EPHEMERIS

August 2012

SJAA Activities Calendar

Jim Van Nuland

August

4 **General Meeting**. Board meeting (*)at 6:00; Social Time at 7:30; General Meeting at 8:00. Our speaker is Tim DeBenedictis, Founder/Owner of Southern Stars software, maker of the Sky Safari app and SkyFi WiFi controller. His topic: Planetarium software: "Astronomy on the iPhone".

5 Observing H-alpha flares and sunspots at Houge Park. Also our Telescope Tune-up Time. Sun party and tune-up hours: 2:00 until 4:00 p.m.

10 Astronomy Class at Houge Park. 8:00 p.m. The topic: Star charts and planetarium programs.

10 Houge Park star party. Sunset 8:05 p.m, 37% moon rises 12:56 a.m. Star party hours: 9:00 until midnight.

11 Dark-Sky weekend. Sunset 8:04 p.m, 28% moon rises 1:42 a.m.

18 Dark-Sky weekend. Sunset 7:55 p.m, 3% moon sets 8:18 p.m. Henry Coe Park's "Astronomy" lot has been reserved.

24 Houge Park star party. Sunset 7:47 p.m, 57% moon sets 12:25 a.m. Star party hours: 8:45 until 11:45 p.m.

September

1 **General Meeting**. Board meeting (*) at 6:00; Social Time at 7:30; General Meeting at 8:00. Slide and Equipment Night.

2 Observing H-alpha flares and sunspots at Houge Park. Also our Telescope Tune-up Time. Sun party and tune-up hours: 2:00 until 4:00 p.m.

7 Astronomy Class at Houge Park. 7:30 p.m. The topic: Deep sky observing - galaxies, nebulae, clusters, etc.

7 Houge Park star party. Sunset 7:27 p.m, 53% moon rises 11:36 p.m. Star party hours: 8:30 until 11:30 p.m.

8 Dark-Sky weekend. Sunset 7:25 p.m, 44% moon rises 12:25 a.m.

15 Dark-Sky weekend. Sunset 7:14 p.m, no moon. Henry Coe Park's "Astronomy" lot has been reserved.

21 Houge Park star party. Sunset 7:05 p.m, 43% moon sets 11:20 p.m. Star party hours: 8:00 until 11:00 p.m.

29 **General Meeting**. Board meeting (*) at 6:00; Social Time at 7:30; General Meeting at 8:00. Our speaker is Steve Gottlieb, speaking on Lord Rosse's Discovery of Spiral Nebulae.

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

Astro Questions

Paul Kohlmiller

The June 1, 2012 issue of Science magazine presented a list of 8 astronomy questions. These questions are not the type that could be answered by the next Mars Rover or the next release of Kepler data. Rather, these questions are cosmic in every sense of the word. Some may not be answered for centuries but most will at least be studied and perhaps some answers will be presented in our lifetime. Here are the questions:

1. What is Dark Energy? There are some possibilities. Maybe it is just a property of empty, the cosmological constant that Einstein considered. Or maybe it is a unknown force sometimes called the fifth essence of "quintessence". Or maybe it is an illusion, gravity and general relativity create artifacts that we don't understand. How can we solve this? The Dark Energy Survey will use a Chilean telescope to study hundreds of millions of galaxies, 100,000 galaxy clusters and thousands of supernovae. This should help astronomers determine if Dark Energy is truly constant or if it diminishes as space expands which would bolster the case for a quintessence. Other efforts to study dark energy include the ESA's planned space observatory called Euclid. There are plans in the U.S. to build an 8.4 meter instrument called the Large

Continued on page 2

Astro Questions
Continued from page 1

Synoptic Survey Telescope. Current measurements of dark energy have error bars that make it impossible to separate the quintessence theory from the cosmological constant theory. And if it turns out to be illusory, we might not know that for sure for a long time.

