



COLUMBUS
ASTRONOMICAL
SOCIETY

Prime Focus

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The Columbus Astronomical Society Newsletter

Contents

From the President.....	pg 1
What's Up.....	pg 2
Wired for Astronomy.....	pg 4
Hubble press release.....	pg 5
Nasa Space Place.....	pg 6
CAS Calendar.....	pg 7
For Kids.....	pg 8



From the President

Dear fellow stargazers:

I hope you're enjoying the cool nights this month. I can't remember such a pleasant summer for observing. I've setup on the lawn a few times during the past few weeks and enjoyed backyard astronomy just as I did when I was a kid growing up in Grandview. Some things never change.

I hope I never lose the awe of the night sky that I've had since I first became cognizant of the universe beyond the treetops. I'll never forget the feeling I had when I looked through my first serious telescope, a 8" F/6 Dob that Bill Herbert helped me put together. It was as if someone gave me a lifetime pass to the celestial circus and opened my mind to the infinite possibilities that lay beyond my perception and understanding. That's how Bill influenced me, a young man on a shoestring budget, who desperately wanted to fulfill his dream of owning and using a decent telescope. Bill is just one of the many CAS members who share the night sky and their love of astronomy with the public. It's what we do.

The Astronomy Fair is our annual venue where we meet the public. We're trying something different this year. Instead of the club picnic this month, we'll host the fair at Perkins on Saturday, August 8th. We'll have the picnic next month during Buckeye season.

We'll need volunteers to help set up tents, chairs, exhibits, and telescopes for the fair. Charlie Sigrist will coordinate all fair activities. He'd like volunteers to arrive between Noon and 14:00. The public will arrive starting at 16:00, so we need to be ready.

Tony Miller and Brad Hoenhe have organized a "members" summer star party at Hocking Hills Lodge in conjunction with the park's public program on August 22nd. If you've never observed at the lodge, it's a great location on a ridge.

Byron Winchell has sent out reminder emails to all members of the yahoo group in an effort to bring the group memberships in line with club records. A 3-month grace period is in effect to allow anyone who wishes to remain on the yahoo group a chance to join the club or renew membership.

I'll see you at the fair.
Clear Skies!

Regards,
Tom Beck
President, CAS

What's Up Brad Hoehne

What'ss Near

On the Evening of December 5, 1689, Giovanni Domenico Cassini observed a small but distinct dark spot along the equator of Jupiter. He made a careful sketch of it in his notebook. Cassini had noted many Jovian spots, blotches and stains before, perhaps not quite the same dark shade as this one, but close enough. Thus., this Jovian event didn't strike him as particularly remarkable. Over the next 18 days, he revisited this spot five more times and carefully documented its shape as it was warped by weather and time. Eventually it faded away, and, to Cassini, it was just another of many small, transient phenomena that came and went on Jupiter's then poorly understood face.

It wasn't until 1997 that anyone took particular note of this obscure observation. A group of astronomers, led by a Japanese team, had been scouring ancient archives, looking for hints of asteroid or comet impacts on the face of Jupiter. Just three years before, in July of 1994, a long train of the fragments of Comet Shoemaker Levy-9 had slammed ferociously into the atmosphere of Jupiter, leaving black and grey scars that remained visible to amateur astronomers for weeks. (This event inspired my membership in the CAS.) It seemed extraordinarily fortunate that humans today would be equipped at just the right time to witness what was, it was surmised, an exceedingly rare event- a collision between two heavenly bodies. But just in case it wasn't, astronomers wished to determine if any other such events had been recorded by telescopic observers. After a thorough search, Cassini's spot seemed like the best candidate, but the searchers were cautious and didn't jump to conclusions.

Then, just a few weeks ago, on July 19th (exactly 15 years after the S-L9 impacts began) Australian amateur astrophotographer Anthony Wesley, discovered a 5000-mile wide splotch on Jupiter that had a very similar appearance to some of the fragment impacts of S-L9. It was also not unlike the blotch that Cassini had noted in 1689. After infrared observations of the spot were made by astronomers using the Keck telescope in Hawaii, it became clear that this new blemish on the face of Jupiter was caused by another impact. This additional impact after such a short time makes the idea that Cassini had also observed an impact a bit more credible.

The implications of all this is sobering. It seems that the solar system is still roiling with dangerous debris leftover from its formation. Just like Jupiter, Earth may be catastrophically hit more often than we yet know. In another way, however, these observations are also reassuring. Jupiter serves a kind of cosmic vacuum cleaner, slurping up comets that might otherwise wander menacingly through the inner solar system. Perhaps these events are just an example of Jupiter "doing its job."

As of this writing, the impact site on Jupiter is still clear and distinct in backyard telescopes, and, if the precedent of comet S-L9 holds, it may be visible for many weeks to come. For those who wish to look for it, here is a list of favorable dates and times for Ohio observers. The first column lists the estimated time (EDT) when the spot transits the *central meridian* and is most easily viewed. The second is

an estimate of when the spot should become visible around the limb of Jupiter, and the third is when it will disappear from view.

