SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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This image of M42 was created by Alan Smallbone from the Anza site on November 14th. Alan used a Borg 125SD at f/3.8 and a QSI 583ws imager with an Astrodon 5.6nm H-alpha filter.

OCA CLUB MEETING

The free and open club meeting will be held Friday, December 11th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The speaker for this month is yet to be announced as of press time.

NEXT MEETING: January 8th

STAR PARTIES

The Black Star Canyon site will be open on December 12th. The Anza site will be open on December 12th and December 19th. Members are encouraged to check the website calendar, for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

You are also reminded to check the web site frequently for updates to the calendar of events and other club news.

COMING UP

The next session of the Beginners Class will be held on Friday, December 4th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana. The January class will be held January 1st.
GOTO SIG: TBA
Astro-Imagers SIG: Dec. 15th, Jan. 19th
Remote Telescopes SIG: Dec. 23rd, Jan. 27th
Astrophysics SIG: Dec. 18th, Jan. 15th
Dark Sky Group: TBA

December 2009 President's Message

By Barbara Toy

With the year drawing to a close, this is typically a time when we look back on the past year and revisit the good, bad and ugly parts of the year. This year, I'm afraid, the bad and the ugly generally outweigh the good for too many of us. I don't think I've had contact with anyone this year who is completely untouched by the recession and everything that's gone with it, both in the club and outside it. Economic indicators may be saying that the recession has bottomed out and things are improving, but it looks like it'll be a long time before the recovery reaches individual people. In the meantime, people continue to lose income, and often their jobs and their homes. And, as if that wasn't enough doom and gloom, we're in a serious drought…

Well, we've nothing to lose by hoping that next year will be better for everybody, and I certainly hope it is for all of you. In the meantime, looking out into the universe around us can give some much needed mental relaxation and perspective – here's hoping that 2010 features many clear weekend nights around new moon!

Anza Weather and Roads

As we continue our plunge into the holiday season, we should start seeing more consistent wintry weather, though our coldest nights usually are in January and February. There are rumors that this winter will feature a mild to moderate El Niño condition, with more rain than usual (or at least more rain than last year), though, as of the time I'm writing this shortly before Thanksgiving, we've had a lot of clouds and fog, but minimal rain except for one fire-damaged area above La Crescenta that got a cloudburst that caused a mudflow – not quite the type of rain we were hoping for!

If or when the rains do come, they will undoubtedly make a mess of the roads around Anza, so it's a good idea to check on road conditions before you head out there. Fortunately, the soil around our site is mostly decomposed granite, which tends to drain pretty fast. If we get a lot of rain over several days, though, there are parts of the road that turn to deep mud, which is very difficult to get through – that situation can improve a lot in just a few hours if the rain stops, however. Of course, a lot of rain also means ruts and runoff damage, which create challenges of their own.

We've been very fortunate in recent years that several of our neighbors have been doing a great job in repairing damage to the roads on the way to our Anza site fairly quickly. Only the first stretch of dirt road is a county road, the others are all maintained by the adjoining landowners, our neighbors out there. If you see someone working on the dirt road, please be courteous, give them plenty of room, and let them know that you appreciate their efforts.

The OCA Election

You should find a copy of the ballot for the OCA election in the December issue of the Sirius Astronomer. It is also posted on the website, and you can get a copy at the December or January general meetings, as well. If you have a ballot and know other club members who need one, please feel free to photocopy the one you have for them – before you note your votes on it, that is.

Even if you don't think it will make a difference, we need you to help us out by casting your vote, so Bob Evans has something to count. More seriously, it's important for the long-term health of the club for its members to pay attention to the activities of its elected leaders, and voting is the easiest way to demonstrate that you as members are paying attention.

Instructions for voting are on the ballots – please be sure to print your name legibly on the outside of the envelope you put the ballot in (*not* on the ballot itself), so Bob Evans can check it against the membership rolls to make sure it is valid before putting your ballot in the group to be counted. This is how we maintain the privacy of the voting process while also making sure that only the votes of members in good standing as of the date of the election are counted.

You can mail your ballot to Bob Evans at any time after the final ballot is posted on the website, or put it in the ballot box at the January meeting. All members who are 18 or older in a household can vote, but the ballots need to be put in separate envelopes, not all of them together in one envelope.

So – get your ballots in, and maybe we can make this a record-breaking election year!

OCA Desk Calendars:

A lot of members of our AstroImage group offered their best images for the 2010 AstroImage Calendar, and the members of the group voted on the best of the images for the calendar (though there was a limit of only one image per imager for the calendar); the result is a great new desk calendar for the new year, plus calendar pages for November and December of this year, because people had a hard time selecting just twelve. If you were at the general meeting in November, you may have seen them on Charlie's table – they're great to have on your desk to enjoy all year and also to give as gifts.

The price is only $10.00, and we're keeping the costs down by producing them on demand, so we won't have a large stock on hand. If you want to get one (or more), the best way is send an email to Alan Smallbone (who actually provided and customized the calendar template and put the calendar together once the pictures were selected, and who has been getting them printed and then assembling them as orders have come in), at asmallbone@earthlink.net. Delivery can be made at the December general meeting or December AstroImage meeting, if you want them before Christmas.

We have a lot of excellent imagers in the club, and this calendar is a great way to feature their work as well as to support the club – it's certainly unique, not the kind of calendar you could get anywhere else. So, get one for home, for where you do astronomy, and for work, and for anyone you know who appreciates astronomical images!

Website Calendar

While on the topic of calendars, I have been the person who has done the annual update of most of the information on the website calendar for the last several years. I recently uploaded the moon phases, regular club meetings and star party information for 2010, and should have the holidays uploaded by the time you see this.

If you notice any mistakes on any of the entries, or if there is a holiday that is missing, please e-mail the information to me at btoy@cox.net and I will be happy to make the correction.

