March 2008

The Observer

East Valley Astronomy Club

Volume 22 Issue 3

Inside this Issue:

From the Desk of the President
by Claude Haynes

March Madness follows February Lunacy – thanks to all who came out to help with the Lunar Eclipse. It was unfortunate that the clouds didn't cooperate, but we had great publicity and certainly highlighted the observatory program. I had numerous positive comments from people about our volunteer's information, and I know that there will be lots of interest in returning to the observatory on a clear night.

By now I'm sure most members have visited the Starizona website and purchased digital photo equipment based solely upon Gary Jarrette's enthusiasm. He gave a great presentation at the February meeting, and highlighted an exciting new aspect of the hobby based upon improved (and getting less expensive) technology for digital imaging. That should make it a fun challenge for members to visit the website and work through some of the EVAC observing programs covered by Peter Argenziano. Send in your pictures. I always need new images as background for meeting slides.

March promises to be another great meeting, with Ted Dunham and Georgi Mandushev coming from Lowell Observatory to discuss exosolar planet discoveries. Now is an exciting age of astronomical discovery, and more importantly of rapid information access. We read of great discoveries by scientist of the past, but the common person of that time was viewing a lunar eclipse and banging pots to scare away the demons. I appreciate the knowledge shared at our monthly meetings, and often find it handy when attempting to answer questions from children at the observatory who are curious about the latest news items. Their questions are a hopeful sign for the future of our hobby.

The Backyard Astronomer
Stargazing at McDonald Observatory *by Bill Dellinges*

For our 25th wedding anniversary, we decided a return visit to McDonald Observatory might be fun (guess whose idea that was?). Lora and I were last there in 1979 on a driving tour of the southwest. It was the furthest east we got, as we hit observatories and parks along the way. After a one hour flight from Phoenix to El Paso and 200 mile rental drive to Fort Davis in western Texas, we arrived at what might be the most isolated major observatory in the U.S. This place is in the middle of nowhere – one reason for its legendary dark skies. McDonald Observatory was named after William McDonald, a Texas banker who bequeathed funds in 1926 for the establishment of a new large telescope. The site at Mount Locke (el. 6,792') was chosen in 1933 and in 1939 the Otto Struve 82", named after its first director, went into service. It was then the second largest telescope in the world (after the 100" Mount Wilson Hooker telescope).

We had booked time on the 36" telescope the night of Friday, February 8th. The fee was $40 per person for a three hour tour of the night sky. While there were 13 other people signed up (the limit is 15 people per night), we still were able to observe 14 objects. The three hours included a 30 minute coffee and cookie break and 15 minute laser tour of the constellations outside the dome. The line went so fast, sometimes I found myself rushing

Continued on page 2

Upcoming Events:

Local Star Party at Boyce Thompson – March 1

Deep Sky Star Party at Vekol Road – March 8

Edu-Prize Charter School Star Party – March 11

Chandler Hamilton Library Star Party – March 12

Public Star Party in Gilbert – March 14

General Meeting at Southeast Regional Library in Gilbert – March 21

Greenfield Elementary School Star Party – March 28

Local Star Party at Boyce Thompson – March 29

The Backyard Astronomer

Continued from page 1

back inside to be the last person to observe the latest object – the problem being I was so mesmerized by the dark skies, I mostly stayed outside to soak it up with eye and binoculars. In fact, I began to curse the winter Milky Way for causing a form of "light pollution"! Another source of brightness was the zodiacal light, a spear-like vertical shaft of light in the west, best seen in February/March evenings when the ecliptic is steep relative to the horizon. This is sunlight reflected off dust in the plane of the solar system. A dark sky is required for the zodiacal light to be conspicuous. I like to test a sky's darkness by what can be seen with the naked eye. I could spot the Andromeda Galaxy with direct vision. All stars in Ursa Minor could be seen. M46/47 in Puppis were naked eye. The Double Cluster in Perseus jumped out at me. M44, the Beehive Cluster in Cancer, was obvious. For the first time in my life I saw M67, also in Cancer, naked eye. Folks, this sky is dark. I equate it with the North Rim of the Grand Canyon and Chiricahua National Monument. Maybe better. There were three minor light domes to the southeast, east, and west from Marfa (the only "Marfa Lights" we saw!), Fort Stockton, and Van Horn/El Paso respectively.

The telescope we used is a 36", F14 Boller and Chivens cassegrain installed on the mountain in 1956. It is now used primarily for public viewing programs. The eyepiece was a Swan 40mm wide angle with an apparent field of 72º. Thus the scope's focal length of 12,481mm (long enough for you?) rendered a magnification of 312x and real field of 0.23º (13.8'), not as large as I'd like, but fortunately most objects we observed had small angular dimensions. They were:

Mars without a filter: large, sharp but no surface detail.

Almach or Gamma Andromedae: Nice blue and yellow double star. No sign of component B's magnitude 6.3 companion 0.3" away.

M37 (Auriga): Outstanding open cluster.

NGC 891 (Andromeda): This low surface edge-on galaxy was very bright with its prominent dark lane very evident. Best view of this object I've ever had.

M79 (Lepus): Normally disappointing in backyard telescopes, in the 36" it looked more like M13 as seen in amateur telescopes.

NGC 1535 (Eridanus): A new object to me and delightfully impressive. A planetary nebula with a conspicuous magnitude 12.2 central star. Stephen O'Meara in Hidden Treasures (p.126) says he's surprised this is not a more popular object.

NGC 2169 (Orion): The famous "37" star cluster near Orion's elbow.

R Leporis: Even the telescope operator was disappointed in this red carbon star – it must have been near minimum (varies ~7-10th mag.,max Aug. 3/08).

IC 418 (Lepus): Another new object for me, an impressive (at least in this telescope) planetary nebula with a central star.

M42 Orion: The 0.23º field was WAY too small for the Orion Nebula. But what gas could be seen sure was bright! The E and F components of the Trapezium were so bright they seemed natural companions making the four star Trapezium temporarily a six star group.

NGC 2261 (Monoceros): Hubble's Variable nebula. A huge comet-shaped fan of dust from a new forming star. Bigger and brighter than I've ever seen it before. But this 36" monster has ten times the light gathering power of my 11" (!).

NGC 2392 (Gemini): Any stargazer's old friend, the Eskimo Nebula. In the 36", I noticed a dark ring on the planetary nebula's surface between the central star and outer edge of the nebula confirmed by the telescope operator.

M46/NGC 2438 (Puppis): The field couldn't contain all the stars in this open cluster, nevertheless, the stars that did show knocked me over. The foreground planetary nebula (NGC 2438) was huge.

