

# Star Gazer News

Newsletter of the Delmarva Stargazers

[www.delmarvastargazers.org](http://www.delmarvastargazers.org)

July 2005

Volume 12 Number 01

## From the President

Lyle Jones

I hope that all the Dads out there had a good Father's Day. I know that I did! Any astronomy presents?

Did anyone look at the sky on the night of 16th just after sunset? It was so blue and clear! I thought about getting a scope out just to look at the planets and moon but my back yard is "light city" and I was too tired to go anywhere else! I guess that we need to lobby for the light pollution bill that is working its way through Delaware's legislature

(<http://www.wboc.com/Global/story.asp?S=3411246&nav=QEMtaTZA>). Is anyone in the Stargazers willing to do some lobbying?

I am hoping to get some observing in July either at Tuckahoe or Spruce Knob. The skies at Spruce knob are sure impressive! I am really looking for to southern sky at Spruce Knob during the Mountain Institute's Astronomy Camp. By the way, Dave Wells is taking his grandkids for the week. There may still be room for some more grandkids!

For those who may be interested on July 6<sup>th</sup> through 10<sup>th</sup> is the 2<sup>nd</sup> annual Green Bank Star Quest ([www.greenbankstarquest.org](http://www.greenbankstarquest.org)) at the National Radio Astronomy Observatory in Green Bank, West Virginia. Besides the dark skies, the trip would be worth it just to see the radio telescopes! It takes only 6 six hours from Dover to get there. There are plenty of other activities within an hour drive from the Observatory (Cass train, Pearl Buck house, and caves). The family will have good time.

The new officers are planning to get together in early July for planning our up-coming year. At the picnic, we spent some time talking about our activities for next year and got some of your ideas for the Stargazers. We also talked about the No-Frills Star Party in September.

## South Pacific Solar Eclipse Cruise

Kent Blackwell

I left home Sunday April 2, 2005 heading for Washington DC to catch a flight to Los Angeles, CA. After a long 6-hour flight I arrived in L.A. and then flew another 8 hours to Papeete Tahiti. Although the flight attendants endeavored to make the trip as less strenuous as possible it still was a grueling travel day.

Upon arrival at the airport in Papeete the officers of the cruise ship m/v Discovery met us to take us to the ship. This had been a very long day; in fact I had now been awake more than 25 hours.

The ship sailed at midnight. Although I should have gone to bed I stepped outside to stargaze. Wow, Scorpius was at the zenith. Crux, better known as *The Southern Cross*, was half way up in the sky. *The Jewel Box* cluster, though small in my 10x30 binoculars, was nevertheless pretty. *Eta Carinae* was a bright naked eye object. I could see many involved open clusters through the binoculars, but the real beauty was the nebulosity in this magnificent region. I gave thought to unpacking the Orion Star-Blast telescope but decided to go to bed instead. After all, I'd have the next three weeks to view the southern sky.

Surprisingly I awakened at 5:45 am, just in time to watch sunrise over the island of Moorea, Tahiti. The shark-toothed *Mount Rotui* and the towering *Mount Tohivea* were beautiful. We docked at Cook's Bay. Moorea is rumored to have been James Mitchener's idealized island Bali Hai. Many people have described it as the most beautiful place on earth.

Instead of taking an organized tour of the island, Robert Hitt and I went ashore and rented bicycles. This gave a greater

*(Continued on page 2)*



## Upcoming Events:

- ★ ⇒ No Monthly meeting in July
- ★ ⇒ Monthly field observing - July 8<sup>th</sup>
- ★ ⇒ Perseid Meteor Shower Watch (see pg. 4)
- ★ ⇒ Eclipse Cruise - March 2006 (see pg. 5)
- ★ ⇒ NO FRILLS X Starparty (see pg. 5)



(Continued from page 1)

opportunity for picture taking; allowing us to stop and snap pictures as we pleased. We rode the bikes down the main road about 2 miles until it became too hilly to comfortably pedal. The view of the Pacific Ocean from this tiny island is difficult to put into words. Once back on the ship we dined for lunch and sipped champagne as the m/v Discovery raised anchor and set sail for Pitcairn Island. It would take three full days to reach Pitcairn.

I set the clock for an early hour the next morning to watch sunrise. It was a bonus to see both a beautiful sunrise and the green flash. Later in the day it was fun chatting with fellow passengers. I've seen many of these people on previous eclipse cruises, so it was good seeing them again. The passenger list included everyone from those who had never witnessed a solar eclipse (eclipse virgins) to those who have seen as many as 25! This would be Bob and my 10<sup>th</sup> total eclipse. I consider total eclipses those that are truly total, not annular. Some people count annulars, and some even count partials, as part of their list of eclipses. That's cheating, in my opinion.

Dinner that evening was formal. After an exquisite meal I set up my Orion StarBlast telescope forward on the deck, just above the bridge area of the ship. I must say I was better dressed that night for stargazing than ever before. How often does one hunt down deep sky objects sporting high gloss black shoes and a fancy tuxedo? There I was crawling on my knees reading star charts and pointing the telescope skyward in such attire. The sky was absolutely stunning, but it took awhile just to identify the constellations. I can now completely sympathize how "lost" beginners must feel when viewing the unfamiliar sky for the first time. I quickly learned that *The Southern Cross* (Crux) and *The False Cross* were good guidepost for finding one's way to other constellations. Dozens of passengers glimpsed through my scope at various objects. After I set up the StarBlast a friend from San Francisco assembled his "little" scope, a monstrous 4" Takahashi refractor. The view of *Eta Carinae* in his 4" Takahashi fitted with a 31mm Nagler was indeed better than my StarBlast, but considering how very ultra portable and comfortable the StarBlast is to observe through I'm not sure I could see that great a difference, especially on a ship moving up and down and from side to side. If you ever take a telescope aboard a cruise ship I highly recommend either a StarBlast or an Edmund Astroscan as the ideal instrument. In all honesty Rick Fienberg (editor, *Sky & Telescope*) and I agreed his new Canon 15x50 stabilized binoculars were nearly as satisfying as the telescope. The only downside of such binocular viewing is the lack of tripod adaptor on many stabilized binoculars, and therefore the inability of sharing views of objects with others.