Fire Prevention at Anza

At the November board meeting, we considered the fire prevention information that I was given by the Dave Jurasevich and others from Mount Wilson during the PATS conference, based on what they learned from the firefighters during the Station Fire. One of the concerns we discussed was the feasibility of somehow screening the gap between observatory roll-off roofs or domes and the fixed walls of the observatories.

As many of you may know, Gary Schones, who has been one of our trustees for a number of years now, is a contractor and has built a number of the observatories on our Anza site, including his own, and has also built observatories in other locations, with different variations in the designs. He is a wonderful resource on issues related to observatory design and construction, and after a good discussion of the difficulties involved in engineering an effective screen for these areas of the observatories that wouldn't interfere with their function, the board reached a consensus that we would do better to look to other means of making our site more resistant to fire.

We agreed that the more effective approach for protecting the Anza site, particularly the buildings, from potential wildfires is to be more aggressive about clearance around all of the structures on the site. This, of course, includes the area around Anza house; when I was at Anza House in November, I noticed that a lot of brush has grown in the area between the house and the slope separating it from the RV area. This does need to be cleared – if you regularly use Anza House, next time you go out there, please bring some clippers or other weed-clearing implements and spend some time clearing brush around the house. The more we can clear out now, the easier it will be to keep the area clear once the spring growth begins.

Dark Sky Issue

Scott Kardel of Palomar recently sent an alert to the people on the Dark Sky e-mail group, letting us know of a new threat to the night sky. This is a new streetlight technology, using LEDs, which is very attractive to municipal governments because LED lights use a lot less electricity than other types of lighting. Unfortunately, the type that is being sold to the municipalities produces a blue-white light that is very glaring, causing problems particularly for aging eyes (as anyone who's had to see past the glare of bluish headlights has probably noticed). The wavelength of this type of lighting is in the part of the spectrum that is disruptive to circadian rhythms (which govern sleep and wake cycles, among other things), and will also put more light pollution into the night sky. For more details, please see the release from the International Dark Sky Society at http://docs.darksky.org/PR/PR_Blue_White_Light.pdf.

If you learn that one of your local governments is planning to use this type of lighting, please take time to register a protest, and advise any and all of the agencies involved of the safety and environmental issues associated with using lighting in this part of the spectrum. Of course, we have a particular interest in seeing that this type of lighting isn't used, as it definitely would affect our viewing conditions, as well as the continued effectiveness of facilities such as Palomar Mt. and Mt. Wilson as research observatories.

Venus as UFO

You may have heard that the object that is most commonly identified as a UFO turns out to be the planet Venus, and that people who identify it as a UFO describe it as making loops, turns, sometimes moving with tremendous speed and sometimes pacing them. Because it's very bright, particularly when it's closest to us, and fairly low, Venus is often perceived as something that's within a mile rather than something at a distance of millions of miles, and that discrepancy makes for some interesting perceptions about its motion. I haven't recently watched Venus put through its paces, so to speak, but did find that Jupiter can put on a similar show.

(continued on page 11)

Your Own Time Machine - Your Telescope

By Tom Koonce
Antelope Valley Astronomy Club, Inc.
Lancaster, California

Look up in the sky this evening at the Moon. In the time it takes to read "The Moon light took a second and a half to reach my eyes," - It did! The light from our Sun takes about eight minutes to reach us. Farther out in space, Jupiter is high in the evening sky during October. Its light takes approximately forty to fifty minutes to travel the distance to Earth. Can you remember what you were doing five hours ago? Perhaps you were at school or at work. Light that left distant Pluto at that moment five hours ago and is just arriving here. This means that when we look at Pluto, we are seeing it as it looked five hours earlier. In the meantime, an asteroid could be crashing into it right now, erupting into a great plume, but we'd have no way of knowing this yet until the light arrives showing us the scene.

All of the light reflected from objects within our Solar System arrives at Earth in a matter of hours. At the speed of light, this demonstrates the vast distance involved between the solar system objects. When we look up into the night sky and see the stars of our own Milky Way Galaxy, the light has traveled years or even thousands of years to get to our eyes. Some of the light you see started its journey the day you were born and has been on its way ever since - every second of your life the light has been moving 186,000 miles closer. The night sky has objects whose light left them when the Declaration of Independence was signed, the fall of Rome, or when the capstone was set in place at the top of the Great Pyramid… Back farther and farther in time.

Andromeda Galaxy – Approx. 2.54 million ly away

With our telescopes pointed outside of the Milky Way Galaxy, we can see the light of much more distant objects in the Universe. The light that we see from the Andromeda galaxy shows it as it was about two and a half million years ago, long before modern humans walked our planet. Some common amateur astronomy 'deep-sky' objects are so distant that the light has been on its way to us since the time of the dinosaurs.

When you think about it, the telescope is a type of time machine, showing us objects as they looked, not as they are at this instant in time, but as they looked at the moment the light left them.

Before your next public star party, it could be a lot of fun to make up a table of objects' distances in units of light years (ly). Then you can ask a young stargazer to tell you their age and show them the object whose light left it in the year of their birth. I have attached a table of "Birthday Stars" developed by Timothy Ferris in 1997 for your use. *(pages 5-6 - Ed.)*

Print this out on a sheet of paper with the distance/age table on it, along with your club's contact and membership information (or application) and a calendar of your club's events and you'll have a great handout that people will enjoy and get them interested in astronomy.

For Sale: Celestron C6-R refractor on a CG-4 mount with 2 inch Antares diagonal, 2 inch 32mm wide field eyepiece, 9X50mm finder, 6" white light solar filter by Baader; Baader semi-apo filter for 1 1/4" eyepieces; 20mm Plossl eyepiece, counterweights and dustcap. All kept in good condition. $450 Contact Val Akins at (949) 855-9018.

For Sale: Meade ETX 125 PE Astro with Meade 5000 eyepiece kit. Barely used, must sell! $500. Contact Mark Hunter at 949-370-9300 or mrplant2000@yahoo.com.

