SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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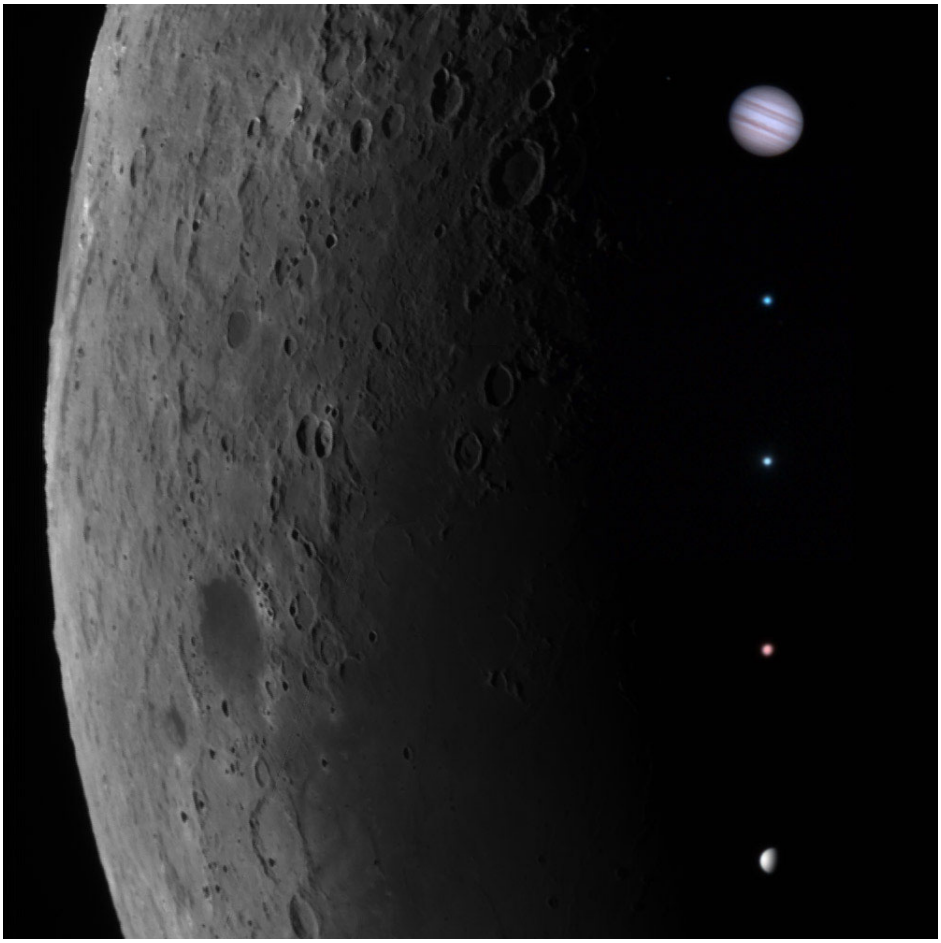

Bill Warden created this composite of the Moon and morning planets visible (in order of appearance and to the same scale as the Moon)on July 18, 2009 from images captured through an 8-inch LX200. The planets from top to bottom: Jupiter, Neptune, Uranus, Mars, Venus.

OCA CLUB MEETING

The free and open club meeting will be held Friday, November 13th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, OCA's own Bob Buchheim will be discussing "The Evidence of Things Not Seen"

NEXT MEETING: December 11th

STAR PARTIES

The Black Star Canyon site will be open on November 7th. The Anza site will be open on November 14th. 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, November 6th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana. The December class will be held December 4th.
GOTO SIG: TBA
Astro-Imagers SIG: Nov. 17th, Dec. 15th
Remote Telescopes SIG: Nov. 25th, Dec. 23rd
Astrophysics SIG: Nov. 20th, Dec. 18th
Dark Sky Group: TBA

November 2009 President's Message

By Barbara Toy

With November upon us, we're sliding fast into the holiday season – and genuine winter viewing, which is a grand way to celebrate life and anything else you want to celebrate. For those who like to use holidays to indulge in extra nights of viewing or imaging, this year is kind of a bust – Thanksgiving weekend is just before the full moon, and so is the week between Christmas and New Years (the full moon falls on New Years Eve). On the brighter side, we have two Anza star parties in December, which, if the weather cooperates, should give us some excellent times under the stars. I hope you'll brave the colder nights and join us!

Reminder on the OCA Election…

We close the taking of nominations for the 2010 Board at the end of the November General Meeting, so be sure to get your nomination in! And once the ballot is available on the website – why not get your vote in early? That way you don't have to scramble to get it in before the deadline (which is the January General Meeting), and can be sure that your votes get counted, making life much easier for all concerned.

PATS

This year was the second Pacific Astronomy And Telescope Show (aka PATS), which was housed in a different section of the Pasadena Convention Center than last year, apparently because they finished the construction that was then under way. For those who haven't yet indulged in this great new entry on the local astronomy scene, the show featured a big exhibitor/vendor area, with all kinds of astronomical gear on display and (mostly, but not always) for sale, and booths for local clubs and such exciting entities as Mt. Wilson and Palomar, and plenty of opportunities to run into friends and indulge in discussions of all kinds of astronomical subjects. There were also lecture halls where talks were going on all day, and (though I wasn't able to check it out myself) it looked like there was some solar scopes set up outside.

PATS itself was on Saturday and Sunday, and they had a one-day imaging conference on Friday before the show; I heard that it had two tracks of presentations for at least part of the day, for newer and for more experienced imagers. Clubs and other astronomy-related organizations are encouraged to schedule events around PATS, to take advantage of the fact that people would be gathering for this event, but I don't know what other organizations have started to take advantage of this yet.

