February 2008

Volume 22 Issue 2

The Observer

East Valley Astronomy Club

Inside this Issue:

From the Desk of the President
by Claude Haynes

A lunar eclipse highlights February. Astronomers are often accused of being a bit "loony", and spending a cold night by a telescope might provide evidence. But while the fingers may be frozen, the heart is warmed by the beautiful objects of a clear winter sky. Join us Wednesday night February 20 at the GRCO for a public star party during the lunar eclipse. We plan to set up on the grass near the observatory, and hope that a number of families bring their lawn chairs and join us. Feel free to set up in the parking lot as well if you have a heavy scope, and to come without a scope because I'm sure we will have lots of general questions to answer. Totality is about 8:00pm, and we will end by 9:00pm (when totality ends). We also have a number of school star parties scheduled. Check the calendar at www.eastvalleyastronomy.org for more information. Special thanks to all who participate in our many public outreach events.

The speaker for our February meeting is Gary Jarrette, who will be talking about beginning CCD photography. While past EVAC speakers have been taking astrophotographs for some time, Gary has recently started with this aspect of the hobby. We will be able to gain from his experience in selecting equipment, and the learning curve at the beginning.

Make plans for the Messier Marathon on April 5, and keep looking up.

The Backyard Astronomer
Hidden Doubles for Winter *by Bill Dellinges*

If you despise double stars, read no further. But if you admit to finding them mildly interesting or you're a double star fiend, you may find the following subject of interest (I hope!).

Discovering a new double star can be thrilling. Finding one where you wouldn't expect it to be is thrilling and surprising. Let's look at a few winter doubles hiding where you'd least expect them.

Phi Cassiopeiae: [01h 19.1m +58° 20']. You've probably looked at this double many times without knowing it. It's the two bright stars in NGC 457 that make the "eyes" of the "E.T. Cluster" or the tail lights of the "Airplane Cluster" (my favorite moniker for this group of stars). A 9x50 finder will split this wide pair. The A component is magnitude 5.1, the B component 7.0. Separation is 135.3" (arc seconds). Position angle is 233°. The primary's spectral type is B5. An 11" SCT shows a yellow primary and blue secondary (Take my color estimates with a grain of salt, I'm slightly color blind).

Polaris, Ursa Minor: [02h 31.8m +89° 16']. A-B Mag 2.0, 9.0, Sep 18.4", PA 218° Spec F7 Ib, F7 II.

Actually a star for all seasons! Not only is Polaris our Pole Star and the sky's brightest Cepheid variable star, but it has a ninth magnitude companion 18.4" away. Can you pick it out? Even my little pea shooter Televue 85 (3.3 inch) can resolve the pair at 66x. I've always thought, however, the view in my C-8 renders the most pleasant view.

S 437 (SAO 76169) Taurus: [03h 46.3m +24° 11']. A-B Mag 8.13, 7.70, Sep 39.4", PA 309°, Spec A7 V.

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Upcoming Events:

Local Star Party at Boyce Thompson – February 2

Public Star Party in Gilbert – February 8

Deep Sky Star Party at Vekol Road – February 9

Ryan Elementary School Star Party – February 13

General Meeting at Southeast Regional Library in Gilbert – February 15

Total Lunar Eclipse – February 20

Coronado Elementary School Star Party – February 21

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Dead center in the "bowl" of the Pleiades (M45), it makes a tiny delicate triangle with an equal magnitude star. I'll bet you've seen it before and thought "What a neat little isolated triangle of stars I see there". An easy split in a 70mm scope or 10x50 binoculars.

∑450, Taurus: [03h 47.4m +23º 55']. A-B Mag 7.3, 9.3, Sep 6.1", PA 265º, Spec B9.

Also found in the Pleiades. Have you ever noticed the chain of 7th and 8th magnitude stars running off from a point between Alcyone and Merope? After you've recovered from the general impact of this spectacular star cluster, this star chain will probably be the next thing to catch your eye. The first star in it is a double star. In a SCT 11" at 90x, I see a bright white primary with a dim, very close secondary.

∑485 (SAO 13031) Camelopardalis: [04h 07.8m +62º 20']. A-B Mag 7.0, 7.0, Sep 18", PA 304º, Spec B0.

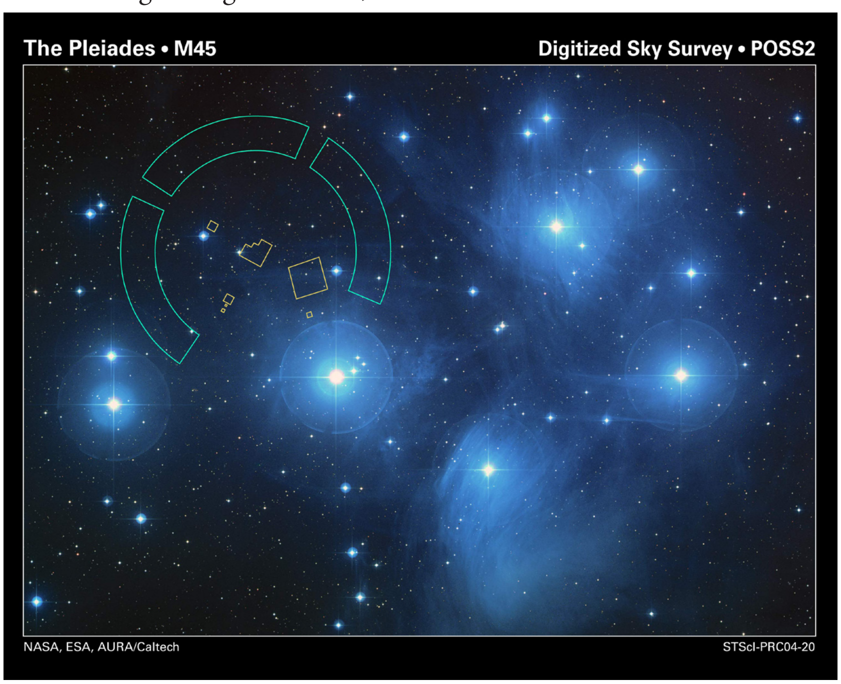
At the terminus of Kembles Cascade lies NGC 1502, an open star cluster. This pair seems to be brighter than the cluster stars and thus easy to spy. Tripod mounted 10x70's could just barely split this equal magnitude pair. Quite easy to split in a Televue 85 at 29x or CPC 11" at 70x.

∑ I 10 (SAO 93957) or 77 and 78 Tauri: [04h 28.7m +15º 52']. A-B Mag 3.4, 3.9, Sep 347" (5.78') PA 346º, Spec F0, K0.

In 1974 I was the proud owner of a brand new Celestron 8" Schmidt-Cassegrain telescope, a new type of reflector being offered by Tom Johnson's Celestron International of Torrance, California. I financed it partially by selling my Unitron 4" refractor, a beast from the 50's telescope era. Though bought in 1970, I quickly realized I needed more aperture and portability (moving it was like trying to move the Eiffel Tower). One night while looking through my little orange "cement mixer" at the Hyades in Taurus, a neighbor and fellow amateur stargazer pointed out an interesting group of stars in the cluster just west of Aldebaran. There you'll find three pairs of stars about 120 degrees apart – quite a distinctive grouping. The west pair is ∑ I 10, a very wide double and a good eye test. Even my dinosaur eyes can split it. So, even a finder will easily separate this equal magnitude pair of white stars. By the way, the east pair is also a double, LDS 2246 (SAO 93975). Alas, the southern pair, 80 and 81 Tauri, is only an optical pair (unrelated) although each one is a double itself.