The next few days would be full days at sea en route to Pitcairn Island. I enjoy days at sea, and these were filled with enrichment lectures from the *Sky & Telescope* team discussing eclipses and methods of photographing them. After dinner I once again set up my telescope on deck but clouds quickly moved in so I retired to my cabin for the evening. At 2:30 AM I awakened to find the sky had cleared beautifully. I had a great time exploring many open star clusters in the tiny constellation of Crux. One of my favorites, besides *The Jewell Box* is **NGC 4609**, a neat little tiny open cluster lying just northwest of the 5.3 magnitude star HR 4830.



At very low power it looked very much like a globular, but 30x showed individual stars. It's a great object. The real showpiece in Crux is *The Coalsack*, a velvet black void in The Milky Way lying east of the stars Acrux and Mimosa. I pointed it out to several people and explained how averted vision helps seeing it. By 3:00 AM I was the only person stargazing. Something really neat was the fact that the officer piloting the ship would warn me when he saw rain showers ahead on the ship's radar. I simply moved the little StarBlast into a sheltered area and waited for the showers to end. Within minutes the sky was clear again.

The m/v Discovery arrived at Pitcairn Island at noon a few days later. Pitcairn is the island chosen by the mutineers of the HMS Bounty in the 1700's as their new home. Even today the tiny island only has 45 inhabitants. The seas, always treacherous at this island were unusually rough the day of our arrival so Captain Erik made the decision that it was too dangerous for us to go ashore. The only way to get ashore even on calm days in to climb down rope ladders from the ship into the islander's long boats. But today the swells reached 20-30' as they crashed into the rocks ashore. Nevertheless several

of the islanders came out to greet our ship, bringing their souvenirs on board. I had a nice discussion with Tom Christian, the great, great, great grandson of Fletcher Christian. Only three cruise ships per year visit the people of Pitcairn so it was a real treat for them

(Continued on page 4)

**How to Join the Delmarva Stargazers:** Anyone with an interest in any aspect of astronomy is welcome

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY, STATE & ZIP \_\_\_\_\_

E-MAIL ADDRESS (If any) \_\_\_\_\_

Please attach a check for \$15 made payable to Delmarva Stargazers and mail to Kathy Sheldon, 20985 Fleatown Rd, Lincoln, DE 19960. Call club President Lyle Jones at 302-736-9842 for more information.

## Observing Notes

*Kent Blackwell*

### NGC 3077 and two close double stars

The other night I stumbled on a pretty little pair of double stars. These are easy to find because these bright stars are less than 10' from the galaxy NGC 3077 in UMa, and therefore in the same field of view even at the highest power.

**NGC 3077** Galaxy Magnitude 10.6 10h 03m +68 44' UMa **HD 86677** Double star Mag 7.9 & 10.5, separation 3.3" UMa. I could see black space between the components in my 10" f/4.7. **HD 85458** Double star Magnitude 8.5 & 9.41, separation 2.12" UMa. More difficult than HD 86677 but I could still split it with the 10".

### Viewing the Great Red Spot

(Thursday night 6/9/2005 )

Well, dear folks, I hope you got out your telescopes in the brief clearing this particular evening. It was public ShowTime at the Chesapeake Planetarium in Chesapeake, VA (near Norfolk/Virginia Beach, VA). Steve Hamilton (of BBAA Astronomy Club) and I watched as clouds moved in just as the public arrived for the show. But 8:15 the sky cleared so we set up the planetarium's 33-year old Celestron C-14 and aimed it toward Jupiter. I have NEVER seen the planet look so awesome. Steve will concur; detail was visible even within the Great Red Spot itself. Absolutely 10 out of 10 seeing tonight. Just spectacular! I'm was impressed. Hope you seeing in MD & DE was equally wonderful. Sometimes, being near the water as we are in Tidewater, the seeing is sub-arc second and tonight was one of those nights.

### M 13

The sky was clear last night (6/13) but the moon occupied the sky most of the evening. I'd like to draw your attention to M 13. The next time you're viewing it (aka NGC 6210) notice the galaxy NGC 6207, only 27' to the NW and in the same field of view at moderate power. I managed to see it very faintly with a Televue 76mm refractor at 80x, even in the midst of city lights and first quarter moon. Big scope owners will note it has a very bright core. Actually that's a faint foreground star and not the core of the galaxy.

## The Solar system in July:

*Pj Riley*

The nights are getting longer (slowly), but the temps are still climbing. Everyone is hiding indoors in the AC, but the nights are the coolest part of the day, so go out and exercise your glass. Watch out for those vampire skeeters !

The planets:

**Moon:** The full moon on the 21<sup>st</sup> is the largest in 2005 ! Why? Because the moon is at perigee the same day. Go out and look, it might look close enough to touch.