I could only be there on Saturday, and spent most of the day at our club booth, with assistance from Kyle Coker for most of the afternoon, and from Shelia Cassidy when she was able to free some time from her other volunteering obligations. John Castillo very kindly helped me bring things in from the car and set up, and Wally Pacholka loaned us one of his spectacular images printed on canvas, so it looked like a painting, which attracted a lot of attention. We had a slideshow about the club running through the day (many thanks to Dave Radosevich for donating the projector!) with a lot of historical club pictures, mainly because that was what I had available and could edit for the show. Craig Bobchin handled the booth on Sunday, and had a different slideshow, so anyone came by that day would more modern club pictures. The historical pictures attracted a surprising amount of attention, though, and there was one gentleman who told me that he had been a member and helped with construction at Anza shown in some of the pictures. I'm sorry to say that I forgot to write his name down and don't remember it; he left the club when he moved out of the area and is now active in a different club.

One of the best aspects of PATS for me was that our booth was next to the Mt. Wilson booth, and I could visit with the Mt. Wilson people a lot during the day. There was an ever-shifting crowd of well-wishers around their booth most of the day, talking about the fire, what was happening at the observatories and when we would have public access again (the answer? Probably several months, no official body had given a reliable timetable yet). The fact that everyone was delighted and relieved that the observatories were safe made for a certain light-heartedness around the booth, and I'd say overall that the Mt. Wilson crew is pretty optimistic, even though they have a lot of challenges ahead. They were running a slideshow with a lot of spectacular pictures of the fire threatening Mt. Wilson and the devastation left behind it, and I suggested that they modify it to include slides showing what they need and why in addition to the fire pictures, to distribute to the local clubs to show in their general meetings as part of an effort to get more support for Mt. Wilson. They seemed to like the idea, and I hope that they'll follow through with it.

Over the course of the day, I received a number of fire tips, mostly from Dave Jurasevich (Observatory Superintendent, who was up there helping the firefighters during the fight to save the Mt. Wilson and who took a lot of the fire pictures they have from the that area), based on what he learned from the firefighters. Some highlights are…

Fire Tips From Mt. Wilson

Over the last few years, Mt. Wilson volunteers did a lot of work to clear brush and other flammable materials around the observatories and other buildings on the mountain, and took other steps to fire-harden the area. From what they said, this was a major consideration in the firefighters' decision to devote so many resources to protect the observatories and related buildings, as those efforts made the area much more defensible and reduced the risk for the firefighters. I was told that only one of the antennas in the big antenna complex near the observatories had the area it was standing in cleared of brush and weeds so it was defensible; the firefighters worked to save that one, but not the others that were standing in weeds and brush that hadn't been cleared in years and, where there had been some clearance, where the debris from the clearance was dumped into an adjacent gully, adding to the fuel load there. Because of this, the firefighters didn't do much to protect most of the antennas, as it was far too risky. The moral of the story is that the more you do to reduce the fire risk on your property, the more likely it is that the firefighters will aggressively defend the area and succeed in protecting it from a wildfire. This is one reason it's so important to keep the areas around the buildings and pads at Anza clear of weeds and brush.

One of the pleasures of visiting Mt. Wilson in the past has been the beautiful old trees around the top of the mountain that have provided shade as well as picturesque views. Unfortunately, they are also very flammable. Mr. Jurasevich told me that they will have to remove all trees and any remaining shrubs that are within 100 feet of any building, which will be another sad loss for the mountain but necessary to protect them from future fires.

At Anza, we have a lot of shrubs and trees that provide a light screen for areas of the site, help stabilize the slopes, give some shade and also make it look better. Unfortunately, all the native brush is very flammable (the dominant shrub/tree is known as "greasewood" for good reason) and, based on what the firefighters told the Mt. Wilson people, we really do need to remove all of it that is within 50 feet of any structure, and it would be better if we remove all shrubs within 100 feet from any structure. I expect that this will be a subject of serious discussion at the next Board meeting, particularly as many areas where the brush is growing at Anza would suffer more serious erosion if we clear off all the greenery.

Wildfires are generally very hot, often move fast, and produce a lot of sparks that can be driven through any opening in a building, starting fires on the inside that then burn even fire-resistant buildings from the inside out. Mr. Jurasevich told me that this is a particular concern with observatory domes and roll-off roofs, as there is inevitably a gap at the break between the non-moving walls and the moving dome/roof – any wind-driven sparks can easily enter there. They are looking at ways to install some kind of screen, probably a double-screen system, to protect this gap on the domes for the 60-inch and 100-inch telescopes. He suggested that we do something similar to protect the observatory buildings on our site, particularly those that have any wood components, which would include our main observatory.

Another important tool they had at Mt. Wilson was an enormous water tank (the biggest on the mountain) that was pressurized to deliver high volumes of water to fire hydrants throughout their facilities. We do have a water tank at Anza (that's what keeps the water running at the club observatory and Anza House, with the water in the tank supplied by our well), but it would be drained pretty quickly if called upon to help douse a fire. At some point, particularly as the area of the site that's in active use continues to grow and we have more buildings to protect, we will need to store more water on site, and we may need to have a pressurized system – that would be a significant expense, but would certainly help in limiting damage from any future fires.

