SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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UPDATE: OCTOBER MEETING MOVED TO OCTOBER 7TH!

This photo, by longtime OCA member Monsingor Ron Royer of Springville, CA, is a composite showing all three recent supernovae in M51 (1994, 2005, 2011). The magnitudes of two foreground stars are also shown as a reference.

OCA CLUB MEETING

The free and open club meeting will be held October 7th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, our featured speaker is Marina Lazarova, Ph.D candidate in physics at UC Riverside, presenting 'Catastrophic Galaxy Collisions and the Birth of Quasars'.

NEXT MEETINGS: Nov. 11th, Dec. 9th

STAR PARTIES

The Black Star Canyon site will be open on October 1st. The Anza site will be open on October 22nd. 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, October 14th at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana. Next month the class will be offered on November 4th.

GOTO SIG: TBA

Astro-Imagers SIG: Oct. 18th, Nov. 15th

Remote Telescopes: TBA

Astrophysics SIG: Oct. 21st, Nov. 18th

Dark Sky Group: TBA

Around OCA for October 2011

By Barbara Toy

OCA Observatory Custodian and Member Liaison

The summer monsoon season out in the Anza area normally hits us in August, but this year the most intense storm system to hit us was well into September, on the 13th, to be exact. According to one of the weather stations on site, we had 3.63 inches of rain with hail in about three hours, most of it in a two-hour period with a particularly intense period of about 15 minutes at a rate of 2.1 inches per hour. If you want to see the data for yourself, check the SW Aguanga weather station on Weather Underground for September 13, 2011 (and note that the hail took out the wind vane part way through the storm). Needless to say, there was a lot of damage to the roads going to the site as well as on the site itself. Gary Schones made arrangements with one of our neighbors to repair the roads on our site, and club members who have homes out there have been keeping us posted on progress on repairs to the surrounding roads, where the erosion was so bad in one area that utility lines were left exposed for several hundred feet.

We generally post information about the Anza site and other matters of immediate importance of club members on the two club Yahoo Groups, OCAstronomers@yahoogroups.com, and AstroImagers@yahoogroups.com. If you're planning to go out to Anza, it's generally a good idea to check for any recent postings about conditions out there before you leave, or, if nothing has been posted, you may want to send an inquiry about conditions, particularly if the weather has been unsettled. If you see a lot of thunderhead activity over the desert (such as those billowing mushroom-like clouds that we can see when looking inland from Orange County during monsoon season), that is a sign that we may very well have had thunderstorms at Anza, too.

Our thanks to Tom Caldwell and Rick Wiggins for their efforts to keep us informed about developments after the storm; Tom's email after the storm was the first notice we had about this situation, and he made a special trip to our site to check for damage before emailing us even though it must have been something of a challenge to deal with the roads between his house and our site. Tom was also the person who let us know about the fire that burned over about a third of the Anza site several years ago – we really appreciate all he has done over the years to help keep us informed of conditions on our site when other club members aren't there and for keeping an eye on it for us.

The Pacific Astronomy and Telescope Show (PATS)

As I write this, the first day of PATS has just ended, and I hope you all had a chance to attend it. I'm happy to report that our club booth saw a steady stream of people coming by. There were quite a people who were interested in learning about the club as possible future members, which was gratifying, but there were also a number of past members who came by to check on what we're doing, a lot of current members who came by to chat or find out the latest information on the situation at Anza (the storm was just a few days before), and a lot of friends and acquaintances from other clubs and organizations who came by to say "hi" and catch up. People from the Planetary Society and from the new Columbia Memorial Space Center came by to explore possible ways we could connect and help each other out – showing what a great networking event this can be.

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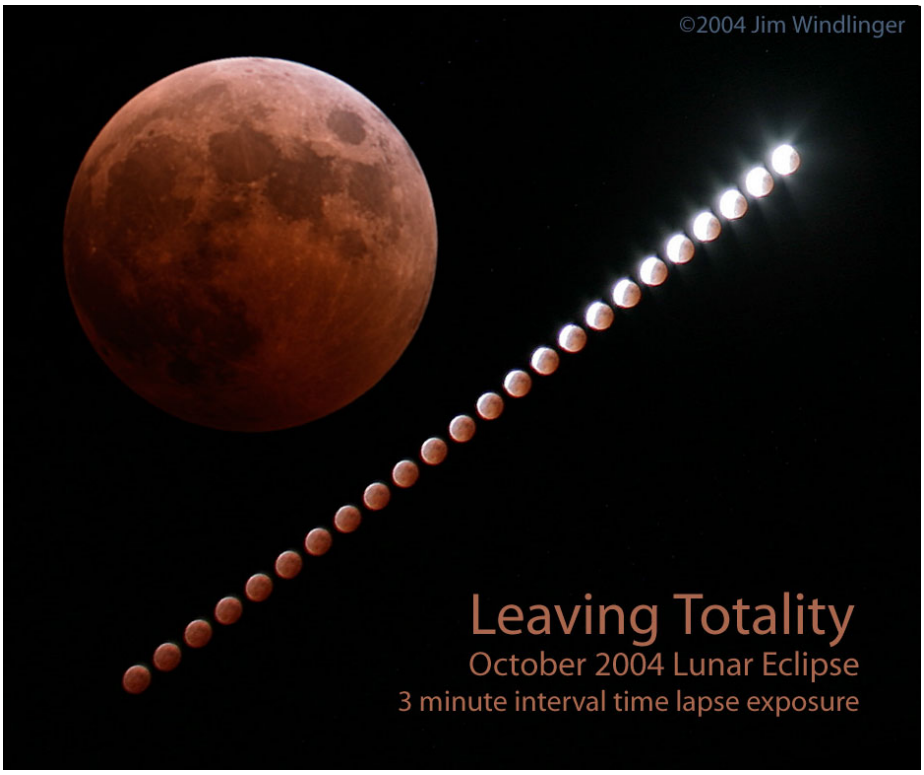
TOP TWENTY THINGS AN ASTRONOMER SHOULD SEE

1 A Total Solar Eclipse—Part 2

By Helen Mahoney



Total eclipse trips have many layers. There are the fascinating people, the interesting places, and the amazing eclipses themselves. I have shared the Moon's shadow with authors, astrophotographers, comet finders, and world-class astrophysicists such as John Sanford, Joel Harris, Noel Munford, Monsignor Ron Royer, David Levy, Rodney Austin, Alan Hale and Tom Bopp, and Alex Filippenko. I have walked the streets of Ephesus; seen the Acropolis lit up at night outside my hotel window; visited Inca, Minoan, and Hittite ruins; and touched Uluru (Ayers Rock).