**Mercury** is 0.9 deg. N of the Beehive (M44) on the 3<sup>rd</sup>. On the next night, it's **Venus'** turn to be close to the Beehive (0.06 deg. N). These two planets will be in conjunction on the 7<sup>th</sup>. On the 8<sup>th</sup>, the thin crescent moon will join these two in the sky.

**Mars** rises after midnight, reaching 'bout 30 deg high before morning twilight.

**Jupiter** is in Virgo, but hurry out to observe, because it sets around 11pm.

**Saturn** is in conjunction this month on the 23<sup>rd</sup> with the **Sun!** That kinda rules out any ring watching this month.

**Pluto** is out there near Xi Serpentis, but you need a really big glass.



Kent and friends on the South Pacific Solar Eclipse Cruise

### Your 2005-2006 Officers

Office	Officer	Phone	e-mail
President	Lyle Jone	302-736-9842	lyjones@state.de.us
Vice President	Jerry Truitt	410-885-3327	truittjs@netscape.com
Secretary	Pj Riley	302-738-5366	pjr127@yahoo.com
Treasurer	Kathy Sheldon	302-422-4695	f.a.sheldon@att.net

## Perseid Meteor Shower Watch

Have you ever had an all night shower ? Join us for the Perseid meteor shower August 11/12. No equipment necessary. Details will be in the August newsletter.

to see us. They only have electricity a few hours per day so the night sky is as black as anywhere in the world. There are no inhabited islands for many hundreds of miles. Oh how I'd love to have my 25" telescope on that island. I was told I'd be welcomed at any time. If you wish to move to Pitcairn you're required to live on the island four years before being accepted by the community. By sunset we set sail for Easter Island, a 3-day voyage across the South Pacific Ocean.

The eclipse was the next day, and the most important day of the cruise. I'm glad to say Tom & Betty Christian had been invited by the ship's staff to cruise with us to witness

the eclipse. The fascinating couple would sail with us to Easter Island but would not be able to return home to Pitcairn until the next ship sails to their island home in November!

After a hearty breakfast on Friday April 8, 2005 Robert Hitt and I set up our telescopes and cameras on the deck of the m/v Discovery situated about 500 miles from the isolated land mass of Pitcairn Island. The sky was mostly clear but some puffy white clouds and a few high cirrus clouds gave us a scare. It wouldn't take much for one of those clouds to completely obscure a total eclipse lasting only thirty-one seconds. As our ship steamed slowly forward we actually gained a full second of totality from our intended position. The reason Captain Erik Bjurstedt moved his vessel was that he feared clouds would be more prevalent in the original location. Our final position at totality was S 22 37.879 latitude and W 129 39.27 longitude.

First contact occurred at 10:22 AM, as suddenly a tiny bite was taken out of the sun's disk. I've anticipated this for a long time and it was hard to believe the time had finally come to witness this awesome event. As 2<sup>nd</sup> contact approached at 11:51 AM everyone became more excited. Suddenly the moon slipped completely in front of the sun, revealing a spectacular diamond ring. It's been my experience not to waste too much valuable time worrying about photographing a total eclipse. At totality, especially one of this short duration, it's far more important to look at it visually. Believe me, you will never witness anything in nature to match it.

I watched the eclipse through my Orion 4.5" f/4 StarBlast, and the view was nothing short of astounding. Those who have seen prominences through hydrogen alpha filters may take my word for it those views can't even come close to the vibrancy and glory of those marvelous pink prominences visible during a total solar eclipse. I can honestly say I have never witnessed a more beautiful corona or more spectacular prominences than this eclipse. Surely that's because the moon was so much smaller in angular size than it is at longer eclipses. The view was just breathtaking. As I viewed the sun in the StarBlast I simultaneously photographed it with a Canon 20D digital SLR camera and an 80mm f/6 William Optics Megrez refractor telescope, all riding piggyback on the main scope. I'd like to offer my gracious thanks to friend Steve Hamilton for lending me this superb instrument. I never took my eye away from the 25x image in the StarBlast telescope, so could only hope the camera caught at least a fraction of what I saw visually. Viewing and photographing this eclipse was one of them most challenging I have ever undertaken because the swells in the Pacific Ocean reached nearly 10-12', with very high wind gusts, and totality only lasted 32 seconds. Even at 25x the sun would, at times, drift completely out of the field of view, return to the center and then drift out the opposite side. You have to learn to snap a picture on one of these "returns" to be even moderately successful.

The next port was Easter Island, truly the most remote place in the world. The nearest inhabited island is tiny Pitcairn, over 1200 miles to the west. Easter Island is 2,300 miles from Santiago and, in the other direction 2500 miles from Tahiti. To its inhabitants it has always been the center of the world, a fact reflected in its name, Te Pito o Te Henua, meaning "navel of the world", in the belief that they were the only inhabitants. Easter Island is most famous for its *Moai* statues. The exact number of Moai is unknown because many lie buried in piles of rubble or beneath the soil at the stature quarry; the estimates vary from 800 to 1,000 and range in size from 12' to 30' tall.

I explored Easter Island two days, traveling over most of its 18x11-mile area quite thoroughly. Robert Hitt and I also explored the very small town center, stumbling upon a local school. We were invited onto the school grounds where we promptly handed out solar eclipse stickers to the kids. I took a photograph of them in a group and upon displaying their picture the eager kids stormed me as they saw themselves on the postage stamp size monitor screen of my camera! We then walked from the school to the Easter Island Museum situated on a beautiful parcel of land overlooking the South Pacific where gigantic waves crash over the rocky shore below.