Why the September *Sirius Astronomer* Was Late

When you received the September *Sirius Astronomer*, you may have noticed that there were three paper tabs holding it closed instead of a staple. In all the past years that we have mailed it out, the Post Office happily accepted the newsletters with the single staple holding them closed, and part of what Charlie did in processing them for mailing was to put a staple in each one (he had a series of power staplers to do this, which is a tale in itself).

Well, times change, and so do Post Office regulations. As of early September, the Post Office decreed that stapled bulk-mailed pamphlets like our newsletter wouldn't be accepted anymore, and we instead have to use three tabs of a specific type and placement (two on the "leading" edge, one on the "trailing" edge as seen by their sorting machines; you can see the required tabs on any issue from September on).

When Charlie found out about this, it didn't take him long to determine that manually applying three tabs to each of over 600 newsletters for our regular monthly mailings wasn't going to work – in fact, I doubt he considered it at all, as it would be far too difficult physically as well as too time consuming. So, in his usual thorough way, he researched our alternatives, and learned that having our printer do the job would add around $400 per month to our newsletter costs, which would quickly become

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This month's theme of the International Year of Astronomy is "The Life of a Star"

The Life Cycles of Stars

By Tom Koonce

Antelope Valley Astronomy Club, Inc.

Lancaster, California

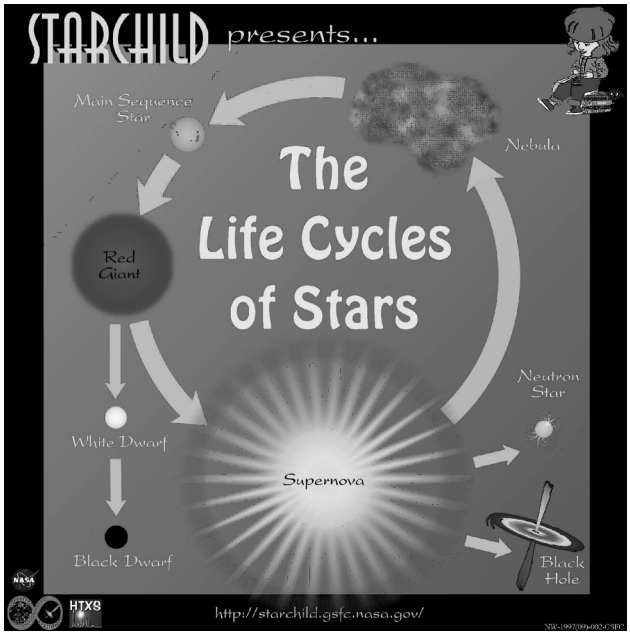
"The bigger they are, the harder they fall…" This is certainly true of stars. When single stars condense from a star forming nebula, their life history is pre-written based upon their initial mass and the cloud's composition. High mass stars burn very hot, have very short stellar lifetimes then explode in spectacular Supernovae, forming either Neutron Stars or Black Holes. On the other end of the mass scale, low mass single stars have relatively cool temperatures, but live extremely long lifetimes and may radiate dimly for many, many billions of years

Over time, higher density regions within giant nebulae like the Orion Nebula or the Eagle Nebula begin to contract gravitationally, and as they do, the cloud rotates. As the gas contracts and rotates faster, the gas begins to heat up to become a Protostar. Once its temperature reaches approximately 15,000,000 Celsius, nuclear fusion initiates in the cloud's center causing the Protostar to begin to radiate brightly. The smallest stellar objects that form in the star forming regions are called Sub-Stellar Objects. These form with masses between 0.013 and 0.08 times the mass of our own Sun (our Sun = one solar mass). These stars radiate briefly as a dim star, but gradually collapse, cool as they evolve further into Brown Dwarf stars. Eventually the Brown Dwarf will cool further and it will cease radiating at all.

The stars known as "Red Dwarf" stars have between 0.08 and 0.4 solar masses when they form. These are the most common type of stars in the observable universe and have lifetimes longer than 13 billion years. As these small, long living stars eventually cool, they die and become Black Dwarf stars.

Stars approximately the size of our Sun with 0.4 to 8 solar masses are called "Intermediate" stars and will swell into Red Giant stars as their fuel is expended. Eventually, these stars will end their lives as White Dwarf stars.

Nebulae and stars are typically composed of 74% hydrogen, 25% helium and 1% everything else in the periodic table by mass. A star's initial mass is determined by the amount of material available within the nebula from which the star forms. Very dense nebulae can produce the most massive stars - true giants with 8 times (or greater than) our Sun's mass. Those stars with between 8 and 25 solar masses will expand into Super Giant stars then explode as supernovae and end their lives as Neutron Stars; those stars with greater than 25 solar masses will expand into Super Giant stars, explode as supernovae and become Black Holes. It isn't known what the upper limit is to a star's initial mass is, but in the early 1990's, a star nicknamed the "Pistol Star" was discovered by the Hubble Space Telescope near the center of the Milky Way galaxy with a mass of 100 solar masses and a radius of 100 million miles, comparable to the Earth-Sun distance of 93 million miles. The Pistol Star is called a Blue Hyper Giant and is so hot that its gravity can't stabilize it and it is expected to go supernova within only 1 to 3 million years. A great deal of gas and matter is expelled during these supernovae explosions which then give rise to future generations of stars, repeating the cycle of stellar birth.



Smaller stars burn dimly, but may burn for billions and billions of years. Giant stars burn with incredible intensity, but go through their hydrogen and helium fuel in as little as millions of years, and then end their lives in dramatic supernovae explosions. I can think of a few analogous Hollywood situations…but that's for another type of "Star" article altogether.

