Starscan

Johnson Space Center Astronomical Society

Volume 25, Number 5 May 2009

FORTY YEARS AND COUNTING!

A SIGHT TO SEE.... STS-125 AND STS-400 TWO ORBITERS ON THE PADS AT KENNEDY SPACE CENTER

Our own Triple Nickel (tail # 62) Flying Overhead With Charles Justiz

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***ASTRONOMY AND KIDS* —18-28**
CONNIE HAVILAND

Un mensaje del Presidente
(A message from the President)

Folks:

This has been a horrible, rainy month for any sort of viewing. I tried a couple of times over the past few weeks to put in for some of that IYA time at the George and both nights we were relegated to simply giving dome tours of the 36" scope.

Anyway, this month we have a the honor of hearing from another Rice graduate student of astronomy. A Mr. Naved Mahmud, who's presentation will be "Searching for the Youngest Planets". If you remember Gary Kilper from March of last year who gave the very interesting talk on the sun, Mr. Mahud is an office mate of Gary's. Guess we treated Gary right and we were recommended as a good group to talk to! By the way, Gary is now Dr. Kilper and begins his PostDoctoral work at Goddard Space Center this month.

Clear skies!
David Haviland

LETTER FROM THE EDITOR
By Connie Haviland

Hi Everyone!!

I am back, taking hold of the reins again. I want to thank David for taking this over for the few months, not only for me giving up control for Lent, but for giving me a break. It was hard, not to come in and take total control (I couldn't give up the kids' section, it is just a huge part of me), but it was nice not to have to feel the stress of getting it out on time.

Enjoy…..Connie

LETTER TO THE EDITOR

NOTHING THIS MONTH

A Pleasant Surprise
David Haviland

This stared rather innocuously while getting ready for last years Astronomy Day All Clubs Meeting. I wanted to make sure we had some choice door prizes and while waltzing through a local Walmart (I know, it isn't Land, Sea, & Sky) I came across binoculars in the Sporting Goods section.

I picked them up, looked them over, and put them back. Part of my putting them back had to do with the fact that the "brand name" was one associated with production of the "holiday scopes" we astronomers discourage people from buying around the holiday season.

Well, after going through the store for other items I went back to Sporting Goods and picked them up again; yes, they were still on my mind. For $28.99, they were a pair of 10X50 Tasco binoculars. Recall that Tasco had since been bought out by Bushnell Outdoor Products some time ago. Mind you, in my astronomy box I have a pair of very old 7X50's of unknown origin with no tripod mount, they clearly had "seen" water on the inside and despite being older than dirt were still adequate for viewing. None the less, I kept the Tasco pair. To cut right to the chase, we were fine for door prizes thanks to Bob's efforts and the binocs stayed under the bed for a few months. Connie and I looked at each other and we both had the same thought—let's keep them. In total truth, that older pair did have a minor focusing issue and I had to spend some time in the garage to fashion something to mount them to a tripod.

After cutting through the Fort Knox packaging, it was no surprise that they came with a case, and a strap. As with a good microscope, one eyepiece is fixed and the other variable. I found them easy to adjust to my eyes and adapt to my pre-scription and focusing was easy.

But that wasn't the last thing this pair of binoculars had. On the front was a cap. I didn't expect it but I took a chance a played with the cap on the front figuring

if the cap broke of, there was SuperGlue. To my surprise, the cap popped of revealing a threaded port for an "L-bracket" that lets the pair be mounted to a tripod. Who would have thought for $28.99 one could get a decent pair of binoculars that can be fitted to a tripod? Not me.

- David

Star Parties for 2009

Bob Taylor

MAY 22	HAAK WINERY
JUNE—AUGUST	OPEN
SEPTEMBER 12	MOODY GARDENS
OCTOBER 15-18	FORT McKAVETT
NOVEMBER 6	HAAK WINERY
DECEMBER	OPEN

Stephen Hawking's Hospitalized

LONDON, England (CNN) April 21, 2009-- Scientist and author Stephen Hawking is "very ill" and has been hospitalized, according to Cambridge University, where he is a professor. Hawking, 67, is one of the world's most famous physicists and also a cosmologist, astronomer, and mathematician. Wheelchair-bound Hawking is perhaps most famous for 'A Brief History of Time' which explored the origins of the universe in layman's terms, is considered a modern classic. Hawking has Lou Gehrig's Disease (Amyotrophic Lateral Sclerosis, or ALS), which is usually fatal after three years. Hawking has survived for more than 40 years since his diagnosis. On his Web site, Hawking has written about living with ALS. "I try to lead as normal a life as possible, and not think about my condition, or regret the things it prevents me from doing, which are not that many," he wrote. He added: "I have been lucky, that my condition has progressed more slowly than is often the case. But it shows that one need not lose hope." The disease has left him paralyzed -- he is able to move only a few fingers on one hand. Hawking is completely dependent on others or technology for virtually everything -- bathing, dressing, eating, even speech. He uses a speech synthesizer with an American accent. Hawking has been married and divorced twice. In 2004, police completed an investigation into accusations by Hawking's daughter that his second wife was abusing him. Authorities said they found no proof. His Web site says he has three children and one grandchild.

Hawking was born on what turned out to be an auspicious date: January 8, 1942 -- the 300th anniversary of the death of astronomer and physicist Galileo Galilei. A Cambridge University spokesman told CNN: "Professor Hawking is very ill and has been taken by ambulance to Addenbrookes Hospital, Cambridge." Professor Peter Haynes, head of the university's department of Applied Mathematics and Theoretical Physics, said: "Professor Hawking is a remarkable colleague, we all hope he will be amongst us again soon." At Cambridge, he holds the position of Lucasian Professor Mathematics -- the prestigious post held from 1669 to 1702 by Sir Isaac Newton. Hawking has guest-starred, as himself, on Star Trek: The Next Generation and The Simpsons. He also said if he had the choice of meeting Newton or Marilyn Monroe, his choice would be Marilyn.

Article posted by Lisa Hommel via email on list serv (pictures added by C. Haviland)

On April 21, 2008, the Space Policy Institute co-hosted, along with Lockheed Martin and NASA, a lecture by world-renowned Professor Stephen Hawking of Cambridge University and his daughter Lucy Hawking on "Why Go Into Space?" This was the third is a series of lectures commemorating NASA's fifty years of operations. The lecture took place in the Morton Auditorium on the GW campus and was attended by over 250 people, including NASA Deputy Administrator Shana Dale and GW President Steven Knapp. It was televised live by C-Span and NASA Television and received wide media coverage. (www.gwu.edu/%7Espi/body1.html)

It was a really great Friday after all! - Chuck Shaw

A few Fridays ago, I found myself sitting in an all day review with the Hubble Space Telescope Program up at the Goddard Spaceflight Center at Greenbelt Maryland. The review was the "Pre-ship Readiness Review" for the Science Instrument Command and Data Handler (SI C&DH) that we will carry up to the Hubble Space Telescope on STS-125. Recall that it was the SI C&DH aboard the telescope that had a failure last October that caused us to delay the launch for 6 months so a replacement unit could be made ready. So here we were pouring thru all the build paper and testing and test results, and the shipping and handing plans, etc. etc. etc for this replacement unit. Now I must admit that I am a Geek (actually I am quite proud to admit that!!), but even by my standards I was wearing down. Then, I thought about what this hardware does…….

This assembly is the TOTAL interface for all the astounding science instruments aboard the telescope. Its importance is the reason why when its primary side failed in October, and the telescope was switched to its alternate side, that put the telescope only one failure away from collecting amazing data, but not being able to get it to the ground! Not a good configuration to leave the telescope in after the last servicing mission to it, especially when we were going to be leaving the telescope at the apex of its scientific capabilities and productivity since it had been put in orbit about 19 years ago with all our repairs and new instruments!

And, as I started thinking about the hardware I wondered what mysteries of our universe would be revealed by data that would pass thru this hardware in the future? The result was the review instantly turned from a tedious chore, to a labor of love! This thing HAS to work right!!! So my Friday turned from one I thought tedious, to one I was honored to experience! I kept that same feeling all the way thru the rest of the day, and all the way to the airport for my flight home that evening….. Then I looked at my return ticket a bit more closely, and found my flight was not direct, but was to Orlando, and then to Houston… Ugh……. OK, so Friday at least had had a bright spot, but it would be a long tiring flight home….