H 3948 (SAO 173446) Canis Major: [07h 18.7m -24º 57'] A-B Mag 4.4, 10.5, Sep 8.2", PA 90º, Spec O9. This is Tau Canis Majoris, a multiple star dead center in NGC 2362 in eastern Canis Major about three degrees northeast of Delta Canis Majoris. I've always found this open cluster to be an especially pretty one because of Tau's being so much brighter than the cluster's other members. Not too many clusters have such a prominent star in them (Another is M11 in Scutum). In a finder, you'll see Tau has a little "fuzz" around it – a tantalizing introduction to this prize. Tau is actually a triple star (A-C Mag 4.4, 11.2, Sep 14.5", PA 70º). My CPC 11" at 165x easily resolved the B and C components. Do not let this interesting triple escape you this winter!

Your mission, should you accept it, is to put on eight layers of clothing, plug in your heat suit and try to knock off a few of the objects above. You'll be glad you did. Trust me.



The brilliant stars seen in this image are members of the popular open star cluster known as the Pleiades, or Seven Sisters. The Hubble Space Telescope's Fine Guidance Sensors refined the distance to the Pleiades at about 440 light-years. The Fine Guidance Sensors are at the periphery of Hubble's field-of-view. They trace a circumference that is approximately the angular size of the Moon on the sky. They are overlaid on this image to give a scale to Hubble's very narrow view on the heavens.

Hubble Fine Guidance Sensors measured slight changes in the apparent positions of three stars within the cluster when viewed from different sides of Earth's orbit. Astronomers took their measurements six months apart over a 2 1/2-year period. About 1,000 stars comprise the cluster, located in the constellation Taurus.

The color-composite image of the Pleiades star cluster was taken by the Palomar 48-inch Schmidt telescope. The image is from the second Palomar Observatory Sky Survey, and is part of the Digitized Sky Survey. The Pleiades photo was made from three separate images taken in red, green, and blue filters. The separate images were taken between Nov. 5, 1986 and Sept. 11, 1996.

The Earth's Atmosphere, Ionosphere and Ozone Layer

by Henry DeJonge

Last time we discussed the UV radiation from the sun. Now we will discuss the Earth's atmosphere, the ionosphere, and the ozone layer with respect to solar UV radiation. Our atmosphere is relatively light in mass compared to the earth and comprises less than 1/1,000,000 of the mass of the earth. The Earth's atmosphere is composed up of about 21% Oxygen, 78% Nitrogen, 1% Argon and other gases, with a slight trace of carbon dioxide. It also contains water vapor, which varies up to about 3%. This content is overall fairly constant up to about 90km above the surface. Above this height, the density of the air begins to vary due to molecular dissociation, (ionization and molecular breakdown due to solar radiation and solar particles). Pressure and density decrease roughly exponentially with height while water vapor decreases even more rapidly.

The atmosphere has a layered structure, which can be broadly labeled, (from bottom to top) as the troposphere, the stratosphere, the mesosphere, and the thermosphere. The troposphere is the layer we live in. It extends from the surface of the earth to about 12km, (about 39K feet). This layer includes about 80% of the mass of the atmosphere and shows a temperature decrease with altitude.

Above this layer is the stratosphere, which extends from about 12km to about 50km above the surface of the earth. This layer's distinctive feature is that it contains ozone. Ozone is a triple atomic molecule of oxygen, (O_3), while a regular oxygen molecule is usually only two atoms, (O_2). Ozone absorbs the genetically damaging UV radiation quite well and this serves as a protective layer in our atmosphere. It also causes the stratosphere to heat up with altitude.

In the next layer above, called the mesosphere, we find very little ozone. It stretches from about 50km to about 80km above the surface of the earth. The solar radiation can be very strong here while little UV radiation is absorbed and the temperature declines with altitude.

In the mesosphere we have some atoms that absorb UV radiation and lose an electron becoming ions. This can also happen when energetic particles from the sun and other electromagnetic radiation such as x-rays cause ions to be formed. These atoms become positively charged and with the loose negatively charged electrons, form another layer called the ionosphere. This partial ionization, (about .1%) basically forms a plasma that is coupled to both the magnetosphere and our neutral atmosphere. The ionosphere extends from about 80km to about 400km. The ionosphere is the conducting layer that also reflects radio waves. Thus, the ionosphere is formed by the heavy bombardment of the upper atmosphere by solar UV radiation and energetic particles, which causes dissociation and ionization.

The number of free electrons in the ionosphere generally increases with altitude up to about 300km where electron density is the highest. This increase in density occurs in steps and is also dependent upon the constituents. Above 150 km is the F region which is composed up of mainly ionized atomic nitrogen, atomic oxygen, (N^+ and O^+). The E region is about 85-150 km and is largely composed up of O_2^+ and NO^+ ions. The third region, about 50-85 km above is called the D region and is largely composed up of hydrated ions. The ionosphere has seasonal and diurnal variations, (due to the incident solar radiation) and is also strongly latitude dependent. Solar activity such as sunspots also causes variations, (higher densities during solar maximums) in the plasma density of the ionosphere.

Above the mesosphere we have the thermosphere. This is a very, very, low-density region that begins from about 80km above the earth and extends to outer space, (the interplanetary medium), although the exact upper boundary is not well defined. The temperature, (defined as the kinetic energy of the particles) rises again with altitude. This is mainly due to the isolated atoms, (mainly O and N) absorbing very short UV radiation and heating up, which the molecular forms of O and N cannot, (O_2 and N_2). The pressure in this layer is very low, about 10^{-11} as much as sea level.

The exact boundaries of the atmospheric layers are not well defined due to the constantly changing environmental conditions, and there is much overlap and mixing. Yet overall some properties are distinct enough for this classification. See figure "A" below.

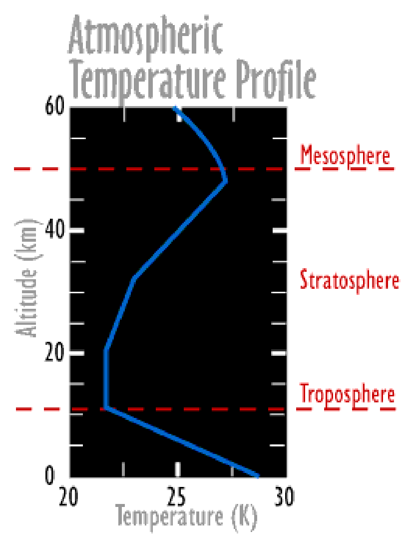


Figure 1

Ozone as we have seen is largely a component of the stratosphere. Essentially some of the oxygen molecules, (O_2) of the lower atmosphere diffuse upwards and are dissociated into atomic oxygen, (O) by the strong solar radiation. Atomic oxygen strongly absorbs all solar radiation below 1850 A. The Ozone layer is formed in the upper atmosphere, specifically in the stratosphere about 30km above the surface where the upward diffusing O_2 and the downward diffusing O meet and react to form ozone, (O_3). The chemically active single oxygen atoms join with the ordinary oxygen molecules, (O_2) to form the three-atom molecule called ozone.

In some detail, an ozone, (O_3) molecule is formed when UV radiation of less than 240nm breaks apart a molecular oxygen molecule, (O_2) into atomic oxygen, (two O atoms). This process is called photolysis. These two atoms attach themselves, (react with) to a molecular oxygen molecule and form two ozone molecules. This rate of ozone forma-

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My Lowell Observatory Trip in October 2007
photos and text by David Brandt

When I was about 20 I drove through Arizona a couple of times on my way to and from the naval base I was stationed at in San Diego. Back then it was just another state to get through. Then my Dad and Aunt and Uncle moved to Mesa. Since then I try to get there at least once a year. I like the dry heat.