References and image credit: NASA StarChild initiative, NASA Hubble Space Telescope, Wikipedia.

(continued from page 3)

prohibitive. This left getting a tabbing machine for the club as the most realistic approach, and he ultimately found one that seems rugged enough to meet our needs for the foreseeable future. It was expensive, but cost less than we would pay if we had the printer do it for six months, so the club is now the proud owner of a tabbing machine that (with Charlie feeding each newsletter into it in the right orientations three times) will apply the requisite three tabs – this takes about three times as long as the old stapling technique, but does mean there is less chance that newsletters will get jammed in the sorting machines and damaged.

We had some faint hope that we would be able to get the September issue out within the short window the Post Office allowed before the new regulations came into effect. Unfortunately, Steve Condrey wasn't able to get the finished newsletter to the printer early enough for the printer to get it to Charlie in time to get it processed and mailed before the deadline, and it took awhile for the new tabbing machine to arrive. Charlie actually had the newsletters for several days after they were delivered by the printer before the machine arrived. He told me later that just unwrapping the machine was a major project, as it was enveloped in multiple protective layers, many of which were difficult to get through. However, he did ultimately get it set up and then had a baptism of fire as he had to run the full September bulk mailing through it with minimal time to get familiar with its idiosyncrasies. The ultimate arrival of the Sirius Astronomer in September is evidence that he was successful in mastering the device.

As an aside, if you are troubled by the fact that the Sirius Astronomer is sometimes later than we would like, please keep in mind that one of Steve Condrey's challenges each month is finding enough content for a complete issue. If you have seen or done anything of an astronomical nature, gone anywhere of astronomical significance, had any kind of interesting observing or imaging experience, please do a short article on it and send it to Steve at SiriusAstronomer@ocastronomers.org. If you've read a book that might be of interest to other members, write a couple paragraphs about it as a brief book review to let us know about it and send that to Steve (and please post any reviews on our website). Send any pictures you would like to share (of any astronomical interest, including astroimages), ideally with comments about them, such as how you achieved the effect shown or why these are of particular significance to you. The more content Steve has to work with, the easier it is for him to put each issue together, the earlier he can get it to the printer, the earlier it gets to Charlie for his processing and into the mail, and the earlier it gets to you. So please do help us out here…

The zodiac names we use today are actually the names our ancestors gave to special star groups known as constellations. How many of the ancient constellation names can you correctly identify? Place the constellation's letter on the line next to its description.

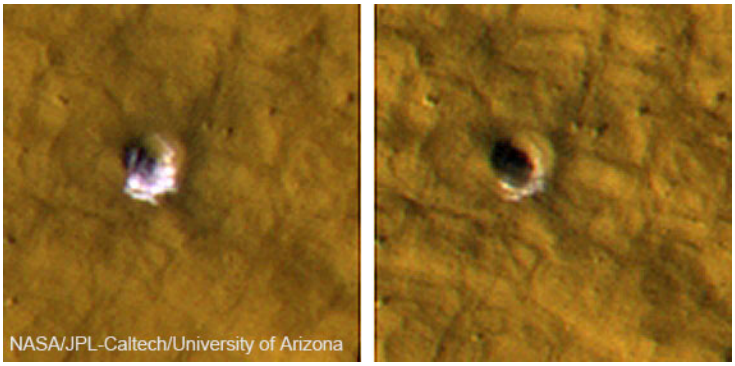
A. Gemini	_____ The Water Carrier
B. Cancer	_____ The Crab
C. Aries	_____ The Goat
D. Libra	_____ The Twins
E. Ursa Major	_____ The Dragon
F. Capricornus	_____ The Winged Horse
G. Leo	_____ The Scorpion
H. Draco	_____ The Bull
I. Pegasus	_____ The Archer
J. Taurus	_____ The Fish
K. Pisces	_____ The Hunter
L. Aquarius	_____ The Lion
M. Sagittarius	_____ The Scales
N. Scorpius	_____ The Ram
O. Orion	_____ The Great Bear