After these wonderful days it was time to leave Easter Island. Five days at sea were required for the m/v Discovery ship to reach the next port of call, Pisco, Peru. The first night at sea the sky was completely cloudy. To tell the truth I was a bit relieved because I needed to get a good night's rest. After a wonderfully elegant dinner aboard the ship I enjoyed a live variety show before retiring for the evening.

I spent a large part of the days at sea reviewing different sky maps to determine the most interesting southern sky objects to view. That wasn't as easy as it sounds because I had to only select objects visible in the relatively small 4.5" aperture of the Orion StarBlast telescope and objects that would be viewed under the most challenging conditions imaginable. First, forget using any printed star maps. I learned that lesson the first night stepping out on the forward deck of the ship. The winds howled at 45-55 mph. Immediately, a huge gust of wind grabbed the David Chandler Southern Hemisphere Planisphere from my hands and tossed it overboard. I found it best to use a laptop computer, making certain to secure the red filter over the screen. Another obstacle was the ship's motion. Some nights the sea swells exceeded 30 feet! Imagine the difficulty trying to identify unknown objects and watching as they drift wildly in and out of the field of view. By the time I would familiarize myself with the sky the laptop battery would die. Those who know me can only imagine my impatience and frustration. At one point I decided to take an Orion UltraBlock filter out of my pocket and put it in a more secure place. As soon as I did the wind grabbed it. I watched as it slid under the secured locked area on deck labeled, "Ship's Bridge, No Admittance". Well, no admittance except for Kent Blackwell looking for his \$80 filter. I hoped no one would step outside the bridge to find me crawling around on my hands and knees with a red flashlight scrutinizing the bridge floor looking for the

*(Continued on page 5)*

(Continued from page 4)

filter. Within a few minutes the filter was found and tucked away safely. That night didn't go un-rewarded because I saw several beautiful open and globular clusters as well as *The Etched Hourglass Planetary Nebula* and *The Blue Planetary Nebula*. I may never get a chance to see these objects again.

Our third day at sea Rick Feinberg of *Sky & Telescope* offered an interesting lecture, *The Eclipse Revisited*. Rick collected some of the passengers' pictures of the eclipse. One of the most interesting was a series of pictures taken by Miloslav Druckmuller. Miloslav highly processed thirty-one images he took during the eclipse to produce an unbelievable montage image. His MMV project (Mathematical Methods Of Visualization Of Solar Corona) is to develop new mathematical methods to make the processing of corona images more effective, especially the highly precise registration, and to visualize coronal structures by means of adaptive filters, which are inspired by human vision. Mr. Feinberg also showed Robert Hitt's eclipse video titled, *South Pacific Total Solar Eclipse*. Robert put the production together using digital still images he and I had captured during the eclipse and am proud to say it was a big hit at the finale of the lecture.

I had a number of objects selected to view but unfortunately clouds moved in for the duration of two days and nights. Too bad, because the first ten days of the cruise the weather was clear each day and night.

The next port of call was Pisco, Peru, famous for its fine wines. Pisco has a population of 250,000 but the economy is very poor. The only place in the world I have seen such poverty is Honduras. Most residents don't have electricity and live in little more than houses made of mud and sticks. These are truly desperate souls, but everyone seemed quite content. I couldn't help but think how extravagant we live compared to these people.

At the last minute we were able to sign up for a long sold out tour to see the Nazca Lines. The exact reason for the ancient people etching these lines into the desert remains a mystery to this day. Our guide suggested the lines represented an astronomical calendar. Many people have their own ideas, some even believing aliens were responsible!

Nasca Peru is a three-hour bus trip across the desert from where the ship docked, but part of that duration allowed for a stop to a museum. Of particular interest was seeing mummies dating back to 7,000 BC. They're very well preserved because of the arid desert climate.

Upon arriving at the small privately owned Nazca Airport I contemplated whether or not to fly in the Cessna 206 5-seater airplane. Before I knew it I was pushed into a craft smaller than my station wagon and five of us immediately taxied off the small dirt runway. Each person was handed a barf bag but the adrenalin was running too high for me to get scared or sick. The plane flew over one of the many markings with its port wing pointing straight down for those passengers to get a good view. Then the pilot circled, tipping the starboard wing down to benefit the passengers seated on that side. This went on for enough time for us to see all the desert markings. Within about 40 minutes we were back on the ground again. Kent fell to his knees and kissed the ground. That, dear friends, was surely an experience I shall never forget. If you ever have the opportunity by all means do it.

The next day was spending cruising the South Pacific from Pisco to Lima, Peru. Lima, a city of nearly 9 million inhabitants is a sprawling and beautiful city. I stayed in the Miraflores region of the city near the beaches. During the last

(Continued on page 6)

### Did you know ?

The days of the week are named after the Sun, the Moon, and the five 'wandering' stars:

English	French	'Star'
Saturday	Samedi	Saturn's Day
Sunday	Dimanche	Sun's Day
Monday	Lundi	Moon's Day
Tuesday	Mardi	Mar's Day
Wednesday	Mercredi	Mercury's Day
Thursday	Jeudi	Jupiter's Day
Friday	Vendredi	Venus' Day

### Eclipse Cruise

There are cruises scheduled for the March 2006 eclipse. One 7-day cruise is on the Coasta Fortuna sailing out of Savona Italy. Prices range from ~\$1050 to ~\$1800 per person. For more info see Don Surles, Pj Riley or visit <http://www.costacruise.com/costa/USA/Home-page.htm>