The following night we attended the observatory's star party given every Tuesday, Friday, and Saturday nights (fee $10). After a constellation familiarization session in the amphitheater, the crowd set upon two small domes housing 16" and 22" telescopes. Several staff members also manned four smaller instruments outside the domes. A few steps away is an impressive visitor's center containing a café, auditorium, astronomical exhibits and huge gift shop.

The venerable 82" Struve reflector (circa 1939), like the 36", is also available for viewing sessions ("8-10 objects") several nights a month for a fee of $75 including a dinner. Once a month during the night of the full moon the 107" is available for viewing ("1-2 objects") for $50 including dinner. To my knowledge, this is the largest telescope available for public viewing.

Sunday we took the 11:00 a.m. tour of the Hobby-Eberly 362" (circa 1997) and Harlan Smith 107" (circa 1968) telescopes. The Hobby telescope is a weird bird. It's strictly designed and used for spectroscopy. Though the primary mirror is 433" inches across composed of 91, 36" six-sided mirrors, its effective aperture is only 362" because that's all the movable secondary can take in at any given moment. The primary mirror is permanently tilted at 55 degrees and can rotate 360 degrees, but it's the secondary that scoops up objects by sweeping the primary's surface.

The concept for the 107" was originally planned as a 105". It was cast as a 108" and worked to a 107". In 1970 a deranged staff person shot the mirror seven times. While it did not shatter, the repaired bullet holes have reduced its effective aperture to 106".

We stayed at the Indian Lodge in Davis Mountains State Park 4 miles north of Fort Davis and 13 miles south of the observatory (the Park also has a campground). It is a charming pueblo-looking complex built in 1935 by the Civilian Conservation Corps (CCC). I recommend the lodge, which has a restaurant, as a place to stay while exploring the area. It is beautifully tucked away in the Fort Davis Mountains and conveniently placed between Fort Davis and the observatory. There are also two hotels and a motel in town for you city slickers.

We thoroughly enjoyed our visit to McDonald Observatory which offers more public programs than any other observatory I'm aware of; I was overwhelmed by their web site. See for yourself at www.mcdonaldobservatory.org

For a look at the Indian Lodge: www.tpwd.state.tx.us./park/indian

Don't forget your cowboy hat.

The Earth's Atmosphere, Ionosphere and Ozone Layer

by Henry DeJonge IV

Continued from last month's issue

Winds in the atmosphere can play a large role in ozone distribution by transporting it from one area to another over vast distances and are the principle reason for the seasonal, higher latitude, ozone variations. A stratospheric circulation pattern called the Brewer-Dobson circulation transports the ozone from the tropics to the poles and downward to the lower stratosphere of the high latitudes.

As we have seen, ozone distribution also varies somewhat in altitude within the stratosphere. It is higher in altitude in the tropics for example, (where it is originally formed) and lower in altitude as one goes to the Polar Regions. This vertical distribution is caused by a slow atmospheric circulation pattern. The ozone poor air of the troposphere is lifted into the tropic stratosphere where more ozone is produced, (by higher UV exposure). Circulation patterns push this rich ozone air, (in the tropic middle stratosphere) towards the mid and high latitudes, (in the lower stratosphere). This global circulation pattern moves very slowly. For example the time to lift and move air from the tropics at 16km to 20km is about 4-5 months, (30 feet per day). These slow global circulation movements can also cause the slow distribution and subsequent removal of human produced pollutants.

Scientists use a measurement called the number density to describe the vertical distribution of ozone. This is basically the number of molecules, (or mass) per cubic meter. If a total column of ozone has a DU value of 300 this corresponds to $8.07x10^{22}$ molecules per square meter or $6.42x10^{-3}$ kg/square meter. We can also express the density versus altitude in units of DU per km. Here we would have 10 DU/km = $2.69x10^{18}$ molecules per cubic meter, (or $2.14x10^{-7}$ kg/cubic meter) density, (number density). Number density is directly related to altitude and the higher the altitude the lower the number density.

The ozone concentration, (in a column) is also strongest between 15 and 30km above the surface of the earth. A peak number density of 5x10^12 molecules/cubic meter is around 22km above the earth. This is due to the high UV intensity and the relatively high supply of oxygen present. It is also clear that ozone created above in the stratosphere will lessen the rate of ozone created below in the troposphere, as the UV radiation is absorbed in the creative process.

Overall, the amount of ozone in any location over the earth is a complex function of three basic processes. These are the in place creation, in place destruction, and transportation in and out of the area. Some recent data suggests that ozone can vary by as much as 25% in a single day, but typically varies 5% or less per day. It is also known that ozone density varies directly with the 11-year solar cycle, which also causes both expansion and contraction of the atmosphere into space.

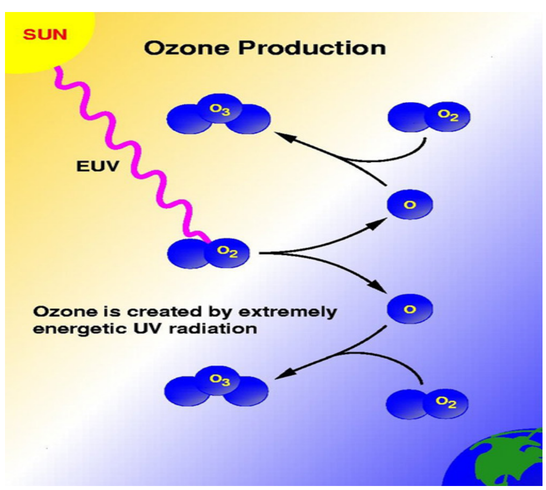

Figure 1: Showing ozone production

Due to its small concentration however, relatively small changes in the ozone levels may have dramatic effects. As we have seen ozone molecules absorb UV radiation from the sun. It is completely effective in screening the high energy UV-C radiation, partially effective in screening UV-B radiation, and not effective at all in screening UV-A radiation.

In 1986 scientists discovered an ozone hole over Antarctica. This hole is a region that has an unusually low concentration of ozone. The DU reading inside this ozone hole has been as low as 100 DU. Over time that hole has expanded year to year. TOMS satellite data has showed that the ozone present in Antarctica during the spring, (August- November) has steadily decreased since 1978. We know from other data that there was no ozone hole in the 1950's. This hole is a result of chemical reactions that occur on the surface of the polar stratospheric cloud particles, which causes the release of chlorine from usually inert forms, (as HCl and ClONO2) into a form that can very quickly destroy ozone.