I saw several partial eclipses growing up. I would make a pinhole camera to see the bite taken out of the sun. One morning, I awoke to see a partially eclipsed sun making a line of crescents on my wall as it shone through the string holes of my Venetian blinds. My first total eclipse was in 1979 in Oregon. It was cloudy, so I couldn't see the corona. But it got dark as night, the temperature dropped, the birds got quiet, and the cows started to walk back to the barn. My appetite had been whetted; however, it was not until 1991 that I had the opportunity to travel to Baja California to see the next one. That eclipse, at seven minutes, was the longest totality I have experienced. That time, I was able to see the whole enchilada—the diamond ring, the brilliant corona, the prominences, and the sunset colors around the horizon. It was magnificent! At first contact, when the moon takes the first tiny bite out of the sun, I have a rush of feelings. The sun is going away, and there is nothing I can do about it. It truly reminded me of my first labor pain. Something wonderful was happening by itself. I couldn't control it, but I was part of it. It was such a mixture of excitement and fear.

Everyone hovers over an eyepiece or grabs binoculars to see first contact. Then, with confirmation that we are here on the right day, they busy themselves with preparation. As more of the sun is taken away, people play with the crescent-shaped sun images, some punching holes with words or designs in cardboard, and projecting the little crescents. When the sun is half gone, it becomes noticeably darker—like a cloudy day without clouds. It's an eerie feeling, and my body shivers a little. When there is a tiny crescent of sun left, things happen so quickly. Everyone is making last minute checks on their equipment. My heart is racing in anticipation. Venus appears. The temperature drops rapidly. The smaller the crescent of sun, the faster things happen. I see the clouds in the distance darken, as the Moon's shadow over takes them. The sky darkens like a time-lapse video of a sunset, with a ring of sunset colors 360 degrees around me on the horizon. Some people are watching for shadow bands; some are watching the approaching shadow, some are waiting for the precise moment to remove their solar filter to get the shot of the emerging corona. I want to see it all. Still using solar filter glasses, I see the sliver of sun disappear behind the mountains of the moon, with the last bits—called Bailey's Beads—peeking through the valleys. I put my solar filter down to see the last brilliant bead showing through as the corona begins to emerge around the moon—a dazzling effect known as the Diamond Ring—shining for a moment, then gone!

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AstroSpace Update

October 2011
Gathered by Don Lynn from NASA and other sources

Diamond planet – Astronomers have found a planet-size object that probably consists of mostly carbon and has such a high density that it is likely diamond. It is orbiting a pulsar so closely that the pulsar had to have gravitationally stripped much of the mass of the object. So it probably started life as a star, but got stripped down to planet size. A pulsar is a spinning neutron star as small as a city, but with more mass than our Sun. This pulsar is a millisecond one, that is, it spins completely every few milliseconds. Each time a pulsar spins, a beam of radio waves from it sweeps past us. Tiny variations in the timing of these radio pulses allowed astronomers to infer the presence and properties of the newly discovered "diamond planet". The system is about 4000 light-years away in Serpens. The orbital period is just 130 minutes, and the distance between the 2 objects is 370,000 miles (600,000 km), a little less than the radius of our Sun. This is so close to the pulsar that tidal forces would rip the "planet" apart if it is any larger than half the diameter of Jupiter, so we know that it is smaller than that. The pulsar was discovered in a systematic search for pulsars in the whole sky, using the radiotelescope in Parkes, Australia. White dwarf stars are common companions to pulsars, so it is likely that the newly discovered object started out as a white dwarf. If so, then it lost over 99.9% of its mass in the stripping process. White dwarfs have cores of carbon and oxygen, and it is part of this core that now remains. The rarity of objects of this mass orbiting pulsars implies that it is unusual for a white dwarf to be stripped down so far and yet not disappear entirely.

Kepler (exoplanet [planets outside the solar system] hunting spacecraft) data showed that one of the planets that it discovered has been running a little late or early, indicating that another planet was orbiting the same star and perturbing it. Searches for transits (passes in front of its star) of the 2nd planet were unsuccessful, probably indicating that it passes above or below its star from our viewpoint. This is the first definite detection of a previously unknown planet using this method. The star has been designated Kepler-19, is 12th magnitude, and is 650 light-years away in Lyra. The 1st planet there is called Kepler-19b and the 2nd Kepler-19c. The former orbits its star 11 times closer than Earth does to our Sun, takes only 9 days and 7 hours for its year, has a diameter more than twice that of Earth, and is heated by its star to about 900° F. (480° C.) We know nothing about Kepler-19c, except that it exists. Many different masses and periods could possibly produce the perturbing effects seen on Kepler-19b. Observations will continue to try to pin down some information on Kepler-19c.

Exoplanets and disks – It had been noticed by astronomers that many of the exoplanets discovered by the radial velocity method orbited stars that showed excess infrared, which is the signature of a disk of debris surrounding the star. But none of the exoplanets discovered by the transit method showed signs of a debris disk. To test if this was a real difference, a team of astronomers searched through archived infrared mission data for all known transiting planets. Data was found for 52 of the 93 (at the time) known transiting planets, and only 2 of them (4%) had definite signs of debris disks. This was compared to a previous study looking for debris disks for radial velocity planets, which had found 7% with debris disks. More data is needed to determine if this difference is a fluke or represents a real difference between these 2 types of planets.