Transits CM	First Visible	Last Visible
8/10/09 0:06	8/9/09 22:06	8/10/09 2:06
8/11/09 5:51	8/11/09 3:51	8/11/09 7:51
8/12/09 1:41	8/11/09 23:41	8/12/09 3:41
8/12/09 21:31	8/12/09 19:31	8/12/09 23:31
8/14/09 3:16	8/14/09 1:16	8/14/09 5:16
8/14/09 23:06	8/14/09 21:06	8/15/09 1:06
8/16/09 4:51	8/16/09 2:51	8/16/09 6:51
8/17/09 20:31	8/17/09 18:31	8/17/09 22:31
8/19/09 2:16	8/19/09 0:16	8/19/09 4:16
8/20/09 8:01	8/20/09 6:01	8/20/09 10:01
8/21/09 3:51	8/21/09 1:51	8/21/09 5:51
8/21/09 23:41	8/21/09 21:41	8/22/09 1:41
8/24/09 1:16	8/23/09 23:16	8/24/09 3:16
8/24/09 21:06	8/24/09 19:06	8/24/09 23:06
8/25/09 7:01	8/25/09 5:01	8/25/09 9:01
8/26/09 3:09	8/26/09 1:09	8/26/09 5:09
8/26/09 23:00	8/26/09 21:00	8/27/09 1:00
8/28/09 4:47	8/28/09 2:49	8/28/09 6:49
8/29/09 0:39	8/28/09 22:39	8/29/09 2:39
8/29/09 20:30	8/29/09 18:30	8/29/09 22:30
8/30/09 6:26	8/30/09 4:26	8/30/09 8:26
8/31/09 2:20	8/31/09 0:21	8/31/09 4:21
9/1/09 7:59	9/1/09 5:59	9/1/09 9:59
9/2/09 3:55	9/2/09 1:55	9/2/09 5:55
9/2/09 23:46	9/2/09 21:46	9/3/09 1:46

In other astro-news: On the evening of August 11th, and the Morning of August 12th, the **Perseid meteor shower** reaches its peak. In years when conditions are favorable, as many as 100 meteors per hour can be seen by vigilant observers. However, this year, a waning third-quarter moon makes its appearance before midnight and washes out the faintest ones. A third-quarter moon is not exceptionally bright, and will likely leave room for a moderately good show. Begin watching at around 11:00 p.m. on the 11th, and continue as late as you can into the night.

Saturn is almost gone, lost in the evening twilight. Its rings, too, have been whittled away to an anemic toothpick of light. The equinox of Saturn occurs on August 11. On that date, the rings will appear entirely edge-on with respect to the sun. (Not the Earth.) The Cassini spacecraft will witness the rings dramatically change in appearance as subtle, previously unseen, ripples are brought stark relief and tiny moons imbedded in them cast long, needle-thin shadows. It is likely that many new phenomena and structures will be discovered at this time. Follow the latest imagery from the Cassini mission can be seen at: <http://saturn.jpl.nasa.gov>.

Mars and **Venus** both hover in the morning sky. **Mercury** will reach its *maximum eastern elongation* on August 24th, and might be visible in the evening twilight just off the western horizon.

(Continued on page 3)

What's Far

On clear August evenings the **summer milky-way** reaches up from the southern horizon to realms high overhead. From not-so-dark skies, the light from its countless stars combines to form a hazy glow that is often mistaken for faint earthly clouds. Under more pristine conditions, much more structure can be appreciated.

Traveling roughly along the middle of the cloudy band of the milky-way is a long network of interconnected dark patches, which we might see as the spinal cord of the so-called "backbone of night." Through small telescopes and binoculars, these regions reveal themselves to be places where stars seem to be less numerous. Indeed, in the 1790s astronomer William Herschel interpreted these regions as such. But their appearance is misleading. We now know that what we are seeing is the muting of starlight by great clouds of gas and dust that hover between the stars.

While all of the stable elements and even a great variety of molecules have been found to reside in these immense clouds, like the rest of the universe their greatest component is hydrogen, the simplest element made up of just one proton and one electron. However, in these dark patches, called *dark nebulae* by astronomers, it is dust that does most of the light blocking.

If you could take a great scoop of an average patch of a great dark nebula, you might be surprised at how little of it there really is. Depending on where you found yourself in the cloud, a meter wide scoop of cloud would yield somewhere between a million and a hundred billion atoms. While this may sound like a lot, consider there are about a hundred *trillion* atoms in a single cell borrowed from inside your cheek. In other words, in even the densest dark nebulae, it would take a cubic scoop 40 feet on a side to cobble together enough material to rival a living cell too small to see with the naked eye. There's not a lot of there there.

What dark nebulae lack in density, they make up for in great size. The smallest patches of dark nebulae, called *Bok Globules*, are roughly a light year across and contain a few to a few dozen solar masses of material. The great networks of clouds that bisect the northern milky-way and form what we perceive as **the great rift** span hundreds to thousands of light years, and contain many thousands to perhaps millions of solar masses of material. So, while a visit to a great nebula would reveal it to be but the faintest wisp, over the light years even such a wisp adds up and blots out the light from stars beyond.