During the first few trips my wife and I didn't do any sightseeing beyond the Phoenix area. I did think about moving there so I joined the East Valley Astronomy Club and I timed two of my trips so I could go to their monthly meetings. It was on one of those trips that I met their guest speaker, Ted Bowell, of the Lowell Observatory. I am interested in asteroids and he is well known for his work with discovering asteroids. (http://www.lowell.edu/users/elgb/)

Eventually, my wife and I were looking for something new to do so we signed up for a one day tour of the Grand Canyon. It was February and no one warned us that it was going to be cold and snowy at the 6000 foot altitude of the South Rim. Between warming up in the El Tovar Lodge and gazing down at the canyon I knew I had to return someday. Some people think the Grand Canyon is a big hole in the ground and some could spend hours gazing at it and exploring it. I am in the latter group. Since that first trip, I have been back three times and I'm planning to go again. During my last trip I decided to add the Lowell Observatory to my plans.

I arrived at the observatory about 20 minutes before the 9:00 AM opening time. It was a near perfect ady for me at the 7,000 foot location at about 70 degrees with a clear blue sky. I had been in the Grand Canyon the previous day and I had taken a picture of some mountains to the south. I had planned to see how far away those mountains were. As I drove south from the canyon I realized one of those mountains was next to Flagstaff - about 60 miles to the south of the Canyon. No wonder 18 major observatories are located in Arizona.

The astrograph used by Clyde Tombaugh to discover the dwarf planet Pluto. Photo by David Brandt

I wanted to explore the observatory on my own, but the parking lot was surrounded by a fence with signs warning visitors to stay with the guided tours. There were a couple of buildings that looked like dormitories. I guessed that the astronomers slept there during the day. Also, I could see the unmistakable shape of a dome through the trees further up the mountain.

I was the only one waiting when the visitor center opened so I examined the merchandise at the souvenir store. There was also a small children's museum there that had several exhibits meant to demonstrate some of the principles of astronomy.

The observatory housing the Clark refractor. Photo by David Brandt

More people began to trickle in and there was an announcement about the start time of a guided tour.

The tour started with a short movie. After the movie the tour guide, Drew, asked if anyone had questions. I wanted to know his background and where the other people on the tour were from. He had majored in mathematics and he didn't plan to be an astronomer. The other people in our group were from various places in the U.S.A., but one couple was from Australia. I was the only amateur astronomer.

We walked to the Clark Telescope and Drew told us the story of how Percival Lowell had moved to Arizona and had the Clark Co. build the telescope so he could observe Mars. His wife had a mausoleum built for his remains. It is about 50 feet from the telescope. Drew asked for a volunteer to approach the telescope and push on the tube. A child, who looked like she was about 12, was selected. She easily moved the huge telescope. Drew also told us about the astronauts who had used the telescope to look for places to make the first landing on the moon.

We next walked further up the mountain toward the observatory that houses the astrograph that Clyde Tombaugh used to discover Pluto. The path to the building was marked with signs with the name of a planet on each one. Drew explained that the distances between the signs are a scaled down version of the actual solar system distances. Naturally, someone asked if Pluto is still considered a planet.

Some of the people on the tour were not used to thin air so they waited at the bottom of the path while the rest of us went into the observatory.

I had read a biography about Clyde Tom-

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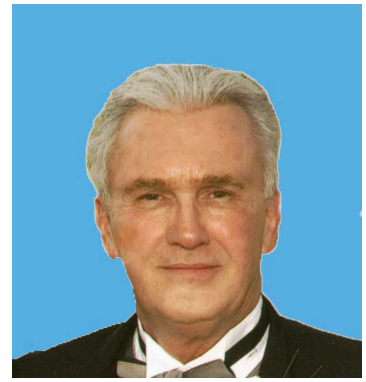
February Guest Speaker: Gary Jarrette



Gary Jarrette is currently retired after spending the last 20 years of his working career at Arizona State University where he worked as an Instrument Maker/Designer Sr. in the Physics & Astronomy departments Mechanical Instrument Shop. While at ASU, his work included the design and repair of many subminiature parts and assemblies for the many Electron Microscopes at ASU as well as the fabrication of complex high vacuum systems used in the various fields of research in the Center for Solid State Science.

Notable projects include but are not limited to the fabrication of many components for three of the Mars Missions under the direction of Phillip R .Christensen PhD, several Scanning Tunneling Microscopes, and a myriad of various other projects for the scientific community at ASU.

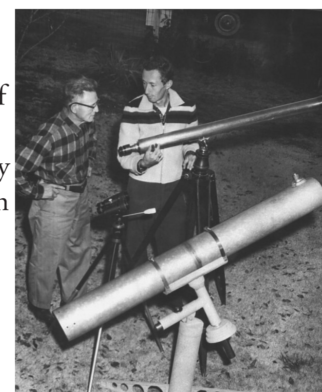
Earlier training included a formal apprenticeship in Tool & Die Making with Ford Motor Company in the Chicago area and some college work in electronics and other areas of personal interest. An earlier fascination with electronics led to an Advanced Amateur Radio License and was the stimulus for participating in the many facets of Amateur Radio over the past 35 years. His latest endeavor was involvement in Amateur Television Community here in the Valley.

He is a current member of EVAC, and relatively new to Amateur Astronomy, and will speak on his "Fast Track Approach" to amateur astrophotography and the trials and tribulations of acquiring the knowledge and equipment necessary to capture DSOs from a beginners standpoint.

Areas of discussion will include the motivation and justification for the desire to capture stunning CCD astrophotographs, resources, equipment, and a beginners approach to making all this happen with the recent advances in telescope design, improvements to readily available CCD cameras, and necessary software to acquire high quality images with minimal investment of time and effort.

Robert Burnham Jr. Memorial Fund

You can be a part of history as people from all walks of life coordinate their efforts to pay tribute to one of the most influential people in amateur astronomy. The East Valley Astronomy Club is proud to serve as fiduciary agent for a drive to place a permanent memorial to Robert Burnham Jr on the grounds of Lowell Observatory in Flagstaff, Arizona. It is estimated the memorial will cost approximately $20,000. Any additional funds raised will be contributed to the Northern Arizona University scholarship fund for the benefit of astronomy students.



Robert Burnham Sr and Robert Burnham Jr at the telescope

Robert Burnham compiled his three volume Celestial Handbook while working at Lowell Observatory as part of the Stellar Proper Motion Survey. This grassroots effort began on a Cloudy Nights discussion forum, and with the guidance of Burnham's sister, Viola Courtney, and her daughter Donna Cox, has grown to include numerous members of the astronomy community, including the honorary chairman of our fundraising committee Jack Horkheimer of the Miami Science Museum, better known for his PBS Star Gazer series.

For more information on Robert Burnham Jr please visit the official memorial website www.rbjm.org .

If you wish to make an online donation, please use the PayPal link here:
http://www.eastvalleyastronomy.org/rbjm.htm

If you wish to make a donation by mail, please make check payable to Burnham Memorial Fund and mail it to EVAC, PO Box 2202, Mesa, Az., 85214-2202… or you can donate at a club meeting.