Related holes, (although much smaller) have been observed in the stratosphere above other parts of the earth as well. Moderate ozone depletion in the mid-latitudes is also a growing concern as this is where much of the earth's population resides. It is thought that the release of CFC's otherwise known as Chlorofluorocarbons is the cause of this ozone depletion. CFC's are commonly used in refrigerators and air conditioning systems as a refrigerant and as a cleaning agent for some electronics. CFC's contain fluorine, carbon, and chlorine. It is now acknowledged that most of the chlorine in the stratosphere is man made.

CFC's, (aka Freon) were also used for decades as propellants in aerosol cans. At ground level it was quite inert, stable, non-water soluble, and harmless to life, thus it was widely used. As it rises intact into the stratosphere it can cause the end of an ozone molecules life. This occurs when a chlorine, nitrogen, bromine, or hydrogen atom takes the place of the catalyst atom mentioned above, in the ozone formation process. This is called a loss reaction. These loss reactions are also caused by natural gases that are released into the atmosphere, such as methane, nitrous oxide, methyl bromide, and methyl chloride.

Specifically, the ozone molecule is lost when these catalyst atoms form other compounds with the oxygen atom (like ClO-chlorine monoxide) that then react with another oxygen atom, to form molecular oxygen and the catalyst atom. This free catalyst atom, (like a Cl atom) then reacts with an ozone molecule, to reform molecular oxygen and a catalyst compound, (the ClO again) with a free atomic oxygen atom. The overall result is the formation of two oxygen molecules from an oxygen atom and an ozone molecule, while the catalyst compound, (like a ClO molecule) remains free to react all over again.

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The Earth's Atmosphere, Ionosphere and Ozone Layer

Continued from page 3 In the stratosphere this Cl-ClO catalytic reaction chain can destroy about 1,000 ozone molecules before the Cl or ClO compound is converted to a harmless compound such as HCl, (hydrochloric acid) or ClONO2, (chlorine nitrate). These harmless compounds typically last a few days before they are broken down by the UV radiation, which frees the Cl, (and other catalysts) to begin the ozone destroying process anew. Over time the catalyst atom is eventually carried out of the atmospheric region. During the active lifetime of such catalysts a single Cl atom can destroy up to 100,000 ozone molecules. Thus while harmless enough on the surface of the earth, the high energy UV radiation in the upper atmosphere can break the CFC molecular bonds.

Since CFC's are broken down by the higher atmospheric UV radiation, their concentrations decrease with altitude. It can take up to a year for the average CFC molecule to get to the upper stratosphere. Even longer, it takes a few decades or more to cycle all of the air in the troposphere through the upper stratosphere. This slow circulation pattern implies that it may take decades to cycle all the CFC's through the upper atmosphere while continuing to produce chlorine molecules and affecting the ozone layer.

Signs of ozone depletion were noticed in the 1970's when jetliners began to travel frequently in the stratosphere. The exhaust clouds formed from these jets, (named contrails) are largely condensed water vapor but also contained nitric acid, (NO) and other nitrogen oxides, which react strongly with ozone to produce other nitrogen compounds and molecular oxygen. These other nitrogen compounds, (like nitrogen dioxide) then continue reacting with atomic oxygen to create molecular oxygen and more nitric oxide, thus depleting the ozone. Later studies showed that subsonic planes flying near the troposphere create ozone like the pollution in autos and can replenish some of the depleted ozone above it by rising in the atmosphere. Since 1996 chlorine compounds that can destroy ozone have begun to decrease in both the lower atmosphere and in the stratosphere. It has been established that an increase in surface UV radiation is linked to this upper atmospheric ozone depletion.

Despite all of this, overall the average level of ozone in the stratosphere is expected to recover over the next century. This positive trend will continue to be investigated.

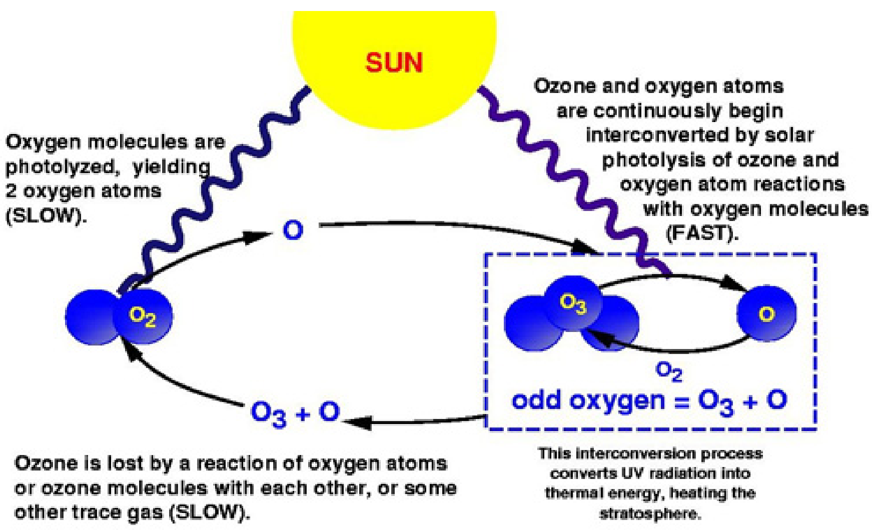


Figure 2: The production and loss of ozone.

UV Radiation and the Atmosphere

The screening of UV radiation in the atmosphere also depends upon other factors than the variable ozone distribution and absorption. The time of day, the season, the latitude, the altitude, the cloud cover, pollution, and haze, (aerosols), and ground, can all affect the amount of UV radiation reaching the surface of the earth and the amount we are exposed to.

The time of day, seasons, and latitude, are all-important because they determine the angle of the sun in the sky. This angle of the sun is called the "solar zenith angle", (SZA) and is the angular difference, in degrees, between directly overhead, (the zenith) and the suns actual position. Thus when the sun is directly overhead the SZA is zero, (occurring only at latitudes between 23.5 degrees south and 23.5 degrees north).