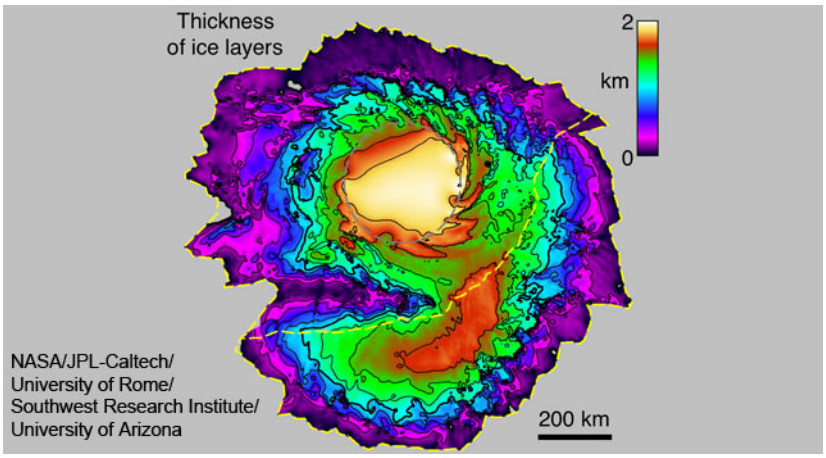
Answers on page 11

AstroSpace Update

November 2009
Gathered by Don Lynn from NASA and other sources

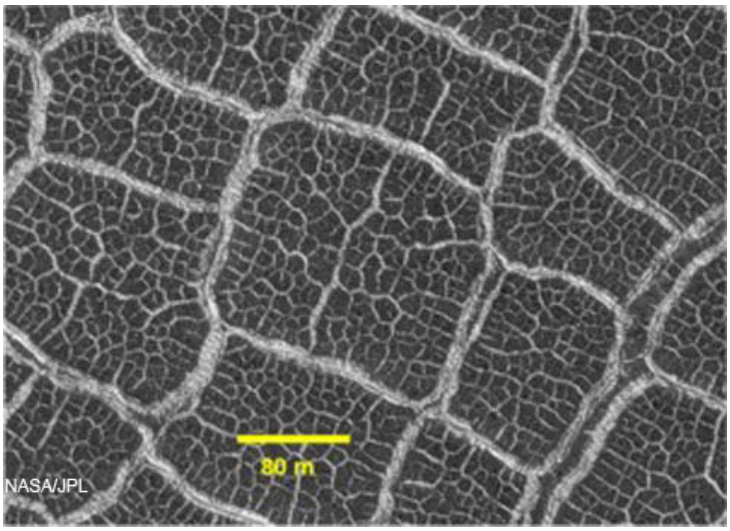
Mars Reconnaissance Orbiter (MRO) has imaged newly formed craters from meteorites striking Mars, and found them often to be surrounded by white material, which then fades over weeks. The white material was suspected to be subsurface water ice that was splashed out by the impact. So a spectrum was taken of one of the new impacts, and the material was indeed ice. The fading is caused by the ice subliming (evaporating directly from solid) and by dust settling over it. These white splashes can be used to determine where ice lies close to the surface of Mars, and make estimates of how deeply the ice lies beneath. One of these new icy craters is located about halfway between the pole and equator. From the Mars Phoenix mission and various radar experiments from orbiters, it was known that ice lies just below the surface near the poles, but the new observations extend that range to lower latitudes. Viking 2 landed on Mars in 1976 and dug into the soil as deep as 6 inches. The best estimate from the new MRO data is that ice lies less than 10 inches below the surface at the latitude of the Viking 2 landing. We may have barely missed discovering subsurface Martian ice in 1976 by not digging just a little deeper.





New 3-D imaging by the MRO radar of the **Martian north-polar ice layers** has been found consistent with theoretical models of Martian climate swings during the past few million years. The ice-rich layered deposits cover an area 1/3 larger than Texas and form a stack up to 1.2 miles thick atop a basal deposit with additional ice. Earlier radar observations indicated that the Martian north-polar layered deposits are mostly ice, with little rock and dust. These Martian deposits hold about 1/3 as much water as Earth's Greenland ice sheet. The radar results provide a cross-sectional view of the deposits showing that high-reflectivity zones with multiple contrasting layers alternate with more homogeneous zones of lower reflectivity. Patterns of how these types of zones alternate can be correlated to models of how changes in Mars' tilt on its axis have produced changes in the planet's climate in the past 4 million years or so. However, some possibilities for how the layers form have been ruled out – the observed pattern does not fit well with an earlier interpretation that the dustier layers are formed during high-tilt periods when sunshine on the polar region sublimates some of the top layer's ice and concentrates the dust left behind. Rather, it fits an alternative interpretation that the dustier layers are simply deposited during periods when the atmosphere is dustier. The most recent 300,000 years are a period of less dramatic swings in the planet's tilt than during the preceding 600,000 years. The top zones of the north-polar layered deposits (the most recently deposited portion) is strongly reflective, and correspond to periods of relatively small swings in the planet's tilt. The geographical center of the ice deposition shifted by about 250 miles at least once during the past few million years.

Images taken by MRO of giant **polygons** (up to 820 feet across) on Martian plains have been shown to be too large to have been formed by temperature changes in ice. The polygons that Mars Phoenix landed on, which were smaller polygons, definitely were formed by temperature change. The only method of forming larger polygons is from a lakebed drying up. This is one more piece of evidence that in the distant past (perhaps 4 billion years ago), Mars was warmer and wetter in order to form lakes. However, it has been proposed that lakes could have formed more recently by meteorite impact that melted subsurface ice. Such a lake would soon freeze over in the current Martian climate, but the polygons could form as the water under the ice layer slowly dried up.



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NASA's Space Place

Staring at Lightning

There's something mesmerizing about watching a thunderstorm. You stare at the dark, dramatic clouds waiting for split-second bursts of brilliant light — intricate bolts of lightning spidering across the sky. Look away at the wrong time and (FLASH!) you miss it.

Lightning is much more than just a beautiful spectacle, though. It's a window into the heart of the storm, and it could even provide clues about climate change. The strong vertical motions within a storm cloud help generate the electricity that powers lightning. These updrafts are caused when warm, moist air rises. Because warmth and lightning are inextricably connected, tracking long-term changes in lightning frequency could reveal the progress of climate change.

The Geostationary Lightning Mapper (GLM) on the next generation of GOES satellites will detect the very rapid and transient bursts of light produced by lightning at near-infrared wavelengths. This image was taken from the International Space Station and shows the Aurora Australis and lightning.

It's one of many reasons why scientists want to keep an unwavering eye on lightning. The best way to do that? With a satellite 35,800 km overhead.

At that altitude, satellites orbit at just the right speed to remain over one spot on the Earth's surface while the planet rotates around its axis — a "geostationary" orbit. NASA and NOAA scientists are working on an advanced lightning sensor called the Geostationary Lightning Mapper (GLM) that will fly onboard the next generation geostationary operational environmental satellite, called GOES-R, slated to launch around 2015.