### DON'T MISS

No Frills X  
Sept. 28-Oct. 2  
Equestrian Center  
Tuckahoe State Park  
Denton MD

registration form will be available in the Aug. and Sept. newsletters and online at [www.delmarvastargazers.org](http://www.delmarvastargazers.org)

Sun and Moon Data for July 2005  
Daylight Time Astronomical Twilight  
T u c k a h o e M D 3 8 . 9 8 ° N 7 5 . 9 3 ° W 5 h r W

Date	Sun				Moon				%
	Twil.	Rise	Transit	Set	Twil.	Rise	Transit	Set	
7 / 1 / 2 0 0 5	3 : 4 4 a	5 : 4 2 a	1 : 0 8 p	8 : 3 3 p	1 0 : 3 1 p	1 : 5 9 a	9 : 0 7 a	4 : 2 6 p	2 1
7 / 2 / 2 0 0 5	3 : 4 4 a	5 : 4 2 a	1 : 0 8 p	8 : 3 3 p	1 0 : 3 1 p	2 : 2 8 a	9 : 5 5 a	5 : 3 2 p	1 4
7 / 3 / 2 0 0 5	3 : 4 5 a	5 : 4 3 a	1 : 0 8 p	8 : 3 3 p	1 0 : 3 1 p	3 : 0 2 a	1 0 : 4 5 a	6 : 3 6 p	8
7 / 4 / 2 0 0 5	3 : 4 6 a	5 : 4 3 a	1 : 0 8 p	8 : 3 3 p	1 0 : 3 0 p	3 : 4 3 a	1 1 : 3 7 a	7 : 3 5 p	3
7 / 5 / 2 0 0 5	3 : 4 7 a	5 : 4 4 a	1 : 0 8 p	8 : 3 3 p	1 0 : 3 0 p	4 : 3 1 a	1 2 : 3 0 p	8 : 2 8 p	1
7 / 6 / 2 0 0 5	3 : 4 7 a	5 : 4 5 a	1 : 0 9 p	8 : 3 2 p	1 0 : 2 9 p	5 : 2 5 a	1 : 2 2 p	9 : 1 3 p	0
7 / 7 / 2 0 0 5	3 : 4 8 a	5 : 4 5 a	1 : 0 9 p	8 : 3 2 p	1 0 : 2 8 p	6 : 2 4 a	2 : 1 2 p	9 : 5 1 p	1
7 / 8 / 2 0 0 5	3 : 4 9 a	5 : 4 6 a	1 : 0 9 p	8 : 3 2 p	1 0 : 2 8 p	7 : 2 6 a	2 : 5 9 p	1 0 : 2 2 p	4
7 / 9 / 2 0 0 5	3 : 5 0 a	5 : 4 6 a	1 : 0 9 p	8 : 3 1 p	1 0 : 2 7 p	8 : 2 7 a	3 : 4 3 p	1 0 : 4 8 p	9
7 / 1 0 / 2 0 0 5	3 : 5 1 a	5 : 4 7 a	1 : 0 9 p	8 : 3 1 p	1 0 : 2 6 p	9 : 2 8 a	4 : 2 5 p	1 1 : 1 2 p	1 5
7 / 1 1 / 2 0 0 5	3 : 5 2 a	5 : 4 8 a	1 : 0 9 p	8 : 3 0 p	1 0 : 2 5 p	1 0 : 2 8 a	5 : 0 6 p	1 1 : 3 3 p	2 2
7 / 1 2 / 2 0 0 5	3 : 5 3 a	5 : 4 8 a	1 : 0 9 p	8 : 3 0 p	1 0 : 2 5 p	1 1 : 2 8 a	5 : 4 6 p	1 1 : 5 3 p	3 1
7 / 1 3 / 2 0 0 5	3 : 5 5 a	5 : 4 9 a	1 : 1 0 p	8 : 3 0 p	1 0 : 2 4 p	1 2 : 2 8 p	6 : 2 6 p	*****	4 0
7 / 1 4 / 2 0 0 5	3 : 5 6 a	5 : 5 0 a	1 : 1 0 p	8 : 2 9 p	1 0 : 2 3 p	1 : 3 1 p	7 : 0 9 p	1 2 : 1 5 a	5 0
7 / 1 5 / 2 0 0 5	3 : 5 7 a	5 : 5 1 a	1 : 1 0 p	8 : 2 9 p	1 0 : 2 2 p	2 : 3 7 p	7 : 5 5 p	1 2 : 3 8 a	6 1
7 / 1 6 / 2 0 0 5	3 : 5 8 a	5 : 5 1 a	1 : 1 0 p	8 : 2 8 p	1 0 : 2 1 p	3 : 4 7 p	8 : 4 6 p	1 : 0 5 a	7 1
7 / 1 7 / 2 0 0 5	3 : 5 9 a	5 : 5 2 a	1 : 1 0 p	8 : 2 7 p	1 0 : 2 0 p	5 : 0 1 p	9 : 4 3 p	1 : 3 8 a	8 0
7 / 1 8 / 2 0 0 5	4 : 0 0 a	5 : 5 3 a	1 : 1 0 p	8 : 2 7 p	1 0 : 1 9 p	6 : 1 5 p	1 0 : 4 6 p	2 : 2 0 a	8 9
7 / 1 9 / 2 0 0 5	4 : 0 2 a	5 : 5 4 a	1 : 1 0 p	8 : 2 6 p	1 0 : 1 8 p	7 : 2 4 p	1 1 : 5 3 p	3 : 1 4 a	9 5
7 / 2 0 / 2 0 0 5	4 : 0 3 a	5 : 5 4 a	1 : 1 0 p	8 : 2 5 p	1 0 : 1 6 p	8 : 2 4 p	*****	4 : 2 2 a	9 9
7 / 2 1 / 2 0 0 5	4 : 0 4 a	5 : 5 5 a	1 : 1 0 p	8 : 2 5 p	1 0 : 1 5 p	9 : 1 1 p	1 2 : 5 9 a	5 : 3 9 a	1 0 0
7 / 2 2 / 2 0 0 5	4 : 0 5 a	5 : 5 6 a	1 : 1 0 p	8 : 2 4 p	1 0 : 1 4 p	9 : 4 9 p	2 : 0 2 a	7 : 0 1 a	9 8
7 / 2 3 / 2 0 0 5	4 : 0 7 a	5 : 5 7 a	1 : 1 0 p	8 : 2 3 p	1 0 : 1 3 p	1 0 : 2 0 p	3 : 0 1 a	8 : 2 2 a	9 3
7 / 2 4 / 2 0 0 5	4 : 0 8 a	5 : 5 8 a	1 : 1 0 p	8 : 2 2 p	1 0 : 1 2 p	1 0 : 4 7 p	3 : 5 4 a	9 : 3 9 a	8 5
7 / 2 5 / 2 0 0 5	4 : 0 9 a	5 : 5 9 a	1 : 1 0 p	8 : 2 1 p	1 0 : 1 0 p	1 1 : 1 1 p	4 : 4 4 a	1 0 : 5 2 a	7 6
7 / 2 6 / 2 0 0 5	4 : 1 1 a	5 : 5 9 a	1 : 1 0 p	8 : 2 1 p	1 0 : 0 9 p	1 1 : 3 6 p	5 : 3 1 a	1 2 : 0 2 p	6 6
7 / 2 7 / 2 0 0 5	4 : 1 2 a	6 : 0 0 a	1 : 1 0 p	8 : 2 0 p	1 0 : 0 8 p	*****	6 : 1 7 a	1 : 1 1 p	5 5
7 / 2 8 / 2 0 0 5	4 : 1 3 a	6 : 0 1 a	1 : 1 0 p	8 : 1 9 p	1 0 : 0 6 p	1 2 : 0 2 a	7 : 0 4 a	2 : 1 8 p	4 4
7 / 2 9 / 2 0 0 5	4 : 1 5 a	6 : 0 2 a	1 : 1 0 p	8 : 1 8 p	1 0 : 0 5 p	1 2 : 3 0 a	7 : 5 2 a	3 : 2 5 p	3 4
7 / 3 0 / 2 0 0 5	4 : 1 6 a	6 : 0 3 a	1 : 1 0 p	8 : 1 7 p	1 0 : 0 3 p	1 : 0 3 a	8 : 4 2 a	4 : 3 0 p	2 5
7 / 3 1 / 2 0 0 5	4 : 1 7 a	6 : 0 4 a	1 : 1 0 p	8 : 1 6 p	1 0 : 0 2 p	1 : 4 2 a	9 : 3 4 a	5 : 3 1 p	1 7