New Moon on February 6 at 20:44

First Quarter Moon on February 13 at 20:33

Full Moon on February 20 at 20:31

Last Quarter Moon on February 28 at 19:18

Thinking About More Aperture?

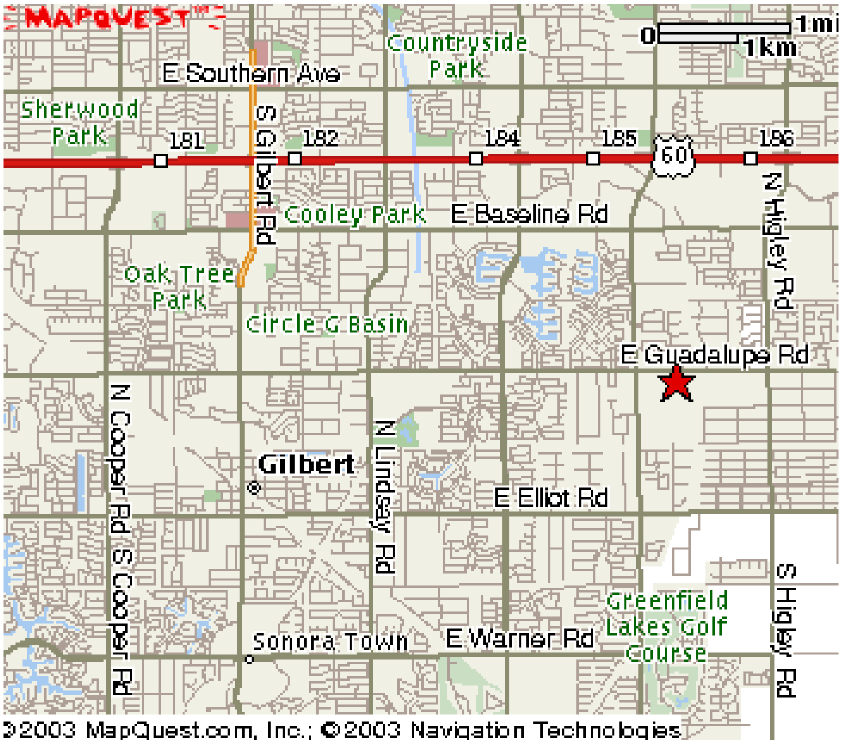
I am contemplating the sale of my 25" F5 Obsession (#620) later this spring, and thought I would make it available to any interested club member first. The telescope features a Galaxy primary mirror (.964 Strehl) along with a 3½" United Lens secondary mirror. Included with the standard Obsession components are the complete ServoCAT GoTo system - including *every single option available*: 2nd Generation CAT, 2nd Generation Argo Navis DTC with 10k encoders; CatTail Stalk; powered groundboard; wired and wireless handpaddles; Wireless232 system to interface with your laptop, etc. The telescope also features a dual-speed Feathertouch focuser; Obsession shroud; cable mirror sling; updated ALT encoder coupler; and a Telrad. Rounding out this observing machine are some custom covers from Astrosystems: Scope Coat; truss pole case; upper truss assembly case and secondary mirror cover. I'll even include a Werner MT-22 telescoping multiladder.

If you ordered this telescope today, equipped with all the options and accessories included here, it would cost over $17,000 plus crating and shipping. I may also consider selling my custom 5' x 8' TNT trailer (new cost was $3,175). I would be willing to sell the telescope for only $9,000 or the whole shebang: telescope and trailer for $11,000. If interested, I invite you to check it out at an upcoming star party!

Peter Argenziano 480-633-7479
Email: news@eastvalleyastronomy.org

Orion StarMax
102mm Maksutov-Cassegrain
1300mm focal length F12.7
Orion TeleTrack Alt-Az tracking mount
$300
damionbow2@aol.com

www.eastvalleyastronomy.org/grco/obs.asp

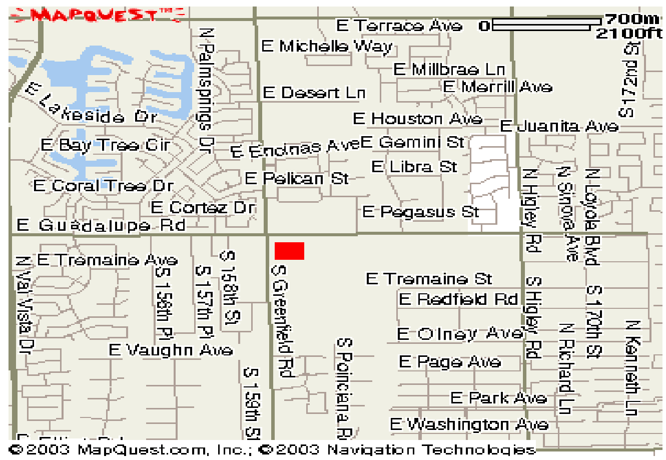


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

Our meetings are held on the third Friday of each month at the Southeast Regional Library in Gilbert. The library is located at 775 N. Greenfield Road; on the southeast corner of Greenfield and Guadalupe Roads.

Meetings begin at 7:30 pm.

Visitors are always welcome!



2008 Meeting Dates

February 15

March 21

April 18

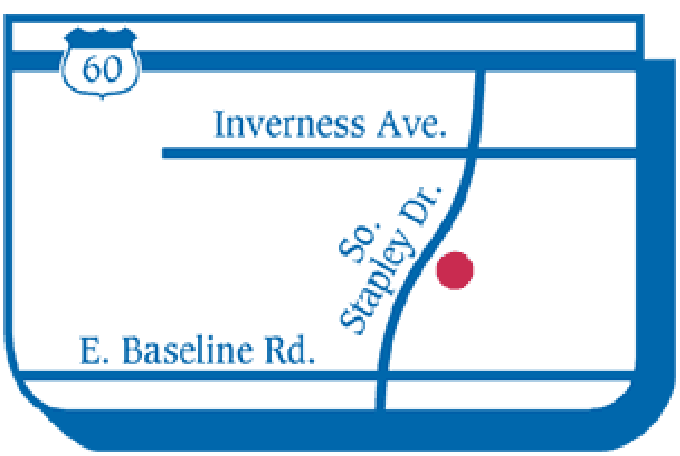
May 16

June 20

July 18

Southeast Regional Library
775 N. Greenfield Road
Gilbert, Az. 85234

All are welcome to attend the pre-meeting dinner at 5:30 pm. We meet at Old Country Buffet, located at 1855 S. Stapley Drive in Mesa. The restaurant is in the plaza on the northeast corner of Stapley and Baseline Roads, just south of US60.



Old Country Buffet
1855 S. Stapley Drive
Mesa, Az. 85204

Likewise, all are invited to meet for coffee and more astro talk after the meeting at the Village Inn restaurant located on the northeast corner of Gilbert and Baseline Roads in Mesa.

