



EPHEMERIS

SJAA Activities Calendar

Jim Van Nuland

August (late)

- 28 **General Meeting** at 8 p.m. Our speaker is Dr. Seth Shostak from the SETI Institute. His talk is on "New Approaches to the Search for Extraterrestrial Intelligence".

September

- 3 Astronomy Class at Houghe Park. 7:30 p.m. Topic is TBA.
 3 Houghe Park star party. Sunset 7:33 p.m., 23% moon rises 2:09 a.m. Star party hours: 8:30 until 11:30.
 4 Dark Sky weekend. Sunset 7:32 p.m., 14% moon rises 3:21 a.m.
 11 Dark Sky weekend. Sunset 7:21 p.m., 20% moon sets 9:11 p.m. Henry Coe Park's "Astronomy" lot has been reserved.
 17 Houghe Park star party. Sunset 7:12 p.m., 78% moon sets 2:32 a.m. Star party hours: 8:00 until 11:00.
 25 **General Meeting** at 8 p.m. Slide and Equipment night (aka "Show and Tell").

October

- 1 Astronomy Class at Houghe Park. 7:30 p.m. Topic is TBA.
 1 Houghe Park star party. Sunset 6:51 p.m., 38% moon rises 1:03 a.m. Star party hours: 7:45 until 10:45.
 2 Dark Sky weekend. Sunset 6:49 p.m., 23% moon rises 2:14 a.m.
 9 Dark Sky weekend. Sunset 6:39 p.m., 9% moon sets 7:45 p.m. Henry Coe Park's "Astronomy" lot has been reserved.
 15 Houghe Park star party. Sunset 6:31 p.m., 63% moon sets 1:22 a.m. Star party hours: 7:30 until 10:30.
 23 **General Meeting** at 8 p.m. Our speaker is Dr. Daniel Usikov. The topic is "Current Hypotheses on Dark Energy".
 29 Astronomy Class at Houghe Park. 7:30 p.m. Topic is TBA.
 29 Houghe Park star party. Sunset 6:13 p.m., 53% moon rises 12:02 a.m. Star party hours: 7:15 until 10:15.
 30 Dark Sky weekend. Sunset 6:12 p.m., 42% moon rises 1:12 a.m.

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>

Alien Life: Wanna Bet?

Paul Kohlmler

You can bet on almost anything. The entire science called astrobiology is betting that there is life somewhere other than Earth. What are the odds? Currently the odds on finding intelligent life are dropping. There is a betting office online based in England that will give odds on finding extraterrestrial intelligent life. It is called William Hill. They dropped the odds from 1000-1 to 100-1 when the first almost Earth-like exoplanets were discovered.

Is 100-1 overly pessimistic? Perhaps. In the early 1960's they gave 1000-1 odds against a man walking on the moon by 1970. They paid out about 2 million dollars.

There are reasons for believing that life exists on other planets. A look at recent developments shows the chances of finding some form of alien life are increasing. It might not be time to bet the farm but the foolish gamble is to bet against it. Here are some of the reasons why.

There Are So Many Stars

If all of the factors required for life are probabilities, then the odds are alien life exists somewhere. One way to conceptualize this is the famous Drake equation. Frank Drake created

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this equation decades ago. It gives an estimate of the number of planets that have intelligent life at this time in our galaxy. A rough approximation of this equation is as follows. First, start with the total number of stars in the galaxy, say about 200 billion. Then reduce that number by the percentage that has planets. Then reduce that number by the percentage of those planets that are in a temperate zone. Then reduce again by the number of planets with life, then those with intelligent life. These are just guesses at this point in our scientific knowledge but we are fairly certain that the percentages are better than zero. In short, if you look at enough stars then you eventually come up with a number of planets where life could start.

Wow Signal

In 1977, a radio astronomy site run by Ohio State University detected a large signal. It was a strong, narrowband signal and the wavelength was near 21 cm – the so called water hole of radio astronomy. The signal was strong enough that a researcher wrote “Wow” on the computer printout. It was never heard from again but it was never explained either.