Wanted: Old style 84-key AT keyboard for DOS/Windows PC (the kind with the function keys on the left instead of above the other keys). Tim Hogle timhogle@aol.com, (626) 357-7770.

Wanted: assistance in transferring data from Apple II disks (ProDOS format); primarily word processing documents written in AppleWorks. Would like data either printed out or converted to modern format (preferably ASCII). Contact Steve Condrey 951-678-0189

Birthday Star Chart

Note: Stars listed in italics are too dim to see by naked eye.

Credit: http://www.pbs.org/seeinginthedark/explore-the-sky/birthday-stars.html

Your Age	Star	Distance (light years)	Magnitude	Comments
0	Sun	(8 light-minutes)	-26.7	The "birthday star" for babies born today is the Sun!
4	Alpha Centauri	4.4	0	Nearest known star to the Sun; actually part of a triple star system; bright, but too far south to be seen from North America
6	Barnard's Star	6	5.9	E. E. Barnard discovered that this star is speeding toward the Sun; it will become the nearest star to us in 10,000 years
8	Wolf 359	7.8	13.4	Very faint dwarf in Leo, the Lion; visible with a medium-sized telescope
9	Sirius	8.6	-1.4	Brightest star in Earth's skies; can cast shadows on dark, clear nights
10	Epsilon Eri	10.5	3.7	Less luminous than the Sun today but may resemble the young Sun (closest star known to have a planet)
11	Procyon	11.4	0.4	More luminous than the Sun and about twice as big; in Canis Minor, near Sirius
12	Tau Ceti	11.9	3.5	First star to be examined by radio astronomers searching for signals from intelligent life; they heard nothing
15	Gliese 876	15.3	10.2	Dwarf star in Aquarius, the Water Bearer; has planets
16	Keid	16.5	4.4	Multiple star (as discovered by William Herschel) in Eridanus, the River, W of Orion
17	Altair	16.8	0.8	Bright, rapidly-spinning star in Aquila, the Eagle
18	Van Biesbroeck's Star	18.7	17.4	Small, dim, cool star that sometimes flares up
19	Eta Cass	19.4	3.5	Westernmost star in the "W" of Cassiopeia, the Queen; Sunlike, has an orange companion—as Herschel discovered, in August 1779
20	36 Oph	19.5	4.3	Double star which can be resolved ("split") with a small telescope; 10 deg. SW of the bright star Antares
21	Xi Bootes	21.9	4.5	Double star, resolvable with small telescopes
24	107 Piscium	24.4	5.2	Inconspicuous orange dwarf in Pisces, the Fishes
25	Vega	25.3	0	Brilliant blue-white "diamond" star in Lyra, the Lyre; may be forming planets
26	Chi Draconis	26.3	3.6	Lies E of the bowl of the Little Dipper
27	Beta CVn	27.3	4.2	Yellow star NW of the Big Dipper's bowl, in the constellation Canes Venatici, the Hunting Dogs
28	Chi1 Ori	28.3	4.4	In Orion, The Hunter, 12 deg. N of Betelgeuse
29	Gamma Lep	29.3	3.6	Double star, "splittable" with binoculars and of attractive colors, sometimes described as yellow and garnet; in Lepus, the Hare
30	Kappa1 Cet	29.9	4.8	Multiple star in Cetus, the Whale, SW of Aldebaran
31	61 UMa	31.1	5.3	In Ursa Major, the Big Bear, 20 deg. S of Big Dipper's bowl; may have planets
32	12 Oph	31.9	5.8	Variable star but otherwise resembles the Sun; in Ophiuchus, the Serpent Handler
33	Alpha Men	33.1	5.1	Southern-hemisphere star in Mensa, the Table
34	Pollux	33.7	1.2	The southern (and warmer-colored) member of the two bright stars, Castor and Pollux, in Gemini, the Twins
35	Zeta Her	35.2	2.8	Multiple star at the SW corner of the "Keystone" of Hercules, the legendary strongman
36	Denebola	36.2	2.1	"The Lion's Tail"; resembles Sirius
37	Arcturus	36.7	-0.1	"Follow the arc"—of the Big Dipper's handle—"to Arcturus" is the start of many star-finding lessons; in Bootes, the Herdsman
38	Lambda Ser	38.3	4.4	Yellow star in Serpens, the Serpent
39	Delta Cap	38.6	2.8	White star on the ecliptic in Capricorn, the Goat
40	Beta Tra	40.2	2.8	Southern star, 9 deg. E of Alpha Centauri in Triangulum Australe, the Southern Triangle
41	Lambda Aur	41.2	4.7	Elderly dwarf star due S of Capella in Auriga, the Charioteer
42	Capella	42.2	0.1	Brightest star in Auriga; color variously described as reddish to golden, perhaps because it is a double star but too close to be resolved even through a telescope
43	58 Eri	43.4	5.5	Sunlike star in Eriadanus, the River
44	Theta UMa	43.9	3.2	Yellow star SE of the Big Dipper's bowl
45	Gamma Cep	44.9	3.2	Located 12deg from Polaris, in Cepheus, the Ethiopian King
46	Alpha For	46.3	3.9	Double star in Fornax, the Furnace
47	Eta Cep	46.7	3.4	In Cepheus, 20deg. SW of the "W" in Cassiopeia; one of Barnard's dark nebulae lies 1.6deg. S
48	Alderamin	48.8	2.5	Bright star in Cepheus, the King; the slow wobble of Earth's axis (called "precession") will make it the north Pole Star—5,500 years from now
49	51 Peg	50	5.5	Just E of the "Great Square" of Pegasus, the Winged Horse; first normal star around which planets were discovered
50	Delta Aql	50.1	3.4	In the Milky Way at the center of Aquila, the Eagle
51	Castor	51.6	1.6	Northern (and bluer) of Gemini's two brightest stars
52	104 Tau	51.8	4.9	In Taurus, the Bull, 7.5 deg. W of Aldebaran; twice as old as the Sun
53	Xi Peg	53	4.2	In Pegasus, SW of the Great Square
54	Beta Cas	54.5	2.3	Easternmost star in the "W" of Cassiopea; variable
55	Tau1 Hya	55.8	4.6	SW of Leo, in Hydra, the Water Snake