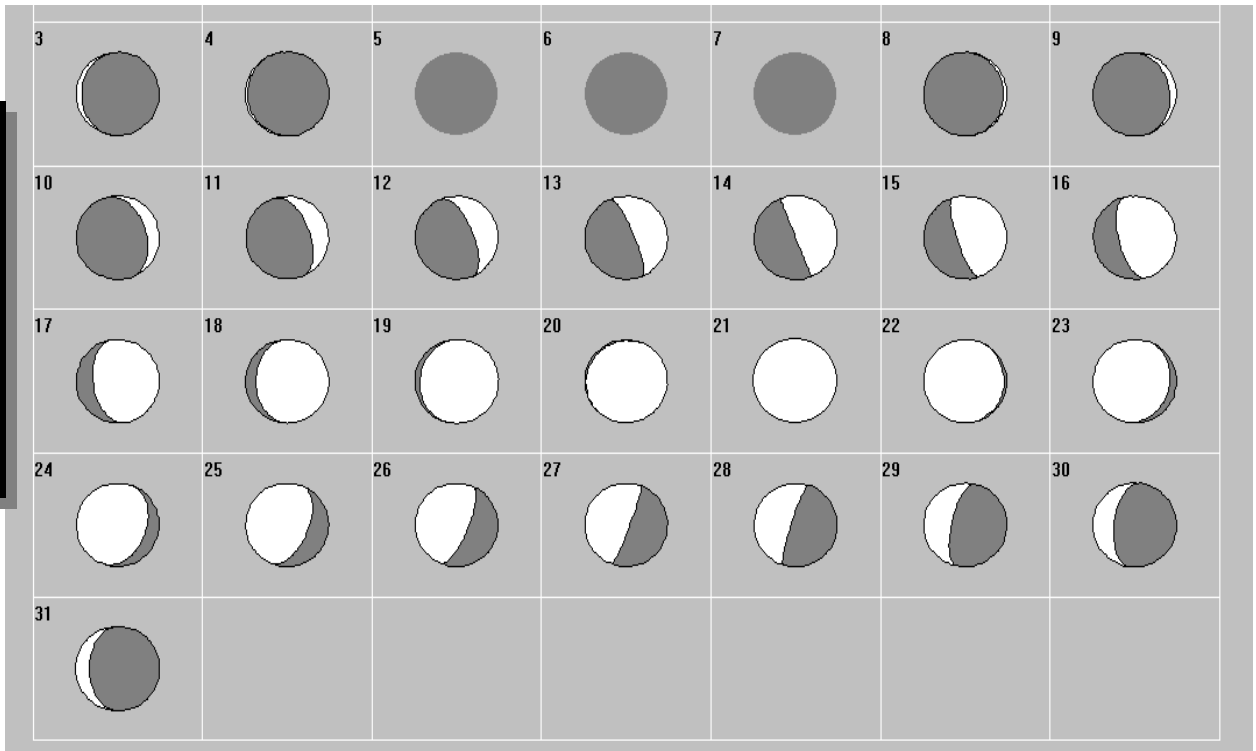
(Continued from page 5)