What if a civilization sent a onetime signal in our direction? Ridiculous you say! But we did it. As described by Dr. Seth Shostak in his book “Confessions of an Alien Hunter”, in 1974, Frank Drake and his team used the Arecibo telescope to send a 210 byte message toward the globular cluster M13. It won't get there for 25,000 years but when it arrives it will be a onetime event. The Russians did something similar in 2008 when it sent a signal toward the exoplanet Gliese 581c, at the time the most Earth-like planet found. So, very slowly, the odds of extraterrestrial life detecting us are increasing. At the recent SETICon held in Santa Clara, CA this August, members of the SETI institute admitted that they have seen candidate signals but they could not be verified or reacquired.

Advanced Technology Looks like Magic

The Fermi Paradox says that if intelligent life exists, we should have seen them by now. This is still the best argument against the likelihood that we will talk to E.T. But it is true only if that intelligent life is far advanced. Arthur C. Clarke said that any sufficiently advanced technology would look like magic to us. So the answer to Fermi might be, “How do you know they aren't here?”

Jill Tarter, Research Director at the SETI Institute, says “we've poorly explored our solar system. The sorts of things we could rule out are big, bright Starship Enterprise-like craft, and those only in a few locations. Anything dark, or small, or representative of space colonization by other than wet meat are not at all excluded.”

Catching Planetary Transits (us or them)

The NASA Kepler spacecraft is looking for Earth-like planets. It is looking at a section of the sky between the constellations Lyra and Cygnus. The idea is that planets passing in front of their star might reduce the amount of light we see from that star. This is called the “transit method” of exoplanet detection. But astronomers are now considering that E.T. might do the same thing. This means that the odds of an extraterrestrial intelligence deliberately sending a signal in our direction are greater if they can see the Earth against the background of the sun. The SETI Institute will make targeted studies of some of these stellar systems starting this summer. Meanwhile, Kepler is up to 700 planet candidates. One estimate is that half will turn out to be verified.

SETI Quest Answers a Wish

Dr. Jill Tarter gave a speech at the TED conference, an organization that brings together people from three areas: Technology, Entertainment, Design. Each TED conference speaker gets to make a wish. Tarter's was “that you would empower Earthlings everywhere

to become active participants in the ultimate search for cosmic company.” The realization of that wish is SETI Quest which will “help us maximize the potential of the fantastic Allen Telescope Array (the ATA, funded by Microsoft billionaire Paul Allen) ... I'm pleased that new technologies and the opportunity to make this a global endeavor have the potential to greatly improve our search capability.” SETI Quest allows computer programmers to write code that can process data from the ATA. At a minimum, this will increase the chances of finding extraterrestrial intelligence.

But What About Non-Intelligent Life

So are 100-1 odds on finding intelligent life a good bet? What should the odds be? Dr. Tarter says “I don't give odds. I don't know the answer. The only reasonable thing to do is (to) do the experiment.”

So what about other life: bugs, bacteria? And what would finding alien life mean to the search for extraterrestrial intelligence. Dr. Shostak says “I think finding life of any variety (including DEAD pond scum) would galvanize SETI, simply because it would be a demonstration that biology, at least, is not a miracle!” In other words, such a discovery would change the betting odds dramatically.

Do you know what the betting odds are for finding any kind of life? Here are some things to consider before placing your bets.

Life Started Quickly on Earth

For Dr. David Morrison, the likelihood of finding life off of this planet has to do with how you see life in general. If you think life came about as a “natural process” then life is probably pretty likely. If you think life was “seeded by little green men” then life is less likely.

One strong reason for thinking that life is a natural process is that it started on

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In and out of the ecliptic

Akkana Peck

September skies are full of planets as we approach the autumnal equinox, on the night of the 22nd.