Your Age	Star	Distance (light years)	Magnitude	Comments
56	Xi Oph	56.7	4.4	In the Milky Way in Ophiuchus, near the ecliptic
57	58 Oph	57.2	4.9	On the ecliptic E of Scorpius
58	Delta Leo	57.7	2.6	Luminosity 50 times the Sun's; 10 deg. NW of Denabola
59	70 Vir	59.1	5	Sunlike star in Virgo, the Virgin
60	Navi	60.9	4.8	Yellow star E of Gamma Cas, the center of Cassiopeia's "W"
61	Mu Vir	60.9	3.9	In Virgo, W of Libra
62	Eta Ser	61.8	3.2	In Serpens, the Serpent, 8 deg. NW of the "Wild Duck" star cluster (M11)
63	Beta Pic	62.9	3.9	In the southern constellation Pictor, the Painter, 6 deg. NW of the bright star Canopus; appears to be forming planets
64	Alpha Tri	64.1	3.4	In Triangulum, the Northern Triangle, 4 deg. SW of the Pinwheel galaxy (M33)
65	Aldeberan	65.1	0.9	Brightest star in Taurus, the Bull
66	Alpha Ari	65.9	2	Giant star W of the Pleiades
67	Sigma2 U Ma	66.7	4.8	In Ursa Major, W of the Big Dipper's bowl,
68	Tau Cyg	68.3	3.7	Outlying star in Cygnus, the Swan, just under 10 deg. SE of Deneb
69	40 Leo	69	4.8	In central Leo, less than 1 deg S of the bright star Algieba
70	Zeta Lep	70.2	3.55	Blue-white star S of Orion in Lepus, the Hare
71	Alpha Hya	71.3	2.9	Orange giant, wide as 30 Suns; brightest star in Hydra, the Water Snake
72	Epsilon Cyg	72.1	2.5	Tepid orange giant; innermost star in the right wing of Cygnus, the Swan
73	Mu Cyg	73.06	4.5	Close double star whose duplicity was discovered by William Herschel; at tip of the Swan's right wing
74	39 Leo	74.1	5.8	On the Lion's back, 0.3deg. SE of the brighter star Adhafera; use binoculars
75	Alphecca	74.7	2.2	Eclipsing binary star that changes brightness (by only 0.1 magnitude) every 17.4 days; in Corona Borealis, the Northern Crown
76	Omega Dra	76.5	4.8	Near Little Dipper, in Draco, the Dragon
77	Regulus	77.5	1.4	Blue-white giant, 120 times as luminous as the Sun; brightest star in Leo
78	Mizar	78.2	2.2	Naked-eye double star with its partner, the fainter Alcor, and itself a telescopic double; in Ursa Major, at the crook of the Big Dipper's handle
79	SAO1002	78.6	10.4	Double star in Camelopardalis, the Giraffe; requires a telescope
80	7 And	79.9	4.5	One star among many in the rich star clouds of the Milky Way, in Andromeda
81	Alioth	80.9	1.8	The "bright eye" in the Big Dipper's handle, immediately W of Mizar and Alcor
82	Beta Oph	81.9	2.8	Pale yellow; good in binoculars
83	Zeta Aql	83.3	3	Tip of Aquila the Eagle's West wing
84	Sabik	84.1	2.4	White star E of Scorpius, in the ecliptic near the Milky Way
85	Seginus	85.2	3	Just under 10 deg. N of Arcturus
86	Tau3 Eri	86.2	4.1	SW of Orion, in Eridanus, the River
87	Algorab	87.9	2.9	At the NE corner of Corvus, the Crow
88	Epsilon Cet	88.2	4.8	In Cetus, the Whale, 10 deg. SE of Mira
89	Ascella	89.1	2.6	Bright enough to stand out against the rich star clouds of the central Milky Way; in eastern Sagittarius, the Archer.
90	15 Peg	90.2	5.5	In Pegasus, on the E edge of the Milky Way's glowing river of stars
91	38 Gem	91.1	4.7	In Gemini, all but lost amid Milky Way star clouds
92	Omega And	92.3	4.8	Look 9 deg. NE of the Andromeda galaxy
93	Algol	92.8	2.1	The most famous variable star in the sky; an "eclipsing binary" that dips in brightness, from mag. 2.1 to mag. 3.4, when the primary star is partly eclipsed by its dimmer companion. In Perseus, 18 deg. NNE of the Pleiades star cluster.
94	Lambda Gem	94.3	3.6	Variable star of the Cepheid type, which can be used to measure distances; in Gemini, at the right knee of the eastern Twin
95	Gamma Oph	94.8	3.75	In Ophiuchus, 18 deg. NW of the Wild Duck star cluster (M11)
96	Diphda	95.8	2	A yellow star near the ecliptic in Cetus, the whale
97	Alpheratz	97.1	2.1	NE corner of the "Great Square" linking Andromeda and Pegasus; spectrum displays "weather" in form of sulfur clouds on its surface
98	SAO141665	98	4.5	In central Ophiuchus
99	Nu1 Dra	99.9	4.9	Part of a telescopic double star in Draco, the Dragon
100	Nu2 Dra	99.9	4.9	The other member of this pretty pair of white stars (see 99)
101	Alkaid	100.7	1.85	White star at the tip of the Big Dipper's handle

Some Comments on the Chart (Credit: http://www.pbs.org/seeinginthedark/explore-the-sky/birthday-stars.html)
Looking over the chart, you may have noticed that it's missing entries for several ages—notably 2, 3, 5, and 7—and that our entry for age 6, Barnard's Star, is too dim to be seen without a telescope. But at greater distances there's a bright star for nearly every age. What's up with that? The reason is that as we go out farther, we're sampling much larger volumes of space, and therefore have more stars to choose from. (The volume goes up as 4/3*Pi*R^3, where Pi = 3.14 and R is the distance, meaning the radius of the sphere in which we are searching.) In cases where we had several options, we have picked the brightest star visible from northern latitudes.