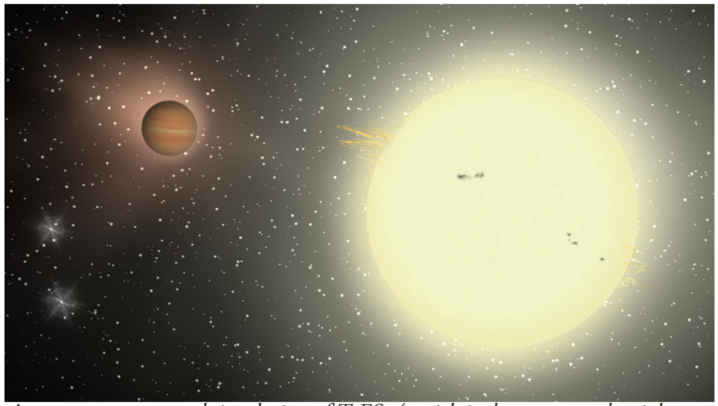
This angle determines how much of the atmosphere the suns rays must pass through. When the sun is directly overhead, (local noon) the UV radiation comes straight down and passes through a minimum of absorbing ozone and atmosphere. When the sun is near the horizon, (high SZA) the UV radiation must pass through more of the atmosphere due to the lower angle of the sun. This allows more of the ozone and atmosphere to absorb UV radiation and will lessen the amount of UV radiation that reaches the earth's surface. Tropical regions that have low ozone above and the sun high overhead will have more intense UV exposure, while higher latitude regions with higher ozone above will experience lower exposure.

The worldly distribution of overall solar radiation, (not necessarily UV radiation) on a global scale which is used for solar power calculations, is roughly divided into 4 broad belts around the surface of the earth. The belt with the greatest amount of solar radiation is roughly between 15 degrees N & S of the equator and 35 degrees N & S. More than 90% of the solar radiation in this belt comes as direct radiation from the sun and is moderated little because of the limited cloud cover and rainfall, (<250mm year). On the average there are over 3000 hours of sunshine in this belt per year. The belt between the equator and 15 degrees N & S, (the Tropics) is the next most intense region. Due to the high humidity and frequent cloud cover this region has a relatively high portion of scattered sunlight with a total of about 2,500 hours of sunlight a year. The solar irradiance here is mostly uniform throughout the year though due to the minimal seasonal changes. The belts between 35 degrees and 45 degrees (N & S) are marked the most by seasonal variations in both intensity and daylight hours. The belts above 45 degrees, (N & S) have about 50% of their total solar irradiance in diffuse, (scattered) radiation due to the high proportion of cloud cover, especially in winter. Thus the overall solar irradiance does not always correspond with the total UV irradiance on the surface of the earth due to the *Continued on page 13*

March Guest Speakers: Ted Dunham and Georgi Mandushev

"TrES-4 is the largest known exoplanet," said Georgi Mandushev, Lowell Observatory astronomer and the lead author of the paper announcing the discovery. "It is about 70% bigger than Jupiter, the Solar System's largest planet, but less massive, making it a planet of extremely low density. Its mean density is only about 0.2 grams per cubic centimeter, or about the density of balsa wood!

The new planet TrES-4 was first noticed by Lowell Observatory's Planet Search Survey Telescope (PSST), set up and operated by Edward Dunham and Georgi Mandushev. TrES-4 is about 1400 light years away and orbits its host star in three and a half days. Being only about 4.5 million miles from its home star, the planet is also very hot, about 1,600 Kelvin or 2,300 degrees Fahrenheit.



A computer-generated simulation of TrES-4, with its host star on the right. The planet's home star is bigger and hotter than the Sun, and is about ten times larger than the planet. Astronomers speculate that the large size and low density of TrES-4 may cause a small fraction of its outer atmosphere to escape from the planet's gravitational pull and form an envelope, or a comet-like tail around the planet. Credit: Jeffrey Hall, Lowell Observatory.

Georgi and Ted are part of an international collaboration, the Transatlantic Exoplanet Survey, dedicated to the discovery of planets orbiting other stars. They use the transit technique, employing high precision photometry to detect planets as they cross the disk of their parent stars along our line of sight, causing a small and temporary dip in the star's brightness. Using a network of small telescopes around the globe, including a fully automated facility at Lowell Observatory, Georgi and Ted have co-discovered several new planets in the class of so-called "hot Jupiters. Make plans to attend this meeting to hear Georgi Mandushev and Ted Dunham discuss their exciting research.

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.

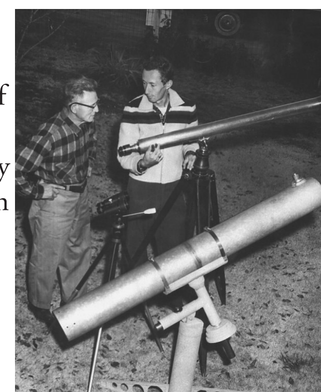
Robert Burnham compiled his three volume Celestial Handbook while working at Lowell Observatory as part of the Stellar Proper Motion Survey. This grassroots effort began on a Cloudy Nights discussion forum, and with the guidance of Burnham's sister, Viola Courtney, and her daughter Donna Cox, has grown 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.



Robert Burnham Sr and Robert Burnham Jr at the telescope

New Moon on March 7 at 10:14

First Quarter Moon on March 14 at 03:45

Full Moon on March 21 at 11:40

Last Quarter Moon on March 29 at 14:47

Classified Ads

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.

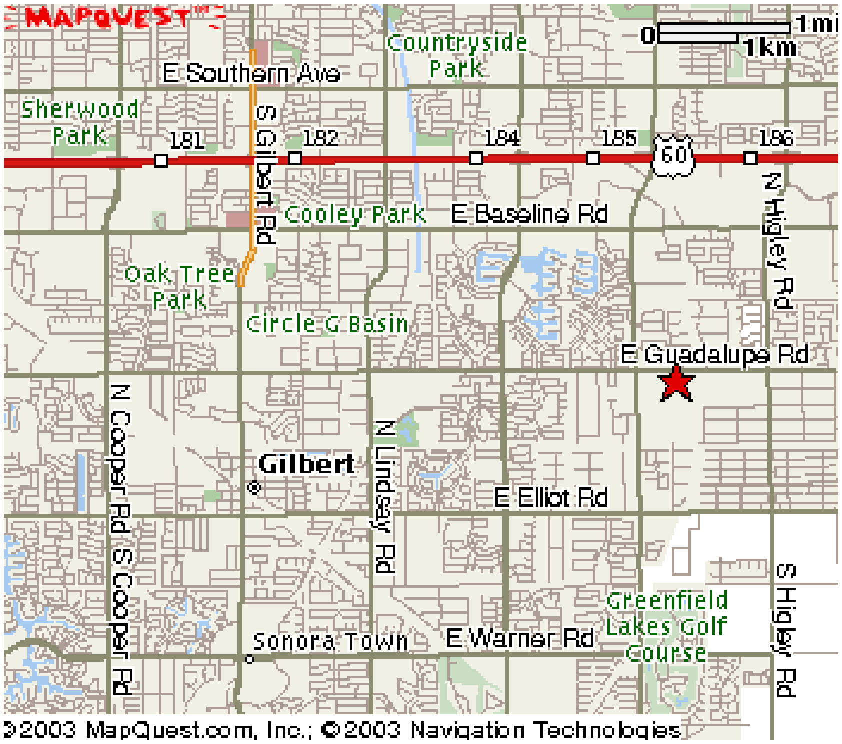
If you ordered this telescope today, equipped with all the options and accessories included here, it would cost over $17,000 plus crating and shipping. I may also consider selling my custom 5' x 8' TNT trailer (new cost was $3,175). I would be willing to sell the telescope for only $9,000 or the whole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