“Jupiter season” begins this month. Jupiter hits opposition on the 21st, so it’s well placed for viewing most of the night. Alas, no multiple transits of the Galilean moons this month; but there are plenty of single moon transits, plus the big mystery: how visible will the South Equatorial Band be? You may recall that it vanished mysteriously a few months ago during Jupiter’s pass behind the sun — just one of those wild Jupiter atmospheric changes that makes the giant planet so much fun to watch. Will the Great Red Spot be standing alone in a sea of off-white? Or will the band darken by September to hide the GRS? We report; you observe AND decide.

Uranus hangs a scant degree to the north of Jupiter. It should be easy to find them in the same low-power telescope field. Uranus’s magnitude is around 5.7 — just a little brighter than Ganymede. But it won’t be hard to tell Uranus apart from Jupiter’s moons: Uranus will show a disc of 2.3” (that’s arcseconds, not inches) compared to Ganymede’s 1.7. More important, Uranus’s striking green color proclaims it as an entirely different beast.

Even aside from its odd color, Uranus will be well out of the plane of Jupiter’s moons. But wait: why is that? Aren’t they all orbiting along the ecliptic? Well, yes — more or less — but planets never stick exactly to the ecliptic (except Earth, since our orbit defines the ecliptic). Jupiter and Uranus are both pretty orderly as planets go. Jupiter’s inclination is 1.31 degrees, while Uranus’s is only 0.77. That sounds like a pretty small deviation. But a degree or so is a healthy distance when you’re looking through the eyepiece at 100x and the moons are all staying within a few arcminutes of Jupiter.

While you’re waiting for Jupiter and Uranus to get high enough for good viewing, there’s plenty else to command your attention in the early evening sky. Venus continues its long and beautiful evening twilight show, reaching its maximum brightness of -4.8 on September 23rd. Mars, much dimmer at magnitude 1.5, hovers nearby. And you can still barely catch Saturn at sunset as September begins, but it’ll disappear into the twilight as the month progresses.

Neptune is about three and half degrees up and left of the left horn of Capricornus. Don’t confuse it with the 5th magnitude star to its right: Neptune is magnitude 7.8, and with enough magnification you should see it as a small blue disk, though it’s much harder than Uranus to resolve or identify.

Pluto is visible in the early evening, but not as high or well placed as it was a few months back. Still, if you missed it and want your chance, there’s still time — go for it!

Early riser? Not all the action is in the morning sky. Mercury moves into the morning sky starting in mid-September, though it’s gibbous, so there’s not much detail to see, but it’s a pretty naked-eye or binocular sight if you have to be up early for work.

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.

ASTRONOMY magazine renewal time

Jim Van Nuland

It’s time to renew our group subscription to Astronomy magazine.

The rate for 2011 is still \$34, or \$60 for two years. Please send a check payable to Jim Van Nuland, 3509 Calico Ave., San Jose CA 95124.

Subscribers: if I have your e-mail address (from the SJAA roster), you should have gotten a note with particulars of your subscription.

If not, write me, e-mail address below.

If you subscribe independently, and your subscription ends during 2010 or 11, you may convert to the group rate. Send a check and the renewal card or a mailing label to me, and you’ll be added to the group for an additional 12/24 months.

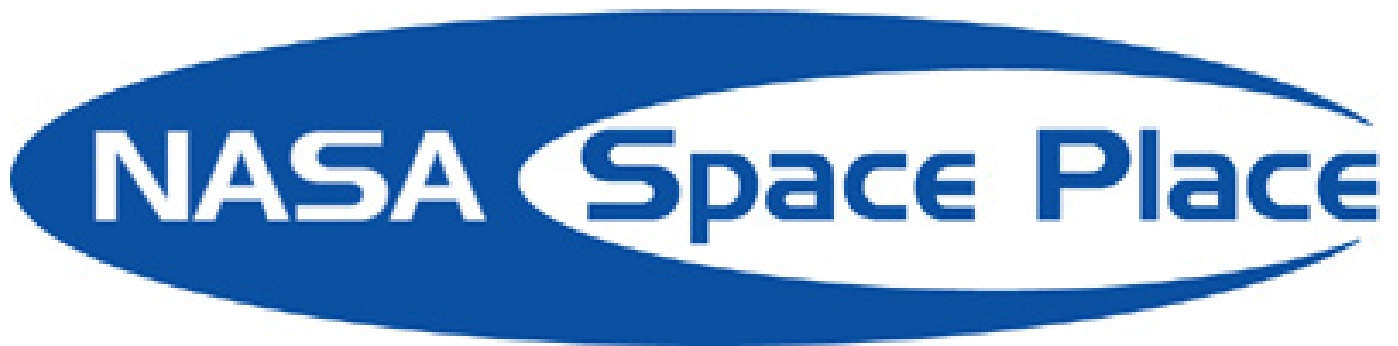
If you do not subscribe and wish to do so, send the \$34/60 and your subscription will begin with the January 2011 issue.

