeus is front and center. This slim dark feature should be easy to spot in the southern temperate zones, with the larger Sinus Meridiani trailing it to the east. In the north, the features are a lot more subtle — how much detail can you see on Protonilus? You should still be able to see the dark shape of Acidalium on the northeast limb. Meanwhile, in the southwest, Mars' most prominent feature, Syrtis Major, has started to become visible.

A week later, on the 20th, Syrtis Major is centered around 9p.m., showing its Africa shape (some think it looks more like India). Along the limb on the south edge of Syrtis Major is the very light area Hellas. With the south pole pointed away from us, it'll be easy to mistake Hellas for a polar cap — in fact, it may look more like a polar cap than the real polar cap we can see, the northern one, on the opposite side of the planet. But Hellas is really just a huge impact crater, a low area of Mars that collects frost in some seasons and so tends to look lighter than everything else. At least, that's usually the case. But this year, since it will be fall in the southern hemisphere, Hellas may not be as light as usual. Will it still look like a polar cap? Take a look and find out.

"As you look, spare a thought to the poor Spirit rover, still fighting for her life ..."

Finally, through the last week of February, Mare Cimmerium and Mare Tyrrhenum are visible, two dark areas entwining along the southern half of the planet. As you look, spare a thought to the poor Spirit rover, still fighting for her life near the northeast edge of Cimmerium. It's looking bad for the little rover, but she moved a wheel last month and the latest I heard was that they might be able to tilt her to get enough sunlight to survive the winter. Cross your fingers!

Meanwhile, in the north, subtle features like Elysium, Thoth and Trivium Charontis will test your seeing abilities. Good thing you've had all month to practice your Mars observing!

Sunglasses for a Solar Observatory

Patrick Barry

In December 2006, an enormous solar flare erupted on the Sun's surface. The blast hurled a billion-ton cloud of gas (a coronal mass ejection, or CME) toward Earth and sparked days of intense geomagnetic activity with Northern Lights appearing across much of the United States.

While sky watchers enjoyed the show from Earth's surface, something ironic was happening in Earth orbit.

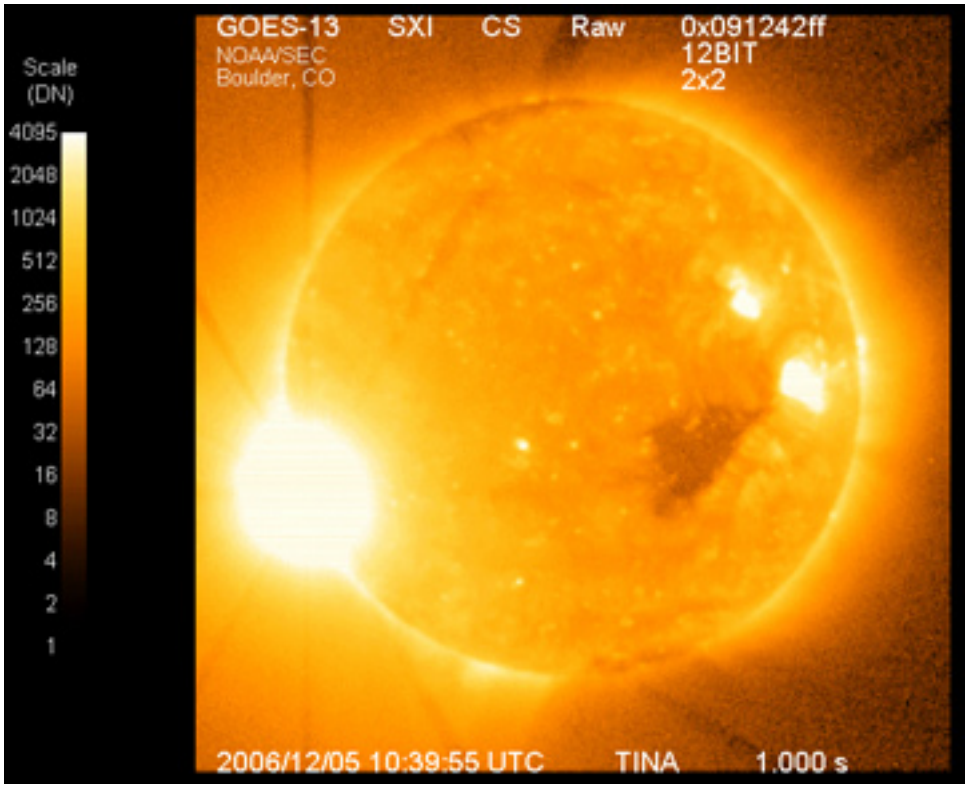
At the onset of the storm, the solar flare unleashed an intense pulse of X-rays. The flash blinded the Solar X-Ray Imager (SXI) on NOAA's GOES-13 satellite, damaging several rows of pixels. SXI was designed to monitor solar flares, but it must also be able to protect itself in extreme cases.