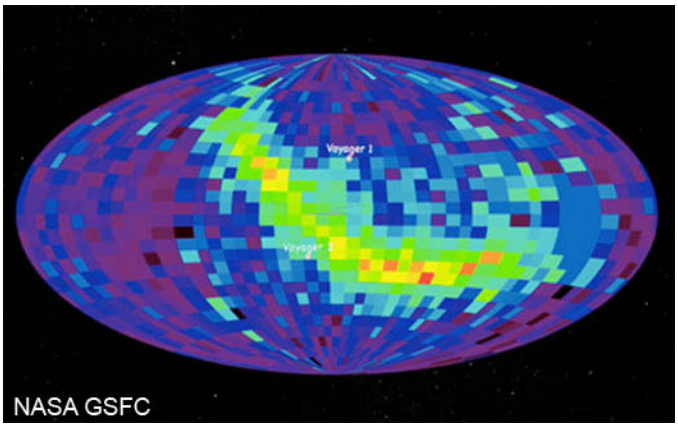
Certain commercial concerns offer to "name" stars for individuals—at a price. These "star registries" have no official sanction. All astronomical objects are named by the International Astronomical Union, according to internationally agreed-upon protocols which do not permit naming stars for living persons. Stars rarely get names these days, but catalog numbers. But while you cannot legitimately name a star for yourself or a friend or family member, we invite you to observe a star whose light is as old as you are, or they are, and to possess a photo of it if you like. Like the night sky, it's free! The list of Birthday Stars is based on a book project of that title initiated by Timothy Ferris in 1997.

AstroSpace Update

December 2009
Gathered by Don Lynn from NASA and other sources

Cassini (Saturn mission), using its radar on Titan, has observed seasonal changes in the surface that appear to be caused by drying up of the lakes of liquid methane. The reflectivity of the lakes changed (toward that seen in dry lake beds) and the shorelines changed. The most probable reason for this is that the lakes are evaporating as the season changes. Calculations showed that the liquid level probably dropped about a yard in an Earth year. A Titan year is 29 Earth years, so seasons change much more slowly there.

Spitzer (infrared space telescope) has found a huge doughnut-shaped (torus) ring about Saturn, much larger, thicker and tilted than the other rings. The moon Phoebe lies within the rings, and is probably ejecting the material that forms the ring when it is struck by meteorites. Phoebe is the most distant moon (from Saturn) of substantial size. The ring is composed of ice and dust particles, and is quite tenuous. The dark material covering about half of the moon Iapetus could possibly be dust from the newly discovered ring that drifted inward toward the planet and collided with Iapetus. Phoebe and the ring orbit retrograde, that is, in the opposite direction from the other major moons. Though the ring stood out in infrared, it is so dim in visible light that it has never been detected.



IBEX is a spacecraft that measures neutral particles that originate just beyond the planets of our solar system, where the stellar wind hits the interstellar medium. This area has been penetrated by only the 2 Voyager spacecraft, but IBEX maps it remotely, from its position near Earth. The first map of this stellar wind boundary has just been released, and it shows a huge ribbon of particle emission. Both Voyagers missed the ribbon, so did not hint at its existence. It is unknown what produced the ribbon. The direction of the ribbon is perpendicular to the magnetic field of the Milky Way, and this may be significant in explaining it.

Cassini also has an instrument that detects neutral particles (and also charged particles) from the stellar wind boundary, and its first map of this region was also just released. It had long been assumed that this boundary region would be comet shaped, a result of the solar system's motion through the interstellar medium; ahead of motion would be rounded, with a tail streaming behind the direction of motion. But the map from Cassini shows it to be more of a spherical bubble. This implies that the pressure of the stellar wind or the strength of the Sun's magnetic field control the shape of the boundary, not the pressure of the interstellar medium against the moving solar system.

Spirit (Mars rover) has been stuck in soft soil since April 23, when it broke through a hard crust covering talcum-like material. After extensive testing of alternative moves, using test rovers here on Earth, a plan to try to free Spirit has been approved. Steering of wheels has begun and a drive attempt is scheduled for November 17. The first move will be back the direction from which the rover came. Rover controllers are not at all sure the attempt will succeed. Even if successful, it may take many weeks. Efforts to free Spirit may last until February, when a mission review is scheduled. The current state of the solar panels is such that Spirit should endure the next Martian winter, even if it does not move to a more sunlight-optimized position. Of course winds can either add or remove dust from the panels and change that state.

Opportunity (the other Mars rover) found another meteorite less than half a mile from the last one, which was found in July. From the appearance and proximity, it probably broke off the same meteoroid body and fell the same time. The previous meteorite was determined to be quite old, falling perhaps 3 billion years ago. 2 weeks later the rover found yet another meteorite, its 4th.

LCROSS (lunar impact mission) –The LCROSS rocket body impacted Cabeus Crater on October 9, followed about 4 minutes later by the spacecraft impacting, as planned. The plume of material was observed by the spacecraft and by other space and ground-based telescopes. In visible light the plume was much more difficult to observe than had been estimated, but much of the data was planned for spectroscopy rather than visible light images. The plume fell back to the lunar

(continued from page 6)