Village Inn
2034 E. Southern Avenue
Mesa, Az. 85204

February 2008

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	**2**
3	4	5	6	7	**8**	**9**
10	11	12	**13**	14	**15**	16
17	18	19	**20**	**21**	22	23
24	25	26	27	28	29	

February 2 - Local Star Party at Boyce Thompson

February 8 - Public Star Party at Riparian Preserve in Gilbert

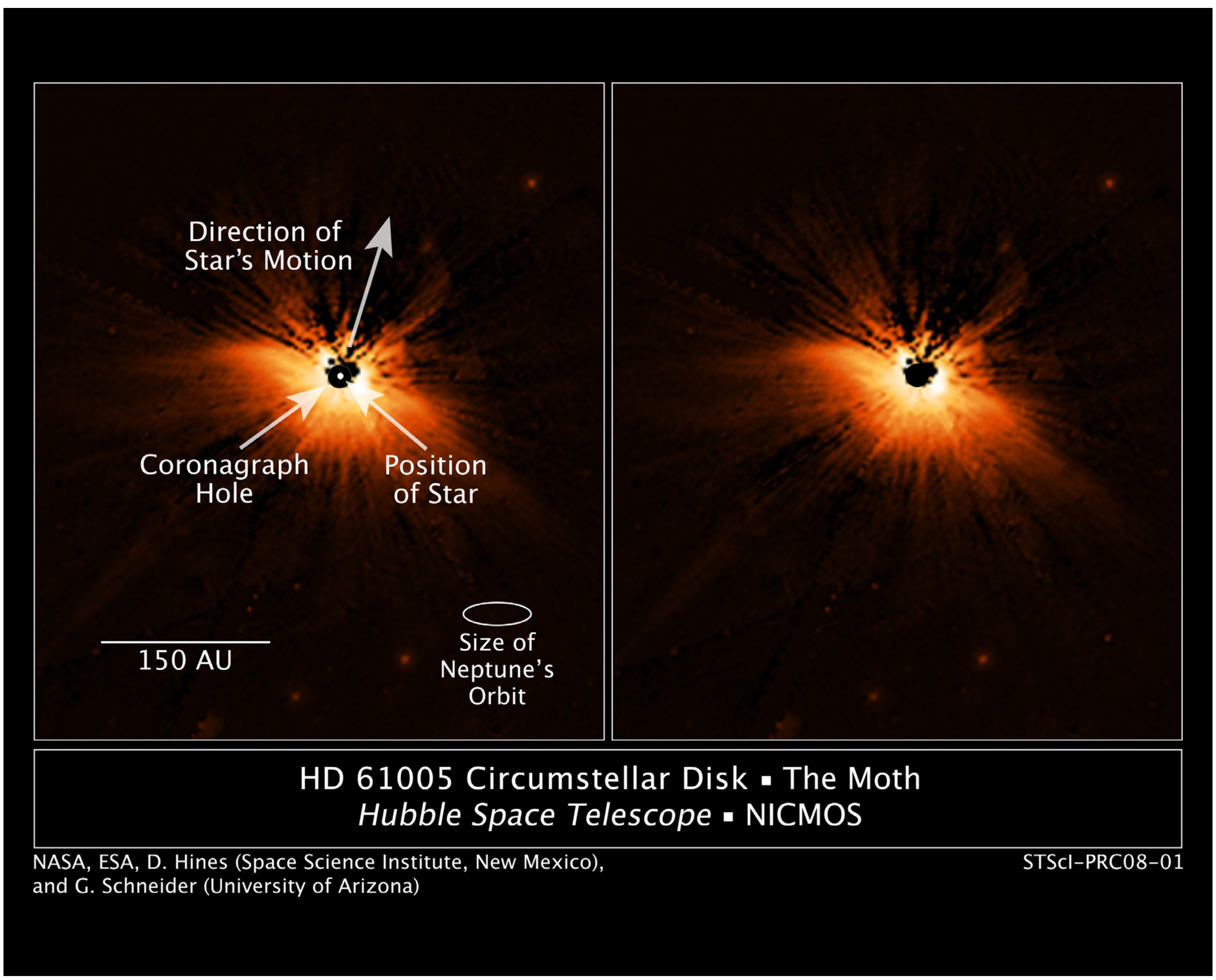
February 9 - Deep Sky Star Party at Vekol Road

February 13 - Ryan Elementary School Star Party

February 15 - General Meeting at Southeast Regional Library in Gilbert

February 20 - Total Lunar Eclipse

February 21 - Coronado Elementary School Star Party



East Valley Astronomy Club -- 2008 Membership Form

Please complete this form and return it to the club Treasurer at the next meeting or mail it to EVAC, PO Box 2202, Mesa, Az, 85214-2202. Please include a check or money order made payable to EVAC for the appropriate amount.

IMPORTANT: All memberships expire on December 31 of each year.

Select one of the following:

☐ New Member ☐ Renewal ☐ Change of Address

New Member Dues (dues are prorated, select according to the month you are joining the club):

☐ **$30.00 Individual** January through March
☐ **$35.00 Family** January through March
☐ **$22.50 Individual** April through June
☐ **$26.25 Family** April through June
☐ **$15.00 Individual** July through September
☐ **$17.50 Family** July through September
☐ **$37.50 Individual** October through December
☐ **$43.75 Family** October through December

Includes dues for the following year

Renewal (current members only):

☐ **$30.00 Individual** ☐ **$35.00 Family**

Magazine Subscriptions (include renewal notices):

☐ **$34.00** Astronomy ☐ **$33.00** Sky & Telescope

Name Badges:

☐ **$10.00** Each (including postage) Quantity: ______

Name to imprint: ________________________

Total amount enclosed: [ ]

Please make check or money order payable to EVAC

☐ Payment was remitted separately using PayPal ☐ Payment was remitted separately using my financial institution's online bill payment feature

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Name: [ ] Phone: [ ]

Address: [ ] Email: [ ]

☐ Publish email address on website

City, State, Zip: [ ] URL: [ ]

How would you like to receive your monthly newsletter? (choose one option):

☐ Electronic delivery (PDF) *Included with membership* ☐ US Mail **Please add $10 to the total payment**

Areas of Interest (check all that apply):

☐ General Observing ☐ Cosmology
☐ Lunar Observing ☐ Telescope Making
☐ Planetary Observing ☐ Astrophotography
☐ Deep Sky Observing ☐ Other

Please describe your astronomy equipment:

Would you be interested in attending a beginner's workshop? ☐ Yes ☐ No

How did you discover East Valley Astronomy Club? [ ]

PO Box 2202
Mesa, AZ 85214-2202
www.eastvalleyastronomy.org

All members are required to have a liability release form (waiver) on file. Please complete one and forward to the Treasurer with your membership application or renewal.

Liability Release Form

In consideration of attending any publicized Star Party hosted by the East Valley Astronomy Club (hereinafter referred to as "EVAC") I hereby affirm that I and my family agree to hold EVAC harmless from any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), which may directly or indirectly be connected to EVAC and/or my presence on the premises of any EVAC Star Party and related areas.

I further agree to indemnify any party indicated above should such party suffer any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), caused directly or indirectly by my negligent or intentional acts, or failure to act, or if such acts or failures to act are directly or indirectly caused by any person in my family or associates while participating in an EVAC Star Party.

My signature upon this form also indicates agreement and acceptance on behalf of all minor children (under 18 years of age) under my care in attendance.

EVAC only recognizes those who are members or invitees and who also have a signed Liability Release Form on file as participants at an EVAC Star Party.