Exoplanets galore – Astronomers using the HARPS spectrograph on the 3.6-meter telescope in Chile announced more than 50 newly discovered exoplanets, including 16 super-Earths, one of which orbits at the edge of the habitable zone (where temperatures allow liquid water). Super-Earths are defined as planets with more mass than our Earth, but less than 10 times its mass. There are no super-Earths in our solar system, but they appear to be very common around other stars. This is the largest number of confirmed exoplanets ever announced at one time. In the 8 years since HARPS began surveying Sun-like stars for planets, it has discovered more than 150 of them. Because it is sensitive to extremely small shifts in spectra, it can detect the smallest planets. Its current capability is about 2 Earth masses. Analysis of the planets discovered by HARPS shows that super-Earths and Neptune-size planets (very roughly 17 times Earth's mass) are common orbiting Sun-like stars. At least 40% of such stars have at least 1 planet smaller than Saturn. The majority of Neptune and smaller sized planets are found in systems with other planets. Statistics on smaller planets have been hard to come by because most exoplanets are found by methods that are far more sensitive to larger planets.

Higgs, or not – Scientists announced early in August that data from the Large Hadron Collider (LHC, particle accelerator in Switzerland) showed with 99% certainty that a particle was being created in the right range to be the long-sought Higgs particle. But 99% in a single experiment is not good enough to claim a discovery. So they kept on colliding particles and taking data, and instead of the probability rising, it dropped to only 95% certain. So maybe the results seen are merely statistical fluctuations. According to the standard model of subatomic particles, the Higgs boson is responsible for endowing every other particle with its particular mass. Higgs is the last remaining particle in the standard model yet to be detected. 2 experiments at the LHC have both recorded "excess events", that is, slightly more events with W boson particles than would be expected if the Higgs does not exist. The excess occurred in the region between 130 and 150 gigaelectron volts (a measure of particle mass), which is the expected mass range of the Higgs. The LHC is now operating at 7 teraelectron volts (here a measure of energy, which is of course equivalent to mass by Einstein's equation $E=mc^2$). The LHC is designed to reach 14 teraelectron volts, which is scheduled to be reached by 2014.

Y brown dwarfs – Scientists using data from WISE (infrared space telescope) have discovered the coldest class of star-like bodies, with temperatures as cool as 80° F. (27° C.) The class already had a name: Y brown dwarf. Astronomers had searched for these for more than a decade without success. They are nearly impossible to see in visible light. In infrared, WISE was able to spot 6 of them relatively close by, within a distance of about 40 light-years. Brown dwarfs are sometimes called failed stars, because they are too low in mass to sustain atomic fusion at their cores, the source of power for normal stars. Instead, brown dwarfs cool and fade with time, until what little light they do emit is at infrared wavelengths. So far, examination of WISE data has revealed 100 new brown

dwarfs, including the 6 that are so cold that they qualify for the Y class. More discoveries are expected. The Y dwarfs range from 9 to 40 light-years away. The closest of these, pending verification, will become the 7th closest star system to the Sun. To confirm the brown dwarf candidates found in the WISE data, the team took spectra with the Hubble Space Telescope and large Earth-based telescopes looking for water, methane and ammonia, which occur in brown dwarf atmospheres.

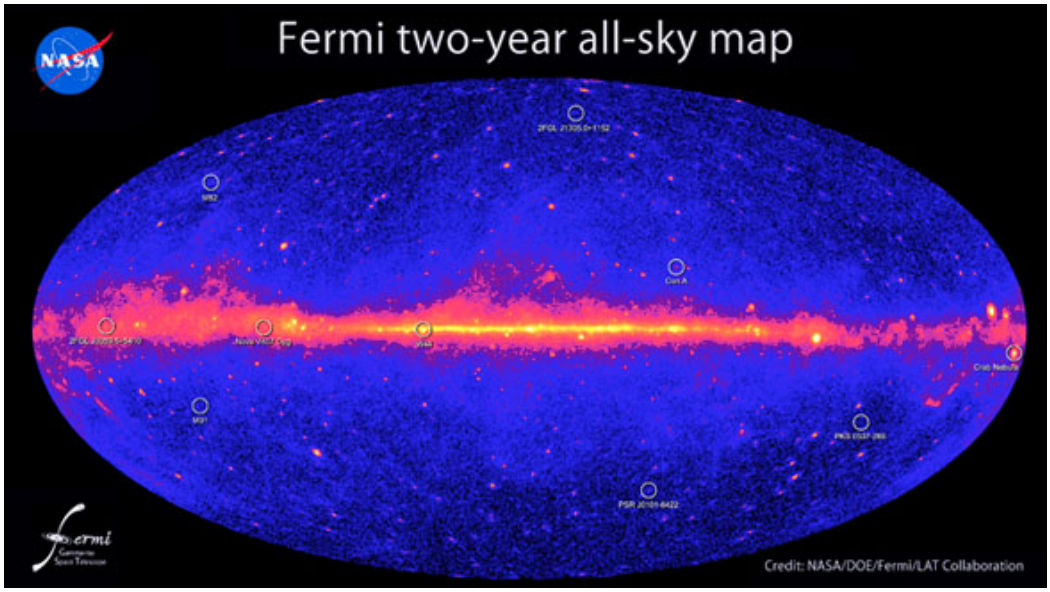
Brown dwarf weather – A team of astronomers has observed extreme brightness changes on a nearby brown dwarf, known as 2MASS J21392676+0220226, or 2MASS 2139 to its friends. Possible explanations of this include a gigantic storm rotating into/out of view, or holes in the cloud deck that reveal hotter atmosphere. The observations were made with an infrared camera on a 2.5 meter telescope in Chile. The brightness was seen to change by 30% in less than 8 hours, the largest variation ever seen on a cool brown dwarf. The variations in brightness vary over weeks and months, so apparently the weather is changing on this brown dwarf. Because old brown dwarfs have similar atmospheres to giant planets, studying this brown dwarf could shed light on weather of exoplanets.

Primitive star – A team of astronomers using the VLT telescope in Chile have discovered a star, designated SDSS J102915+172927, composed almost entirely of hydrogen and helium, with extremely little of the other heavier elements. It has the least of other elements of any known star, more than 20,000 times lower than our Sun. Since the Big Bang produced hydrogen and helium and little else, the first stars to form afterward were of this composition. Later generations of stars contain heavier elements that were created in the first stars and their supernovas. But theoreticians tell us that the first stars should have formed with very large masses, which caused them all to have ended their lives billions of years ago (the more massive a star is, the more quickly it fuses through all its fuel). So why is this low-mass primitive star still in existence? The theoreticians are going back to their drawing boards to answer that one. Another issue is that the newly discovered star actually has less lithium (50 times less) than the trace amount that the Big Bang created. So somehow the star had to have destroyed its lithium. More theory that needs revising. Further observations with the VLT have found more possibly similar stars, and these will be investigated.