I will hold your checks until late September, when the renewal package must be sent in. So don’t worry that your check doesn’t clear promptly.

Any questions? Call me at 408.371.1307, from 11 am to 11 pm, or e-mail to <jvn@svpal.org>.

PLEASE NOTE: this applies to Astronomy magazine, not Sky & Telescope! The latter subscription is paid to the treasurer as part of your SJAA dues.

Good Reading!



The Turbulent Tale of a Tiny Galaxy

Trudy Bell and Dr. Tony Phillips

Next time you hike in the woods, pause at a babbling stream. Watch carefully how the water flows around rocks. After piling up in curved waves on the upstream side, like the bow wave in front of a motorboat, the water speeds around the rock, spilling into a riotous, turbulent wake downstream. Lightweight leaves or grass blades can get trapped in the wake, swirling round and round in little eddy currents that collect debris.

Astronomers have found something similar happening in the turbulent wake of a tiny galaxy that is plunging

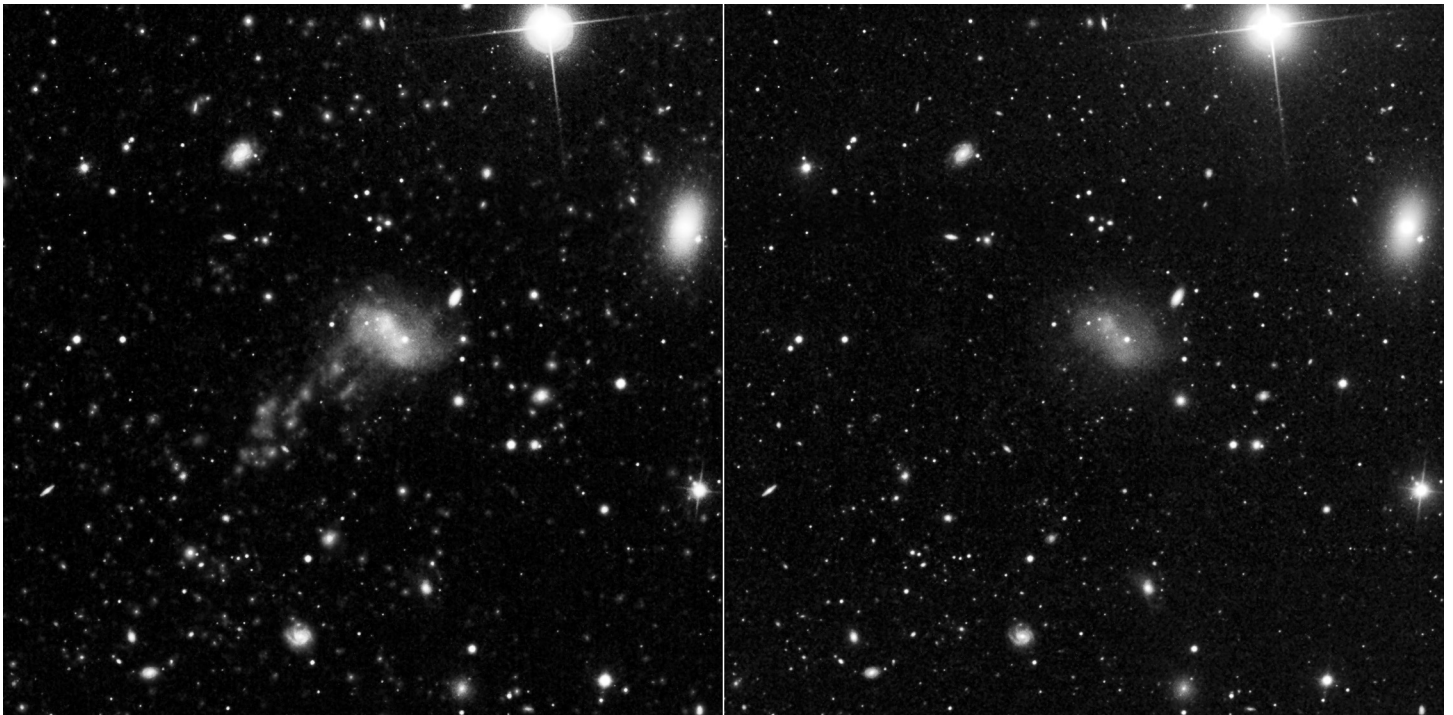
into a cluster of 1,500 galaxies in the constellation Virgo. In this case, however, instead of collecting grass and leaves, eddy currents in the little galaxy's tail seem to be gathering gaseous material to make new stars.