SUP-PORT YOUR LOCAL TELE-

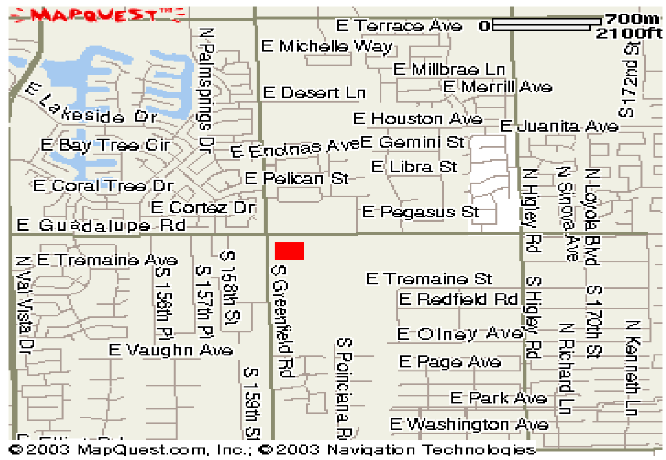


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

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!



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.

2008 Meeting Dates

March 21

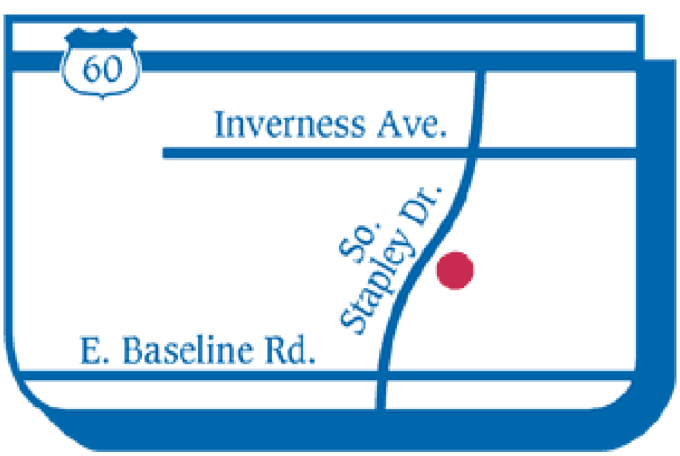
April 18

May 16

June 20

July 18

August 15



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

March 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**
30	31					

March 1 - Local Star Party at Boyce Thompson

March 8 - Deep Sky Star Party at Vekol Road

March 11 - Edu-Prize Charter School Star Party

March 12 - Chandler Library, Hamilton Branch Star Party

March 13 - Editor reaches half-century mark

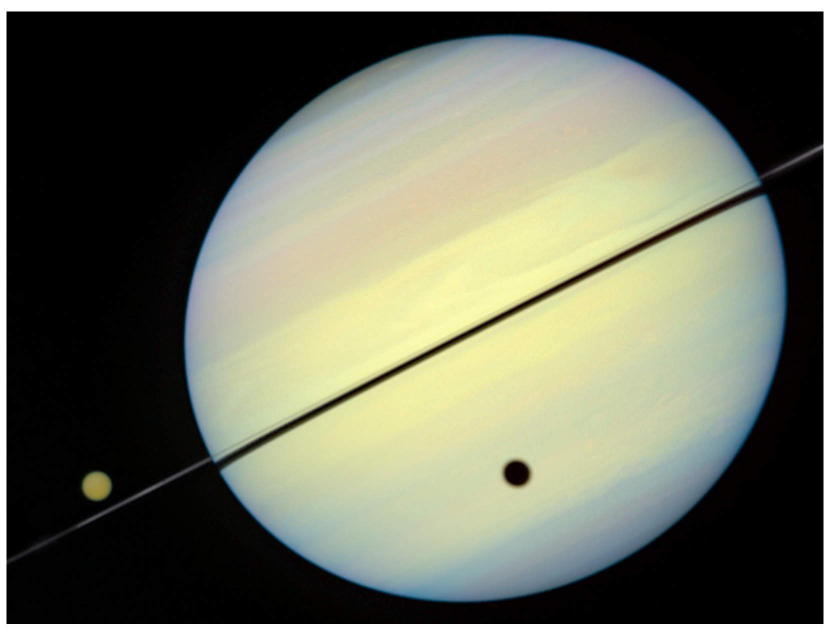
March 14 - Public Star Party at Riparian Preserve in Gilbert

March 21 - General Meeting at Southeast Regional Library in Gilbert

March 28 - Greenfield Elementary School Star Party

March 29 - Local Star Party at Boyce Thompson

On March 25, 1655 Christiaan Huygens discovered Saturn's satellite Titan and was also the first to clearly see its rings and to explain their appearance over time.



Hubble catches Titan chasing its shadow.
Photo credit: NASA, ESA, and E. Karkoschka (University of Arizona)

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

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$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.