Herschel (infrared space telescope) has discovered that galaxies do not need to collide with each other to drive vigorous star birth. Herschel observed 2 patches of sky, which were found to contain more than 1000 galaxies at a variety of distances from us. It has been known for some years that the rate of star formation peaked in the early Universe, about 10 billion years ago, when some galaxies were forming stars 10 to 100 times as fast as is happening in our galaxy today. In the nearby, present-day Universe, such high birth rates are rare and always seem to be triggered by galaxies colliding with each other. It had been assumed that this was always true. But the Herschel results show that that vigorous star formation is linked to the quantity of gas contained, not with collisions. It is only in galaxies that have run out of gas, which is the norm today, that collisions are needed to add gas that triggers high rates of star formation. This finding agrees with a recent study using Spitzer infrared space telescope data, reported here 2 months ago, which found that galaxy growth in the early Universe was correlated with gas falling into it.

Galaxy jets – A galaxy, being called Speca by the researchers studying it, has been found to have giant jets of particles shooting out from the disk around its supermassive central black hole. Almost all galaxies with such jets are elliptical galaxies, but Speca is a spiral galaxy, only the 2nd one known with jets. The particles in galaxies' jets are often thrown out in separate episodes. Speca is only the 2nd known galaxy to show evidence of 3 separate episodes in its jets. The outermost radio-emitting lobes, which are the result of the earliest episode, are old enough that their particles should have lost most of their energy and ceased to produce radio emission. The researchers propose that the oldest lobes have been re-lighted by shock waves from rapidly moving material falling into the cluster of galaxies. Speca is about 1.7 billion light-years away.

Fermi (gamma-ray space telescope) scans every 3 hours the entire sky in gamma rays, the most energetic form of light. Every year, scientists reanalyze all data to produce an updated gamma-ray map of the sky. It shows the relatively steady sources in addition to numerous transient events, such as flares on the Sun and distant gamma-ray bursts. The latest map was released. More than ½ the relatively steady sources have been identified as blazars, which are active nuclei of galaxies whose jets are by chance aimed at Earth. In decreasing order of frequency, other steady sources are: unknown, pulsars, supernova remnants, non-blazar active galaxies, high-mass binary stars, globular clusters, and normal



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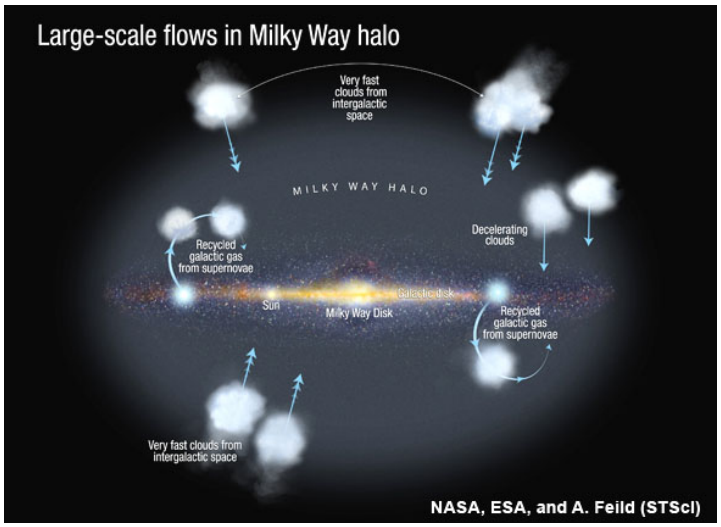
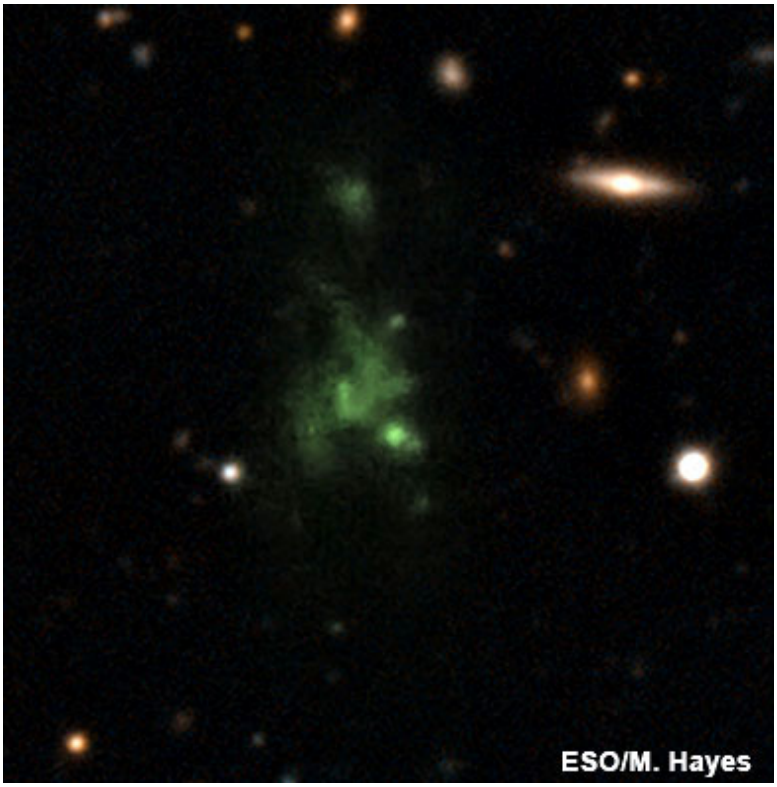
galaxies. The binary stars typically contain a white dwarf and a red giant, a formula known to cause novas when too much mass is pulled gravitationally between the pair. The unknowns, which represent 31%, are gamma-ray sources that lie where no object is seen at any other wavelength (visible, infrared, radio, X-rays, ultraviolet). The unknowns are where some great discoveries are sure to be made.