That's why NASA engineers gave the newest Geostationary Operational Environmental Satellite a new set of sophisticated "sunglasses." The new GOES-14 launched June 27 and reached geosynchronous orbit July 8.

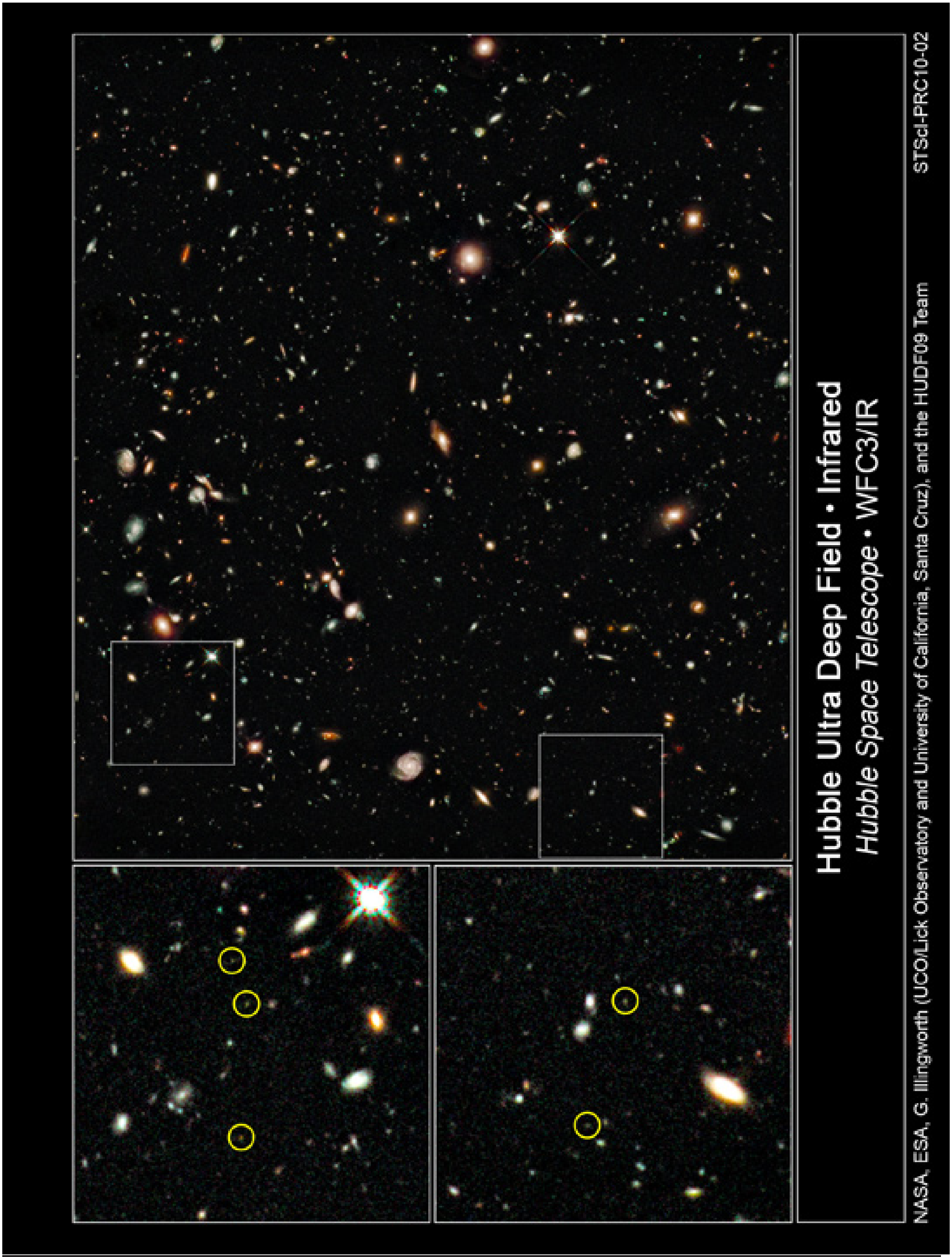
Its "sunglasses" are a new flight-software package that will enable the SXI sensor to observe even intense solar flares safely. Radiation from these largest flares can endanger military and civilian communications satellites, threaten astronauts in orbit, and even knock out cities' power grids. SXI serves as an early warning system for these flares and helps scientists better understand what causes them. "We wanted to protect the sensor from overexposure, but we didn't want to shield it so much that it couldn't gather data when a flare is occurring," says Cynthia Tanner, SXI instrument systems manager for the GOES-NOP series at NASA's Goddard Space Flight Center in Greenbelt, Maryland. (GOES-14 was called GOES-O before achieving orbit). Shielding the sensor from X-rays also reduces the amount of data it can gather about the flare. It's like stargazing with dark sunglasses on. So NASA engineers must strike a balance between protecting the sensor and gathering useful data. When a dangerous flare occurs, the new SXI sensor can protect itself with five levels of gradually "darker" sunglasses. Each level is a combination of filters and exposure times carefully calibrated to control the sensor's exposure to harmful high-energy X-rays. As the blast of X-rays from a major solar flare swells, GOES-14 can step up the protection for SXI through these five levels. The damaged sensor on GOES-13 had only two levels of protection—low and high. Rather than gradually increasing the amount of protection, the older sensor would remain at the low level of protection, switching to the high level only when the X-ray dose was very high. "You can collect more science while you're going up through the levels of protection," Tanner says. "We've really fine-tuned it." Forecasters anticipate a new solar maximum in 2012-2013, with plenty of sunspots and even more solar flares. "GOES-14 is ready," says Tanner.