I was flying on Southwest, and was able to get an exit row, by the window, and the seat that does not have a seat in front of it! Yea!!! Maybe the day turned around again a little for me after all…. till I found out EVERY seat was sold, and you guessed it, the LAST guy that boarded was at least as big as a car, and sat down in the middle seat beside me….. Wow! Plenty of leg room but I had to twist sideways to not have my collar bone compressed till it splintered between his shoulder and the side of the cabin. This guy was not fat by the way, he was a ton of muscle, and I had no other seats to go to…. I smiled at him weakly (but not so much as to send any signals that could be misinterpreted!!!!), and resigned myself to another twist to the day!

Somehow we made it to Orlando, and I found that I did not have to change planes, the plane I was on was going to Houston. So I could keep my exit seat!!! I was a little worried about being trapped again though, but then the Flight Attendant told me there were only 14 people on the flight! Wow, things had really turned around again!!! Little did I know how much better it would get……

The sun was a very huge red ball as it set in the west as we taxied to the runway. It was fun watching it slowly finish sinking below the horizon as we started our takeoff roll. Then, as I was watching, hoping to maybe get a glimpse of the green flash, much to my surprise, the sun rose again!! How cool!!! It rose in the west right after it just set in the west????? Well, it was pretty simple, we were climbing like a homesick angel, and the increased altitude let us see a bit more around the edge of the earth.

We were climbing faster than the sun was setting, and it rose almost1/4 deg clear of the horizon (using the sun's disk as a ½ deg gage). As we turned west and slowed our rate of climb, the sun stopped rising, and seemed to just hang there just above the horizon…. Our slower rate of climb must have just about exactly offset the sun's rate it was sinking. Wow, I figured THAT probably does not happen too often, since you have to takeoff right after sunset, and climb at just the right rate! (I pondered whether to try to figure out what rates of climb and altitudes we would have needed to have had to make all that happen, but then I decided to simply enjoy the experience instead!) . Boy, Friday was turning out better again for sure! I was really glad to have had to have gone thru Orlando!!! (besides, the feeling was coming back into my shoulders).

As we leveled off, the sun started setting again, but it in way way slow motion. How cool! We were chasing the sun!!!! It was getting away from us, but very slowly!!! I remembered the article in S&T I had recently read about chasing the eclipse in the Concorde, and their excitement on board as time seemed to stand still for a while, or at least really slowed! I had been fixated on the sun, but then I thought about the terminator (not the robot guy!!! this is an astronomy related article!!), so I twisted in my seat and looked back to the east, and sure enough you could see the darkness way back in the east. Just how cool could this Friday get! I was really fortunate to have had so many cool things happen to me! No longer did I dwell on the downsides I had been fixated on earlier! (I think were are supposed to do that anyway, right??? J)

Now airplane windows, especially on a 737, do not allow you to look "up" very easy, but wait, no one was sitting anywhere nearby, and there was no seat in front of me, just the cabin floor! So since the belt sign was off (I "think" it was off?) I simply unbuckled and say down on the floor, and started getting a wondrous view of the show unfolding outside. The sun was slowly setting, the terminator was slowly catching us, and the sky was changing from reds in the west, to light blues, then darker and darker blues further to the east, and finally the long straight shadow line of the terminator turned the sky essentially black. Stars were really bright in the dark part of the sky, and slowly faded towards the west, till our home star blew away any thoughts of darkness in the west! The Flight Attendant came by and for some reason did not ask why I was sitting on the floor. Maybe she was concerned about what the answer might have been? I was going to have her come share the view, but then I thought I better not……. A shame, she missed a wondrous show!

By my dead reckoning navigation, we were somewhere south of Louisiana by the time the sun was well tucked away below the horizon and the terminator finally caught us. Here we were in darkness above and below, with stars showing their colors and the constellations actually a little hard to pick out as I looked north.

Even so, I could easily find Cassiopeia, and off to the east a bit was bright Mirphak. But wait, there were TWO bright stars there, not just one??? I could easily trace out all of Perseus, and could account for all the major stars, so what was the mystery star? Then I noticed it was moving!!! A plane maybe???? However, it did not take long to recognize the telltale movement rate of a satellite. It was moving slightly east of north, so whatever it was, it was in a very highly inclined orbit. Later, I thought about writing down the time of the sighting and trying to figure out what satellite it had been, but I soon decided I would relegate that to the same dust bin as my calculations of rate of climb to make the sun rise, and simply enjoy the short time remaining in the flight…

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As we approached Houston, clouds appeared, and huge bolts of lightning were off to our north. I caught myself smiling at what a GREAT Friday this had really turned into, once I had stopped grousing about it!! As we turned north we flew over Bolivar, and with wisps of clouds all around us, and lighting off in the distance, I could only imagine what “Ike” must have been like when it followed a very similar path ashore.

While driving home from the airport, the sky was opaque, but a layer of fog had also formed. As I turned in to the driveway at home, an almost full moon rose above the house, and glowed though the mists to welcome me home. Just how cool was that?????

Without a doubt, it had turned out to be a really great Friday after all!

Cheers!

Chuck

If you want to read what Chuck Shaw has to say about the Hubble Service Mission, go to http://www.aiaa-houston.org/newsletter/apr09/apr09.pdf and read the Interview with Chuck Shaw: Parallel Perspectives on Hubble, written by Sean Keefe, Asst. Editor, HORIZONS

National Aeronautics and Space Administration

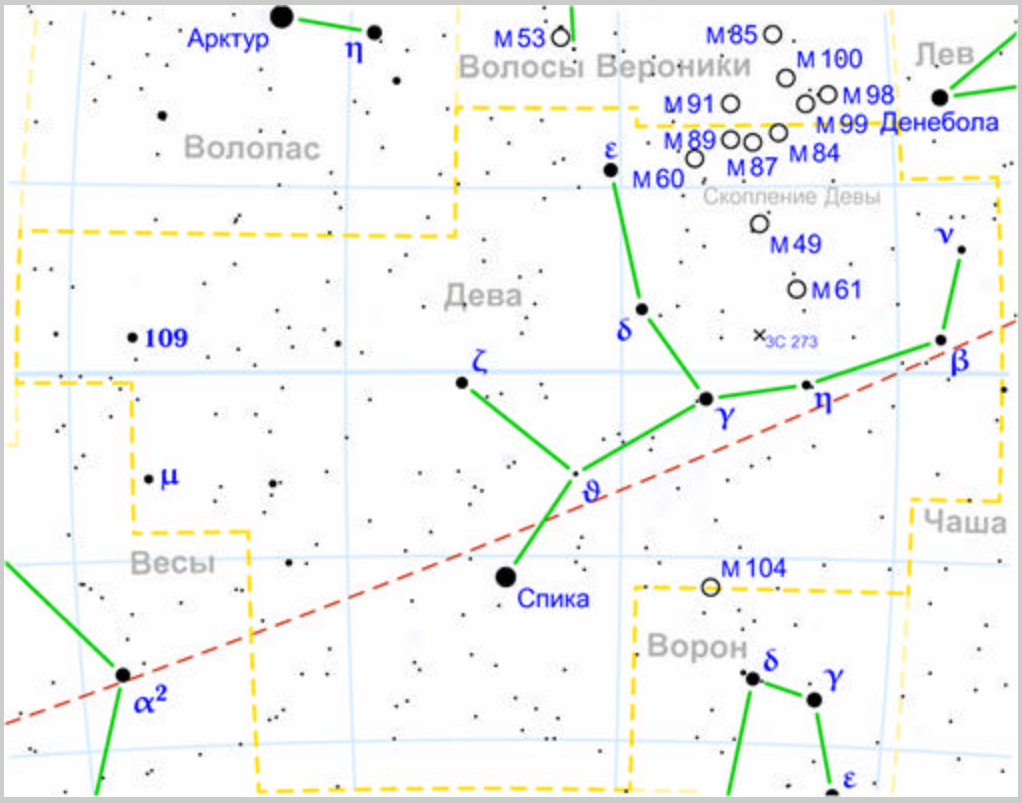
MAY OBSERVING - The MAY Sky
Hernán Contreras

When we look up in the May sky we're looking away from the center of our galaxy and can see almost forever. With just binoculars, we can see smudges in Virgo that boggle the mind when we realize that tiny smears are galaxies with millions of stars and even more planets.