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NASA's Space Place

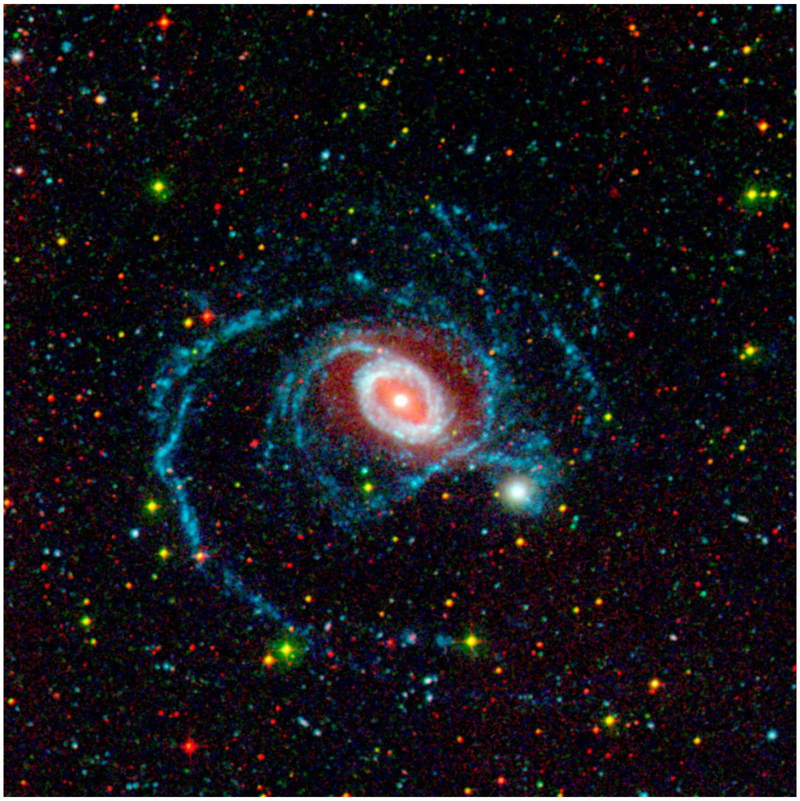
Invisible Spiral Arms

by Patrick Barry

At one time or another, we've all stared at beautiful images of spiral galaxies, daydreaming about the billions of stars and countless worlds they contain. What mysteries—and even life forms—must lurk within those vast disks?

Now consider this: many of the galaxies you've seen are actually much larger than they appear. NASA's Galaxy Evolution Explorer, a space telescope that "sees" invisible, ultraviolet light, has revealed that roughly 20 percent of nearby galaxies have spiral arms that extend far beyond the galaxies' apparent edges. Some of these galaxies are more than three times larger than they appear in images taken by ordinary visible-light telescopes.

"Astronomers have been observing some of these galaxies for many, many years, and all that time, there was a whole side to these galaxies that they simply couldn't see," says Patrick Morrissey, an astronomer at Caltech in Pasadena, California, who collaborates at JPL.



In this image of galaxy NGC 1512, red represents its visible light appearance, the glow coming from older stars, while the bluish-white ring and the long, blue spiral arms show the galaxy as the Galaxy Evolution Explorer sees it in ultraviolet, tracing primarily younger stars. (Credit: NASA/JPL-Caltech/DSS/GALEX).

The extended arms of these galaxies are too dim in visible light for most telescopes to detect, but they emit a greater amount of UV light. Also, the cosmic background is much darker at UV wavelengths than it is for visible light. "Because the sky is essentially black in the UV, far-UV enables you to see these very faint arms around the outsides of galaxies," Morrissey explains.

These "invisible arms" are made of mostly young stars shining brightly at UV wavelengths. Why UV? Because the stars are so hot. Young stars burn their nuclear fuel with impetuous speed, making them hotter and bluer than older, cooler stars such as the sun. (Think of a candle: blue flames are hotter than red ones.) Ultraviolet is a sort of "ultra-blue" that reveals the youngest, hottest stars of all.

"That's the basic idea behind the Galaxy Evolution Explorer in the first place. By observing the UV glow of young stars, we can see where star formation is active," Morrissey says.

The discovery of these extended arms provides fresh clues for scientists about how some galaxies form and evolve, a hot question right now in astronomy. For example, a burst of star formation so far from the galaxies' denser centers may have started because of the gravity of neighboring galaxies that passed too close. But in many cases, the neighboring galaxies have not themselves sprouted extended arms, an observation that remains to be explained. The Galaxy Evolution Explorer reveals one mystery after another!

"How much else is out there that we don't know about?" Morrissey asks. "It makes you wonder."

Spread the wonder by seeing for yourself some of these UV images at www.galex.caltech.edu. Also, Chris Martin, principle scientist for Galaxy Evolution Explorer —or rather his cartoon alter-ego—gives kids a great introduction to ultraviolet astronomy at spaceplace.nasa.gov/en/kids/live#martin.

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

If It's Clear…

by Fulton Wright, Jr.
Prescott Astronomy Club

March 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.

All March Venus and Mercury dance together just before sunrise. They are low and hard to observe at the beginning of the month and conditions get worse as the month progresses. They are joined by Neptune at the beginning of the month (impossible to see) and Uranus at the end of the month (really impossible to see). You might be able to catch the thin crescent moon in their midst on March 5

On Friday, March 7, it is new moon so you can hunt for faint fuzzies all night.

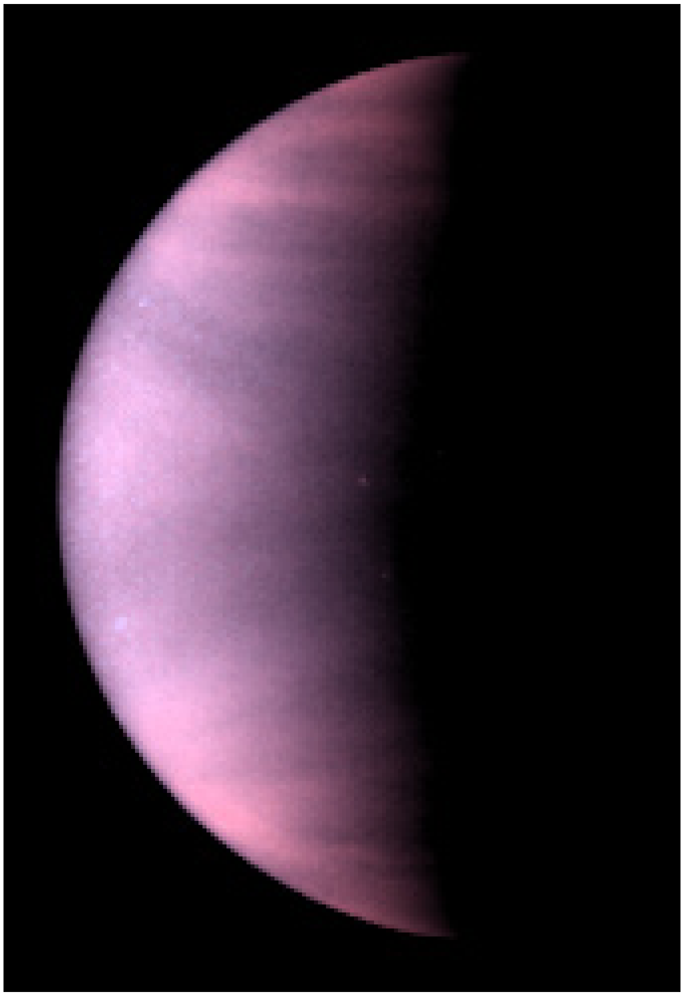
On Sunday, March 9, about 8:00 PM, Dione and Rhea form a close "double star" (4 arcseconds) on the east side of Saturn.