2. *How Hot is Dark Matter?* Notice this question is not "What is Dark Matter?". Astronomers think an answer about that is not far off. If dark matter is cold that predicts that the Milky Way should be surrounded by thousands of dwarf galaxies. The count so far: 20. Also, cold dark matter suggests that the dark matter should be concentrated tightly in the center of a galaxy but it appears to be more spread out though that could be due to some interactions within galactic centers. Another problem, cold dark matter says the Milky Way galaxy should have about 10 large satellite galaxies such as the Magellanic clouds. The count so far: 3. And this is a big problem because it seems real unlikely that 7 Magellanic clouds could have escaped our attention this long. But let's get back to what dark matter is. If it turns out to be WIMPs (Weakly Interacting Massive Particles), and the LHC might create them, that would bolster the case for Cold Dark Matter. But not finding WIMPs means dark matter may be hard to pin down anytime soon.

3. *Where are the Missing Baryons?* If it is embarrassing that we don't know what 96% of the universe is made of, what word do you use to characterize the fact that half of the rest of the matter is unaccounted for as well? Baryonic matter is the matter that is mostly protons and neutrons. Not only is much of it missing, it seems to have disappeared recently. Looking at the list of distant quasars, it looks like the expected number of baryons was still around 10 billion years ago. But when looking at nearer (and thus newer) objects, the baryon count falls off. The breakdown goes like this: 10% of the baryons are in galaxies; another 10% is in the warm gas between galaxies; another 30% is in cold globs of matter outside of galaxies. The remaining 50% might be nothing but a WHIM (Warm-Hot Intergalactic Medium). The temperature of this medium might be as hot as 10 million K which means it would emit electromagnetic radiation in the high UV or low X-ray wavelengths. The medium would be so thin that light passing through it would not show up as spectral lines. Well, almost. Astronomers think they should be able to detect highly ionized Neon VIII (neon minus 8 electrons) or Oxygen VI (O stripped of 6 electrons). They may have made such a detection but others are not convinced. Instead they look forward to new, more sensitive X-ray space observatories.

4. *How Do Stars Explode?* While a lot about supernovae is known, questions remain. For example, in the case of Type 1A supernovae, a binary star system heads toward destruction when a white dwarf star pulls material from its companion. Since the supernovae will occur when a distinct amount of material (1.38 solar masses) has been built up onto the white dwarf, these supernovae have consistent properties making them useful as standard candles for measuring the accelerating expansion of the universe. But how long does it take from the start of this mass stealing process until the star explodes? What are the exact final events of such a star system? The answer might lie in studies of the supernova as soon as it starts, triggered by detection of a gamma-ray burst.

5. *What Reionized the Universe?* According to the standard model of cosmology, the universe appeared dark for the first 400,000 years after the big bang. The cosmic microwave background is from this time when photons were finally allowed to move. Move forward a few hundred million years when something stripped the electrons off of the atoms. This is called ionization. Why did that ionization occur? The answer might be that early stars emitted UV radiation and early galaxies filled with these stars would practically burp out ionized hydrogen, swamping the existing neutral hydrogen. The problem is that the number of such galaxies should not be enough to do the job. Hubble can look back to galaxies when the universe was 800 million years old but that isn't far enough. The James Webb Space Telescope, now slated for a 2018 launch, should be able to find galaxies from when the universe was 700 million years, maybe close enough. Another idea is to find the signature of neutral hydrogen which would be so red-shifted that it would appear in long radio waves. Remember stringing out a wire for your crystal receiver?

6. *What's the Source of the Most Energetic Cosmic Rays?* Some cosmic rays are easily accounted for. These particles, mostly single protons, travel at almost the speed of light and have energies of around 10 to 10 power electron volts, if they come from the sun. More powerful energies come from supernovae, up to 10 to 15 power eV. But some of these particles have energies of 10 to 20 power eV and models of supernovae can't account for them. Recent measurements suggest that these higher energy particles become active galactic nuclei (such as quasars) that are relatively close (250 million light-years). More information may come from the Extreme Universe Space Observatory. This spacecraft was designed by the ESA but dropped for budgetary reasons. Japan has picked up the idea and plans to launch it in 2016 and add it to the ISS.