Virgo, the second largest constellation in the sky, is marked by bright Spica, the dominant star in the constellation. To find Spica, follow the curve of the handle of the Big Dipper to Arcturus in Bootes, then, following the same curve, speed on to Spica.

Mythology

Named for the Greek goddess Demeter, the Earth-goddess, and is associated with the arrival of spring and bringer of the growing season. Hades, the God of the Underground, fell in love with Demeter's daughter, Persephone, but Demeter would not approve. She did not like his background even though he was well connected to beings in low places. One day Hades, in a black chariot drawn by four great black horses in golden harness and reins, rode up to Persephone and carried the girl off with him back to the Underworld. Demeter became worried when her daughter did not return home. She sent out to search for her daughter. Demeter searched without food or sleep. While she searched nothing grew and a great famine draped the earth. Zeus pleaded with her to return to Olympus and end the famine. She refused and the famine continued. Zeus sent Hermes, Messenger of the gods, to visit Hades and tell him that Persephone must return with him. Hades, knowing that the gods of heaven were stronger than he, returned Persephone. There was a happy reunion, but Persephone told her mother that she loved her husband Hades. Zeus solved the problem by saying that Persephone would spend half of her time in the Underworld with Hades and the other half on Olympus with her mother. In this way, winter comes when Persephone goes down to the Underworld to be with Hades. When Persephone returns to Olympus, the winter cloak of death melts and there is a rebirth of life over the land and the crops begin to grow.



Deep Sky

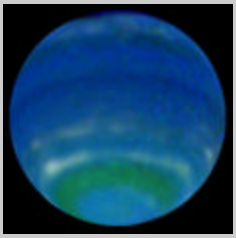
The Virgo Cluster: Eleven Messier Objects in Virgo--all galaxies

Omega Centauri: Below Corvus, just above the horizon is the biggest globular cluster in the sky--visible to the naked eye as a smudge with an apparent size of the full moon.

Solar System

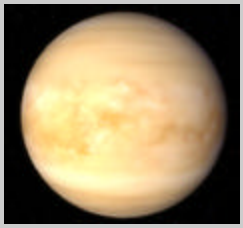
Saturn is high in the sky, almost stationary in Leo. Saturn wobbles giving a different aspect views of the rings with maximum tilt occurring on May 13. Over the month the tilt will narrow to a line and then expand in the other direction.

Jupiter is in the southeastern sky before sunrise.



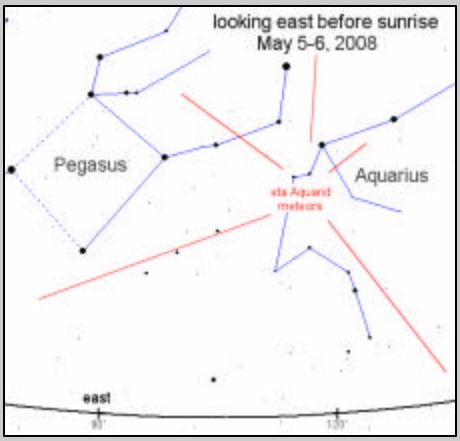
Neptune is close Jupiter and will be less than a degree apart on May 15.

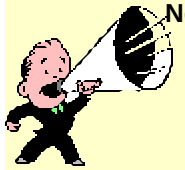
Mars and **Venus** great the dawn low in the eastern sky.



Events

Eta Aquarids meteor shower peaks on May 5-6, with expected hourly rate of 45, but with a full moon on the 8th only the brighter meteor will be seen.





What's Happening at the George!!!

Cynthia Gustava

George Observatory May 2009 Events

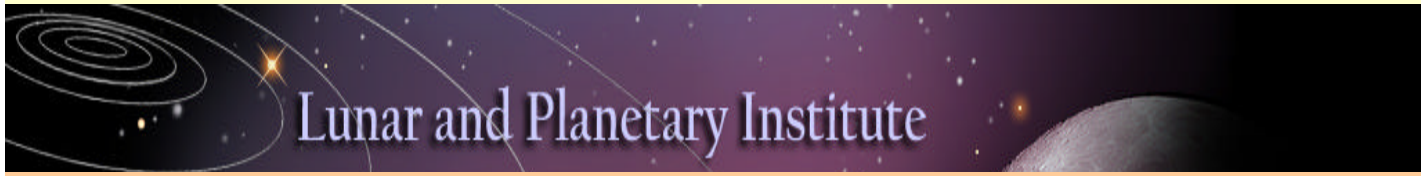
Friday Night Groups (all times are 19:30 to 22:30)…Volunteers for domes and deck scopes are needed. Bring those laser pointers and instruct the visitors on the constellations and bright objects! Contact Cynthia Gustava at cynm31@att.net to volunteer.

May 01 – Home School Star Party
May 08 – Sky Search Overnight (Full)
May 22 – Christian Way Home School and Families (30) and Cypresswood 50+ Club – BM = Cynthia Gustava
May 29 – HMNS Member's Night

NOTE: May 15 is the annual HMNS Volunteer Appreciation Dinner downtown at the Museum. (this information will be out later)

Saturday Night Public Viewing (dusk to 23:00)…Volunteers for domes and deck scopes are needed. Contact the building manager teams below.

May 02 – Barbara Wilson and Buster Wilson gobserve@consolidated.net or retsub@ix.netcom.net
May 09 – Jessica Kingsley and Jack McKaye gnkingsley@att.net or jemckaye@comcast.net
May 16 – Tracy Knauss and Keith Rivich birdbarn2000@yahoo.com or icgalaxies@ic.com
May 23 – Cynthia Gustava and Mary Lockwood cynm31@att.net or mplockwood@att.net
May 30 – Mary Lockwood and Joe Mills mplockwood@att.net or k5jmm@yahoo.com



For more information, go to http://www.lpi.usra.edu/education/space_days/
Or call Katy at (281) 486-2106

3600 Bay Area Boulevard, Houston, Texas

Folks:

In times past, people that have wanted to take advantage of the club discount have had to write their check, put it in with the renewal slip, and then either mail it to me at my home or chase me down at a meeting. In most cases, within a week, I have sent out the renewal. Sometimes, and I don't really mind, the renewals have gone out at my expense for the postage. Without hesitation, question, or fail, it is not the most efficient means to maintain club subscriptions. So as secretary, I'd like to try something new...

You get all your stuff ready for the subscription, whether it be Astronomy or Sky & Telescope, you keep it - you hang on to it. Email (most reliable) or tell me when you see me that you want to take advantage of the club discount for either or both of these publications and that you need a supporting letter. What I'll do is get the letter together and email the "letter from the treasurer/secretary" back to you as a PDF. You print it off, and enclose it with your renewal. For this to work your computer must have Adobe Reader (which is free) and a means to print it. I would like this procedure to become the "Standard Operating Procedure" for Astronomy/S&T discounts through JSCAS. For those still not in the computer age, we can process things as we have in the past.

Clear skies,
David Haviland

Occultation of Venus and Moon shots from Bldg 30 (Mission Control) Hand held, but steadied on a pole, Olympus E-500, 70-300 zoom around 7:30am…see the Southwest airlines jet? Jeff Stone at JSC (Space Shuttle In-Flight Maintenance)

A bright crescent Moon (with Earthshine) above the Pleiades open star cluster and Mercury
Becky Ramotowski

Randy Brewer taken from
Redondo Beach, CA

Thru thin dust, 85mm fl f3.8 1 sec D50 DSLR, cropped. Also have a time lapse of the event at 10 second intervals.
Andy "Yoda" Saulietis

Members' Gallery—MAY 2009
Cont'd

LRGB composite of NGC 5033 (Canes Venatici) made from exposures taken on the first night of the TSP (4/19/09). L:R:G:B = 130:50:30:40 min. C-14 at f5.5 with MX916 and AstroDon CRGB filters. Excellent transparency, but average seeing. Image taken by Al Kelly at TSP 2009, please see http://www.kellysky.net/5033larg.jpg for details.

Award given to Becky Ramotowski- "Best Wide Field Photograph", at the astrophotography contest held at TSP. It was a pinhole photo made with one of my homemade pinhole cameras.
This is a solargraph that I made by leaving a small pinhole camera beside the river road during a visit to Moab, Utah. The weather was not the best 'sun' wise- it snowed and the temps rarely rose above the 20's-but there was enough light to make an image of the rock mesas and formations near Castle Valley.
Home made camera
nine day exposure on photo paper
ASA = very slow

Light pollution:
Any adverse effect of artificial light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste.