few years tourist have made Mirflores the most visited district of the city, not just for the well-known shops, cinemas and theaters but galleries that offer classic and avant-garde exhibitions as well.

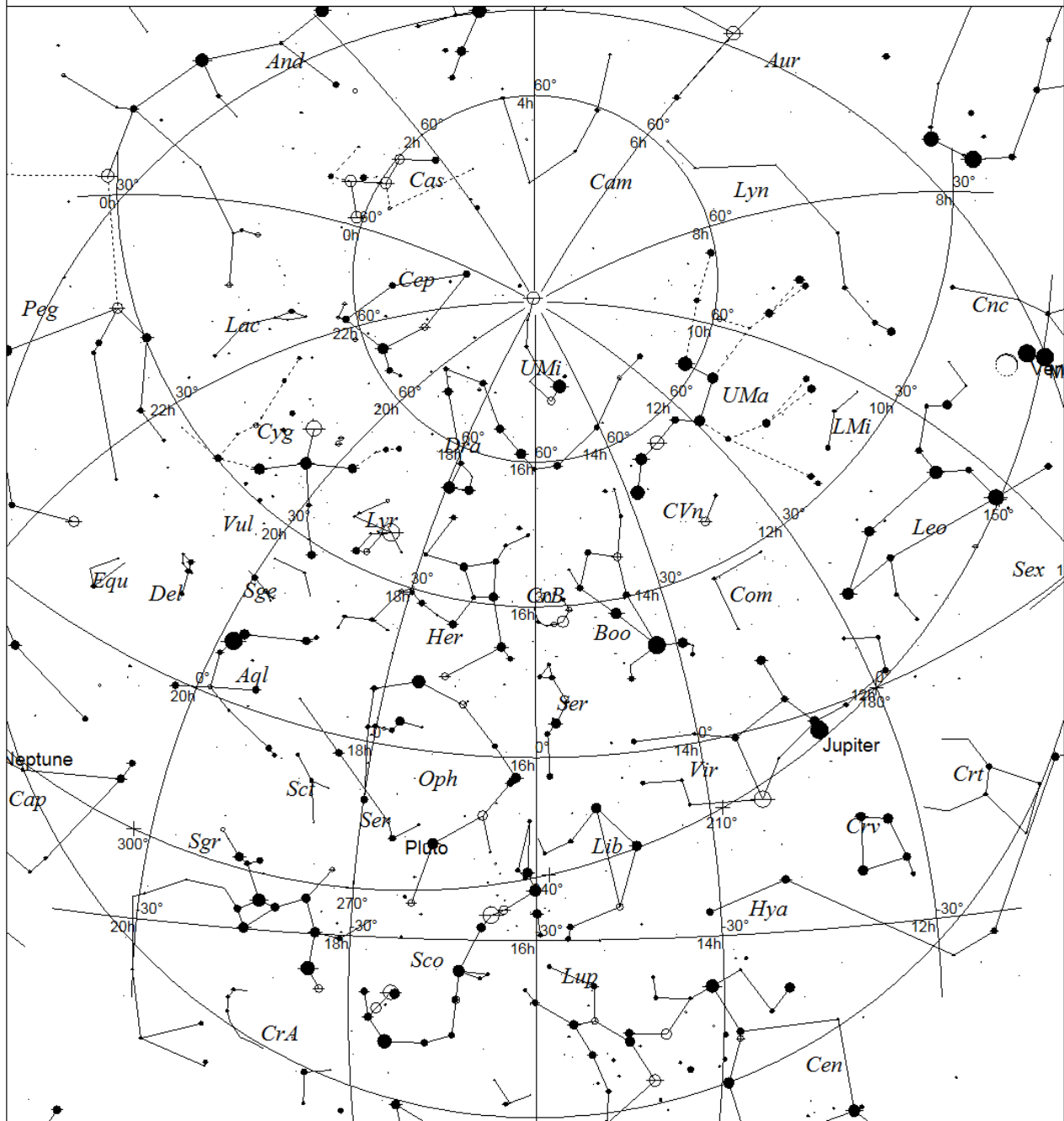
Despite being a desert city, Lima is also humid, yet only receives 2-3mm of rain annually! Lima residents refer to the gray skies as "donkey belly gray". It would not be an ideal city for amateur astronomers because I'm told they rarely see the stars at night because of the thick haze. I spent two days in this exciting city before returning on a long flight home.

The three week trip was one of the most exciting eclipse expeditions I have ever experienced. It was certainly a total eclipse seen by very few since it was not visible from any land mass on Earth. Only three ships on the expedition witnessed it, a total estimated at 1500 people. That made it even more special for each of us. The next total solar eclipse will be of nearly 4 minutes duration, and far more accessible than this one. I'll be somewhere along the centerline, ready, once again, to experience the grandest spectacle nature has to offer.