7. *Why is the Solar System So Bizarre?* Why are Venus and Earth so different from each other? They have the same mass and density. But one has an ocean, a magnetic field, a large moon, rotates 365 times a year, has a breathable atmosphere, and it has plate tectonics. Venus isn't close on any of those and doesn't even rotate in the same direction. Why does Mercury have a stronger magnetic field than the much larger Mars? Also, the MESSENGER spacecraft is telling us that Mercury is made out of different stuff than the other terrestrial planets. Jupiter and Saturn have magnetic fields that seem more or less aligned with their axis of rotation, that makes sense. But Uranus and Neptune have magnetic fields that are off by more than 45 degrees. Why the diversity? It might come down to nothing but randomness. If we could study exoplanets for these same attributes we might see stronger patterns.

8. *Why is the Sun's Corona So Hot?* The sun is really hot at the core, 16 million K. It is cooler on the surface, 5780K. But then the sun's "atmosphere" heats up to 1 million K. The answer as to why this should be usually includes magnetic fields transporting energy. But just how does that work? One idea involves magnetic waves, possibly the Alfve'n wave, an oscillation traveling along magnetic field lines. Another idea is nanoflares, produced when magnetic field lines break and reconnect. This probably does happen but does it really account for the high heat? Three new instruments might shed some light on the problem. NASA's Interface Region Imaging Spectrograph is set to launch in December. ESA has a Solar Orbiter scheduled for 2017 which will give us a good view of the poles. And the Advanced Technology Solar Telescope is under construction in Hawaii - it will be twice the size of the current largest solar telescope. Studies will concentrate on the chromosphere, the thin area between the solar surface and the corona best seen during a total eclipse as a thin red line.

Loaners

The telescope loaner program has been revamped. The program now includes QuickSTARt, program geared to those new to astronomy. Please check it out at http://www.sjaa.net/loaners.shtml.

The Shallow Sky

A daytime occultation

Akkana Peck

There aren't many planets in the August evening skies. But early risers can watch lots of planets in the morning sky — and there's an unexpected daytime bonus. Even stranger, it doesn't involve the sun this time, and you won't need a solar filter: it's a daytime occultation of Venus by the moon.

On Monday, August 13th, starting a little after 1 pm, the moon passes in front of Venus. The RASC handbook lists the time as exactly 1pm, but XEphem and some web sources show Venus disappearing at more like 1:30. In any case, the most interesting part of this occultation will be the lead-up, while you can see both Venus and the moon at once.

The nearness of the moon makes it easy to locate Venus during the day, something that's usually a bit challenging even with this bright magnitude -4 planet. And you'll be able to compare the phases of the two objects: the slim crescent of the moon contrasted with the half Venus.

It's a great excuse to set up a telescope or binoculars for a late lunchtime observing session and share some photons with your co-workers or anyone else who happens by. I've heard an amazing number of adults express amazement at the idea of seeing the moon during the daytime (even though they've undoubtedly seen it themselves at some point)! So seeing both objects, and their phases, should be a great conversation starter outside the cafeteria or local coffeehouse.

Of course, what goes behind must come out again: Venus should re-emerge on the other side of the moon some between around 2:30 and 3 pm.

Aside from daytime views, Venus is an object of the morning twilight this month. Mercury joins it in the dawn sky a week into August, and stays there for a couple of weeks before disappearing again by month's end.

Jupiter doesn't rise until after midnight and will be at its best just before dawn. It just figures, because this month is full of double shadow transits — too many to list. Jupiter also has an occultation this month, on August 11 — but only if you're in Hawaii or west of there.

You wanted an excuse to go to Hawaii this month, didn't you?

What about normal nighttime observing? Well, Mars and Saturn are visible in the early evening, setting around 10-11. Catch them as early in the evening as possible if you want a good view.

The only planets that are really well placed for true nighttime observing are the three outer planets, Uranus, Neptune and Pluto.