"GLM will give us a constant, eye-in-the-sky view of lightning over a wide portion of the Earth," says Steven Goodman, NOAA chief scientist for GOES-R at NASA's Goddard Space Flight Center. Once GLM sensors are flying on GOES-R and its sister GOES-S, that view will extend 18,000 km from New Zealand, east across the Pacific Ocean, across the Americas, and to Africa's western coast.

With this hemisphere-scale view, scientists will gather an unprecedented amount of data on how lightning varies from place to place, year to year, and even decade to decade. Existing lightning sensors are either on the ground — which limits their geographic range — or on satellites that orbit much closer to Earth. These satellites circle the Earth every 90 minutes or so, quickly passing over any one area, which can leave some awkward gaps in the data. Goodman explains: "Low-Earth orbit satellites observe a location such as Florida for only a minute at a time. Many of these storms occur in the late afternoon, and if the satellite's not overhead at that time, you're going to miss it."

GLM, on the other hand, won't miss a thing. Indeed, in just two weeks of observations, GLM is expected gather more data than NASA's two low-Earth orbiting research sensors did in 10+ years. The new data will have many uses beyond understanding climate change. For example, wherever lightning flashes are abundant, scientists can warn aircraft pilots of strong turbulence. The data may also offer new insights into the evolution of storms and prompt improvements in severe weather forecasting. Staring at (FLASH!) Did you miss another one? The time has come for GLM.

Want to know how to build a weather satellite? Check the "how to" booklet at scijinks. gov/weather/technology/build_satellite.

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

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Spirit (Mars rover) engineering team is having difficulty in finding a procedure that frees test rovers (2 of them) in Pasadena from the sand trap built to duplicate where Spirit is stuck on Mars. Work with the test rovers continues, as does work with computer models of the rover and its sand trap. No attempt to move Spirit will occur until at least late October. MRO has taken amazing pictures of Spirit where it is sitting next to a small plateau named Home Plate.

Opportunity (the other Mars rover) – Analysis of the meteorite (nicknamed Block Island) recently found by Opportunity indicates that it probably fell billions of years ago, maybe 3 billion. This solves the mystery of why the impact of a meteorite this large would not have broken it into pieces. The atmosphere of Mars is thought to have been much thicker billions of years ago, which would have greatly slowed the fall of the meteorite.

Mars Phoenix (recent polar lander) – Analysis of the data from the Phoenix Telltale, a weight on a cord that fluttered in the wind, has resulted in new findings about Martian weather. Wind speeds and direction changed as the season changed. Easterly winds 9-12 mph prevailed during mid summer. Winds increased and came predominately from the west as autumn approached. The highest wind speed seen (up to about 35 mph) coincided with the passing of weather systems, when also the number of dust devils increased greatly. Some of the dust storms occurred with rather low wind speeds however.

LCROSS (lunar impact mission) – Remember when I told you last month that LCROSS was targeted for the crater Cabeus A? Forget that. The LCROSS team changed their mind. Now they will hit Cabeus, the slightly larger crater next to Cabeus A, early on October 9. New images of that area from spacecraft orbiting the Moon showed that the visibility of the plume from impact will be better at the new target. It also has a higher hydrogen content, but that had been known for some time.

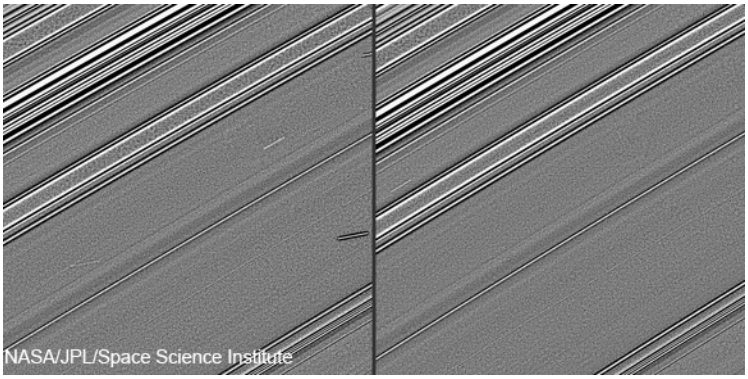
Chandrayaan-1 (Indian lunar orbiter) – Even though contact was lost with Chandrayaan-1, discoveries will continue to be made in the data it sent back. The newest discovery is water. The spacecraft's infrared mineral mapper showed both water and hydroxyl (a related molecule) in a number of areas. The detection did not exactly match the areas of permanent shadow near the poles, where water has been predicted. Instead some water detection was some distance from the poles, and some shadowed areas did not show water. The instrument is only capable of detecting material in the top fraction of an inch of the surface, so it is not known whether the water is only a surface effect or extends more deeply. The amount of water is not much – the peak detection is about one part in a thousand. That is drier than the soils of the driest deserts on Earth. There was some indication that the amount of water was varying over the course of a lunar day. Unfortunately follow-up on this cannot be done, since the spacecraft failed. If the water varies with time of day, then it is probably created by hydrogen in the solar wind striking oxygen in the Moon's surface and reacting to form water, which then evaporates. During the lunar night, no further solar wind strikes the surface and the water would be depleted. Because this discovery was expected to be controversial, the scientists looked for confirming data before announcing their findings. Similar detection of water and hydroxyl was found in data from the Epoxi mission, which flew by the Moon this past June on its way to Comet Hartley 2. There was enough data from Epoxi, which has a wider spectral range, to establish relations between the concentration of water and surface composition, temperature, latitude and time of day. Confirmation of water was also found in old Cassini data, from its lunar flyby of 1999 on the way to Saturn. Water in small concentrations was found in Apollo Moon rocks, but many scientists believed that the water was contamination from Earth's atmosphere. Many of the Apollo sample cases did not seal tightly, raising that possibility. The new findings support that at least some of the water in the Apollo rocks came from the Moon.