On Friday, March 14, about 9:00 PM you can see the first quarter moon about 1 degree from Mars.

On Tuesday, March 18, about 9:00 PM, you can see the Moon near Regulus and Saturn. As the evening progresses, the Moon passes less that 1 degree from Regulus.

On Friday, March 21, at 6:59 PM, the full Moon rises (16 minutes after sunset) spoiling any chance of seeing faint fuzzies.

On Sunday, March 30, about 9:00 PM, you can see Saturn's brightest moons nicely arrayed on the west side of the planet. With a medium (6 inch) telescope look 60 degrees above the southeast horizon for the mag 0.4 planet. Furthest west of the planet is the brightest satellite, Titan (mag 8.2). Halfway in toward the planet is Rhea (mag 9.6). Next comes Dione (mag 10.3) and Tethys (mag 10.1). You might also spot two satellites on the eastern side: Iapetus (mag 11.0) way off and Enceladus (mag 11.6) very close.



Venus cloud tops
Photo credit: L. Esposito (University of Colorado, Boulder), and NASA

Continued from page 4

myriad number of influences on UV radiation.

The latitude has a great effect on the SZA as we have seen which in turn will have a great effect on the UV dose at the earth's surface. For example at Las Cruces, NM which is 32.6 degrees N latitude, on June 21st, on a clear day, with an ozone level of 300DU overhead you would receive a UV-B dose 1.24 times that which you would receive in Seattle, WA at 47.7 degrees N latitude under the same conditions. The highest SZA's, (and therefore UV irradiance) are in the tropics, the summer, and local noon.

The altitude is also critical as there is less atmosphere for UV absorption and scattering. The Rocky Mountains and the Himalayas have high UV exposure due to the shorter column of atmosphere above. This causes an increase in UV irradiance. Studies show that UV irradiance increases by 6-8% per 1000 m in altitude.

Cloud cover, pollution, and haze, are also factors in the amount of UV radiation that can reach the surface of the earth. The clouds and aerosols generally scatter radiation while pollutants such as sulfur dioxide can both absorb and scatter UV radiation. Scattering is strongly dependent on wavelength and UV radiation is the most severely scattered wavelength in the atmosphere. The scattering effect of radiation in the UV can be roughly 10 times that of light in the red region of the spectrum, (why the sky looks blue). Thin or scattered clouds can actually scatter a large portion of the UV-B radiation towards the earth while thick clouds scatter most of the UV-B radiation back to space. There are times when the total UV irradiance under cloudy skies can be greater than when the sky is perfectly clear. Some measurements show that the UV-B exposure on the surface of the earth, is composed up of 50% direct and 50% diffuse reflected, (scattered) UV radiation. Here we see why sometimes one can get a high dose of UV-B exposure and possible sunburn, even on a cloudy day.

The dust, fog, and clouds in the lower atmosphere usually are composed up of particles with sizes more than 10 times the wavelength of visible light and scatter all wavelengths roughly equally, (which is why they usually appear white). Some of these lower atmospheric particles also absorb energy in discrete visible and UV bands.

The surface we are on also plays a role in the amount of UV radiation, (especially UV-B) we are exposed to. This reflectivity of the ground is called the "albedo". Pure, clean snow has an albedo of almost 100%, which is highly reflective. This is the cause of "snow blindness" and also how a skier can get sunburn during a clear winter day. The total levels of UV irradiance can become close to summer values! If the ground is also covered by ice the UV-B absorption is also low. Blacktop has an albedo near zero. Grass and soils reflect less than 10% of the incident UV radiation, while sand may reflect up to 25%. Water can also reflect about 10% of the incident UV radiation, the rest can penetrate clear ocean water up to 50% irradiance at 3 m. All of this extra UV reflection can easily hasten the tan or sunburn at the beach, even when in the water!

This balance of incoming energy from the sun and the energy released by the earth into space is called the "radiation budget".

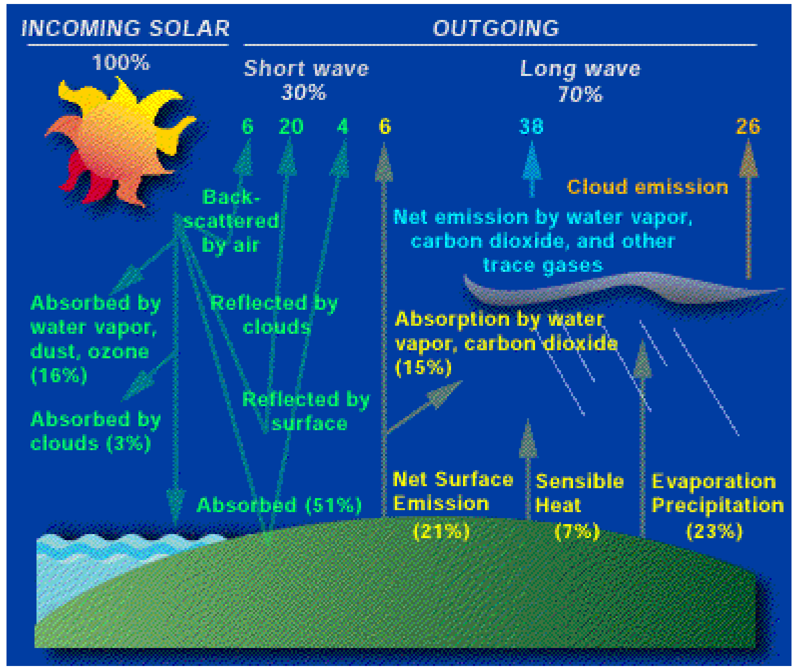


Figure 3: This shows the complex interaction of incoming and outgoing solar radiation, including UV radiation, through the atmosphere.

We can see in Figure 3, the complex nature of this entire radiation budget, and how the solar radiation is affected by these various parameters. The sum of all these components gives us the total amount of radiation we are exposed to.

Although UV radiation and exposure can be very damaging to life, it also played a part in our planet's primordial development and in our own evolution. The amount of UV radiation that reaches the earth's surface is also a highly variable parameter that has many complex influences. We see that almost all of UV-C is absorbed by the atmosphere, and most of the UV-B as well, so that the surface of the earth receives mainly UV-A with some UV-B radiation. Thus we see that the atmosphere is most important in screening out the lethal UV radiation from the sun.

Next time we will look at UV and biology, sun tanning and UV protection.