Please print name here ***Date***

Please sign name here

PO Box 2202
Mesa, AZ 85214-2202
www.eastvalleyastronomy.org

NASA's Space Place

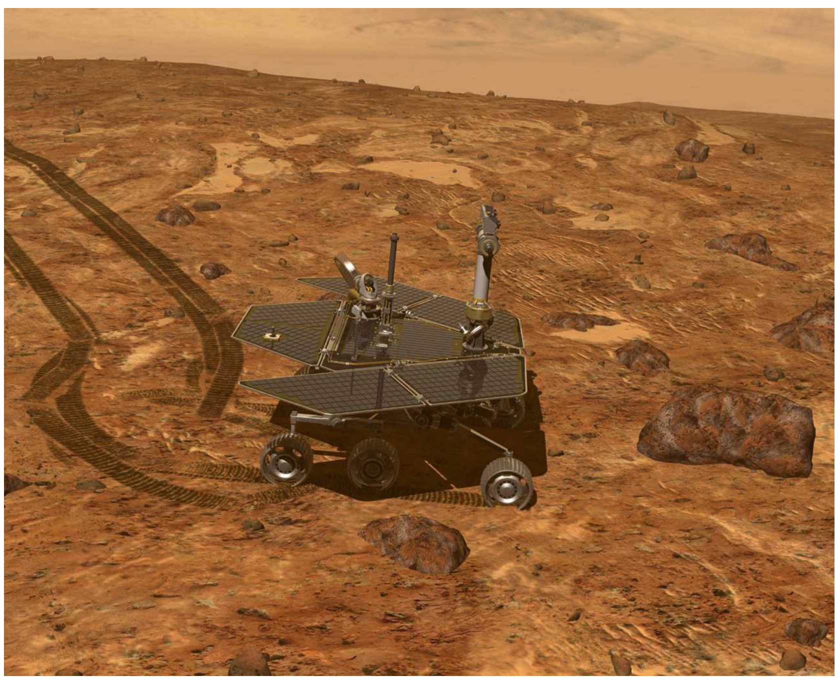
No Mars Rock Unturned

by Patrick L. Barry

Imagine someday taking a driving tour of the surface of Mars. You trail-blaze across a dusty valley floor, looking in amazement at the rocky, orange-brown hillsides and mountains all around. With each passing meter, you spy bizarre-looking rocks that no human has ever seen, and may never see again. Are they meteorites or bits of Martian crust? They beg to be photographed.

But on this tour, you can't whip out your camera and take on-the-spot close-ups of an especially interesting-looking rock. You have to wait for orders from headquarters back on Earth, and those orders won't arrive until tomorrow. By then, you probably will have passed the rock by. How frustrating!

That's essentially the predicament of the Spirit and Opportunity rovers, which are currently in their fourth year of exploring Mars. Mission scientists must wait overnight for the day's data to download from the rovers, and the rovers can't take high-res pictures of interesting rocks without explicit instructions to do so.



Are these rocks of any scientific interest? With the new AEGIS software, the Mars Rovers, Spirit and Opportunity, will be able to judge for themselves whether a scene is worth a high-resolution image. (Artist's rendering.)

However, artificial intelligence software developed at JPL could soon turn the rovers into more-autonomous shutterbugs.

This software, called Autonomous Exploration for Gathering Increased Science (AEGIS), would search for interesting or unusual rocks using the rovers' low-resolution, black-and-white navigational cameras. Then, without waiting for instructions from Earth, AEGIS could direct the rovers' high-resolution cameras, spectrometers, and thermal imagers to gather data about the rocks of interest.

"Using AEGIS, the rovers could get science data that they would otherwise miss," says Rebecca Castaño, leader of the AEGIS project at JPL. The software builds on artificial intelligence technologies pioneered by NASA's Earth Observing-1 satellite (EO-1), one of a series of technology-testbed satellites developed by NASA's New Millennium Program.

AEGIS identifies a rock as being interesting in one of two ways. Mission scientists can program AEGIS to look for rocks with certain traits, such as smoothness or roughness, bright or dark surfaces, or shapes that are rounded or flat.

In addition, AEGIS can single out rocks simply because they look unusual, which often means the rocks could tell scientists something new about Mars's present and past.

The software has been thoroughly tested, Castaño says, and now it must be integrated and tested with other flight software, then uploaded to the rovers on Mars. Once installed, she hopes, Spirit and Opportunity will leave no good Mars rock unturned.

Check out other ways that the Mars Rovers have been upgraded with artificial intelligence software at nmp/TECHNOLOGY/infusion.html#sciencecraft.

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If It's Clear…
by Fulton Wright, Jr.
Prescott Astronomy Club

February 2008

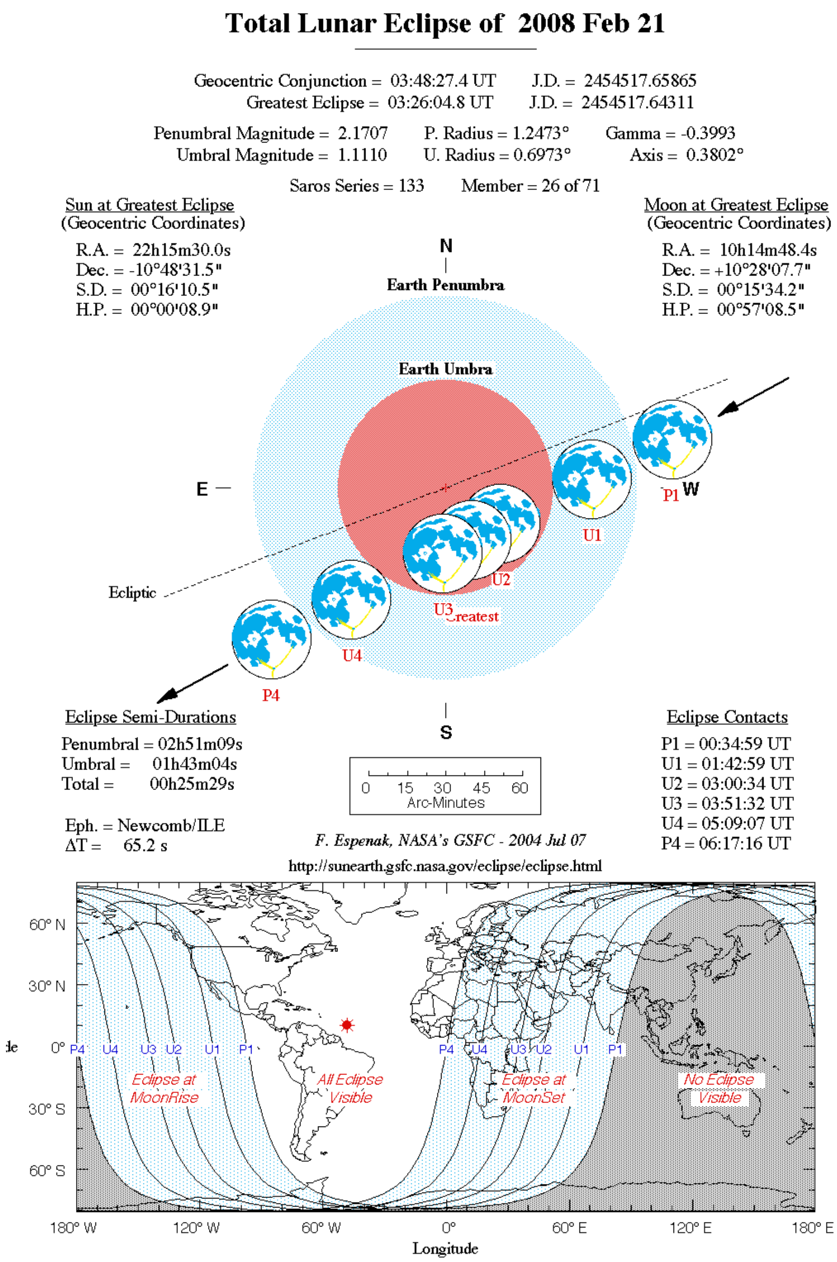
Shamelessly stolen information from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find info. When gauging distances, remember that the Moon is 1/2 a degree or 30 arc minutes in diameter. All times are Mountain Standard Time unless otherwise noted.