Chandra (X-ray space telescope) has discovered a pair of supermassive black holes in a spiral galaxy (NGC 3393), about 160 million light-years away. They are separated by only 490 light-years. The black holes are likely the remnant of a merger of 2 galaxies of unequal mass a billion or so years ago. Previous observations had shown a black hole in this galaxy, but Chandra's new observations were the first to resolve it into 2. This may be the first known instance where a merger of a large and a small galaxy produced a pair of supermassive black holes. One galaxy must have been small because there is no visible disruption remaining in the large galaxy. Masses of the 2 black holes have not been determined yet, but both appear to be more than a million times the Sun's mass. Both black holes are heavily obscured by dust and gas, which makes them difficult to observe in visible light. Because X-rays are more penetrating, Chandra can see the black holes. Other recent Chandra observations have seen what appear to be another pair of supermassive black holes, but in a much more distant galaxy (about 2 billion light-years away), which will make them harder to observe than the newly discovered pair.

Hubble Space Telescope (HST) – Researchers using HST measured for the first time the distances to fast-moving clouds of ionized gas previously seen covering a large fraction of the sky. These clouds reside in the outer parts of the Milky Way and contain huge quantities of gas. The Milky Way would rapidly change its gas into stars if no supply of new matter were available to replenish the gas. Astronomers have hypothesized that the ionized fast-moving gas clouds could be this replenishment, but it was not known if they were interacting with the Milky Way. Gas clouds can be identified and studied because elements in the cloud absorb certain wavelengths of light from a star or other light source that is shining through the cloud on its way to us. Earlier studies of these clouds used light from quasars, but were not successful in determining the locations of the clouds. The new study selected 27 stars around the Milky Way, whose distances were known, and used HST to take line-of-sight readings of their light. Results from the stellar sample showed the ionized clouds largely reside in the Milky Way's halo. The new observations revealed the presence of ionized gas in ½ the stellar sample, comparable to the fraction observed using quasars. The gas clouds



are not uniformly distributed around the Galaxy. The conclusion is that the Milky Way will have fuel from these clouds to continue forming stars. This research also confirmed models that predicted gas falling into the Milky Way slows as it approaches.

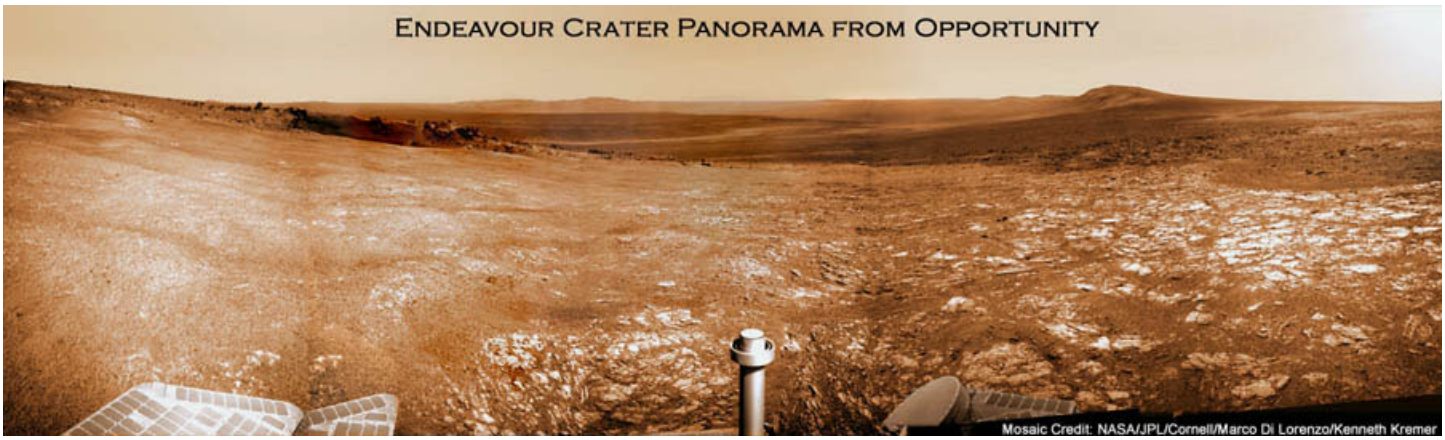


Lyman-alpha blob – Observations using the VLT telescope in Chile showed that the light from a Lyman-alpha blob is polarized. This means the light was scattered off material in the blob, and so originated not in the blob itself, but from galaxies within the blob. Lyman-alpha blobs are some of the biggest objects in the Universe: gigantic clouds of hydrogen gas that can reach diameters of a few hundred thousand light-years, larger than a galaxy. They are typically found at large distances, so we see them as they were when the Universe was only a few billion years old. But the power source for their extreme brightness has remained unclear until now. The blob measured, designated LAB-1, was found to be polarized in a ring around the central region, with no polarization in the center, just what is expected if light from galaxies within is being scattered off gas in the blob. LAB-1 is one of the largest such blobs, spanning 300,000 light-years.

Cold Mars – Many planetary scientists believe that Mars, now cold and dry, billions of years ago had a liquid water ocean covering parts of its surface. A recent paper proposes that much of that ocean was very cold and partly frozen. They noted that there is a lack of clays (phyllosilicates) in

the northern lowlands, compared to equatorial regions, and that implies the north was very cold. Computer models of the Martian climate back then show that glaciers may have formed about the northern ocean. More research is planned.

Opportunity (Mars rover) has begun scientific observations on the rim of the planet's huge Endeavour Crater (14 miles across or 22 km). The rover found a small crater (about 66 ft or 20 m across), which has been named Odyssey, right on the rim of Endeavour, and has begun taking spectra of the rocks that apparently were thrown out when Odyssey was created. The soil on Endeavour's rim is of a different texture than any that Opportunity has seen so far. The "blueberries" (iron-rich concretions) seen plentifully elsewhere are absent. One large rock examined, named Tisdale 2, has a light-colored top coating, and has been found to have different mineral content than any previously examined Martian rocks. It has higher zinc and bromine content, although it otherwise resembles other Martian volcanic rocks. Scientists have commented that reaching the Endeavour area is like a 2nd landing site for Opportunity. On the final traverses to Endeavour the rover saw ragged outcrops unlike anything see so far. It also spotted an apparently sedimentary rock that's been cut and filled with veins of material possibly delivered by water. A high priority for the rover is to find the clay minerals that have been seen in this area by the Mars Reconnaissance Orbiter.