Uranus doesn't rise until a bit after the sky gets really dark, so it's best after midnight, while Neptune rises a bit earlier. during evening twilight. Pluto is well up by sunset, and transits after 10 pm, so it's ideally placed — except that it only gets about 33 degrees up and is lost in a Milky Way field right next to the open cluster M25. So much for ideals! In fact, Pluto is so close to M25 that you'll probably mistake it as a faint member of the cluster. Try comparing it with a photo of M25 and see if you can spot the intruder!

The Last Month In Astronomy

JUL-16-2012 ***Curiosity Countdown*** The car-sized Mars rover named Curiosity is set to land on Mars at 10:30 p.m. PDT on August 5. NASA is supporting a large range of programs and websites to increase the audience for this landing, the first of its kind. You can start at http://mars.jpl.nasa.gov/msl/participate/ although some links on that page didn't work as of July 16th. If you are watching on TV and you have DirecTV, note that NASA TV is now on channel 346. http://www.nasa.gov/mission_pages/msl/news/msl20120716b.html

JUL-11-2012 ***Pluto and 5 moons*** Astronomers using the Hubble Space Telescope have discovered a fifth moon around Pluto. The moon has not yet been given a name but it does have an official designation, S/2012 (134340) 1 but among friends it goes by "P5". The previously found moon is still called P4. Better names will not be immediately forthcoming because astronomers aren't sure if a sixth moon will make an appearance soon. So the names of Pluto's moons are: Charon, Hydra, Nix, P4 and P5. The moons are in circular orbits and they seem stable. P5 might be as small as 10 kilometers. http://cosmiclog.msnbc.msn.com/_news/2012/07/11/12683467-plutos-fifth-moon-discovered?lite

JUL-09-2012 ***Finding Planets*** It is very difficult to directly image exoplanets. A new instrument in use at the Palomar Observatory is starting a 3 year survey to try to get this data. The instrument has a number of components. One is a chronograph - think of that as a high tech way of sticking your thumb up to block the sun and see Mercury next to it. That doesn't work unless you have a total eclipse but this new instrument can do it thanks in part to adaptive optics. This component includes a mirror that can be deformed with an accuracy of 1 nanometers (a bacterium is about 100 nanometers) and make these changes 7 million times a second. This work is called Project 1640. It is a collaboration between the Museum of Natural History, Caltech, and JPL. According to Ben Oppenheimer (from the museum), "Once we can actually see these exoplanets, we can determine the colors they emit, the chemical compositions of their atmospheres, and even the physical characteristics of their surfaces. Ultimately, direct measurements, when conducted from space, can be used to better understand the origin of Earth and to look for signs of life in other worlds." http://www.amnh.org/science/papers/starlight.php

JUL-04-2012 ***Higgs boson*** For those of you recently delivered to this planet, the Higgs boson has been detected. Two different experiments at the LHC have confirmed the discovery. What this means next is not clear. It might lead to a model that describes where dark matter came from and just how much of it there is. It might lead to some insight into dark energy. The results are still considered preliminary and more study will be needed. But the detection showing up just as expected is quite an accomplishment for physics. And more particles may be found at the LHC. As one researcher said, "this is A Higgs boson but we don't know if it is THE Higgs boson. http://www.stfc.ac.uk/About%20STFC/39278.aspx

JUN-28-2012 ***Exoplanet Change*** The Hubble Space Telescope and NASA's Swift satellite have detected a massive change in the atmosphere of exoplanets HD 189733b, a Jupiter class planet only 3 million miles from its star. The hot Jupiter is more than 1000 degrees Celsius and its hydrogen is evaporating. It is estimated that 1000 tons of gas are leaving the atmosphere every second. http://hubblesite.org/newscenter/archive/releases/2012/23/full/

JUN-27-2012 ***Odyssey pulls out a spare*** The Mars Orbiter Odyssey is back in service after using a spare wheel, a reaction wheel to be exact. Spacecraft often use reaction wheels to maintain the proper attitude. A reaction wheel works by detecting when it needs to move a bit one way and it turns the opposite way. Hey, Newton was right, this works. Odyssey had a bum reaction wheel so it switched to a spare. That spare reaction wheel was doing nothing but taking up space for about 11 years. Now it has the Odyssey in good shape. By the way, Odyssey can also use thrusters to correct its attitude but that uses up propellant. http://www.jpl.nasa.gov/news/news.cfm?release=2012-189