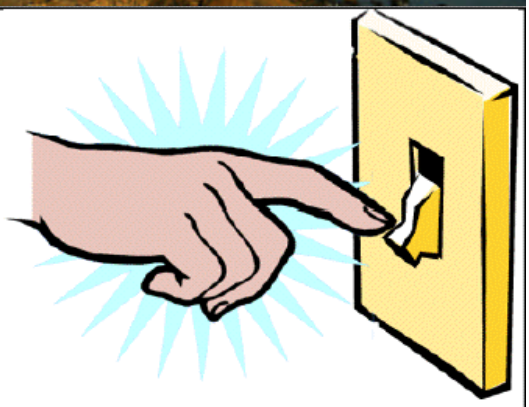
.Do you have a question about light pollution, protecting the night sky, or IDA's resources? **Get Help from IDA** http://www.darksky.org/mc/page.do?sitePageId=56399

Photograph © Phil Hart

IDA
THE LIGHT POLLUTION AUTHORITY

Help turn off the lights...

Join the
International Dark-Sky Association (IDA)
http://www.darksky.org
"To preserve and protect the nighttime environment and our heritage of dark skies through quality outdoor lighting."



Houston Area Astronomy Clubs

Brazosport Astronomy Club
Meets the Third Tuesday of the month, 7:45p.m.
At the Planetarium
400 College Drive
Clute, Texas (For more information, contact Judi James at the Planetarium 979-265-3376)

Fort Bend Astronomy Club http://www.fbac.org
Meets the third Friday of the month, 7:00 p.m.
First Colony Conference Center
3232 Austin Pkwy
Sugarland, Texas

Houston Astronomical Society http://spacibm.rice/edu/~has
Meets the first Friday of the month, 8:00 p.m.
University of Houston, University Park
Science and Research Building, Room 117

North Houston Astronomy Club http://www.astronomyclub.org
Meets the fourth Friday of the month, 7:30 p.m.
In the Teaching Theatre at Kingwood College
20000 Kingwood Drive
Kingwood, Texas

Galveston Stargazers
Meets the first Wednesday of the month At Home Cut Donuts, 6807 Stewart Rd, Galveston, TX
From 7PM to 9PM.
Contact: Jim Gilliam at Jim.Gilliam@dars.state.tx.us or
At (409)795-3620, M - F, 8AM to 5PM

Starscan Submission Procedures

Original articles of some relation to astronomy will be accepted up to 6 p. m. (18:00 hrs) on the 25th of each month. THE most convenient way to submit articles or a Calendar of Events is by email and is preferred, but hard copies (CD, disk) are also accepted. All articles must include author's name and phone number. Also include any picture credits. Word, WordPerfect, and text files will be accepted. I have set up a special email account so that I can keep all of the Starscan articles, pictures, information, etc, separate from all of the other email I get. This makes is much easier to edit and set up the Starscan

Please send all submissions to:
conniesstarscanaccount@gmail.com

The author of individual articles bears all responsibility for publishing any e-mail addresses in the article on the World Wide Web

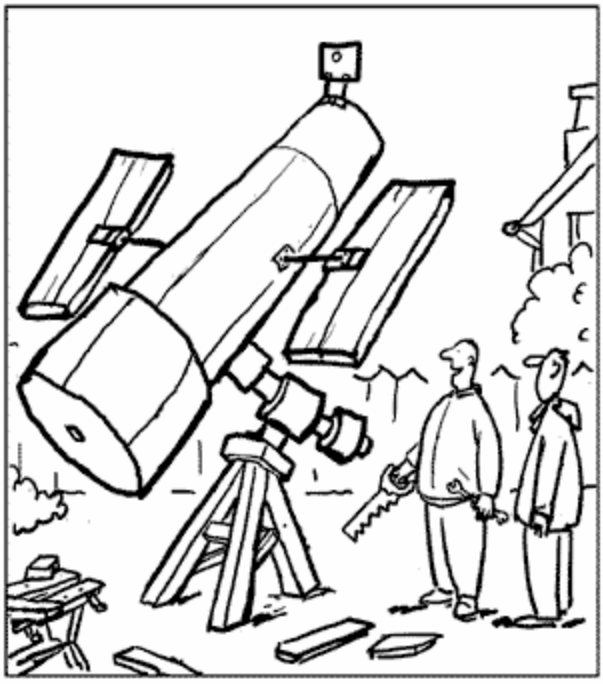
Johnson Space Center Astronomical Society

2008-Club Officers

President – David Haviland
Vice President – Chris Randall
Secretary – David Haviland
Starscan Editor – Connie Haviland
Star Party Chairperson –
Librarian – Bob and Karen Taylor
Historian – Chris Randall
Scientific Expeditions – Paul Maley
Web Master—Chris Randall

SIGS

Observing Awards – Triple Nickel
Astronomy 101 — Triple Nickel
CCD Imaging – Al Kelly
Binocular Observing – "OPEN"
Telescope Making – Bob Taylor
Deep Sky Observing – Hernan Contreras

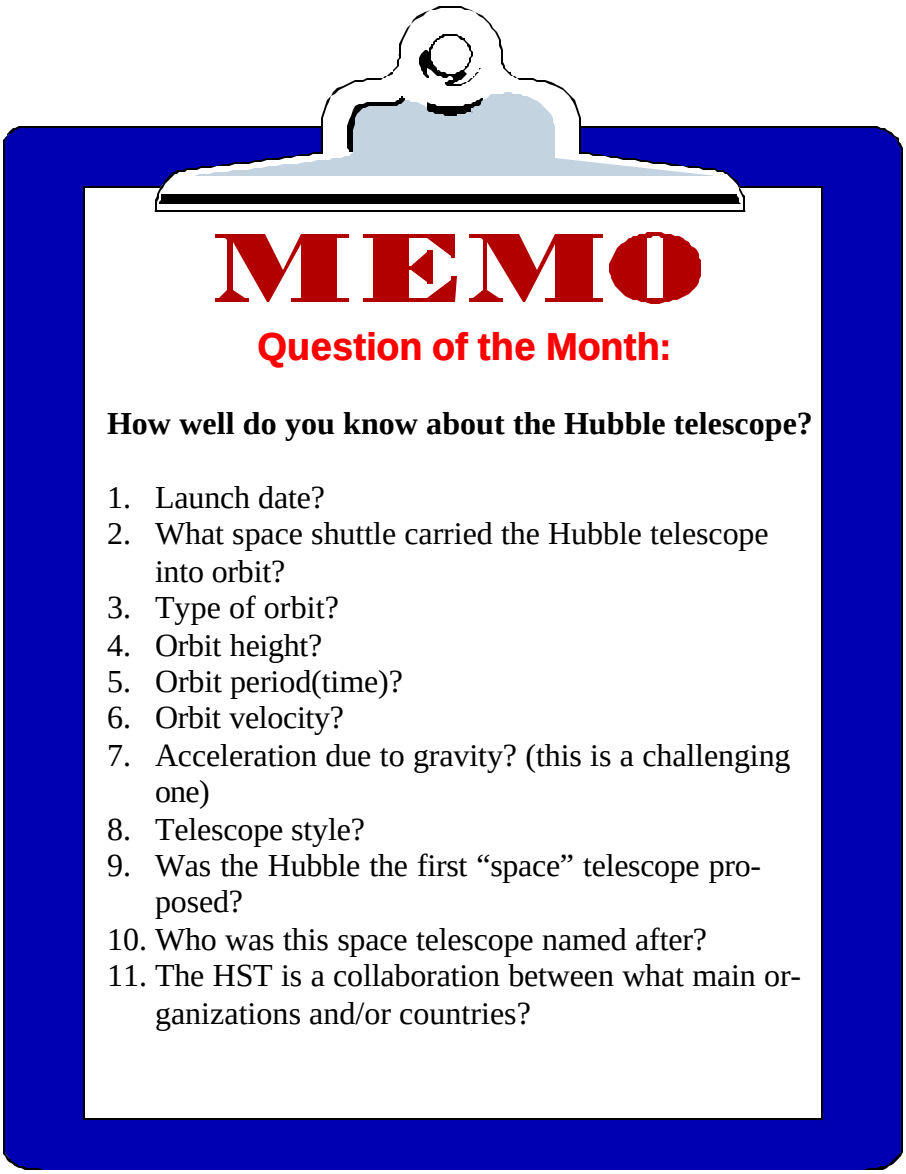


'It's based on the Hubble Space Telescope.'