Cassini (Saturn mission) passed quite close to Hyperion in late August, obtaining spectacular pictures of the moon. It looks like a sponge due to strange erosion of many of its impact craters. Hyperion is small, just 168 miles (270 km) across. It has an irregular shape, and it rotates chaotically as it tumbles along in orbit. This odd rotation prevented scientists from predicting exactly which side would face the spacecraft cameras during this flyby. Another close pass by Hyperion is scheduled for September 16.

Earth's size – Since Darwin's time, scientists have speculated that the Earth might be expanding or contracting. That was the prevailing belief until scientists developed the theory of plate tectonics. But some scientists have continued to speculate on Earth's expansion or contraction. A new study combining satellite laser ranging, very-long baseline radio interferometry, the global positioning system (GPS), DORIS (French satellite system to determine satellite positions), and data from GRACE (Earth's gravity measuring satellite) has measured the size of the Earth to be changing at most .004 inches (0.1 mm) per year, which means the Earth is not changing in size to within the measurement uncertainty. The study calculated the location of the center of mass of the solid part of the Earth (excluding liquid water) over time.

GRAIL (lunar gravity mission) – The twin GRAIL spacecraft were launched from Florida on September 10 to study the interior of the Moon. They will do this by flying in formation close to the Moon's surface and monitoring the distance very precisely between the 2. This will allow calculating the mass within the Moon at various depths as the pair flies over. The spacecraft will take about 3.5 months to reach the Moon, due to taking low energy paths, thereby reducing the launch cost. Science collection is scheduled to take 82 days.

Sunspot prediction – A new method of analyzing sound waves seen on the surface of the Sun is able to detect forming sunspots 1 or 2 days before they rise to the surface and become visible. The sunspots are as deep as 40,000 miles (65,000 km) when first detected. The method was developed using data from the SOHO and SDO solar observatory spacecraft. The forming sunspots, because of their magnetic properties, change the speed of propagation of sound waves traveling through the Sun, and thus are

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I think Kyle Coker and Alan Smallbone spent the most time running the booth on Saturday, but Matt Ota, Frank Kloer, Larry Gershon and Marilyn Saeed also helped out – having a group of people to trade off time in our booth gave variety for the people coming by and allowed us all to check out other areas in the Exhibit Hall as well as to attend some of the talks, all of which made it a really nice day. Matt generously agreed to open the booth on Sunday, and he, Shelia Cassidy and James Monroe are to run the booth that day.

There were a number of club members at other booths – Wally Pacholka had an extensive display of his images for sale at his booth (and let us use a couple to dress up the club booth), Kevin Nelson ran the QSI booth (and gave a talk), Joel Harris ran his Twilight Tours booth (and also gave a talk), Mia Ishikawa and Jimmy Nguyen were running the Hutech booth (Ted was at another event in Ohio and had to miss PATS this year), Bob Buchheim helped at the SAS booth, Tim Hogle at the WAA booth Michael Rudy at the Mt. Wilson booth, and there may have been others I didn't have a chance to talk to. It was great to see club members involved in so many different areas at this conference!

Other items of interest – the astroimaging conference the day before PATS (which is an associated event) was reported to be very worthwhile by the people I talked to who attended, there were a lot of interesting talks, the vendors all seemed to be doing good business, and there was conversation everywhere – people enthusiastically greeting old friends, clusters of people discussing all kinds of things, and everyone generally having a good time. Those who know me won't be too surprised to hear that I seemed to spend most of the day in conversation myself – to all kinds of people, including some club members I haven't seen in a long time and usually only see at events like RTMC or PATS. It was a fun and informative event, and, if you weren't able to go this year, you should really put PATS on your list of events to go to next year.

And here's a big "thank you" to all the volunteers who helped us out at the booth!

OCA Elections – Nominations Coming Up...

Our officers and Trustees serve terms of only one year each time, so all positions are up for election every year. Under our current schedule, we take nominations for all of the Board positions at the October and November general meetings, the ballot is then finalized after the November general meeting, posted on the website for download and sent out with the December Sirius Astronomer, and the election itself starts with the posting of the ballot and ends at the end of the January general meeting. You don't have to attend a general meeting to be nominated for the Board – just send Bob Buchheim or me an email letting us know that you want to be a candidate and we'll see to it that you get on the ballot.

Anyone who has been a club member for at least a year can run for Trustee, and we have seven general Trustees on the Board. You could also run for Secretary or Treasurer after being a club member for at least a year. If you want to run for President or Vice President, you would also need to have served on the Board itself for a year to qualify, though that year could be served anytime in the past (in other words, you don't have to be a member of the current Board, though it certainly would help you do these jobs effectively if you were, or at least had attended a couple of recent Board meetings).

Why should you run for the Board? For me, the best reasons are that serving on the Board is fun, informative and useful – you get to work with a group of interesting club members who care enough about the club and astronomy to volunteer their time to help run the club, you get more information about matters relating to the club and the interests of its members than other members, you learn a tremendous amount from other Board members and active volunteers who have different expertise than yours, you get to apply your own skills to improve matters for the club, and you get the satisfaction of solving problems the club faces that a lot of members may never even know about. Serving on the Board gives you a stake in the club and its affairs that you can't get any other way, and ways of contributing to our continued success that most other members don't have.

What would you be committing to if you were elected to the Board? The main formal responsibility is to attend Board meetings, which we have every two months (very rarely we have an additional session – I think we've had two in the last ten years). The meetings generally start with a potluck to share some good food and conversation before we turn to more official matters. Through most of the time I've been on the Board (which is most of the last ten years), we've had a lot of discussion of different issues, and often have had members voicing very different opinions on what we should do, but the discussions are generally positive and

almost always result in unanimous decisions that I think have been better overall because of the discussions. Between meetings, Board members exchange emails on issues of concern that come up. How much you would do beyond that is pretty much up to you – many Board members volunteer for different projects as the need for them arises and depending on their interests, skills and availability.

Serving on the Board is a great way to help make sure that the club continues to work well for its members – so email Bob (rbuchheim@earthlink.net) or me (btoy@cox.net) to put your name on the ballot for the 2012 OCA Board!