Cosmic ray intensity has increased to higher than any level measured in the past 50 years, exceeding the old record by 19%. The cause is the deepest lull in solar activity in that time period. Researchers have long known that the Sun's magnetic field and solar wind protect the solar system from cosmic rays. So when the magnetic field and solar wind are reduced, the cosmic rays increase. Cosmic rays are subatomic particles, mainly protons, accelerated to almost light speed, probably by distant supernovas. Earth is in no great peril from the increase, since its magnetic field and atmosphere protect it from cosmic rays. However scientists are beginning to rethink how much shielding from cosmic rays will be needed on manned spacecraft to the Moon, or anywhere else beyond the Earth's magnetic field. Cosmic rays generate beryllium 10, which is captured in polar ice. So by examining ice cores for beryllium, we know the intensity of cosmic rays for more than a millennium into the past. A few hundred years ago, the cosmic ray intensity was 2 to 3 times what today's relatively high level is.

Messenger (Mercury mission) flew by Mercury at an altitude of only 142 miles on September 29 for the 3rd and final time in preparation for going into orbit in March 2011. More than 1500 images were scheduled, covering much of the 10% of the planet that has never been seen by a spacecraft. Spectrometer measurements, solar wind monitoring, altimeter data gathering, and observations of the extremely thin atmosphere were also in the flyby plan. However, Messenger went into safe mode just before the closest point of the flyby, and no data was taken after that point. Much of the new area had already been imaged, leaving only the polar regions as yet unseen. The gravity slingshot was executed perfectly, so Messenger is now on target for the scheduled orbit insertion.

Cassini (Saturn mission) – Results are coming in from Cassini's observations of Saturn and its **rings** during the time when they became **edge-on** to the Sun, an event that happens twice in every Saturn year (29.5 Earth years). This is the first time a spacecraft has been at Saturn during this event. The main rings (the A, B, C & D rings) are extremely thin compared to their diameter – maybe as thin as 30 feet, though they are more than 20 times the Earth's size across. But when sunlight is hitting the rings edge-on, any thick or elevated spots cast very long shadows and can then be detected. Lumps in the A ring caused by gravitational disturbances from the moon Daphnis have been measured as high as 2.5 miles. This is much higher than the previous measurement, probably due to Daphnis having a particularly close pass by the ring. The biggest surprise was seeing so many places

above or below the rings. Several propeller-shaped features, a few miles long, were found to be casting shadows and therefore are above the ring. Moons orbiting within the ring are known to make these shapes by their gravitational disturbance on tiny ring particles orbiting nearby. Though the moons are too small to see, they are calculated to be about 100 yards across. Streaks up to 3000 miles long have been found to form and dissipate within the rings, and the new observations showed that the streaks are above the rings. They are thought to be caused by meteorites hitting the ring. The meteorites have been calculated to be only about a yard across. The new observations support meteorites as the cause. Temperature measurements of the rings showed the lowest temperature (minus 382° F.) ever seen for those rings, a result of reduced sunlight hitting them.



Cassini has watched 9 different lightning storms during its 5 years orbiting the planet. The current storm is the longest lasting and most powerful storm ever seen at that planet. It has raged for nearly 9 months; the previous record was 7.5 months. Lightning discharges in Saturn's atmosphere emit very powerful radio waves which are about 10,000 times stronger than Earthly counterparts. Storms typically are about 3000 miles across.

CoRoT (stellar seismology and planet-finding space telescope) has discovered an exoplanet that has now been proved to be rocky. Nearly all exoplanets known are obviously (by their mass) gas giants. This is because larger planets are easier to detect, not necessarily because they are more common. The evidence for this being a rocky planet is the strongest for any exoplanet. Its diameter was measured from transit data (crossing in front of its star) as being 14,200 miles, and the mass (5 times Earth's) was calculated from its wobbling effect on its star, measured spectroscopically. The density was calculated from the mass and diameter, and that density could only be explained by a rocky planet. The newly found planet circles its star every 20.4 hours, making it the fastest orbital motion of any planet known, and the closest to its star (23 times closer than Mercury is to our Sun). The star heats the daytime side of the planet to about 3600° F., while the night side is probably about 400° F. This is the 7th planet found by CoRoT, and so the star is being known as CoRoT-7 and its planet as CoRoT-7b. Measuring the star's wobble was difficult because of the small size of the planet and because the star has many huge starspots. But the HARPS spectrograph on the 3.5-meter telescope at La Silla, Chile was up to the task. In fact, it found that there is a second planet orbiting the same star, which does not transit the star. This planet, known as CoRoT-7c, has 8 times the mass of Earth and orbits every 3.7 days. The system is about 500 light-years away in Monoceros.

Spitzer (infrared space telescope) has imaged strange behavior in a planet-forming region, which may tell us something about that process. Planets form out of swirling disks of gas and dust around young stars. Spitzer observed in infrared light one such disk for 5 months. Surprisingly, the light varied in unexpected ways, in as little time as 1 week. Both intensity and the wavelength varied over time. Planets take millions of years to form, so it's rare to see anything change on time scales humans can perceive. One possible explanation is that a close companion to the star. Either a star or a developing planet could be shoving planet-forming material together, causing its thickness to vary. The astronomers plan to follow up with ground-based telescopes to see if a companion is tugging on the star hard enough to be detected. Spitzer will re-observe the star to see if the variations show any periodic behavior, as would be caused by an orbiting companion.