For a great kid-level explanation of solar "indigestion" and space weather, check out http://spaceplace.nasa.gov/en/kids/goes/spaceweather.

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



X-9 class solar flare December 6, 2006, as seen by GOES-13's Solar X-ray Imager. It was one of the strongest flares in the past 30 years.


Hubble Ultra Deep Field • Infrared
Hubble Space Telescope • WFC3/IR
NASA, ESA, G. Illingworth (UCO/Lick Observatory and University of California, Santa Cruz), and the HUDF09 Team
STScI-PRC10-02

The Last Month In Astronomy

07-JAN-2010 ***Near Earth-sized Exoplanet*** The wobble method has been used to find most of the roughly 400 exoplanets found to date. This method measures the red/blue shift of a star caused by a planet jerking around its star. The problem is that this method works well with Jovian class planets but not terrestrial sized planets. That problem is becoming smaller. Geoff Marcy and others at Berkeley have discovered the second smallest exoplanet using the wobble method at the Keck Observatory. The new planet is named HD156668b. It's located 80 light years away and is located in the constellation Hercules. This planet is about 4 Earth masses. This discovery is part of a project to find low mass exoplanets called Eta-Earth. http://keckobservatory.org/index.php/news/second_smallest_exoplanet_to_date_discovered_at_keck/

06-JAN-2010 ***Nearby Supernova Candidate*** The recurrent nova known as T Pyxidis is getting bigger. It last erupted in 1967 and it's overdue. It's also closer than previous estimates. At a distance of 1000 parsecs, if this star goes supernova it could cause problems for Earth. It would probably only be a serious problem if the gamma rays emissions are focused in our direction. http://www.astronomy.com/asy/default.aspx?c=a&id=8944

06-JAN-2010 ***Only 15% of stars have Earths*** One of the key factors in the Drake Equation is what fraction of stars have at least one Earth like planet. Some have pegged this fraction to be as high as 45%. More recent work done at Ohio State's Microlensing Follow-Up Network (MicroFUN) put this value at 15%. More accurately, this is the estimated percentage of stars that have a solar system that is like ours: specifically, a system that has large gas planets in deep orbits. As stated by OSU astronomer Scott Gaudi "Solar systems like our own are not rare, but we're not in the majority, either." http://www.sciencedaily.com/releases/2010/01/100105161540.htm