JUN-22-2012 ***Lichen Likes Life*** The journal Astrobiology is reporting on studies performed back in 2009. These studies took bacteria, seeds, lichen and algae and exposed them to space for more than 200 orbits. The items were brought back to Earth where the lichen are growing normally. Apparently some organisms can go into a dormant state even under the conditions involved in interplanetary travel. That adds support to the idea of panspermia - life spreading throughout the solar system. http://www.esa.int/esaHS/SEM5RNBXH3H_index_0.html

JUN-11-2012 ***Where Now Brown Star?*** The WISE spacecraft has been looking for hard to detect brown dwarfs, stars that are too small to support nuclear fusion. The assumption has been that there must be a large number of these stars, probably as many brown dwarfs as there are regular stars. However, WISE has found only 33 brown dwarfs within 26 light-years. There are 211 successful stars in that same volume. So far no brown dwarfs have been found closer than Proxima Centauri and none are anticipated. http://www.astronomy.com/News-Observing/News/2012/06/WISE%20finds%20few%20brown%20dwarfs%20close%20to%20home.aspx

Imaging SIG

Harsh Kaushikkar

SJAA held the first meeting of the Imaging Special Interest Group at Houge Park on Friday June 29 between 7:30 p.m. - 9:00 p.m.

Close to 30 people attended. There were a few experienced imagers along with many members who are just starting out. The goal of this Imaging SIG is to bring together fellow imagers and discuss technical issues and share information. During the first meeting the group touched upon quite a few introductory topics and concepts that Astro-imagers should know and think about before picking up this hobby.

Most attendees talked about their experience and sometimes frustration at equipment complexity and problems they faced and felt that such a working group would be a great place to seek ideas and solutions.

A few even shared some of their images with the group and gave details about their equipment and how they acquired those images. Two basic imaging setups were on display at the hall also for beginners to get a feel for what to look for!

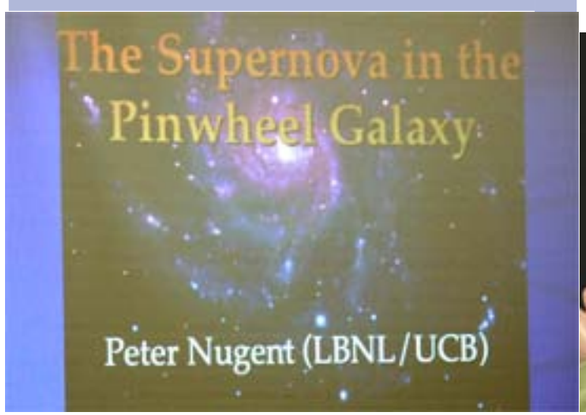
The general consensus was that this meeting should be held as frequently as once per month.

During the follow-up meetings we will pick on each of the introductory topics and discuss them in detail. Moving forward we may have workshops, tutorials and imaging sessions organized as a group for the benefit of all. We will also work towards establishing an Imaging committee which will help keep this Special Interest Group well organized.

At The General Meetings ...

At the July 7 meeting Bob Jardine (above) talked about some of the observation programs developed by the Astronomical League. It would be a surprise if no one tried one of these programs. If you do try it, let us know how it went.

On June 2, Dr. Peter Nugent (below, left and right) talked to us about supernova 2011fe. The talk was aimed for a general audience but didn't pull any punches. The interesting thing about this supernova is that it is easily spotted by amateur astronomers and it is located in M101, a favorite target for astrophotographers.