When one of these great clouds of gas and dust happens to be near a moderately bright star, its presence can often be made out by reflected light. Such areas are known as *reflection nebulae*. Since the light we see in reflection nebulae has simply bounced off of innumerable dust grains, it takes on the characteristic color of the star that is illuminating it. The brilliant blue-white stars of the **Pleiades** are surrounded by a hoary web of blue-white reflection nebulae (some of which can be perceived through a modest telescope under pristine skies.) The brilliant yellow light Antares, in Scorpius, illuminates gas at the tip of a giant strand of interstellar gas and dust called the **Rho-Ophiuci complex** which makes for colorful photographs. (This nebulosity cannot be seen through a scope.)

If you have ever visually run your eye across one of the many great panoramic photos of the milky-way, you may have noticed that intermingled with the stars, dark nebulae, and occasional reflection nebulae, there are many great red or pink patches of light. Examining close-up photos of these regions, you'll likely note that there do not seem to be brilliant red or pink stars putting out the red or pink light that has seemingly reflected off these great dusty clouds. What causes this pervasive glow? Hydrogen.

Unlike reflection or dark nebulae, the *emission nebulae*, as these pink regions are called, reveal to us the presence of hydrogen, which otherwise has little effect in the visible realm. When the very hottest stars- Type O or Type A- mingle with interstellar clouds, the energetic ultraviolet photons that they put out have the ability to knock the single electron from countless hydrogen atoms, leaving behind lonely, naked protons. Astronomers refer to hydrogen that has its normal sole electron as Hydrogen I. A naked proton is referred to as Hydrogen II. And, since these bright pink regions are filled with Hydrogen II, they have been dubbed H-II regions.

When these lonely protons finally hook up with electrons again, it often happens that the resulting atom doesn't quite settle down right away. The electron energetically buzzes about its proton like a giddy newlywed. Eventually, however, as the initial thrill of the relationship wears off it settles down into a less excited, but more cozy, relationship. But unlike their human analogues this doesn't happen in a slow, gradual process. In the quantum world, only certain discrete levels of excitement are allowed. Anything in between these levels is forbidden. Instead, the electron jumps straight from one level of excitement to another, lower level without ever adopting one in between- even for the tiniest blip of time. (Another analogy would be an imaginary sports car that accelerates from 0 to 60 mph without going 10, 20, 33.72 mph or any other intermediate speed along the way.) When this happens, the amount of energy that is shrugged off in this *quantum leap* is emitted back into space in the form of a unit of light- a *photon*.

Pass the light from fluorescent tube of energized, H-II, hydrogen through a prism and you'll note that it is made up of three (or perhaps four if your eyes are young and the source is bright) very specific colors of light. Each of these colors corresponds to one of the possible quantum leaps that electrons take when they settle down into lower states of excitement. The red line is called *Hydrogen Alpha* and represents the jump from the third lowest energy state of the electron to the second lowest. The somewhat fainter greenish-blue line is called *Hydrogen-Beta*. It represents the light that is emitted when electrons jump from the fourth lowest energy state to the second lowest. The "*Hydrogen-Gamma*" is indigo, and starts from the fifth lowest level. And the faint *Hydrogen-Delta* marks the jump down from level six. The group of jumps that produces this series of colors is called *The Balmer series*. (The series that represents jumps down to the lowest energy state of all exists entirely in the ultraviolet and, thus, cannot be seen by humans. It's called the *Lyman-Alpha series*.)

In space, as in the lab, the jump in the Balmer series that produces the Hydrogen-Alpha line is, by far, the most

common- and so the light in H-II regions is dominated, in photographs, by its red hue. However, since our eyes are very bad at seeing dim red light, it is the H-Beta component of hydrogen's glow that stands out at the eyepiece. This is why visual deep-sky observers own H-Beta filters and not H-Alpha ones.

Here are a few nebulae to explore in the rich and wonderful summer milky-way:

Dark Nebulae: With the naked eye or low power binoculars, try to spot the so-called **Dark Horse Nebula**. Situated on the eastern edge of Ophiucus, the form of this 8 degree long dark nebula calls to mind a silhouette of a large horse with its feet pointing to the west, its head pointing north and its back leaning against the center of the milky-way. The hind leg of the horse forms the distinct **Pipe Nebula, Barnard 59**. A bit further north in Ophiucus a keen eyed observer with large binoculars or a small telescope might spot **Barnard 72, the Snake Nebula**, a curious Bok globule against a thick, but even, wash of background stars. Finally, Scan around the "spout" of the teapot asterism of Sagittairus, and you will see that the region is crisscrossed by web of dark bands too varied, interconnected, and numerous to name.

H-II regions: On photographs one can see dozens of these pink patches mingling with the glow of the milky-way. The most distinct of them is **M8, the Lagoon Nebula**. Roughly magnitude 5, this nebula is not difficult to make out with the naked eye as a moon-sized fuzzy patch just east of the lip of the spout of the Teapot Asterism. Eight degrees north of M8 is **M17, the Swan** (or "Omega") nebula. Its characteristic shape is easily made out in small to medium sized telescopes. The nebulosity in **M16, the Eagle Nebula**, is subtle and is easily lost in inferior conditions. However, those with large telescopes and good conditions can make out the dark clouds of the **Star Queen** whose "pillars of creation" are the subject of perhaps the most famous image ever captured by the Hubble Space Telescope. Inside these pillars, as in many H-II regions, new stars are coming to life.