More tweaks to the Kuhn

On the day the August start party, Jerry Brunache, who designed the Kuhn's optics and ground the mirrors, kindly joined Pat Knoll, Trey McGriff, Joe Busch and me for an afternoon of working on the Kuhn's primary mirror. Phyllis Brunache and Paula Knoll also helped, particularly with photographs. The day was enlivened by a couple of storm cells moving through; the heavy rainfall proved that the new metal roof on the observatory is a very effective resonator, as we had a hard time hearing anything other than the rain when it was at its most intense. Jim Hannum, John Kearns and Don Lynn came by to check on our progress and told us what they recalled of what had been done with the Kuhn in the past and how past adjustments had been made (and Jim's long reach helped in adjusting the pads holding the mirror).

After we got the main mirror centered and level in the mirror cell, and tightened all of the pads to the level that Jerry and Pat thought was appropriate, everything seemed fine until we moved the scope from vertical to a position closer to the horizontal "park" position, when they noticed that the main mirror had shifted a little. Unfortunately, there wasn't enough time to try further adjustments, so the telescope was collimated as well as possible, and the objects actually looked pretty good through it during the star party. The atmospheric conditions weren't at their best, mainly because of all the thunderstorm activity, but star clusters in particular looked nice and sharp, with more visible graininess than before.

After this experience, Pat decided that the best course would be to take the mirror cell off of the telescope and work on the primary mirror from there. He and Trey went out the following week to do this, and had quite a challenge to get the metal framework that is used to hold the mirror cell when it is removed from the telescope out of the storage shed and into the observatory – it turns out that it wouldn't got through the doors, so it had to be hoisted over the wall, which wasn't easy. In past years, it was kept in the observing area, against the wall next to the door, where it always took up a lot of room. Pat and Trey's experience shows why it wasn't removed to free up space in the observatory years before, even though it was rarely

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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**	**$37.95**
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 7th. 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.

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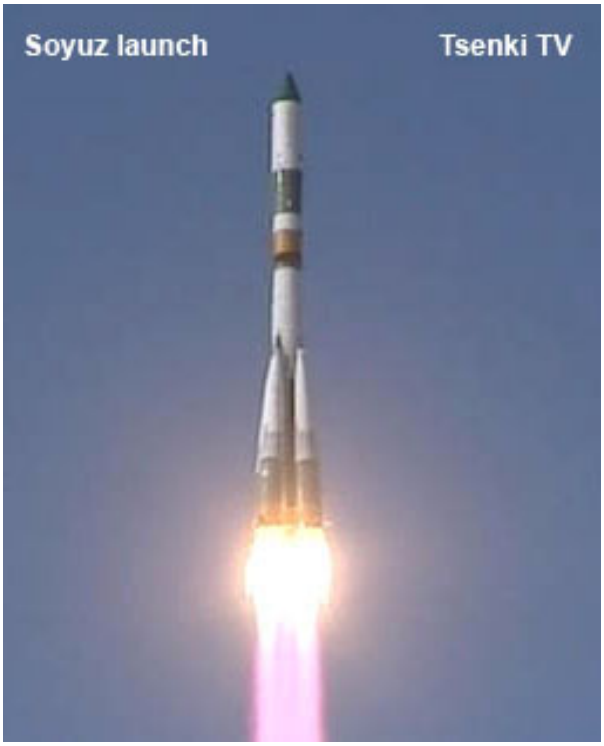
detectable. The method is able to predict the speed at which the sunspot is rising, and therefore when it will arrive at the surface. Smaller sunspots were found to rise more slowly.

STEREO-A spacecraft has for the first time recorded a movie showing a solar storm traveling all the way from the Sun to Earth and engulfing our planet. Pulling the faint clouds of material out of the confusion of starlight and interplanetary dust was a huge challenge and took 3 years of study to accomplish. Researchers can calculate from the movie the gas density with precision. When the CME (solar storm) left the Sun, it was cavernous, with walls of magnetism encircling a cloud of low-density gas. As it crossed the Sun-Earth divide, its shape changed. It "snow-plowed" through the solar wind, scooping up material to form a towering wall of plasma. By the time it reached Earth, its forward wall was sagging inward under the weight of accumulated gas.



International Space Station (ISS) – A Russian cargo supply rocket to ISS, the first after the retirement of the Space Shuttles, failed during the 3rd stage firing and crashed in a remote part of Russia on August 24. Up until now these Soyuz-Progress rockets to ISS had a perfect record of 43 successes. Since ISS has several months of supplies aboard, this is not immediately much of a problem. But the Soyuz TMA-M rockets that carry people to ISS are nearly identical, so they have been grounded also until the cause of the crash has been fixed and tested. Since the Shuttle retirement, this is the only means of getting astronauts to and from ISS, so now we have an immediate problem. The next group of 3 astronauts was scheduled to launch September 21, to replace 3 scheduled to return to Earth on September 8. In response to this situation, the return was postponed by about a week. The Soyuz re-entry vehicles have been tested for only 200 days in space before returning, so the return of these 3 cannot be delayed much more. Russian rocket experts have now announced that they can fix the problem and test it on another cargo flight to ISS by October 30. They would then be ready to launch the 3 astronauts on November 12, shortly before the last 3 astronauts aboard ISS are currently scheduled to return to Earth in mid November. Replacements for the last 3 could be launched by December 20, according to the fix schedule. The return of the last 3 could be delayed considerably if needed, but space agencies are hesitant to do this, since that is the bad weather season in the landing area, and they like to have plenty of spare schedule to handle weather delays. Also, ISS can be left without crew for some months, but doing so would require a lot of extra work that the space agencies would like to avoid. As I write this, NASA and the other ISS partners are reviewing the Russian proposed schedule. The lost supply vehicle contained 2777 lbs (1260 kg) of food, spare parts, experiments, etc., 2050 lbs (930 kg) of propellant to boost the station, 926 lbs (420 kg) of water, and 110 lbs (50 kg) of air. Astronaut Ron Garan wrote and recorded "Space Station Blues" and posted it on YouTube when told he wasn't coming home on time.

New space missions – NASA has selected 3 proposals for Technology Demonstration Missions. The projects will develop and fly a space solar sail, deep space atomic clock, and a space-based laser communications system. The laser system will enable rapid return of voluminous data from spacecraft, up to 100 times faster than today's systems. The mercury-ion atomic clocks, 10 times more accurate than current systems, enable a higher level of navigation precision. The solar sail, 7 times larger than any previously flown, enables highly efficient station-keeping or propellant-less propulsion capabilities. The missions expect to launch in 4 years, except the laser system in 5. To reduce cost, the 3 missions will ride into space with other payloads aboard commercial launch vehicles.