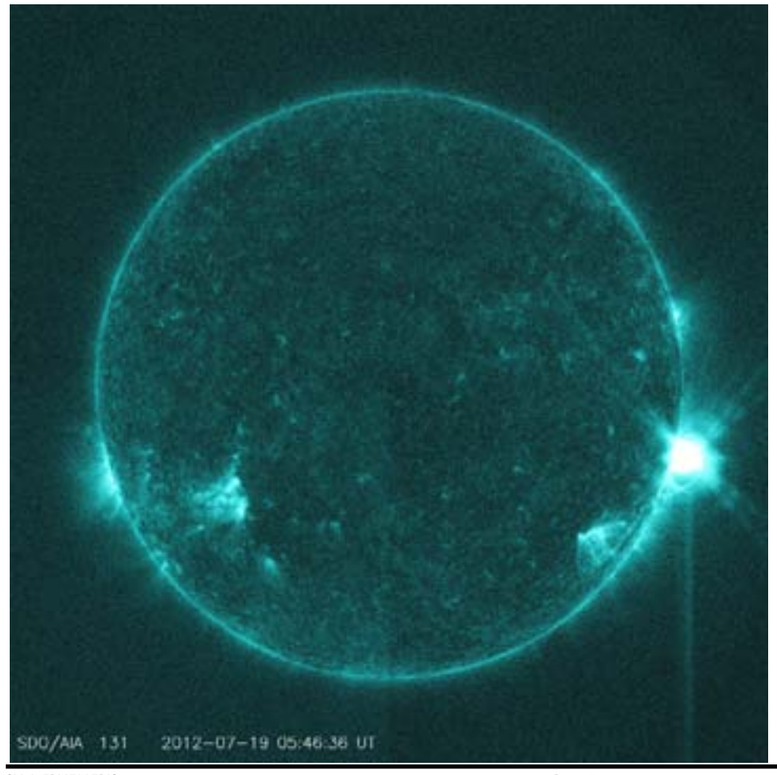


Very Old Spiral

The Hubble telescope has recently found a spiral galaxy that is 10.7 billion years old. That is older than some astronomers have previously estimated would be the oldest spiral galaxy. The galaxy, BX442, is shown to the right but note that this is an artist's rendering. The actual Hubble image is very small and dim.

Image credit is Dunlap Institute for Astronomy & Astrophysics/Joe Bergeron

Late News



Large Solar Flare

A very large solar flare was seen by the SDO spacecraft on July 19. The resulting coronal mass ejection (CME) is not expected to impact Earth. This flare was rated M7.7 which is less than the more serious X flares.

The sunspot that spawned this flare is called AR1520 and it has unleashed CMEs before. The sunspot is estimated to be 186,000 miles wide, coincidentally one light-second.

Sunspot activity is increasing and is expected to peak in 2013 or 2014.

CMEs send solar plasma speeding outward at a speed about 1/200 of the speed of light.

Both stories on this page were seen on space.com. Photo credit for the solar flare is NASA/SDO.

It Must Be Astronomical ...

"When forced to summarize the general theory of relativity in one sentence: Time and space and gravitation have no separate existence from matter." - Albert Einstein

School Star Parties

Completed Events - Final Totals for the 2012 school year					
	Total Sched.	Good Sky	Partial Success	Cloudy Fail	Cancel at noon
Jul	0				
Aug	1	1			
Sep	1	1			
Oct	6	3			3
Nov	13	9		1	3
Dec	4	4			
Jan	4	0	1		3
Feb	10	6		1	3
Mar	10	1	3		6
Apr	5	3	1		1
May	2	2			
Jun	2	1			1
Total	*58*	*31*	*5*	*2*	*20*
Scheduled - for the 2013 school year					
Jul/Aug	3				
Total	*8*				

As of July 7, 2012

School Star Party Link

For information on school star parties including how to schedule one see http://www.sjaa.net/school.shtml.

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.

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

ADDRESS SERVICE REQUESTED

San Jose Astronomical Association Membership Form

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

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

Membership Type:

☐ Regular — $20
☐ Regular with Sky & Telescope — $53
☐ Junior (under 18) — $10
☐ Junior with Sky & Telescope — $43

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”.
You can join or renew online:
http://www.sjaa.net/membership.shtml

Name: _____

Address: _____

City/ST/Zip: _____

Phone: _____

E-mail address: _____