Reflection Nebulae: A few low power telescope fields north of M8 is **M20, the Trifid**, nebula. In photographs, the Trifid is a curious object. One half shines in the characteristic fluorescent pink glow of H-II light- stimulated by brilliant stars pumping out huge amounts of UV light at its heart, and the other half shines pale blue from light reflected off of stars that mingle with its dust but which are too cool to produce UV light.

These are but a sampling of the many riches to be found in the summer milky-way, the most glorious and crowded patch of deep sky.

Clear skies!

Wired for Astronomy:

.Once again we remind our fellow members of the perks associated with the CAS membership.

Our web site is www.the-cas.org. Here you will find information about CAS, contact information, upcoming events, and other astronomy links.

Once you become a member, you can use our dark sites. One is located ay Conkle's Hollow in the Hocking Hills area. The second, darker site is located in AEP reclaimed lands south of Zanesville. For information, ask a CAS officer or check the above link.

One of our best perks is the Yahoo groups., http://tech.groups.yahoo.com/group/The_CAS/. This is our exchange forum where we announce new activities, discuss general astronomy topics, and keep members up to date with CAS information. The group also has a nice photo section where members can upload their latest photos, including astrophotography, equipment photos, and activities photos. The site also contains a links section as well as copies of the CAS constitution and a history of the society.

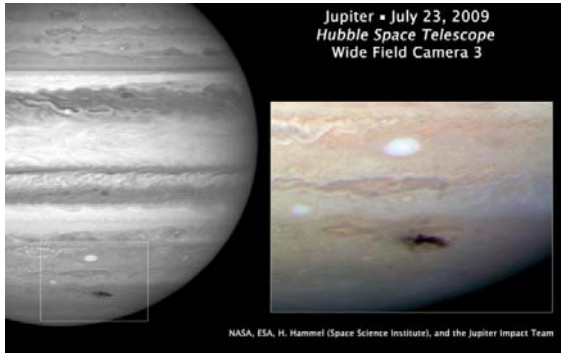
Of course, our best perk is the membership. Several of our members are expert astrophotographers, telescope makers, and instructors. CAS meetings are a perfect milieu to pick their brains and learn new skills. With several special interest groups, you will find one that will match your interests.

See you soon!



Eclipse over the Pacific
Denise Kramer
July 22, 2009

Hubble Telescope Captures Jovian Impact



NASA scientists have interrupted the checkout and calibration of the Hubble Space Telescope to aim the recently refurbished observatory at a new expanding spot on the giant planet Jupiter. The spot, caused by the impact of a comet or an asteroid, is changing day to day in the planet's cloud tops.

For the past several days the world's largest telescopes have been trained on Jupiter. Not to miss the potentially new science in the unfolding drama 360 million miles away, Space Telescope Science Institute director Matt Mountain allocated discretionary time to a team of astronomers led by Heidi Hammel of the Space Science Institute in Boulder, Colo.

The Hubble picture, taken on July 23, is the sharpest visible-light picture taken of the impact feature. The observations were made with Hubble's new camera, the Wide Field Camera 3 (WFC3).

"This image of the impact on Jupiter is fantastic," said U.S. Senator Barbara A. Mikulski, D-Md., chairwoman of the Commerce, Justice and Science Appropriations Subcommittee. "It tells us that our astronauts and ground crew at the Goddard Space Flight Center successfully repaired the Hubble telescope."

"This is just one example of what Hubble's new, state-of-the-art camera can do, thanks to the STS-125 astronauts and the entire Hubble team," said Ed Weiler, associate administrator of NASA's Science Mission Directorate. "However, the best is yet to come!"

"Hubble's truly exquisite imaging capability has revealed an astonishing wealth of detail in the 2009 impact site," said Hammel. "By combining these images with our ground-based data at other wavelengths, our Hubble data will allow a comprehensive understanding of exactly what is happening to the impact debris. My sincerest congratulations and thanks to the team who created Wide Field Camera 3 and to the astronauts who installed it!"

Co-investigator Imke de Pater of the University of Califor-

nia at Berkeley said: "The combination of the Hubble data with mid-infrared images from the Gemini telescope will give us an insight into changes of the vertical structure of the atmosphere due to the impact."

Discovered by Australian amateur astronomer Anthony Wesley on Sunday, July 19, the spot was created when a small object plunged into Jupiter's atmosphere and disintegrated. The only other time in history such a feature has been seen on Jupiter was 15 years ago.

"This is strikingly similar to the comet Shoemaker Levy 9 that impacted Jupiter in July 1994," said team member Keith Noll of the Space Telescope Science Institute in Baltimore, Md.

"Since we believe this magnitude of impact is rare, we are very fortunate to see it with Hubble," added Amy Simon-Miller of NASA's Goddard Space Flight Center in Greenbelt, Md. She explained that the details seen in the Hubble view shows a lumpiness to the debris plume caused by turbulence in Jupiter's atmosphere. The spot is presently twice the length of the United States.