CHRIS WADDEN CARTOONS

Astronomy and Kids

This is the section strictly for kids (or kids at heart). We will be including information, stories, ideas, puzzles or anything that has to do with astronomy. The only difference here is, it will be directed for children. We don't discourage parents or any other adult to get involved. In fact, we encourage it strongly. So we hope you enjoy this section and if it touches a child's interest in astronomy, our goal has been achieved. Enjoy!!



MEMO

Question of the Month:

How well do you know about the Hubble telescope?

1. Launch date?
2. What space shuttle carried the Hubble telescope into orbit?
3. Type of orbit?
4. Orbit height?
5. Orbit period(time)?
6. Orbit velocity?
7. Acceleration due to gravity? (this is a challenging one)
8. Telescope style?
9. Was the Hubble the first "space" telescope proposed?
10. Who was this space telescope named after?
11. The HST is a collaboration between what main organizations and/or countries?

An occultation is a celestial event occurring when an astronomical objects apparently hides another astronomical object. The nearer object completely covers the more distance object.

Introduction (taken from http://www.david-higgins.com/Astronomy/occultations.htm)

Occultation observations are the observations of astronomical objects that are obscured by other astronomical objects. Examples (and the traditional occultation events) are the observations of stars that disappear and/or re-appear from the limb of the moon (moons edge). Example 2 is known as a Grazing occultation where a star 'grazes' the dark limb of the moon, disappearing and re-appearing as it is obscured by features on the moon's surface. The third example is an Asteroidal Occultation where an asteroid passes in front of a star.

These observations have traditionally been undertaken visually with a reasonably powerful telescope (8" is a good average) and the use of a Shortwave Time signal (from Hawaii now that our Australian borne signal was shut down a couple of years ago). Ideally the user will record the observations on tape (that also records the time signal) calling the disappearing and re-appearing event(s). The best observers can really only record events to +/- 0.2 seconds. Not bad when one considers the precision this actually represents (in some cases representing astrometric positions within milliarcseconds - surprising many professional astronomers)

But, there are inherent problems with this manual observation. Sky conditions, limiting magnitudes, the temperature and fatigue can make the observers life hell. The star may be barely observable, the temperature may be so cold that they eyes water or the observer blinks at the point of disappearance. (All these details are required as part of the detailed observation report for each event) Crowded star fields can make it difficult to pick the right star in time for the occultation or confuse the observer if they look away for a moment.

Typical setup - the old days

Occultation setups are portable. They are portable because some events, typically grazing and asteroidal occultation's are pretty few and far between and will almost never occur over one's own home. As such, the observer needs to pack up shop and drive to a location that is predicted for the event to occur. Most observers are happy to respond to events that occur within 150-200km.

This image shows the author's original setup. A Computer controlled Telescope that makes it easier to find the target star within a short period of time, a Shortwave Radio for the WWV Timesignal and a tape recorder to record the time signal and the observer calling out the occultation starting and ending.

Today

Things have moved on in recent years as observers have sought more precision. To this end observers have experimented with and adopted some new higher precision techniques. The first is a method to actually visually record the event. The beauty of recording the event is to ensure that the event is not missed. Digitally recording the event also allows for very accurate measurement. Methods of visually recording the event started with low light video cameras. These were further modified to allow manual adjustment of the signal gain thus improving the cameras limiting magnitude. A second method was developed to use cooled astro ccd cameras. These astro CCD's are still cameras so to use them required the scope drive to be turned off while the shutter was left open. This caused the star to trail across the CCD chip. A bright trail that would be interupted when the star was occulted. Measuring this gap in the star trail based on the time of start and end of the star trail produced highly accurate results and these cameras cane see events that are far fainter that the eye or video camera can see.

The second part of the recording is catching the time signal as well. The problem for us here in Australia is the loss of our own time signal service. If the airwaves are not kind it can be impossible to get the signal from Hawaii. Some ingenious observers have come up with numerous solutions. The first is a beeper box. This is a box that beeps the same time signals as WWV synchronized to a time signal at some stage. Whilst it is left on it maintains its signal to a few milliseconds and provides both an audible and visible time signal. The downside is that without a 1pps GPS trigger, the box must be manually synchronized so the timing accuracy may still only be +/- 0.2 seconds - but this is a fixed error rather than a variable error.

The next is a 1pps (pulse per second) GPS feed. This is a very accurate time signal source but reasonably expensive but combined with Video recording (and time values fed directly into the video feed) makes extremely accurate observations possible.

I have used the CCD drift method but my camera lacked a shutter so it had to be simulated with a matt black board over the face of the telescope. The 'shutter' was manually opened and closed resulting in errors of around 0.2 seconds in the timing. I now have a modified low Light CCD Video camera and beeper box. These low light cameras are very small in deed (as can be seen in the image below. The C mount fits inside the eyepiece adapter of any telescope)

So, what has changed? Well the occultation kit is still portable. I still use a computer controlled Telescope, the small low light CCD Video camera to record the event connected to a 5" B/W monitor then connected to a video recorder (run off a 12 v Inverter) or have a handheld video Camera recording the event via the monitor screen. I still take my SW radio in case I could not synch my beeper box and a tape recorder as backup. A GPS is also necessary to accurately record my location in the field. This kit, all up, is pretty expensive but the advantage is - it will last a very long time.

From How Stuff Works: http://science.howstuffworks.com/occultation-info.htm Occultation in astronomy is the passing of the moon or some other object of the solar system in front of a planet, star, or other celestial body, hiding it from view. The most common type of occultation is that of a star by the moon. An occultation of the sun by the moon is called a solar eclipse.

When a planet with an atmosphere passes in front of a star, the star dims before it disappears, because the planet's atmosphere absorbs some of the light passing through it. When the moon passes in front of a star, the star disappears suddenly without dimming, because the moon has no atmosphere.

Not only light, but also radio waves and other forms of electromagnetic radiation are blocked during an occultation. When the moon occults a celestial body that is a source of radio waves, the reception of the radio waves stops at the same time the body is hidden from view. Occultations have thus helped astronomers identify various celestial bodies as sources of radio waves.

IOTA: The International Occultation Timing Association, Inc. Their mission is to encourage and facilitate the observation of occultation and eclipses. They provide predictions for grazing occultations of stars by the Moon and predictions for occultations of stars by asteroids and planets. They also provide information on observing equipment and techniques, and reports to their members about observations made.

A guide to lunar occultation: (http://www1.kaiho.mlit.go.jp/KOHO/iloc/docs/howto_e.html)

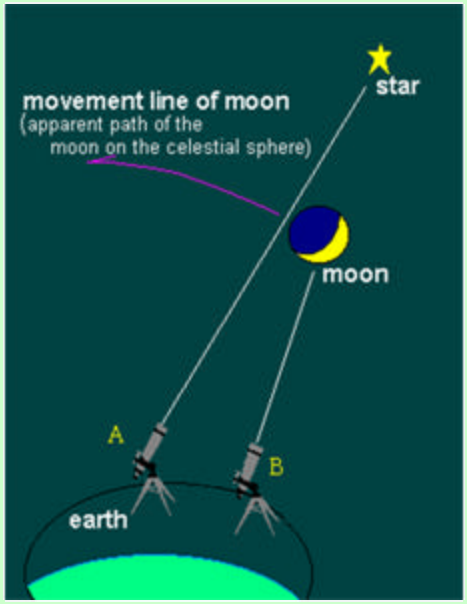
Simply put, the eclipsing of a star is a phenomenon which occurs when one star overlaps another, thus making the second body invisible. Solar eclipses and lunar eclipses are the most familiar examples of this phenomenon.

Just as in a solar eclipse, lunar occultation is caused by the blocking of the light from a star by the moon. In a solar eclipse, it is the sun which is hidden by the moon, but in a lunar occultation, it is a star or planet which is hidden. The moon travels across the sky at a rate of roughly 13.5 degrees per day, and stars in the path of the moon end up being hidden as a result of this movement.