On Friday, February 1, about 5:40 AM, Venus and Jupiter rise about 1/2 a degree from each other in the southeast. They should be visible till about 7:00 AM when twilight starts to drown them out.

On Wednesday, February 6, it is new moon so you can hunt for faint fuzzies all night.

On Monday, February 11 through Friday, February 15, you can get a good look at the southern part of the Moon. The seeing is often steadiest right after sunset so point your telescope up there about 6:10 PM. Libration tips the south toward us and each night the terminator moves to expose some new features.

On Wednesday, February 20, it is full Moon and there is a total eclipse of the Moon. Note that Saturn and Regulus are nearby. It all happens rather conveniently for us in Arizona. Here is the time table of events.



5:35 PM Penumbral phase starts

6:08 PM Moon rises

6:17 PM Sun sets

6:43 PM Partial phase starts

6:43 PM Civil twilight ends

7:12 PM Nautical twilight ends

7:41 PM Astronomical twilight ends

8:01 PM Total phase starts

8:26 PM Mid eclipse

8:52 PM Total phase ends

10:09 PM Partial phase ends

10:45 PM (approx.) last visible shading due to eclipse

11:17 PM Penumbral phase ends

On Thursday, February 21, about 10:00 PM, you can see an interesting arrangement of Saturn's moons. With a medium (6 inch) telescope look 10 degrees above the Moon for the planet. To the lower left are the two brightest satellites, Titan (mag 8.1) and Rhea (mag 9.5). Clustered in close to the upper right are Tethys (mag 10.0), Dione (mag 10.2), Enceladus (mag 11.5), and Mimas (mag 12.7). (Don't forget that lower left may be different in your telescope depending on how your lenses and mirrors flip the image.)

The Earth's Atmosphere, Ionosphere and Ozone Layer

Continued from page 3 tion is relatively slow due to the low intensity, (number of photons) of UV radiation less than 240nm. The new ozone molecule then absorbs UV radiation for most of its life. This absorbed UV radiation breaks apart the ozone molecule into an oxygen molecule and atomic oxygen again. This is immediately followed by the recombination of the atomic oxygen atom with another oxygen molecule and a catalyst molecule, (typically N2 or O2) to reform the ozone molecule and the catalyst molecule. During this process, the UV radiation is converted to heat energy and is carried away by the catalyst molecule. This is how the ozone molecule shields us from the UV-C and UV-B bands so effectively.

Ozone constitutes about .0001% of the total atmosphere, and would form a sea level layer of about 3mm, (or 1/10 inch) thick around the earth. The stratosphere contains about 90% of the ozone in the atmosphere, the rest, (10%) is contained in the lowest part of the troposphere. Ozone is about .00005% of the total volume of the stratosphere. The typical concentration of ozone in the stratosphere is only a few molecules per million molecules of air.

Specifically this sparse ozone molecule strongly absorbs solar radiation below 3150 A, and therefore forms a solar UV screen. The highest levels, (about 35km) of ozone absorb the UV-C band almost completely, while most of the UV-A band reaches the earth's surface. The UV-B band, (which causes sunburn) is largely absorbed by the ozone layer but some reaches the surface. For UV radiation at 290nm, the intensity at the surface of the earth is 350 million times weaker than at the top of the stratosphere due to ozone absorption.

This relationship between ozone and UV radiation is complex. It is formed by the UV radiation from the sun and yet absorbs it as well, so that it self-destructs. As we have seen, this absorption breaks apart the barely stable ozone molecule and allows an oxygen atom to escape, which can again form ozone when combined with another oxygen molecule. This is usually in a rough balance or equilibrium at the top of the ozone layer and as more UV radiation from the sun is absorbed at the top, the reaction is less intense nearer the bottom, thus allowing more ozone to survive. This creates a very effective UV radiation shield for the earth.

Ozone in the troposphere is also formed at ground level, usually in the daytime, mainly and indirectly by automobile pollution, (smog). It also absorbs UV radiation but the effect from high levels of ozone inhalation is much more damaging to human lungs and can even become toxic. Ozone is a very unstable and reactive form of an oxygen molecule. It is generally toxic to life and sometimes used as an industrial germicide. Due to its unstable nature it is also constantly being created and destroyed at ground level.

Ozone formation, concentration, and distribution can vary for many reasons and thus the effectiveness of ozone as a UV shield will vary. For example, one would expect that ozone levels above the tropics would be the highest while ozone levels above the poles would be the lowest, due to the corresponding high and low intensities of ozone producing UV radiation. In reality this is not the case, and the reverse is actually true.

Satellite measurements have shown the low levels of ozone above the tropics. The TOMS, (Total Ozone Mapping Spectrometer) satellite is an example of such an instrument. It measures the total number of ozone molecules between the surface of the earth and the top of the atmosphere. The amount of ozone, (ozone thickness) in this column is expressed in Dobson Units, (DU). It is also directly related to the amount of UV light that would reach the surface of the earth and therefore a measure of UV exposure. As mentioned earlier, if all the overhead ozone molecules spread through the stratosphere could be placed upon the surface of the earth at standard temperature and pressure, (sea level pressure and 0 degrees C) it would form a layer of gas about 3mm thick. This ideal amount of ozone is defined as 300 DU, (1 DU=10^-5 m) and is described as a rough global average. See figure "B" below.