Simon-Miller estimated that the diameter of the object that slammed into Jupiter was at least the size of several football fields. The force of the explosion on Jupiter was thousands of times more powerful than the suspected comet or asteroid that exploded over the Tunguska River Valley in Siberia in June 1908.

The WFC3, installed by the STS-125 astronauts in May, is not yet fully calibrated. So while it is possible to obtain celestial images, the camera's full power cannot yet be realized for most observations. The WFC3 can still return meaningful science images that will complement the Jupiter pictures being taken with ground-based telescopes.

This is a natural color image of Jupiter as seen in visible light.

Credit: NASA, ESA, and H. Hammel (Space Science Institute, Boulder, Colo.), and the Jupiter Impact Team

The members of the Jupiter Impact Team are:

- Dr. Heidi B. Hammel (Space Science Institute, Boulder, Colo.)
- Dr. Amy Simon-Miller (NASA's Goddard Space Flight Center, Greenbelt, Md.)
- Dr. Keith S. Noll (Space Telescope Science Institute, Baltimore, Md.)
- Dr. Michael H. Wong (Space Telescope Science Institute, Baltimore, Md.)
- Prof. John T. Clarke (Boston University, Boston, Mass.)
- Prof. Imke de Pater (University of California, Berkeley, Calif.)
- Dr. Glenn S. Orton (Jet Propulsion Laboratory, Pasadena, Calif.)
- Dr. Agustin Sanchez-Lavega (University of the Basque Country, Spain)

News Release Number: STScI-2009-23

SARSAT to the Rescue

If a plane crashes in the woods and nobody hears it, does it make a sound?

Never mind contemplating this scenario as a philosophical riddle. This can be a real life or death question. And the answer most of the time is that, even if no people are nearby, *something* is indeed listening high above.

That something is a network of satellites orbiting about 450 miles overhead. The “sound” they hear isn’t the crash itself, but a distress signal from a radio beacon carried by many modern ships, aircraft, and even individual people venturing into remote wildernesses.

In the last 25 years, more than 25,000 lives have been saved using the satellite response system called Search and Rescue Satellite-aided Tracking (SARSAT). So what *are* these life-saving superhero satellites?

Why they are mild-mannered weather satellites. “These satellites do double duty,” says Mickey Fitzmaurice, a National Oceanic and Atmospheric Administration (NOAA) systems engineer for SARSAT. “Their primary purpose is to gather continuous weather data, of course. But while they’re up there, they might as well be listening for distress signals too.”

In February, NASA launched the newest of these Polar-orbiting Operational Environmental Satellites (or POES) into orbit. This new satellite, called N-Prime at launch and now dubbed NOAA-19, prevents a gap in this satellite network as another, aging NOAA satellite reached the end of its operational life.

“The launch of N-Prime was a big deal for us,” Fitzmaurice says. With N-Prime/NOAA-19 in place, there are now six satellites in this network. Amongst them, they pass over every place on Earth, on average, about once an hour.

To pinpoint the location of an injured explorer, a sinking ship, or a downed plane, POES use the same Doppler effect that causes a car horn to sound higher-pitched when the car is moving toward you than it sounds after it passes by. In a similar way, POES “hear” a higher frequency when they’re moving toward the source of the distress signal, and a lower frequency when they’ve already passed overhead. It takes only three distress-signal bursts — each about 50 seconds apart — to determine the source’s location.

Complementing the POES are the Geostationary Operational Environmental Satellites (GOES), which, besides providing weather data, continuously monitor the Western Hemisphere for distress signals. Since their geostationary orbit leaves them motionless with respect to Earth below, there is no Doppler effect to pinpoint location. However, they do provide near instantaneous notification of distress signals.

In the future, the network will be expanded by putting receivers on new Global Positioning System (GPS) satellites, Fitzmaurice says. “We want to be able to locate you after just one burst.” With GPS, GOES will also be able to provide the location of the transmitter.

Philosophers beware: SARSAT is making “silent crashes” a thing of the past.

Download a two-page summary of NOAA-19 at www.osd.noaa.gov/POES/NOAANP_Fact_Sheet.pdf. The Space Place gives kids a chance to rescue stranded skiers using their emergency rescue beacons. The Wild Weather Adventure game awaits them at spaceplace.nasa.gov/en/kids/goes/wwa.





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



NOAA's polar-orbiting and geostationary satellites, along with Russia's Cospas spacecraft, are part of the sophisticated, international Search and Rescue Satellite-Aided Tracking System.