The moon appears large to the eye because it is close to the earth, and this means that many stars are hidden by the moon as it moves. In addition, the great distance of the stars means that they appear only as tiny points of light, and for this reason, unlike a solar eclipse, in an ordinary lunar occultation many stars are hidden by the moon at a single time. Whether or not a lunar occultation occurs depends on the relative position of the moon, the stars, and the observer. Since the positions of the stars are known to an extremely high degree of accuracy, if the position of the person performing an observation and the time at which the observation was made are accurately known, it is possible to determine the position of the moon. It is also possible to learn about the relationship between the movement of the moon and the rotation of the earth. While it is possible to perform the same types of observations in other types of eclipses, because the precision to which the positions of the stars are known is quite high, and because lunar occultations occur much more frequently than other types of eclipses, lunar occultations make it possible to easily determine these things both easily and with precision. This is why lunar occultations are useful in calculating the position of the moon or in calculating the time.

What is lunar occultation?

Occultation refers to hiding of one celestial body when it overlaps with another. In a solar eclipse, the sun is hidden by the moon, but in a stellar eclipse it is a star which is hidden instead. When a star passes behind the far side of the moon, the moon blocks the light from the star, thus making it invisible. It is this phenomenon which is referred to as lunar occultation.



Solar eclipses and lunar eclipses can only rarely be seen, but because there are so many stars lunar occultation occurs quite frequently.

Whether or not a lunar occultation occurs depends on the relative position of the moon, the stars, and the observer. Lunar occultations are useful in calculating the position of the moon or in calculating the time.

Guide to Performing Lunar Occultation Observations

A lunar occultation observation is an observation in which the time at which stars are eclipsed by the moon (i.e., the time at which a lunar occultation occurs) is recorded.

An easy method for use in making observations is to record time reports on a tape recorder and to make a sound or sound a buzzer at the moment that an occultation is visually observed to record the sound or buzzer together with the time and then to play back the tape to determine the time at which the observation was made. Using this method, it is possible to make observations as long as one has common items such as a tape recorder and a radio or telephone for use in obtaining time reports together with predictions of when lunar occultations will occur.

There are also methods which make use of photocells to make more precise observations, but as the equipment is more complicated and expensive, these methods are not commonly used.

Data required for making lunar occultation observations:

1. Position of telescope (i.e., longitude, latitude, and altitude of observation point)
2. Precise time
3. Lunar occultation predictions

1. Position of telescope

Because it is necessary to know the relative positions of the stars, moon, and the person making observations in order to perform lunar occultation observations, it is impossible to obtain accurate data unless one knows the precise location at which observations are made (i.e., the position of the telescope).

In order to determine the precise position, the most accurate method is to perform observations from triangulation points or to measure the distance from triangulation points which serve as a standard and then calculate the position, but when performing visual observations, when the precision of visual observations is taken into account, it is sufficient to know the position to an accuracy of plus or minus 25 meters.

It is also possible to instead use a 1/25,000-scale topographical map from the Geographical Survey Institute. While nothing is better than measuring one's position to a high degree of accuracy, when one considers that an accuracy of +/- meters is sufficient, maps can be used not only to obtain triangulation reference points, but also indicate the positions of the centers of the intersections of roads to a fairly high degree of precision. With these positions as reference points, it is possible to measure the distance from such a point to the point at which observations are to be made using a measuring tape reel or similar piece of equipment. A position may thus be determined by measuring the distance in meters in a given direction from a certain intersection to a given point (i.e., to a given landmark on a map).

The position may then be accurately measured and drawn on the map and the latitude and longitude may then be read from the latitude and longitude lines located around the borders of the map. Since the position needs to be determined to an accuracy of +/- 25 meters, it is sufficient to locate the position on the map to a precision of +/- millimeter. The altitude may be determined from the altitude contour lines indicated on the map.

+/- 0.1 seconds is required. Accurate time reports may be obtained from short-wave broadcast JJY times or telephone time reports.

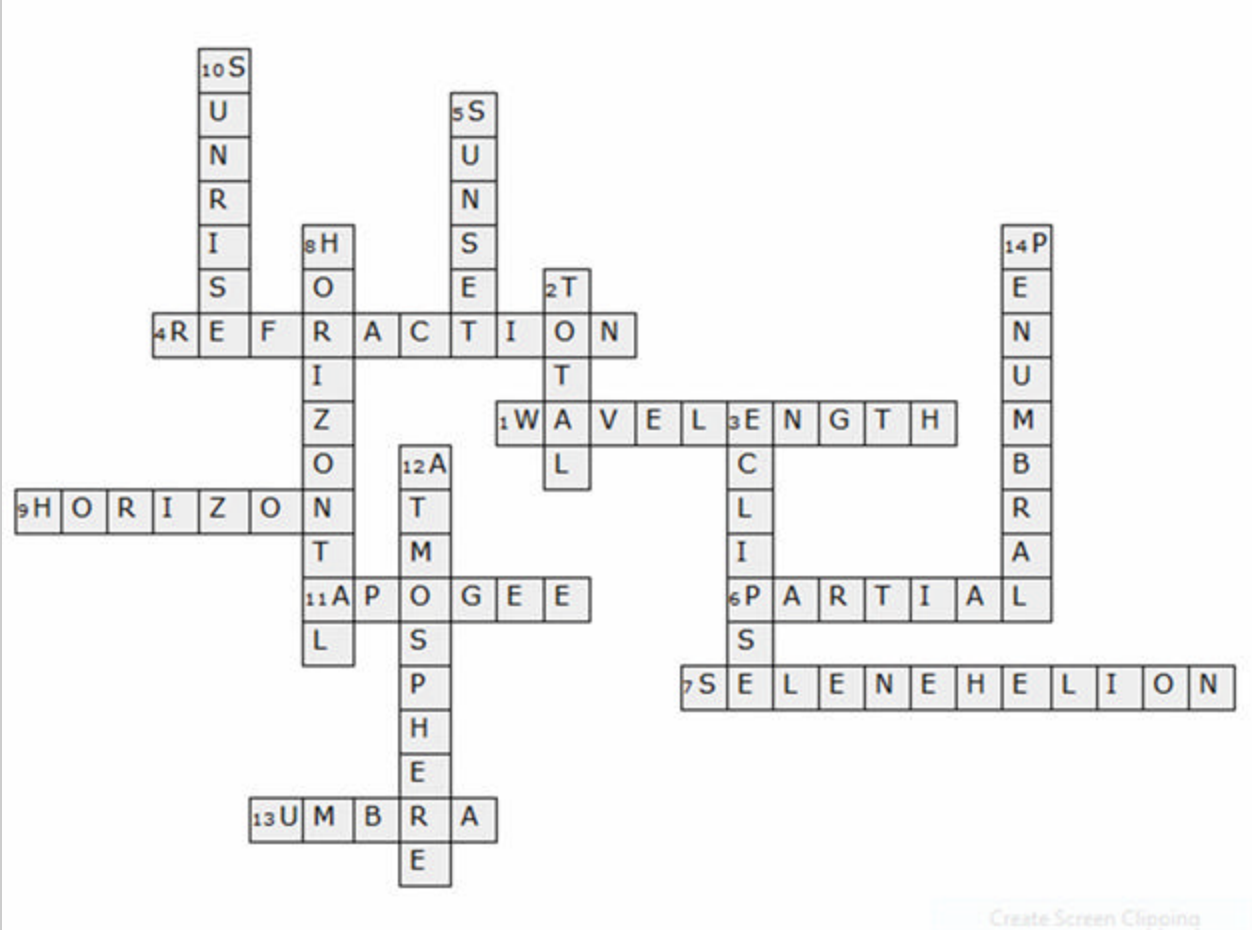
When performing visual observations, it is said that it generally takes about 0.4 seconds from the time an observation is made to the time when the body actually reacts. It is therefore useful to know how fast your own reaction time is in order to increase the precision with which observations can be made. It is also necessary to train yourself in order to ensure that your reaction times are even. Gaining experience in performing observations is another way of improving precision.

2. Lunar occultation predictions It is impossible to perform lunar occultation observations without knowing what stars may be eclipsed by what part of the moon and when.

In order to know this, however, it is necessary to first obtain prediction data for lunar occultations which will be visible in the area in which observations are to be performed. Prediction data consist of data indicating what stars in what part of the sky will be hidden by what part of the moon (or which will reappear from behind what part of the moon) when.

Observations may then be performed by getting everything ready and searching for the star or stars to be occluded before the predicted time actually comes.