"It's a fascinating case of turbulence [rather than gravity] trapping the gas, allowing it to become dense enough to form stars," says Janice A. Hester of the California Institute of Technology in Pasadena.

The tell-tale galaxy, designated IC 3418,

is only a hundredth the size of the Milky Way and hardly stands out in visible light images of the busy Virgo Cluster. Astronomers realized it was interesting, however, when they looked at it using NASA's Galaxy Evolution Explorer satellite. "Ultraviolet images from the Galaxy Evolution Explorer revealed a long tail filled with clusters of massive, young stars," explains Hester.

Galaxies with spectacular tails have been seen before. Usually they are behemoths—large spiral galaxies



In the ultraviolet image on the left, from the Galaxy Evolution Explorer, galaxy IC 3418 leaves a turbulent star forming region in its wake. In the visible light image on the right (from the Sloan Digital Sky Survey), the wake with its new stars is not apparent.

colliding with one another in the crowded environment of a busy cluster. Tidal forces during the collision pull gas and stars of all ages out of these massive galaxies to form long tails. But in IC 3418, the tail has just young stars. No old stars.

“The lack of older stars was one tip-off that IC 3418’s tail isn’t tidal,” says Hester. “Something else must be responsible for these stars”.

Hester and eight coauthors published their findings in the June 10, 2010, issue of *The Astrophysical Journal Letters*. The team described the following scenario: IC 3418 is speeding toward the center of the Virgo cluster at 1,000 kilometers per second. The space between cluster galaxies is not empty; it is filled with a gaseous atmosphere of diffuse, hot hydrogen. Thus, like a bicyclist coasting downhill feels wind even on a calm day, IC 3418 experiences “a stiff wind” that sweeps interstellar gas right out of the little galaxy, said Hester—gas that trails far behind its galaxy in a choppy, twisting wake akin to the wake downstream of the rock in the babbling brook. Eddy currents swirling in the turbulent wake trap the gas, allowing it to become dense enough to form stars.

“Astronomers have long debated the importance of gravity vs. turbulence in star formation,” Hester noted. “In IC 3418’s tail, it’s ALL turbulence.”

To many astronomers, that’s a surprising tale indeed.

See other surprising UV images from the Galaxy Evolution Explorer at <http://www.galex.caltech.edu>. Kids (and grownups) can play the challenging new Photon Pileup game at <http://spaceplace.nasa.gov/en/kids/galex/photon/>.

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Alien Life: Wanna Bet?
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Earth so easily. This planet was barely formed, a recently solidified orb 4 billion years ago. So far, scientists can show that life existed 3.55 billion years ago and it is likely that boundary could be pushed back. Not only did life start quickly but it persisted through a number of extinction events.