August 2009

Columbus Astronomical Society Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Alpha Capricornids meteor shower
2	3 Moon at apogee	4	5	6  Penumbra Lunar eclipse	7	8 CAS astronomy fair 4-10 PM
9	10	11	12 Perseids Meteor shower peak	13 	14 Jupiter at opposition	15
16	17 Neptune at opposition	18	19 Moon at perigee	20  Perkins Observatory New Vistas program	21 Mercury at aphelion	22 CAS Star Party-Hocking Hills Lodge
23	24 Mercury at greatest Eastern elongation	25 Northern Iota Aquarids peak	26 PF Articles deadline	27 	28	29
30	31 Moon at apogee					

September 2009

Columbus Astronomical Society Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4  Saturn's ring edge-on	5
6	7	8	9	10	11 	12 CAS annual picnic 2PM-?
13	14	15	16 Moon at perigee	17 Saturn a conjunction	18 	19
20	21	22 Autumnal equinox Juno at opposition (7.8 mag.)	23	24 Asteroid 20 Massalia at opposition (9.3 mag.)	25	26 
27	28 Moon at apogee	29	30 PF Articles deadline			



Make a Robo-Puzzle . . . Then Just Try to Solve It!

Gather These Things:

- Copy of Robo-Puzzle (on page 3)
- Scissors
- Glue
- Heavy paper or file folders (clean)

Make the Puzzle:

Glue the Robo-Puzzle page onto a piece of heavier paper or half of a file folder.

Then, carefully cut out the squares on the lines. Make your cuts very smooth and straight and cut right through the robots.

Solve It!

Now mix the pieces up, and try to put the puzzle back together again.

Not so easy, is it? There are millions of wrong ways to put the squares together, but only one right way. Adults find this puzzle especially hard! If you need help with the solution, visit The Space Place at http://spaceplace.nasa.gov/robots/robot_puzzle.htm.

Are These Robots for Real?

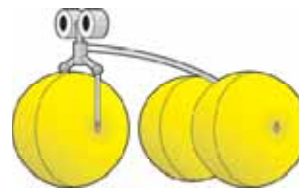
All the cartoon robots on the puzzle are something like the robots NASA is designing to go into space!



A Palm-sized Spiderbot

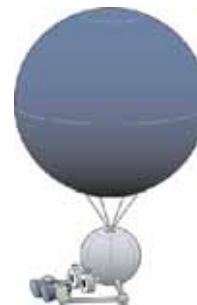
If it had fur and a couple more legs, it would look like a tarantula! Like a real spider, this robot has feeler-like antennas, which help it detect obstacles in its path. Instead of eyes, it has cameras. With its six legs it walks

much like a spider and moves very nicely across rough terrain. Someday, spiderbots like these, or even much tinier, could be used to explore comets, asteroids, or the Moon, or do maintenance and repair jobs on the outside of the International Space Station. On Earth, spiderbots could fill in for humans by sniffing out hazardous materials or taking soil measurements on farms.



Big Wheels in Space?!

What do you get when you cross a tricycle with a monster truck? Then replace the truck's body with computers, cameras, and scientific instruments? You get a funny-looking vehicle with beach ball-like tires that can drive around by itself, climb over big rocks, and take notes and pictures of its surroundings. Just the thing for exploring planets such as Mars! NASA has already tested the Big Wheels rover idea on sand dunes, rocky terrain and even water.



Balloon-bots on Alien Worlds?!

Another way to get around on planets or moons that have atmospheres is by hot air balloon—sort of. A hot air balloon rises when the air inside it is heated. This makes the air expand and become lighter than the air outside the balloon, so the balloon goes up. On Mars,

Club Space Place Activity Guide

for instance, the Sun would heat helium gas inside the balloon and make it go up. At night, the helium would cool and the balloon would come back down and rest on the ground until the next day. The balloon could carry instruments and cameras to study the planet's atmosphere and surface.



Here, FIDO!

A rover a bit like the one in this photo went to Mars in 1997 and two more are on their way to Mars now! This particular rover is part of NASA's Field Integrated Design and Operations (FIDO!) project. This project develops and tests technologies that will be used on robotic rover missions on the surface of Mars. The FIDO rover tries out navigation and control systems, sensing instruments, intelligent behavior systems, data processing, and other types of instruments and tools. NASA plans to send a mission to Mars to collect soil and rock samples and return them to Earth. The field tests that FIDO is doing in Mars-like terrain on Earth will help NASA explore the Martian surface.

Robots can go where no one has gone before. NASA is building smart machines that will be able to do very hard tasks far from home. The robots and spacecraft are our eyes and ears on distant planets, moons, and asteroids. From the information they gather, we will be able to plan for possible human travel to those places someday in the future.

Learn More:

Books:

The Adventures of Sojourner: The Mission to Mars that Thrilled the World, by Susi Trautmann Wunsch. ISBN: 0965049353 (ages 9-12).

Robot Inventor's Workshop: An Explorer's Kit, by Greg Vogt, Gregory Vogt, Deborah Shearer. ISBN: 0762407417 (ages 9-12).

How to Build a Robot, by Clive Gifford ; Illustrated by Tim Benton (How to) by Clive Gifford, Tim Benton (Illustrator). ISBN: 0531146499 (ages 9-12).

Robots (Fast Forward), by Mark Bergin. ISBN: 0531146162 (ages 9-12).

Web Sites:

NASA's Planetary Aerobot Program: <http://robotics.jpl.nasa.gov/tasks/aerobot/aerobot.html>

NASA's Inflatable Rover Program: http://www.jpl.nasa.gov/adv_tech/rovers/summary.htm

Robotic rover videos: <http://www.jpl.nasa.gov/videos/index.cfm?search=rovers>

Spiderbot video: <http://www/video/spiderbot.cfm>

Robotics Education: <http://robotics.nasa.gov/>

The Space Place: <http://spaceplace.nasa.gov>.