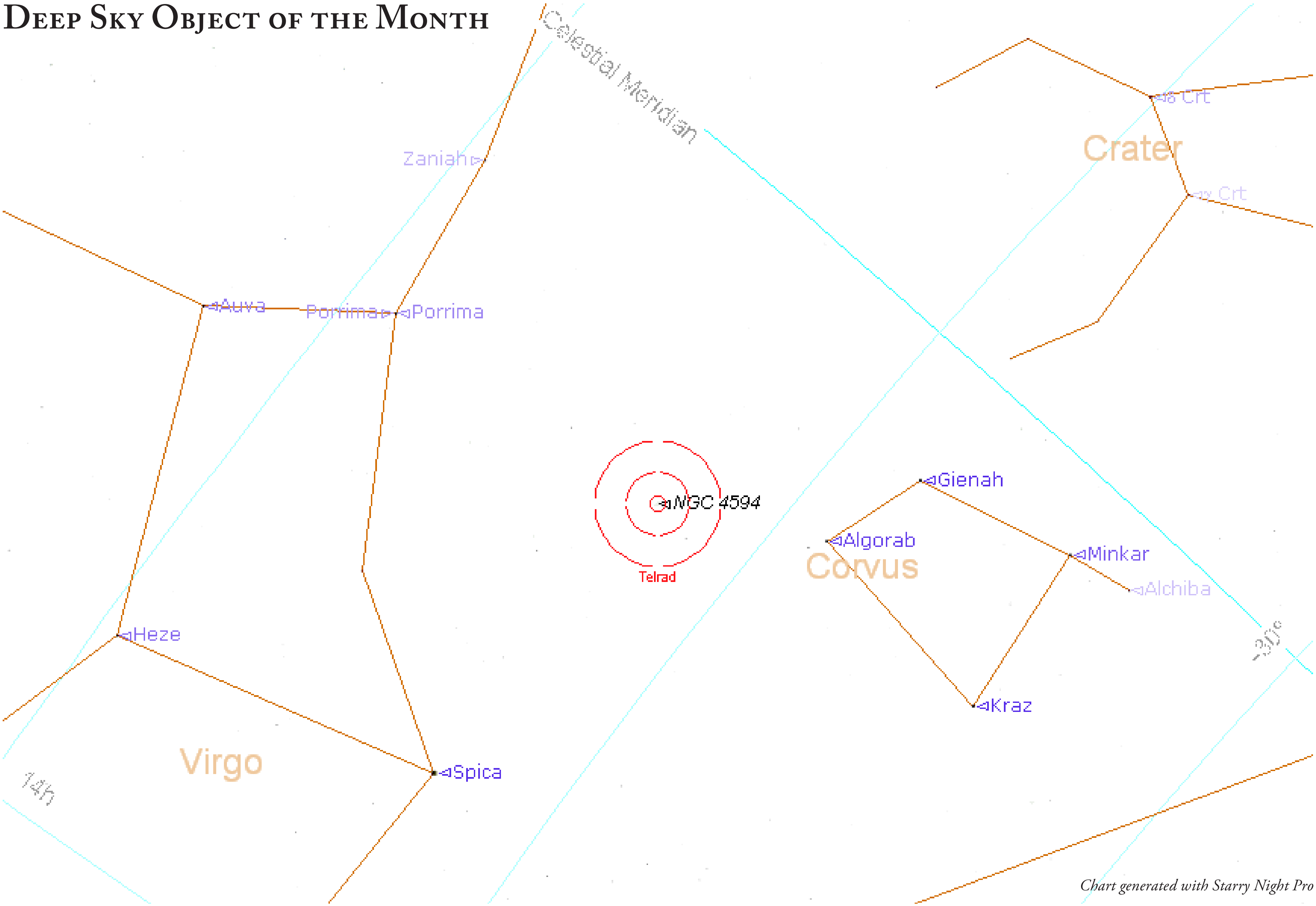
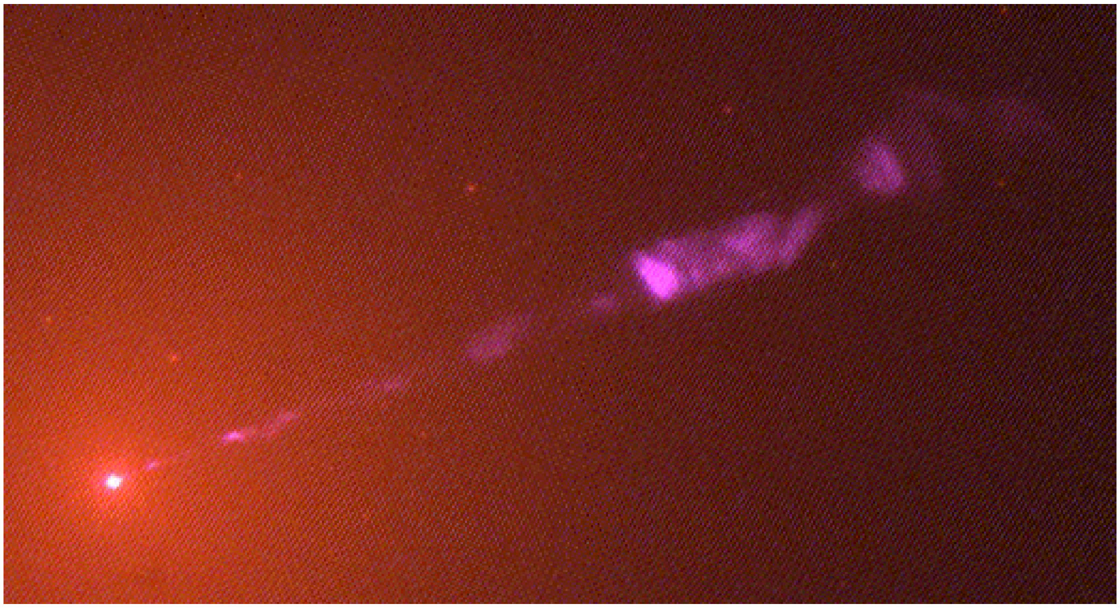


Chart generated with Starry Night Pro

NGC 4594 (M104, Sombrero Galaxy) Galaxy in Virgo

RA 12h 40m 00.1s DEC -11° 37' 34" Size: 8.8' x 3.5' Magnitude: 8.3



A visible light image of the giant elliptical galaxy M87, taken with NASA Hubble Space Telescope's Wide Field Planetary Camera 2 in February 1998, reveals a brilliant jet of high-speed electrons emitted from the nucleus (diagonal line across image). The jet is produced by a 3-billion-solar-mass black hole.
Photo credit: NASA and John Biretta (STScI/JHU)

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

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Keep Looking Up!

East Valley Astronomy Club
PO Box 2202
Mesa, Az. 85214-2202