The Ubiquity of Watery Worlds

Life has very few prerequisites. Although we can find life almost everywhere on Earth, one requirement appears to be water. It seems that life requires plumbing and plumbing doesn’t work without a fluid.

Thus, alien locations that might have life are likely to need water. Fortunately, we see water in many places. Recently, we have discovered that the moon has so much water it actually must have some kind of water cycle. As NASA’s Brian Day says, “This isn’t your father’s moon anymore”. Also, the Cassini spacecraft in orbit around Saturn has found geysers of water on the moon Enceladus. Water is also present on Mars, some of Jupiter’s moons (Europa, Callisto, Ganymede) and the Saturnian moon Titan. It may exist on one or more moons of Uranus (Titania may have liquid water located at the core-mantle boundary) and Neptune (Triton may have a subterranean ocean like Europa). Today Venus is dry but that’s because it has been losing hydrogen and oxygen atoms for most of its 4.5 billion year existence. The European spacecraft Venus Express finds that twice as many hydrogen atoms as oxygen atoms are escaping the planet. Hmm, 2 parts hydrogen, 1 part oxygen. Sound familiar?

This suggests that liquid water might be available in 6 of 8 recognized planet-moon systems with only Venus and Mercury left out. So the chances of finding water are 75% if the rest of the galaxy is similar to our neighborhood.

Extremophiles Expand the Possibilities

If water is one requirement for life

then the next requirement has to do with temperature. After all, water is a plumbing requirement and it is difficult to do much plumbing with ice and steam. But the range of temperatures and pressures where life can exist is growing all the time. Scientists have found primitive life forms ranging from Antarctica to very hot springs at the bottom of the ocean.

Richard Hoover of NASA has been studying bacteria under very cold conditions. Some bacteria can not only survive but thrive at temperatures down to -40°C, maybe even -80°C. Hoover says “Possibly what is going on is these microorganisms are melting the ice as the result of antifreeze proteins. They might look frozen but if it can melt the ice then the microorganism has all of the organics that it needs for metabolic activity.” Not only that, but some bacteria have been found in ice that has been frozen solid for 32,000 years. Some bacteria that has been in solid ice, when the ice is melted, the bacteria start moving around immediately. Hoover says “I think it is a common phenomenon that bacteria stay in a living state down to -40°C.” This means that comets might not only have bacterial fossils, but could have living bacteria on them.

The Best Bet of All

The odds of alien life are improving on various fronts. The range of environments where we know that life can exist is growing. Our ability to detect life, intelligent and otherwise, is growing. The odds of finding alien life keep improving.

Remember the bookmaking firm William Hill? They also give odds on finding life (of any sort) on Mars. When you don’t look for intelligence the odds are quite different. In fact at 4-6, life on Mars is an odds-on favorite.

What would the odds be on finding alien life anywhere, even on a meteorite? It is starting to sound like a sure thing.

The Last Month In Astronomy

16-AUG-2010 **Gamma Rays from a Nova** Gamma-Ray Bursts were thought to require very large stellar explosions, supernovae. But NASA's Fermi Gamma-Ray Telescope has found the high-energy radiation coming from a nova. The story starts when amateur astronomers in Japan detected a sharp brightening of a star in Cygnus. They had imaged this star, V407 Cyg, just 3 days earlier. They alerted astronomers around the world. Three other amateurs in Japan each independently reported the same thing. V407 Cyg is 9,000 light-years away. It is a binary consisting of a white dwarf and a red giant that is 500 times the size of the sun. Supernovae can trap and accelerate particles because of magnetic fields created in supernovae but it was thought that novae could not do the same thing. <http://spacefellowship.com/news/art21762/fermi-detects-shocking-surprise-from-supernova-s-little-cousin.html>