SOLUTIONS TO APRIL'S PUZZLES



Across:

1. The distance (measured in the direction of propagation) between two points in the same phase in consecutive cycles of a wave.
4. The change in direction of a propagating wave (light or sound) when passing from one medium to another, being zero at the zenith and a maximum at the horizon.
6. A type of eclipse occurs when only a portion of the Moon enters the umbra.
7. It occurs when both the Sun and the eclipsed Moon can be observed at the same time.
9. The line or circle that forms the apparent boundary between earth and sky.
11. The farthest point from the Earth in its orbit.
13. The shadow of the Earth can be divided into two distinctive parts, the penumbral and the

Down:

2. A type of eclipse during which the Moon lies exclusively within the Earth's penumbra.
3. One celestial body obscures another.
5. Atmospheric phenomena accompanying the daily disappearance of the sun.
8. A type of eclipse that can only happen just before sunset or just after sunrise, and both bodies will appear at nearly opposite points in the sky.
10. The first light of day.
12. The envelope of gases surrounding any celestial body.
14. A type of eclipse that occurs when the Moon passes through the outer portion of Earth's shadow

SOLUTIONS cont'd

QUESTION: What is used to rate the darkness of a lunar eclipse? What do each of the ratings mean? Can one predict the occurrence of eclipses? If so, how or what do they need?

ANSWER:

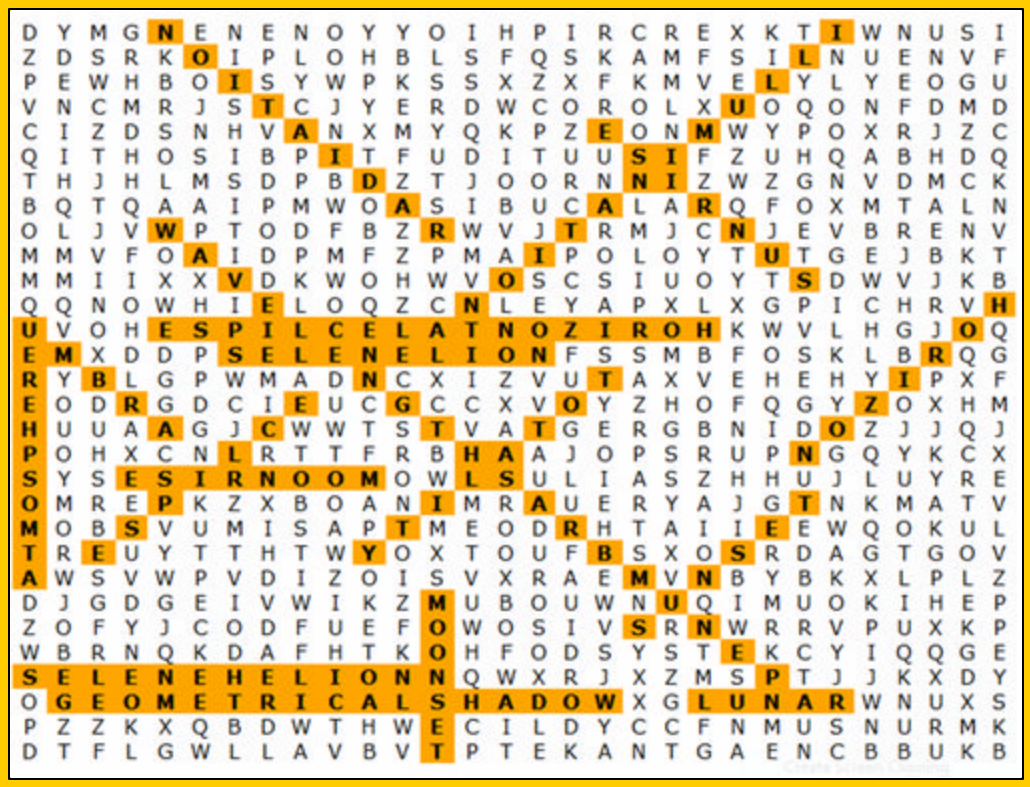
Danjon scale

The following scale (the Danjon scale) was devised by André Danjon for rating the overall darkness of lunar eclipses:

L=0: Very dark eclipse. Moon almost invisible, especially at mid-totality.
L=1: Dark Eclipse, gray or brownish in coloration. Details distinguishable only with difficulty.
L=2: Deep red or rust-colored eclipse. Very dark central shadow, while outer edge of umbra is relatively bright.
L=3: Brick-red eclipse. Umbral shadow usually has a bright or yellow rim.
L=4: Very bright copper-red or orange eclipse. Umbral shadow is bluish and has a very bright rim.

Eclipse cycles

Every year there are usually at least two partial lunar eclipses, although total eclipses are significantly less common. If one knows the date and time of an eclipse, it is possible to predict the occurrence of other eclipses using an eclipse cycle like the Saros cycle. Unlike a solar eclipse, which can only be viewed from a certain relatively small area of the world, a lunar eclipse may be viewed from anywhere on the night side of the Earth.



Lunar	Totality	Sunset
Eclipse	Selenelion	Moonrise
Umbra	Selenehelion	Moonset
Penumbra	Horizontal eclipse	Atmosphere
Illumination	Geometrical shadow	Wavelengths
	Sunrise	horizon

NAME _____

DATE _____

WORD SEARCH

A LOT IS HAPPENING WITH THE CLUB

a g f r z o y m n x z h x x u s a d o l r q j y l q w h j y
q x p t w t q y i o w j o h s g e g d i r b m a c e f w n u
s m j r g s w p a q y e f r m x r p g h o l s i d x d b g w
r l i e f n e s k a s t r o p h o t o g r a p h y z h o x a
e d h f i y k c v i z j q r d k n p s q v m d r c x j d s q
t a l b p u e i g k h f i b s c w q y i o o f c u h j g w w
i e z w o c q s y n r r k i f s n c h w r d r f r o t q m o
b y d b x b s y e a y z m t d g b v r q i u n i s i w q k o
r c p e y r t h l h u t y e m o s w i m r a b c f t c z r i
o x e h k k v p x a z t i r g p f v x l v v h t a v i q c b
l d t v u l s l k z o x p p i n n a i c i t a m e h t a m b
a w q n o i t a t l u c c o z j d c l k m c i v f b r r g a
u j z u f h l c m q w s d a o l y a p y z c n m a o i s m l
d a x x o q e i l w t d p t l i o y q d a a a h m a d d e s
j y t l o e b t q h f m x d w b g z f r q e e u g k j n d a
c t l j q y r e e q c l o u g e h r i g d i s e a s e o j r
s n q n j w x r f k b y d j u c i r t e m o r t s a a c x e
u t j e s q y o u o n s q r k x y f o e l o q h z l t e h m
e o e c l v s e i e l i l a g o e l i l a g g k n g x s h a
v v d p y t e h a x b v j y v c c s r n r f s k i g r c f c
w g e c h q g t k e m q t d h c t n j c e o z u r v h r e e
w h o p q e s p v h r v o m x x q d e v l o i p b e e a a l
w n x m d c n u h v a t x g n p w d g a r b s a p t p i p o
z j j t q q r h b u q h y z p g m p r f m w s c c u m l q h
c j y b e r r o a d b c s r d l r g e c x y t d s f v l k n
k x c m j x i b p w k b z k w t r m l r v y y v y z n i q i
u g s u z g h v a e k a l n y a n j h x m g h g f i p m c p
e b b f m z l r w o q i v e p n c f n l a h d s k h o c d g
e p q b a c a d a g a t n h h h c g w w y k q f r k e l i h
k v o h u l t c u d c y l g e z b w k p w o v y d g i q h c