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Columbus Astronomical Society
PO Box 163004
Columbus, Oh 43216-3004

The Prime Focus is the monthly newsletter of the Columbus Astronomical Society, a not for profit group of amateur astronomers interested in the night sky. Information can be obtained by writing to the address below. Society members build telescopes, observe the splendors of the universe, contribute to scientific research and educate the public at public programs around the city and at Perkins Observatory.
 CAS web site - <http://www.the-CAS.org/>.
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*Must be a club member to qualify for discount magazine subscription rates. If you are renewing a magazine subscription please send your magazine renewal notice from the publisher along with this form and your check to ensure proper credit toward your subscription.

Columbus Astronomical Society
Membership Application/Renewal Form

Please indicate whether a new member membership renewal magazine subscription magazine subscription renewal.

I have checked the class of membership and magazine/s subscription/s desired and enclosed a check made payable to the Columbus Astronomical Society for:

Annual Regular Membership Fee: \$20 _____

Annual Student Membership Fee: (under 18) \$10 _____

Annual Family Membership Fee: \$25 _____

Annual Patron Membership Fee: \$50 _____

Annual Corporate Membership Fee: \$150 _____

Astronomy Magazine: \$34.00/1 year * _____

Sky & Telescope: \$32.95/1 year * _____

Trial - 3 issues of PRIME FOCUS while I decide: \$2 _____

Tax Deductible Donation: _____

Send the Newsletter via USPS instead of e-mail (\$5.00) _____

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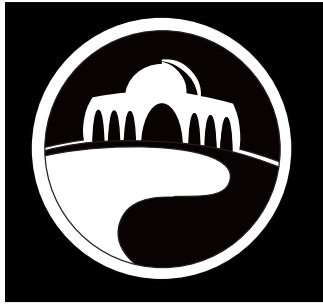
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NIGHTTIMES

The Newsletter of Perkins Observatory Aug. 2009

At Last, Darkness Returns!

Friday night Guest Nights return to the schedule this month starting at 9 P.M. In September they return to their regular 8 P.M. starting time.

On a clear night, we should be able to give you wondrous views of such summer objects as Jupiter, the Ring Nebula, the blue and gold double star called Albireo, and the Great Globular Cluster in Hercules. Stick around, and we'll observe the best objects of autumn: the Wild Duck star cluster, the Andromeda Galaxy, the Double Cluster in Perseus, and the globular cluster M15 in Pegasus. Really, folks. September is the right time to come to Perkins.

On a cloudy night, we'll show you how to find all those glorious objects using a pair of binoculars from your own back yard and give you a tour of the "O." So come on down. Please reserve your tickets soon by calling (740) 363-1257.

As always, members of the Friends of Perkins Observatory are admitted free.

Another Way You Can Help

Starting in November, the cost of mailing this newsletter to you will increase dramatically. You can help us meet our budget and provide more funding to continue our public activities at Perkins by receiving NightTimes by email. Just send an email to <perkinsw@owu.edu> (note the "w" after "perkins") and we'll email you a copy of the newsletter every month. Not only will you get it faster, but you'll help to preserve Ohio's premier public venue for stargazing and astronomy.

Observatory Angels

The following folks participated in our 2,000 Points of Light program:

Thomas Roberts, CAS member and Perkins volunteer, in honor of Peggy A and Raymond E Roberts, \$200.

Susan K Woerner of Dublin, in honor of Lillian Irene Woerner. XLN Systems of Columbus, \$200.

Thanks to the following folks who helped increase the size of our Endowment:

Charles & Kristen Price of Croton, \$25.

Ann Baird Speer of Lancaster, \$100.

Jim Pace made his ongoing \$40 monthly gifts to the Endowment and the Operating Fund.

The following folks participated in our adoption program:

Karla & Fred Roehrig, two observatory bricks in memory of James H Reed and Ruby Roehrig-Greenwood, \$200.

The following kind souls donated directly to our Operating Fund:

The Harrison Street Elementary fifth graders donated \$112.77 to the Operating Fund in their yearly Pennies for Perkins program. We are especially honored by this gift!

Kendra J Hauelsen of Hilliard, \$200.

Dale Lehman, CAS member, \$35.

Ann Baird Speer of Lancaster, \$100.

The following contributed in memory of Ron Ravneberg:

Thomas Roberts of the CAS and Perkins volunteer.

Jim Schoultz of the CAS and frequent Perkins volunteer.

Thanks to all who so kindly contributed equipment to the "O" recently.

Galen Graham, 10-inch Coulter Dobsonian telescope.

William K VanPelt, IBM PII Desktop PC.

Ruth Neal, in memory of Don McCoy, a large quantity of telescope-making supplies.

Jason Schall, Panasonic Toughbook laptop computer.

Marilu Quinn, an enormous quantity of theater-style candy and cookies.

Brad Hoehne, a DVD player and Sylvania TV.