13-AUG-2010 **Einstein Works** A new radio pulsar has been found in data from the Arecibo Observatory. Millions of people have used SETI@Home in the hope of finding signals from an extraterrestrial intelligence. A similar program is called Einstein@Home and the first discovery made by that program has been announced. The credited discoverers are a couple from Iowa and someone from Germany. The new pulsar is PSR J2007+2722. It is a neutron star that rotates 42 times a second. It is 17,000 light years away in the constellation Vulpecula. It is unusual in that a pulsar of that rotational speed tends to have a companion and this one has apparently lost it. <http://www.astron.nl/about-astron/press-public/news/%E2%80%98citizen-scientists%E2%80%99-discover-new-pulsar-arecibo-telescope-data/%E2%80%98citi>

11-AUG-2010 **UV rings around old galaxies** Astronomers have detected loops of ultraviolet light in old, massive galaxies. These galaxies have received an infusion of fresh gas which is creating new stars. This is unusual because it was thought that galaxies eventually age and become quiet. <http://www.jpl.nasa.gov/news/news.cfm?release=2010-264>

10-AUG-2010 **New image of Antennae galaxies** NASA has released a new image of the Antennae galaxies. It is a composite formed from images from the Chandra X-ray Observatory, the Hubble Space Telescope, and the infrared Spitzer Space Telescope. The Antennae galaxies are 62 million light-years from Earth. The collision of the galaxies started 100 million years ago and started a lot of star creation. Photo credits: Chandra: NASA/CXC/SAO; Spitzer: NASA/JPL-Caltech; Hubble: NASA/STScI <http://www.astronomy.com/asy/default.aspx?c=a&id=10116>



01-AUG-2010 **Sun Wakes Up** The sun has started becoming more active. The first of two coronal mass emissions was spotted on August 1. <http://www.nasa.gov/topics/solarsystem/sunearthsystem/main/News080510-cme.html>

29-JUL-2010 **Dunes of Titan** The Huygens lander indicated that surface winds were generally east-to-west. But the Cassini spacecraft images of dunes on Titan suggested that winds must be from west-to-east. A new paper suggests a solution. Seasonal changes produce gusts from the west and these gusts do a better job of moving sand than the usual winds from the east. <http://www.jpl.nasa.gov/news/news.cfm?release=2010-251>

22-JUL-2010 **Buckyballs Found** Buckyballs are arrangements of 60 carbon atoms in a three dimensional structure similar to the geodesic domes designed by Buckminster Fuller. These have now been detected by the NASA Spitzer Space Telescope. They were found in a planetary nebula named Tc 1. Jan Carni of the SETI Institute said "We did not plan for this discovery. But when we saw these whopping spectral signatures, we knew immediately that we were looking at one of the most sought-after molecules." <http://www.jpl.nasa.gov/news/news.cfm?release=2010-243>

12-JUL-2010 **Juno Has Shields Up** The NASA Juno spacecraft is set to launch a year from now. It will go into orbit around Jupiter and stay there for 15 months. The radiation it will get is the equivalent of more than 100 million dental x-rays. To shield the spacecraft it has a 6-sided wall of titanium one centimeter thick. It won't stop all radiation from Jupiter but it will slow down the aging effect on the electronics. <http://www.jpl.nasa.gov/news/news.cfm?release=2010-230>

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>

Q & A

Q: The universe is 13 billion years old. What percentage of the universe's total lifetime is in the future?

A: About 99.9%. ("Death from the Skies", Phil Plait, pg. 280)

Hot Dates

SJAA Yosemite Public Star Party 2010 - Sept. 3-5

CalStar - Oct. 7-10. <http://www.observers.org/CalStar/>

Advanced Imaging Conference, October 22-24, Santa Clara. <http://www.aicccd.com/2010/website/index.html>

Dues Change

Effective January 1, 2011, the SJAA membership dues will be changed. The regular dues will remain at \$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.

"Momentous breakthroughs in science often come unexpectedly and serendipitously, requiring decades of patience. Only rarely does a long-sought scientific frontier loom so prominently just beyond the horizon that the next generation of instruments seems sure to reach it." - Geoff Marcy

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

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I prefer to get the Ephemeris newsletter in print form. The newsletter is always available online at <http://ephemeris.sjaa.net>

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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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