WISE (infrared space telescope) is being readied for launch in December. Why do we need another infrared space telescope? Because WISE is designed with a wide field that will allow it to survey the entire sky during its lifetime, while the field of view of Spitzer is too small for that. WISE is more than 500 times as sensitive as previous infrared survey space telescopes, such as IRAS, due to technological improvements. Scientists using WISE hope to find asteroids that are dark enough to escape detection with visible light, find brown dwarfs (stars too small to sustain nuclear burning), and help understand star formation and the evolution and structure of galaxies. WISE will also be making a catalog of infrared objects to be used by the James Webb Space Telescope, the planned infrared follow-on to the Hubble Space Telescope. Because WISE itself glows in infrared at any reasonable temperature, it will be launched with a block of frozen hydrogen in it, which will keep the telescope at -433° F. WISE is designed to map the entire sky in 6 months.

Instant AstroSpace Updates

A high school student from West Virginia, while working with scientists from the Byrd Green Bank radiotelescope, discovered a **transient pulsar**. Only about 30 of these are known, and the cause of their radio signals coming and going is still unknown.

Researchers have discovered a series of chemical reactions on Saturn's moon **Titan** that form diacetylene and related chemicals (polyynes) which then act as a shield to ultraviolet radiation, like the ozone layer does on Earth. The reactions may also produce the large organic molecules that compose the thick orange haze in Titan's atmosphere.

A new analysis of the cosmic microwave background, as seen by the WMAP spacecraft, but not using the previous statistical method (known as spherical Mexican hat wavelets), failed to find the infamous **cold spot** in the Universe. Apparently the cold spot

(continued next page)

does not exist, but was just a statistical fluke, probably embarrassing some scientists who were trying to explain the cold spot with some really far-out explanations.

A radar study of meteors taking 7 years found 62 **new meteor showers** that had never been recognized before, many of which were identified with a parent comet or asteroid that shed the debris comprising the shower. About half of all observed shower streams were found to have orbits similar to other showers, so probably broke off from the same parent body.

Study of light from **Haumea** (dwarf planet) as it rotates found a dark spot that is somewhat richer in organic compounds or minerals than the remaining surface. The spot could be the result of a recent impact, and could represent material of the impacter or subsurface material churned up.

Scientists using computer filtering techniques that emphasize faint objects have concluded that **Comet Holmes**, during its famous outburst (brightening by a million times in a day) in 2007 ejected numerous small comet pieces that moved radially away at speeds up to 280 mph. As ice sublimed from the surfaces of the pieces, each created its own cloud like a mini-comet, a process never seen in any other comet.

Lunar Reconnaissance Orbiter (LRO) has moved to its final orbit just 31 miles above the lunar surface to begin its mapping mission. It has already detected hydrogen, which may indicate water ice, around the lunar south pole, and temperatures as low as minus 396° F.

An **Ares I-X** rocket is scheduled for launch October 27. This is an Ares I, the smaller of the 2 replacement rockets for the Shuttle, but with dummy second stage, crew capsule, and other parts, so that only the first stage is being tested.

Scientists have produced red Mars-like dirt by tumbling dry sand and magnetite for months. This showed that the generally accepted explanation for the **color of Martian soil**, that it rusted in the presence of water, may not be correct.

The recently launched **Planck** spacecraft has captured its first images of the Cosmic Microwave Background and will spend the next 15 months surveying the entire sky twice. ■

The California Nebula as imaged by Garth Buckles on May 8, 2009. Garth used an AP 130mm f/6 with field flattener and an STL-11000 imager. Large, extended objects such as this are best captured via imaging, although binoculars can usually provide a wide-enough field of view to satisfy the casual observer.

Magazine Subscriptions

Subscriptions to the Astronomy magazines are now due for renewal, if you subscribed for one year or would like to subscribe at the club rate. You may also extend an existing subscription that does not end in December for one year at the club rate. Bring your check made out to the OCA to the meeting or mail it to:
Charlie Oostdyk, Orange County Astronomers, PO Box 1762, Costa Mesa, CA 92628. ***Checks made out to the magazine publishers cannot be processed and will be returned to you***. If you already subscribe, please provide the mailing label or the billing invoice with your check. One-year rates are as follows:

	Club Rate	Regular Rate
Sky & Telescope*	**$33.00**	$42.95
ASTRONOMY	**$34.00**	$42.95

***Sky & Telescope subscribers please note: Due to a change by the publisher, renewals of current subscriptions should now be made directly through Sky and Telescope! New subscriptions at the club rate must still be made through Orange County Astronomers and then renewed through the publisher.**

The **DEADLINE** for subscribing at the club rates will be the **October monthly meeting, October 16th.** The publishers will send expiration notices to all current club subscribers about November 1st even if you renew through the club. It takes the publishers a few weeks to process renewals.

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

STAR SIGNS ANSWER KEY

A. Gemini - The Twins
B. Cancer - The Crab
C. Aries - The Ram
D. Libra - The Scales
E. Ursa Major - The Great Bear
F. Capricornus - The Goat
G. Leo - The Lion
H. Draco - The Dragon
I. Pegasus - The Winged Horse
J. Taurus - The Bull
K. Pisces - The Fish
L. Aquarius - The Water Carrier
M. Sagittarius - The Archer
N. Scorpius - The Scorpion
O. Orion - The Hunter

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