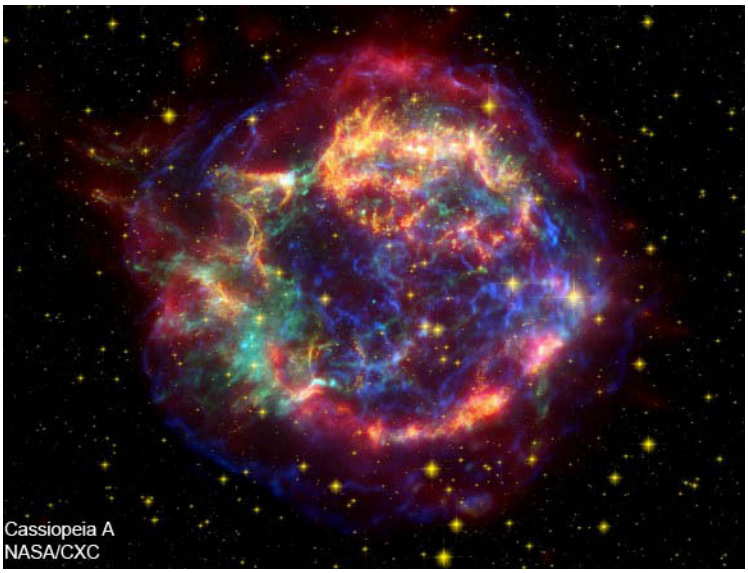
surface in a matter of minutes. However, the plume was composed of 2 parts: one upward, and a curtain that spread outward. Only the upward part reached sunlight, and therefore became visible in ordinary light. The entire plume was visible in infrared wavelengths. The crater from the impact was imaged by the Lunar Reconnaissance Orbiter and is about 90 feet across. The crater floor was heated by the rocket impact from its normal temperature of minus 380° F. to about 1300°. Preliminary results show that the LCROSS spectrometers definitely detected water in infrared and hydroxyl (a break-down product from water) in ultraviolet in the plume (both parts) of the first impact. Also detected were sodium and carbon dioxide. Further analysis is expected to identify other materials. Determining the total water displaced by the impact will require more work, but it has been determined that about 25 gallons were present in the part of the plume analyzed by the infrared spectrometer. This amount of water points toward the impact hitting ice (as opposed to vapor or liquid water), but further analysis will be done to confirm this. As hypothesized, the permanently shadowed regions of polar craters have now been shown to trap and preserve water and other material.

Fermi (gamma-ray space telescope) has completed 1 year of operation and has observed over 1000 discrete sources of gamma rays, 5 times the number previously known. Nearly half of these have been identified with objects known from other wavelengths of light. The most common sources are blazars, with substantial numbers of pulsars, and a few binary stars involving a neutron star. In May, Fermi observed a short gamma-ray burst (GRB) later found to be 7.3 billion light-years away. Since the burst contained a very high energy gamma-ray photon, it was an opportunity to verify one aspect of Einstein's Relativity. Some competing theories predict that high-energy gamma ray photons should travel slightly slower than low-energy ones. Fermi's observations showed essentially no difference in speed for the high-energy ray. Fermi has also observed 3 record-setting GRBs: the highest ejection speed of material in a burst, the highest energy gamma ray photon in a burst, and the greatest total energy in a burst.

Most distant object – Back in June I reported the discovery of a GRB that was found to be the most distant object every seen. Further observations and analysis have shown: The total energy was above average for a GRB, but not nearly a record; in radio light, the afterglow of the burst remained visible for over 2 months; the burst was the result of a large, but not monster, star ending its life in a supernova; this was proof that large stars existed this early after the Big Bang (the light left there only 630 million years into the life of the Universe), which had been long assumed, but not proven; the blast was nearly spherical and expanded into tenuous and relatively uniform gas.

White dwarfs are the remnants of less massive stars that have nuclearly fused all their fuel. More massive stars explode as supernovas when they run out of fuel. Theorists have long predicted that less massive white dwarfs form when they run out of hydrogen and helium as fuel, while slightly more massive stars would be able to ignite carbon also as fuel, which should produce much oxygen and neon as "ash". But astronomers have never found the predicted oxygen-rich white dwarfs, until now. A search of data from the Sloan Digital Sky Survey produced 2 oxygen-rich white dwarfs. Some theorists had claimed that the oxygen of such stars would be trapped in the core, and so would not show up in spectra of the surface. But the fact that such stars are now known to exist requires theorists to explain how oxygen moves up to the surface, at least in some cases. It has been proposed that only stars near the mass limit above which they go supernova would be able to expose the oxygen.

New type of supernova – It is known that a Type Ia supernova occurs when a companion star dumps enough hydrogen onto a white dwarf star until it explodes. Some theorists have pointed out that some stars would dump helium, not hydrogen, onto their companion white dwarf. Then the explosion should be about 10 times less bright, and 10 times quicker in rising to peak brightness and then fading. Some theorists have dubbed this a Type .Ia supernova (point one a). A search of old supernova data produced one that fits this description, 2002bj. The spectra taken 7 years ago also fit the predictions. This type of supernova should not be powerful enough to form a neutron star. On the other hand, it is 1000 times more powerful than an ordinary nova.



Cassiopeia A
NASA/CXC

Yet another – It is known that a Type II supernova occurs when a very massive star runs out of nuclear fuels, having produced an iron core, the heaviest "ash" possible from nuclear fusion. With no power source supplying the energy that supports the star against gravity, the core collapses and the outer parts explode. Theorists have proposed that extremely massive stars should have their cores collapse by a different mechanism before fusion fuel runs out: the supporting energy, in the form of light, can become unstable when photons break into electron-positron pairs. A recent paper announces that 5 supernovas have been found that fit the predictions for this "pair instability" mechanism as far as peak brightness (very bright in ultraviolet) and longevity of the rise and fading. Yet another type of supernova has now been found. Based on the number found, it was estimated that less than 1 in 10,000 Type II supernovas are of this new type. The lead author of this paper is Robert Quimby, long-time OCA member.