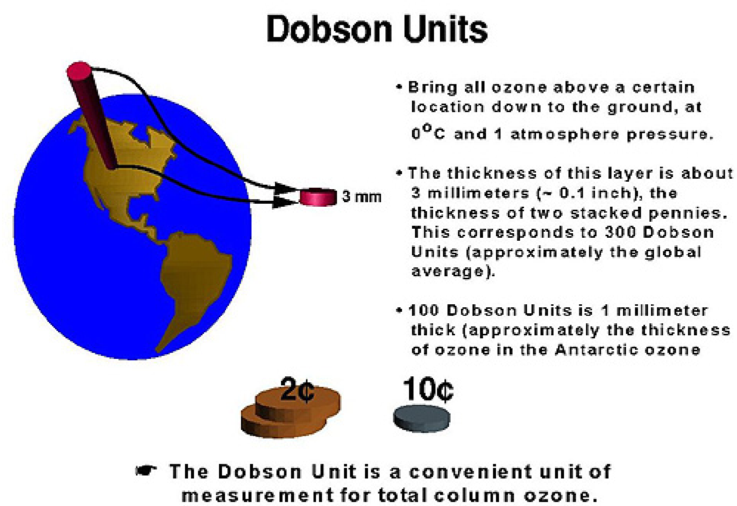
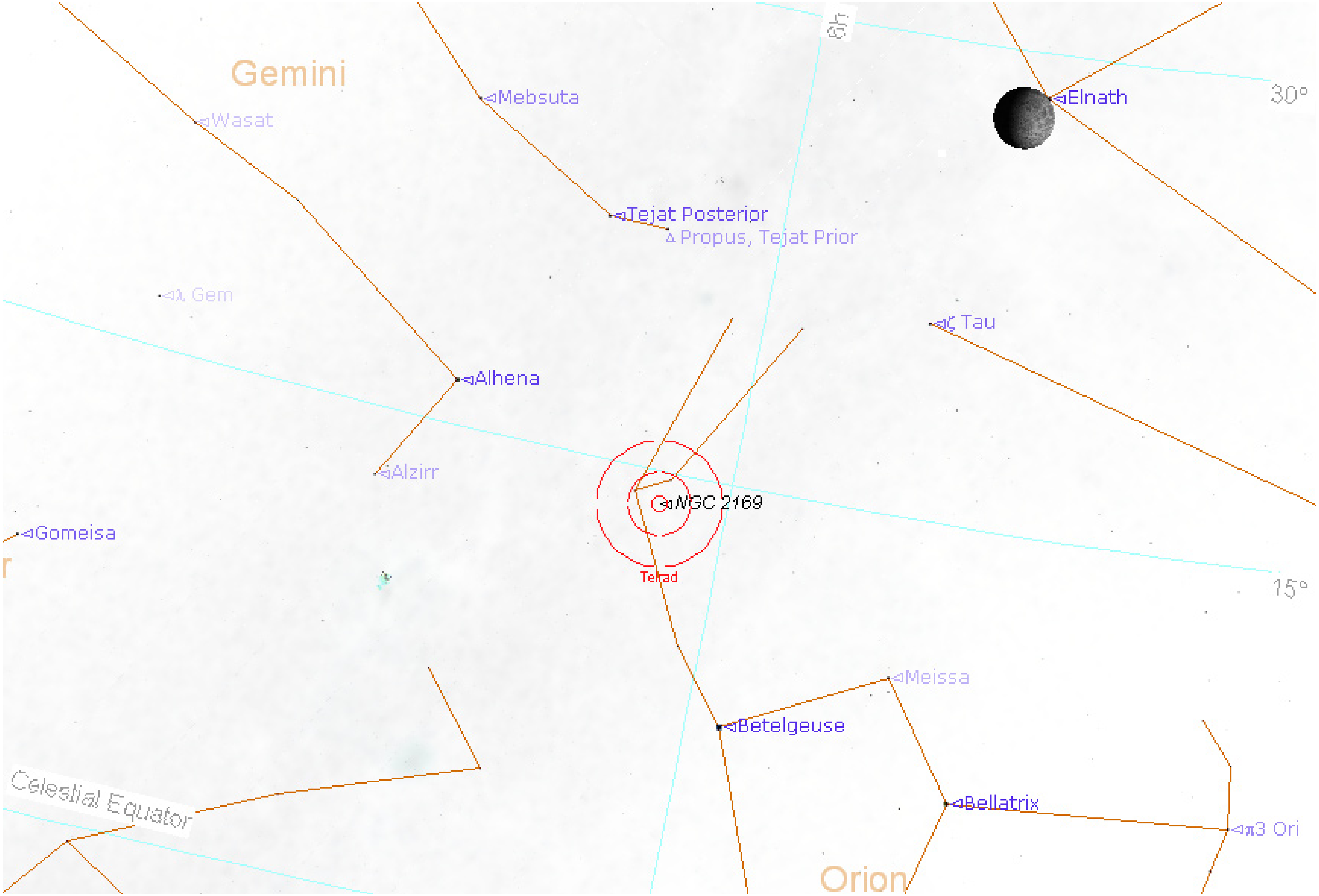


Figure B

The amount of column ozone over the tropics is less than 300 DU over the year and this low ozone amount combined with the high amounts of direct UV exposure, yields a very high dose of overall UV exposure. This is despite the high volume of ozone produced in the tropics, (the highest rate of ozone creation in the atmosphere). The DU measurements generally increase as we move from the tropics to the higher latitudes in both hemispheres, although the northern hemisphere high latitudes generally have a higher DU number than the corresponding southern latitudes. Most of the ozone above the surface is found in the mid to high latitudes of the northern and southern hemispheres. The highest DU readings over the Arctic occur in the northern spring while the opposite is true over the Antarctic when the lowest DU readings occur in the southern spring. In fact the highest DU readings in the world are found over the Antarctic in the summer spring season of September and October. This is important when we discuss the "ozone hole" later.

In the US, ozone DU readings are highest in the northern spring and decrease over the summer to their minimum in October, and then begin to rise again over the winter. This is also why in these latitudes, it is harder to get a tan in the winter due to the increasing UV absorption. Next time we will look at how winds affect the ozone layer and more specific ozone and solar UV details.



NGC 2169 (37 Cluster) Open Cluster in Orion

RA 06h 08m 26.3s DEC +13° 57’ 29” Size: 6.0’ Magnitude: 7.0

My Lowell Observatory Trip in October 2007

Continued from page 4

baugh when I was a kid so I felt a connection with him and his story. He built his first telescope when he was 20 and sent drawings of the planets to the Lowell Observatory. They were so impressed that they offered him

The Clark Telescope used by Percival Lowell to map the canals on Mars. Photo by David Brandt

a job. The job was probably a job that no one else wanted. He was to sit by the astrograph for the entire 1.5 hour exposure time and make corrections as needed. There are about 300 good observing nights in Arizona so he was busy most of the nights. Eventually they gave him the job of using the blink microscope. Clyde worked about a year before he found Pluto. The search was started because of unexplained motions in the orbits of the outer planets. It was later discovered the unexplained motions were caused by an error in the calculations and not by Pluto.

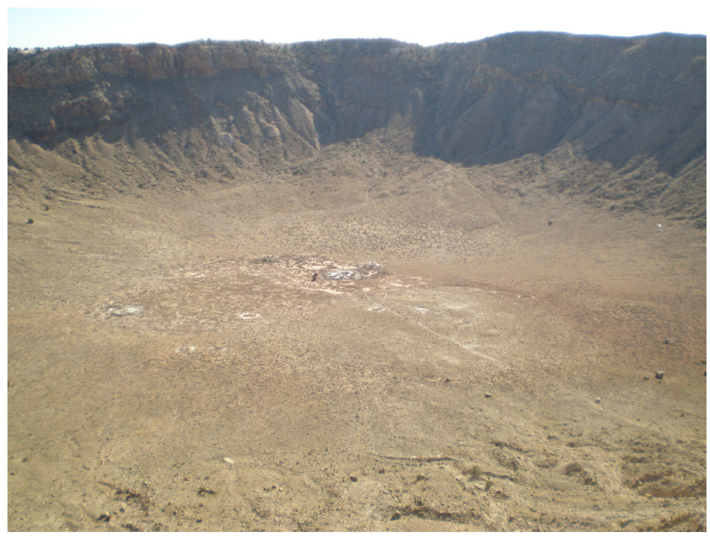
There was a contest to name the ninth planet and it was won by an eleven-year-old named Venetia Burney. The name Pluto was selected partly because the first two letters are Percival Lowell's initials.

After Clyde discovered Pluto, he was sent to college to become a professional astronomer.

As we were leaving the observatory I felt compelled to touch the astrograph. I explained to Drew that, "I just had to touch it." He didn't say anything.

Finally, we went down the path to the "Slipher Building." The front of the building had a dome roof. I thought it might be a planetarium, but it wasn't. It housed a small museum that, among many other artifacts, contained the blink microscope that Clyde used. There was also a visitor's log book with the signatures of Neil Armstrong and Frank Borman from their trip here to use the Clark telescope. After about 10 minutes we were told it was time to go. I could have spent a couple of hours there and I emailed them explaining that the time was to short. I didn't take a single picture there. I regret that. Next time...

It was about noon so there was still time to go to Meteor Crater!



Meteor Crater near Flagstaff. It is the most preserved evidence of an asteroid strike. Photo by David Brandt

All-Arizona Messier Marathon
April 5, 2008
Farnsworth Ranch
Details: http://saguaroastro.org/content/messier2008.htm

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Keep Looking Up!

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