Alan King of Delaware renewed his "Sponsor membership in the Friends of Perkins Observatory, \$100.

Taurus The Bulletin Board

Nighttime Programs Return to Perkins Observatory.

Teachers, now is the time to schedule those autumn field trips.

- ★ August 7 (Friday) 9 A.M. Guest Night. A few tickets available.
- ★ August 8 (Saturday) 10 A.M. CAS telescope making group.
- ★ August 8 (Saturday) 4 - 10 P.M. CAS Astronomy Fair. (Saturday) Reserved all day for Columbus Astronomical Society's activities.
- ★ August 10 (Monday) 10 A.M. Primrose School.
- ★ August 11 (Tuesday) 10 A.M. Primrose School.
- ★ August 12 (Wednesday) 10 A.M. Merry Moppets.
- ★ August 13 (Thursday) 10 A.M. Smoky Row Children's Center.
- ★ August 14 (Friday) 9 A.M. Guest Night. Tickets available.
- ★ August 15 (Saturday) 12 P.M. CAS ATM group.
- ★ August 18 (Tuesday) 9 A.M. Primrose School Golf Village.
- ★ August 19 (Wednesday) 9 A.M. Primrose School Golf Village.
- ★ August 16 (Saturday) 9 P.M. Guest Night. Tickets available.
- ★ August 20 (Thursday) 8 P.M. New Vistas in Astronomy, featuring our own Bob Harmon of OWU on his trip to the July 22 total solar eclipse.
- ★ August 21 (Friday) 9 A.M. Guest Night. Plenty of tickets available.
- ★ August 22 (Saturday) 12 P.M. CAS ATM group.
- ★ August 27 (Thursday) 6:30 P.M. Delaware County Red Cross.
- ★ August 28 (Friday) 9 A.M. Guest Night. Plenty of tickets available.
- ★ August 29 (Saturday) 12 P.M. CAS ATM group.
- ★ September 4 (Friday) 8 P.M. Guest Night. Tickets available.
- ★ September 11 (Friday) 8 P.M. Guest Night. Tickets available.
- ★ September 12 (Saturday) 2 P.M. Annual CAS Picnic.

2,000 Points of Light Perkins Observatory Needs Your Help

On any given night of the year from a dark, rural location, 2,000 stars light up the sky.

You can light up the sky over Perkins Observatory in the same way. Rising costs have made it increasingly difficult for its small but dedicated staff to engage in its public mission: to show the people of Central Ohio the wonder and majesty of the universe they live in.

Over the years, we have reduced our staff to the bare bones. With the switch of our Building Superintendent to part-time status, Perkins no longer has a single full-time employee. Despite those reductions, we have managed to increase our public activities and the number of people, especially children, we serve.

Those of you who love the night sky have been extraordinarily generous with both your time and financial help, and we thank you. Now, we need your help one more time.

If 2,000 people, 2,000 Points of Light, will contribute \$200 each, we can continue our mission unimpaired.

Half of your gift will go into the Perkins Endowment, the interest on which will keep us open for decades to come. The other \$100 will be used to make building repairs (including much-needed repairs to our roof), build new exhibits and displays, and help with ongoing costs.

To show our gratitude, we will associate your name (or the name of any honoree you pick) with one of the over 2,000 stars on our large, publicly-displayed star map. (Sorry, we get to pick the star). We will also send you a certificate honoring your help, mention your contribution in this newsletter, and add you to the monthly newsletter mailing list at your request.

Families, corporations, and fraternal organizations need not limit themselves to a single Point of Light. Why not honor several -- or many -- members of your group by making them a "star" on our map?

You can mail your contribution by using the handy form on the back or by writing 2KPL and the name of your honoree on the memo line of your check. Please mail to

Perkins Observatory 2KPL
PO Box 449
Delaware, OH 43015

Or give us a call at (740) 363-1257 and schedule a trip to one of our weekend public programs. We'd be honored to receive your gift in person.

Please don't lay this newsletter aside. We need you help today. If you become a Point of Light, Perkins can continue its public stargazing sessions for many years to come.

Friends of Perkins Observatory

Membership in FOPO entitles you to attend any or all of our weekend public programs.

Yes, I want to be a member of the Friends of Perkins Observatory. Enroll me at the level of sponsorship checked below:

Individual (\$50) Sponsor (\$100) Family (\$90) Family Sponsor (\$200) Corporate (\$300)

Name _____

Names of family members (for family memberships) _____

Address _____

City _____ State _____ Zip Code _____ Phone: _____

(Please mail to Perkins Observatory, P. O. Box 449, Delaware, OH 43015. Make checks payable to "Perkins Memorial Observatory.")

Yes, I want to be a Point of Light (@ \$200 per "Point"). Amount enclosed: _____

Yes, I want to donate to the Perkins Endowment. Amount enclosed: _____

Yes, I want to donate to the Operating Fund. Amount enclosed: _____

Name _____

Honoree(s) for "2,000 Points of Light" _____

Address _____

City _____ State _____ Zip Code _____ Phone: _____

(Please mail to Perkins Observatory, P. O. Box 449, Delaware, OH 43015. Make checks payable to "Perkins Memorial Observatory.")