Cassiopeia A is the remnant of a supernova that occurred over 300 years ago, but went unnoticed. It was long expected that there should be a neutron star near the center of the nebulosity, the remainder of the star that exploded. A possible

candidate was found in 1999. New observations by Chandra (X-ray space telescope) have shown conclusively that this candidate is indeed a neutron star. No other object could give off the array of X-rays seen. But the observations revealed a new mystery: the neutron star has a carbon atmosphere. Previously studied neutron stars have all had hydrogen atmospheres. Incidentally, neutron star atmospheres are only about 4 inches high, due to the extremely high surface gravity. One proposal is that the extreme heat (about 1 billion degrees) at the time a neutron star is formed fuses all the hydrogen into carbon. Now theorists have to explain how older neutron stars all accumulate a replacement hydrogen atmosphere.

Intermediate black hole – Though known black holes of stellar mass (roughly 10 times the Sun's mass) and supermassive ones (millions or billions of times the Sun's mass) at the centers of galaxies have now become common, black holes with intermediate mass are rare and not well verified. Observations of an ultraluminous X-ray source (ULX) in galaxy NGC 5408 have shown that it is probably an intermediate mass black hole. XMM-Newton (orbiting X-ray telescope) has detected quasi-periodic oscillations, that is, a nearly regular flickering, believed to be caused by hot gas in the accretion disk of material falling into a black hole. The flickering was slower and the X-rays brighter than that of a stellar mass black hole, both indicating a greater mass. The best estimate of its mass, made from a variety of observations, is between 1000 and 9000 times the Sun's mass. It appears from further observations that a massive star is in close orbit about the black hole, dumping material into it.

Lithium (the element) – Astronomers have long known that the Sun and a few other stars have very low abundances of lithium, less than 1% of that found in the majority of stars. A study of the spectra of 500 nearby stars finally shed light on what makes the low-lithium stars different. The answer is planets. All the stars in the new study that are known to have planets also had low lithium abundance. Additionally, the study ruled out factors other than planets from correlating with low lithium. Most lithium in the Universe was produced in the Big Bang, and thus all stars should have roughly the same amount of lithium, at least when they form. That amount turns out to be the higher abundance observed. That means that the low-lithium stars have destroyed their original supply of the element. The mechanism by which forming or keeping planets destroys lithium is not known, but theorists are now feverishly working on it. The observational astronomers, on the other hand, are treating this as a new way to find planets: just observe stars with low lithium in their spectra.

Cosmic Microwave Background (CMB) is the leftover light from the time about 400,000 years after the Big Bang that the Universe cooled enough to become transparent. The QUaD telescope at the South Pole has been observing the polarization of the CMB, and the first analysis of the observations has been released. It confirms the previous CMB results from the WMAP satellite and others, this time matching the theoretical spectrum even more closely, due to reduced noise. The CMB could have been produced only by a Universe containing 5% ordinary matter (made of protons and neutrons), and about 25% non-ordinary matter (dark matter) and 70% energy (dark energy).

Planet formation – Infrared spectra of 88 very distant galaxies showed the signature of circumstellar dust disks, the material out of which planets are formed. The galaxies are too distant to see individual stars or the disks themselves, but the sum of all such disks in each galaxy shows up. Further work was suggested to determine the rates of planet formation over time. This is possible because the more distant galaxies are seen as they were farther back in time.

Cosmic rays are particles, including protons, moving with extremely high energy. The mechanism that accelerates particles to such high energy has been debated for about a century. One theory is that exploding stars (supernovas) and stellar winds accelerate such particles. To test this, a team of astronomers decided to measure the cosmic rays in M82, a galaxy known to have far more massive stars than our Milky Way has, and therefore has far more supernovas and stars with strong stellar winds. Unfortunately we can't measure cosmic rays remotely, only when they strike our instruments. But cosmic rays interact with interstellar gas and produce gamma rays, which we can detect remotely. The VERITAS earth-bound gamma ray detector was used and it found the cosmic ray density in M82 is about 500 times that in the Milky Way. Thus the supernova/stellar wind theory is supported. It required about 2 years of exposure by VERITAS to detect M82.

Large Hadron Collider (world's largest particle accelerator, in Switzerland) – A beam of charged particles was run around the Large Hadron Collider in the clockwise direction in late October. This is the first time particles have been thrust inside it since it was shut down due to a massive magnet failure during a test run in September 2008. For full operation, particles must also be sent counterclockwise, and then collided with the other beam. In early November, a bird dropped a piece of bread into an outdoor piece of the collider, which overheated parts and caused a shutdown of the collider. It was not running particles through it at the time. Officials say this latest incident will not delay further test runs, which are planned to achieve particle collision in December.

NASA competitions have been held for the last few years for those outside the organization to develop technology that is expected to be needed on future space missions. In October the annual Regolith Excavation Challenge was held. The idea was to make a robot with self-contained power source, weighing under 176 pounds, that could excavate and dump into a container over 330 pounds of simulated lunar soil within 30 minutes. No one had succeeded at this in the past 3 years, but this time 3 teams did, and split $750,000 in prizes. 1st prize went to an excavator that loaded 1103 pounds during its half hour.

From July to October, the **Lunar Lander Challenge** was held. To win, a rocket has to take off vertically, fly to a target and land, and take off again within 2.25 hrs and fly back to the starting point. No servicing of the rocket is allowed. Level 1 prizes require 1.5 minute flights over easy terrain, and Level 2 prizes require 3 minute flights over rocks and craters. One Level 1 prize was claimed last year. This year the remaining Level 1 and both Level 2 prizes were awarded to Masten Space Systems and Armadillo Aerospace companies, ending this competition. A total of $1.65 million was awarded this year.

(continued next page)

In early November, the **Space Elevator competition** was held. Winners had to make a device that would climb a 3280-foot-long cable suspended vertically, using only power beamed to the device from the ground (lasers were used). A prize of $900,000 was offered for completing above 4.5 mph, and another of $1.1 million for exceeding 11.2 mph. In the previous 5 years of competition, no one had qualified for either prize, but this year a team from Seattle won the smaller prize. Next year, only the bigger prize will be offered.

Instant AstroSpace Updates

Cassini flew through the geyser plumes of Saturn's moon Enceladus on November 2. Preliminary results are that good data and spectacular pictures resulted.