04-JAN-2010 ***ALMA hits milestone*** The Atacama Large Millimeter/submillimeter Array in Chile has achieved an important milestone now that 3 of its 12 meter antennae are linked. This now gives the array the ability to minimize errors and to produce high quality images. According to the European Project Scientist for ALMA, Leonardo Testi, "The linking of three antennas is indeed the first actual step towards our goal of achieving precise and sharp images at submillimeter wavelengths." http://www.eso.org/public/news/eso1001/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+EsoTopNews+%28ESO+Top+News%29

04-JAN-2010 ***Grunsfeld takes key post*** Astronaut John Grunsfeld has been named Deputy Director of the Space Telescope Science Institute (STSci). Grunsfeld is known as the Hubble's chief repairman having flown to that space telescope 3 times including STS-125 last May. The STSci is the science operations center for the Hubble Space Telescope and it will perform the same function for the Webb telescope when it is launched in 2014. http://hubblesite.org/newscenter/archive/releases/2010/04/text/

04-JAN-2010 ***Kepler finds 5*** The Kepler space telescope hopes to find Earth-sized planets in Earth-sized orbits. It will take about 3 years to do so but other discoveries will occur sooner. As an example of such a discovery, Kepler found 4 Jupiter-sized and 1 Neptune-sized planets. These discoveries are based on only the first 43 days worth of data. http://www.nasa.gov/centers/ames/news/releases/2010/10-01AR.html

29-DEC-2009 ***3 NASA finalists*** NASA has selected 3 finalists for its next unmanned mission to another part of the solar system. One finalist is a mission to Venus to study its atmosphere and its crust. Another is a lunar lander that would go to the moon's south pole and return samples. The third finalist is another sample return mission but this time to an asteroid. The winner will be chosen in mid-2011 and it will launch before the end of 2018. http://www.nasa.gov/home/hqnews/2009/dec/HQ_09-296_New_Frontiers_Candidates.html

18-Dec-2009 ***Telltale Glint on Titan*** The Cassini spacecraft has imaged a glint of light near the limb of Titan. This glint of light proves the existence of liquid hydrocarbons in Ontario Lacus, the largest Titan lake in the southern hemisphere. The image was taken in 2008 but the first person to see it was Katrin Stephan in July 10. "I was instantly excited because the glint reminded me of an image of our own planet taken from orbit around Earth, showing a reflection of sunlight on an ocean. But we also had to do more work to make sure the glint we were seeing wasn't lightning or an erupting volcano." http://www.astronomy.com/asy/default.aspx?c=a&id=8907

14-DEC-2009 ***WISE launched*** NASA's Wide-field Infrared Survey Explorer has been launched into a polar orbit 326 miles high. Its mission is to produce a full sky map based on infrared light. Its detectors are kept as cold as 447 degrees below Fahrenheit. Science operations for this mission is done at the Infrared Processing and Analysis Center at Caltech. http://www.jpl.nasa.gov/news/news.cfm?release=2009-193&rn=news.xml&rst=2407

It Must Be Astronomical ...

Caption for Page 5

In didn't take long for the folks at STSci to use the rehab'd Hubble to take another ultra deep field image. This one uses the infrared capabilities and shows galaxies that are 13 billion years distant in look-back time. The image was created using 3 different infrared wavelengths and assigning them the colors red, green and blue. The most distant galaxies are smaller than the Milky Way and are intrinsically blue. For more information see: http://hubblesite.org/newscenter/archive/releases/2010/02/image/a/ . Credit: NASA, ESA, G. Illingworth and R. Bouwens (University of California, Santa Cruz), and the HUDF09 Team. Ed. Note: the printed version of this newsletter will show the picture inverted as if it was a photographic negative.

Elections 2010

The elections for the SJAA board are held at the general meeting in February. The following members are up for election: Robert Armstrong, Greg Claytor, Kevin Roberts, Rob Jaworski. The SJAA Nominating Committee has renominated these directors. After the board members are elected in February, offices are elected at the March board meeting.

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

Q & A

Q: Of the known supernova progenitor candidates, which star is the closest to us?

A: That would be Spica, the brightest star in Virgo. It is 260 light years away. Betelgeuse is 425 light years distant making it the fifth closest and Eta Carinae, possibly the next supernova in our part of the galaxy, is 7000 light years from us. ("Death From the Skies", Phil Plait, pg. 311)

"For me, it is far better to grasp the Universe as it really is than to persist in delusion, however satisfying and reassuring" - Carl Sagan

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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