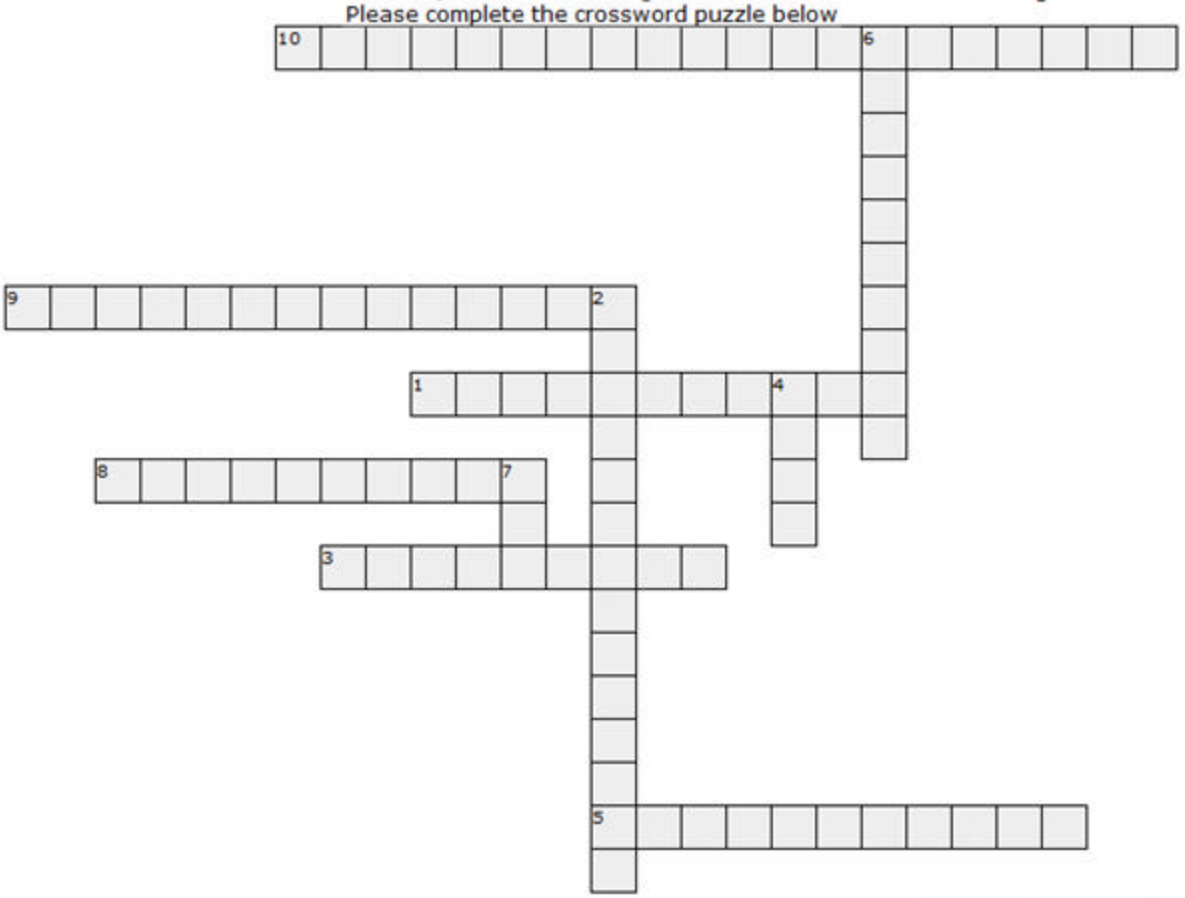
- pinholecameras
- stephenhawking
- hubble
- milliarcseconds
- theoreticalphysics
- dualorbiters
- solargraph
- mathematician
- occultation
- galileogalilei
- payload
- astrophotography
- lougehrigdisease
- astrometric
- cambridge
- orbiter

NAME _____

DATE _____

Famous Astronomers, Telescopes and Their Importance

Please complete the crossword puzzle below

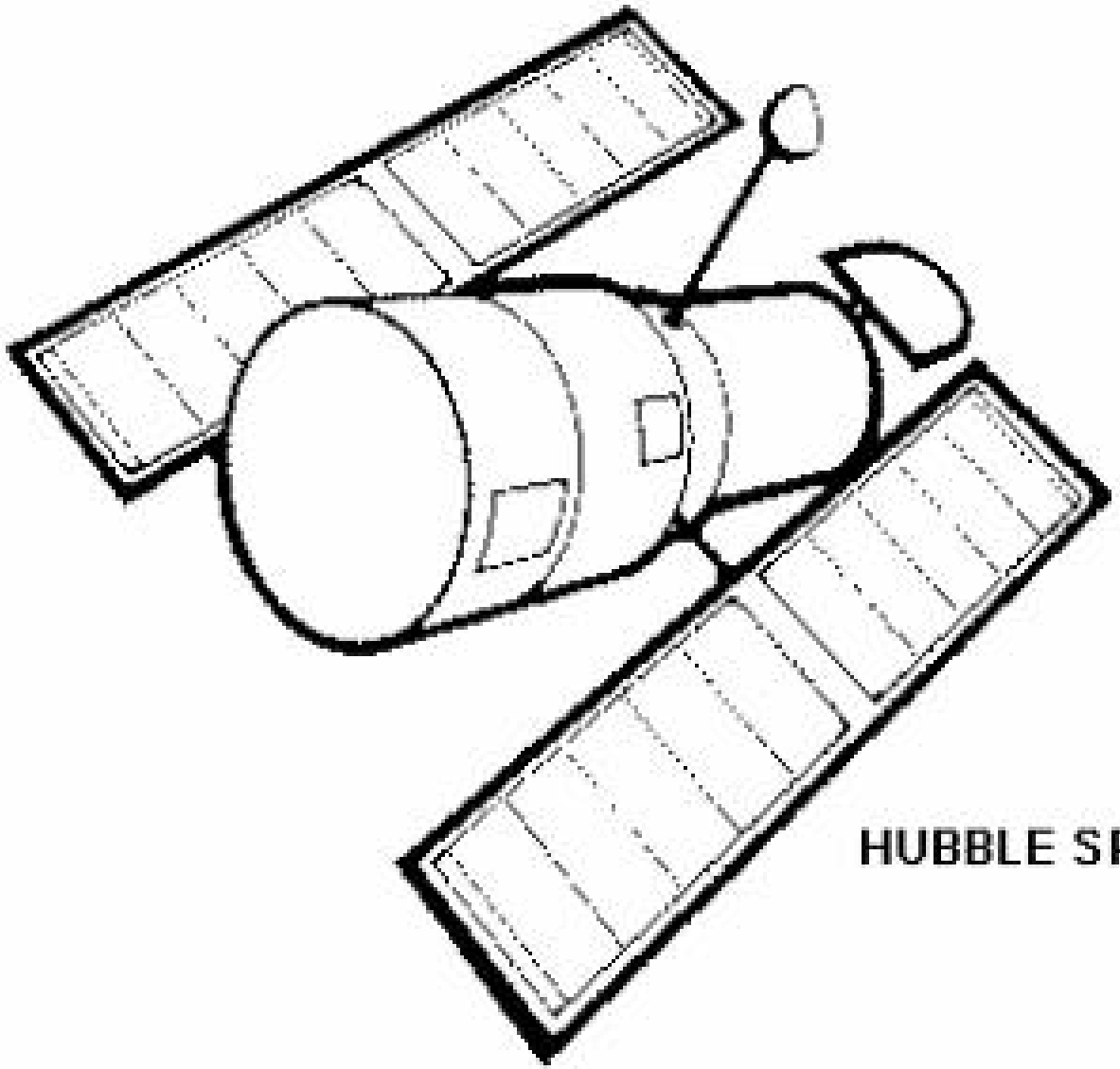


Across:

1. An event occurring when an astronomical objects apparently hides another astronomical object.
3. An optical instrument for making distant objects appear larger and therefore nearer.
5. American astronomer/scientist who confirmed an expanding universe, which provided the foundation for the Big Bang theory.
8. _____ telescope consists essentially of an objective lens set into one end of a tube and an adjustable eyepiece or combination of lenses set into the other end of a tube.
9. Famous scientist, astronomer, mathmetician, famous for 'A Brief History of Time'.
10. Large observatory located at the Brazos Bend State Park.

Down:

2. Famous astronomer and physicist who died January 12, 1642.
4. Organization who mission is to encourage and facilitate the observation of occultation and eclipses.
6. _____telescope has a concave mirror that gathers light from the object and focuses it into an adjustable eyepiece or combination of lenses.
7. Tool used to accurately locate/record longitude and latitude.



HUBBLE SPACE TELESCOPE

Above Earth's hazy atmosphere, this space telescope will see planets and stars more clearly. Scientists will be able to see seven times farther into space than ever before.

The Hubble Space Telescope is made up of the telescope, instruments which relay what it sees to people on the ground, and wing-like solar panels which turn the Sun's rays into electrical power to run the telescope.

NAME_____

Snoopy says, never stop looking up..reach for the stars and may you always have clear skies!!!!