SLS – NASA disclosed the design of the SLS, the launch system to replace the Space Shuttle, as far as lifting heavy loads or people into space. It will have at least 2 versions, similar to the Saturn I and V used during the Apollo days. The larger SLS will be a little taller than the Saturn V, have a little more thrust, weigh a little less, and put somewhat more mass into orbit. It will use Space Shuttle engines on its core stage, have a pair of boosters attached to this core, and have an upper stage using updated J-2 engines, which were used on the Saturn upper stages. The core and upper stages will both use liquid hydrogen and liquid oxygen fuel, but the boosters will probably have both a solid fuel and liquid fuel version. The solid fuel variant will be a somewhat longer version of the Space Shuttle boosters. Obviously this design is reusing much existing design and hardware, a decision forced by budget constraints. The system is flexible for various missions and sizes of payloads. It is planned that eventually this rocket will support a mission to Mars, though no one is currently budgeting such a mission. SLS will have roughly the same capability as the Ares rockets, which were cancelled by Congress, probably for political reasons. The first SLS launch (unmanned, small version) is planned for 2017. The first launch of the small Ares was scheduled for 2011, and the first launch with a crew for 2014.

Liberty – ATK, the company that built the solid rocket boosters for the Shuttle, awhile ago proposed what they are calling the Liberty rocket, which would consist of a European Ariane upper stage mounted on top of a lengthened Shuttle-style solid rocket booster. NASA just gave approval to ATK to go ahead with developing Liberty, at ATK's expense, not NASA's, on the basis that NASA would consider buying some Liberties to launch people to ISS. ATK says they can fly astronauts by 2015. United Launch is

already developing the Atlas into a person-rated rocket, and SpaceX is working on person-rating their Falcon 9 rocket, both to do the same job as the Liberty. There may be 3 new ways to get people to ISS before SLS is ready.

Instant AstroSpace Updates

PAMELA (orbiting antimatter instrument) has detected a **ring of antiprotons** circling the Earth, which were created by cosmic rays striking our upper atmosphere.

Astronomers using the 3.6 meter telescope in Chile have found another **exoplanet in the habitable zone** (where liquid water can exist) of a star in Vela about 36 light-years away. Its year is 54 Earth days and it is 4 times closer to its (dim) star than Earth is to the Sun.

SDO (orbiting solar observatory) has discovered that in ultraviolet light, solar flares can continue up to 5 hours after visible and X-ray flares end, and that the energy in this post-flare can exceed that of the original flare. ■

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used. It did its job well on this occasion, however, and we expect to put it back in the storage shed in spite of the inconvenience of the process, as we really don't have room to keep it in the observatory itself. Pat sent me an account of how they removed the mirror cell, and all they did to get the mirror better positioned, all the mechanisms working, and the mirror itself cleaner than it's been in years, which he said was much easier to do when the mirror was off the telescope. After several hours of work, the mirror cell was reinstalled, and they moved the Kuhn down from the vertical position to collimate it (the main mirror didn't shift this time), and discovered that it just only took a minor tweak to put it into excellent collimation. When they star tested it after dark, everything looked great, though the skies, unfortunately, still weren't very good. Thanks to Jerry's input and the hard work of Pat and Trey in particular, the Kuhn's optics are now as close to optimal alignment as they have ever been, and, thanks to Pat's efforts in cleaning and lubricating the relevant parts, we can adjust the optics with more precision than we've been able to for a long time. This, by the way, does not mean that anyone who uses telescope is free to attempt to adjust the optics – that is reserved to the folks who are properly trained to do so, and only by permission of the observatory custodian.

Here's hoping that we have improved weather over the next few start parties, so we can enjoy sharp views of the heavens while it is still warm enough to make it a thoroughly pleasant experience! ■

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Once again, I experience totality. As my eyes adjust to the new darkness, the corona blossoms out. Every corona is different and depends on the solar activity at the time of the eclipse. It's like opening a Christmas present—I don't know what it will look like, but I know it will be great! I see color in the corona—a silvery purple—that seems to shimmer. The streamers stretch out sometimes 15 degrees on either side of the sun, looking like the spiky sun we drew as children. In Bolivia (1994) the streamers made pointy cat ears (appropriate for the puma that was eating the sun). In 1999, two streamers from the top of the sun leaned over, like rabbit ears. In 2006, they were like delicate petals. Where the sun once was, there is a black hole in the sky. Solar prominences in bright magenta dance on the edges of the dark disk. The human eye has such dynamic range, that it can see at once detail that takes hours of Photoshop to reproduce. Audio recordings of totality document primal grunts, moans, and gasps. About the only words uttered are: "Oh!", "My!", "Oooo", "Wow!" And all too fast, another Diamond Ring—so welcomed at second contact—now heralds the end of the spectacle. Those around me applaud and whoop. We hug and high-five in congratulations. Some of us are in tears. As the sky lightens, we already begin to plan for the next total eclipse.

* * *

If you would like to see photos from an eclipse expedition we were on in 2010, you can follow this link: http://www.eclipse-chasers.com/tse2010pg.html. I hope you have enjoyed reading my articles as much as I have enjoyed writing them. Several of you have come up to me at the OCA meetings with kind comments. I want to thank Sirius Astronomer editor Steve Condrey for printing my articles and always selecting a great picture to accompany them. I want to thank my husband Doug for his inspiration, encouragement, and critique. I also want to thank my friend, Ask-the-Astronomer Don Lynn, for previewing every article for accuracy.

I hope my articles have encouraged many of you to see the wonderful things on my list. Since I wrote the article on supernovae, there have been two bright supernovae (in M-51 and M-101) that were visible with modest telescopes. Next year there will be an annular eclipse and another transit of Venus. In 2017, there will be a total eclipse across the United States. Experiencing everything on my list is do-able. I know—I have done it! It takes planning, travel, and setting aside funds for many of them, but mostly it takes the initiative to get up, get out, and do it! As for me, I will be looking to see what amazing phenomenon is going to be my Number 21. ■

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