The important thing is not to stop questioning.  
Albert Einstein



# Skymap July 8 2005 10PM



<p><b>STARS</b></p> <ul style="list-style-type: none"> <li>● &lt;1    ● 3.5</li> <li>● 1.5    ● 4</li> <li>● 2      ● 4.5</li> <li>● 2.5    ● &gt;5</li> <li>● 3</li> </ul>	<p><b>SYMBOLS</b></p> <ul style="list-style-type: none"> <li>● Multiple star</li> <li>○ Variable star</li> <li>☄ Comet</li> <li>☉ Galaxy</li> <li>□ Bright nebula</li> <li>☐ Dark nebula</li> <li>⊕ Globular cluster</li> <li>○ Open cluster</li> <li>◇ Planetary nebula</li> <li>⊗ Quasar</li> <li>△ Radio source</li> <li>× X-ray source</li> <li>○ Other object</li> </ul>	<p><i>Tuckahoe State Park Denton MD</i></p>
---	---	---

Local Time: 22:00:00 8-Jul-2005      UTC: 02:00:00 9-Jul-2005      Sidereal Time: 16:00:43  
 Location: 38° 58' 0" N 76° 56' 0" W    RA: 16h00m43s Dec: +38° 57'    Field: 182.0°      Julian Day: 2453560.5833

## Moondark for July: What if Eratosthenes had GPS?

Twenty-two centuries ago, [Eratosthenes of Cyrene](#) (276–194 B.C) measured the Earth using [only sunlight and shadows](#). At noon on the summer solstice in Alexandria, Egypt, sunlight reach the bottom of a deep well, meaning that the sun stood directly overhead. At the same moment, to the north some 5000 stadia (the common unit of distance was the length of a Greek stadium) in Syene (now Aswan, Egypt), a vertical stick cast a shadow of the Sun  $7^\circ$  from the zenith. [This is all](#) he needed to know.

If the Earth is spherical (which Greeks knew from our shadow during lunar eclipses) and the Sun's is far enough away that its rays are parallel, [the rest is easy](#). Since the [angular difference of  \$7^\circ\$  is 1/50 of a circle of  \$360^\circ\$](#) , the circumference of the Earth is about 50 times the inter-city distance, roughly 250,000 stadia.

This is an excellent measurement. But what if the ancient Greeks had used the [Global Positioning System](#), better known as GPS? Although satellites and silicon microchips are decidedly 20th-century inventions, the geometric principles of intersecting circles (actually spheres) of time signals to determine the location of a point would be instantly understood. Moreover, a much shorter measurement baseline would work because of [GPS's incredible accuracy](#): about 3 m (10') or so.

Earlier this year, Eratosthenes' experiment was re-enacted in its original form. Sponsored by the [World Year of Physics](#), school groups from all over the country measured noon shadow angles and [reported their results](#). The kids did remarkably well, especially given that measuring shadows requires considerable care. The accuracy is ultimately limited by the fact that the Sun is a disk a half degree across—hence the Sun's shadow has a soft edge. All together, the classes' average estimate was just 3% higher than the modern value.

To make my (admittedly smaller) point, I "repeated" the Eratosthenes experiment using a [handheld GPS unit](#), a 100-m measuring tape oriented north-south as my baseline, and stretched it over a [level area](#). I took [GPS readings](#) at each end, recording all the decimal places, averaging several values since I knew each 3rd decimal place represent about 2 m. The north end was latitude  $38^\circ 47.1913'$ , and the south  $38^\circ 47.1390'$ , a difference of just  $0.000872^\circ$ . Using the same proportionality as Eratosthenes, "my" Earth's circumference is 41,274 km, 3.3% too big.

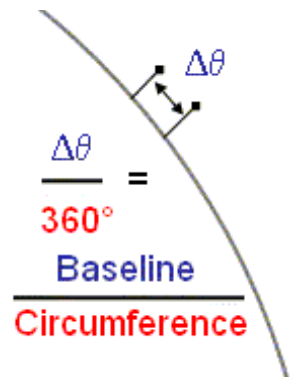
So, [how well did Eratosthenes do](#)? Quite well indeed, but [just how accurately is still debated](#). The answer depends critically on the assumed length of his measuring unit, stadium or stadia. Several values have been documented, and because there were many venues for Olympic games, this value probably differed from region to region. The best-case guess of 185 m, gives Eratosthenes' estimate of 39,690 km, accurate to less than a percent, while the other extreme gives a value about 17% too high. In all, not too bad for two thousand years old technology.

While the [elevation of the noon Sun](#) is no longer used for [position reckoning](#), latitude and longitude are "must-have" info for modern go-to telescopes, and many [high-end models](#) come with [GPS built-in](#). [Navigating great circles](#), [estimating distances](#), and even [viewing the surface from above](#) is easy with GPS coordinates. And with a hand-held GPS, you too can measure the Earth from the ball field at [Tuckahoe](#)!

The modern value for the polar circumference of the Earth is 39,941 km or 24,818 miles. [Moondark](#) is written by [Doug Miller](#), published [online](#), and printed in the [Delmarva Star Gazers' Star Gazer News](#). Last revised on 26 June 2005. Text and images are copyright © 2005 by Douglas C. Miller, All Rights Reserved. This material may not be reproduced in any form without prior permission.



The summer solstice noon shadow is the shortest of any day's in temperate regions



Shadow or GPS, the math is [a simple proportionality](#)



Temple of Poseidon at [Cape Sounion, Greece](#)