Rosetta (comet mission) made its final gravity slingshot by the Earth November 13 and headed toward putting a lander on Comet Churyumov-Garasimenko in 2014. It returned a terrific image of the crescent Earth.

A hardware problem known at launch of the planet finding spacecraft **Kepler** is taking considerable time to fix in software. This prevents the accuracy needed to find smaller planets (but larger ones have already been found), so small planet discoveries are now expected to begin in 2011.

Hayabusa (Japanese asteroid sample return mission) on its way back to Earth has suffered yet another failure, this time a breakdown of another of its 4 ion thrusters, leaving only 1 remaining. It is believed that voltage spikes are killing the thrusters, so controllers will do much analysis before turning on the last working thruster.

Mars Reconnaissance Orbiter has imaged the **Mars Phoenix** polar lander covered in dry-ice frost. Phoenix got too cold and dark to function November of last year, as expected.

Constituent gases in the **atmospheres of exoplanets** have been detected for the 2nd and 3rd exoplanets ever, and again they are carbon dioxide, water vapor, and methane. All are hot Jupiters (gas giant planets very close to their stars).

Results were announced of recent searches for **exoplanets** using HARPS, an extremely sensitive spectrograph at the European Southern Observatory in Chile. 32 more exoplanets were found, pushing the total known to 406.

Computer simulations of the atmosphere of the recently discovered rocky exoplanet COROT-7b show that it is so hot that rock vapor exists. Solid rock condenses at various altitudes, depending on composition, and falls as a **pebble hail** onto the surface, which is covered (on the star-facing side) with molten lava.

An **asteroid** estimated at only 23 feet across was discovered November 6 just hours before it passed about 9000 miles from Earth, the 3rd closest non-impact on record.

A cluster of galaxies discovered in infrared, then observed in visible light and X-rays, has been measured to be so distant that its light took 10.2 billion years to reach us, making it the **farthest known galaxy cluster**. More distant individual galaxies and quasars are known.

NASA and the European Space Agency have signed an **agreement** to jointly build and operate planned Mars orbiter and lander missions. This had been expected due to budget pressures on the space agencies.

Russia announced plans to build one more Soyuz spacecraft per year, and rent out 2 spaces on each of those extras to (rich) **space tourists**. It had been thought that the space tourism, at least on Soyuz vehicles, would be over when the Space Shuttles retire next year, and all Soyuz seats would be needed to take new crews to the International Space Station.

Further observations of the asteroid **Apophis** have refined our knowledge of its orbit and shown that it is extremely unlikely (1 chance in 250,000) to strike the Earth in 2036. But they also showed that the asteroid will return quite close to Earth in 2068, with a nearly equal (extremely unlikely) chance of striking our planet then. The possibility of collision in 2029 had already been ruled out.

The test of the **Ares I-X** rocket mentioned last month was a success, although there were problems with the parachutes that lower the booster to splashdown for reuse. Thrust oscillations, sometimes a problem with new rockets, were negligible.

2010 OCA Astroimage SIG Desktop Calendar - Now Available!

With Images by Jeff Malmrose, Craig Bobchin, Pat Stoker, Jim Windlinger, Gary Carlson, Ronald Royer,Sam Saeed, Gary Schones, Dave Kodama, Bill Warden, Jon Mayfield, John Castillo, Bruce Waddington, Alan Smallbone and Wally Pacholka!

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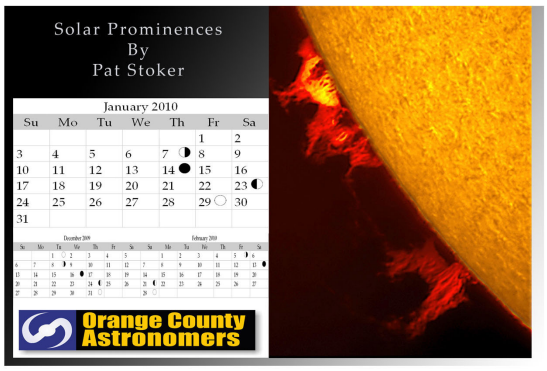

ONLY $10!!!

See Charlie Oostdyk at the general meetings, or contact Barbara Toy or Alan Smallbone for information about ordering and picking up at other OCA meetings! Great Gift Idea!

(continued from page 5)

When Alan and I were coming back from the Advanced Imaging Conference in San Jose at the beginning of November, I discovered that Jupiter was in an excellent position for observing its apparent movements through the passenger window as we were traveling south. It was getting westerly in the evening sky, but was still higher than Venus generally would be, which meant in that particular context that it didn't vanish behind mountaintops as we headed up the Grapevine (which would have destroyed the illusion). Because I was looking through the car window, the window frame was my frame of reference; Venus is often glimpsed through nearby trees or other nearby features, which can make it seem to be moving even faster, zipping along behind the trees, if you perceive it as something nearby (if you see it go behind a distant mountain or building, however, that should correct the misperception about distance – though I guess some people might see that as a sign of tremendous acceleration away from them).

I admit that I was observing Jupiter fairly casually through the window, and my attention was attracted by the fact that, because of the turns in the road, Jupiter appeared to drop behind us, execute a loop, then to shoot forward to a position slightly ahead of us, where it slowed and seemed to pace us. Because I was just observing casually at that point, I'm not certain of the exact turns the car was making as I observed these apparent motions, but after that I noticed that curves to the right made it appear that Jupiter was moving forward, curves to the left made it appear to drop behind, and a straight run with no curves made it seem to be racing along on a parallel course with us. Alas, I didn't see it do any more loops….

Since as astronomers we're often asked about UFOs, and people seem to expect us to pop up with the "real" explanation for various phenomena they describe to us if we insist that whatever it is isn't a sign of intelligent extraterrestrial visitors, observing apparent motions like this can be a good way to help prepare for those kinds of questions – and it's also fun to watch for itself, to see how nature and the wiring of our brains can conspire to fool us.

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