April 2008

Volume 22 Issue 4

The Observer

East Valley Astronomy Club

Inside this Issue:

From the Desk of the President
by Claude Haynes

April – spring at last, and since the temperature has been rising, summer sooner than we want. I'm an early riser and enjoy Scorpio and Sagittarius before dawn, slowly pushing Orion off center stage. Their clusters and nebulae should be a great way to end a night's viewing at the Messier Marathon. Stop by for midnight snacks and a cup of coffee.

There are lots of activities in the coming month. Hopefully you can join us to celebrate Sidewalk Astronomy Night on the 12th, or help us pick up along our section of US 60 on the 19th. Be sure to check the calendar on the website for information. Your participation is always appreciated.

Last month's meeting had a great presentation on exoplanets by Georgi Mandushev, and April's speaker is Kevin Schindler from Lowell Observatory. It will be good to learn more about their various outreach programs and the Clark telescope.

Henry DeJonge is presenting the Skywatch lecture on Friday April 11. He has some slides from Zeiss Corp. on the Apollo lunar landings that should be a special treat.

Wishing you clear skies and pleasant evenings

Claude Haynes

The Backyard Astronomer
Selected Books for Exile *by Bill Dellinges*

Suppose you are being exiled to a desert island. You are allowed to bring a telescope but only six astronomy books. Which six would you choose? Since it's assumed you may never get off the island, choose carefully! I have chosen six from my collection of over 200 astronomy books. It kills me to have to leave behind many fine books that have given me much pleasure over the years but the point of this exercise is to find out which really are your favorites. But one must also consider whether they will be both practical and entertaining. With this in mind, here are my choices.

1) ***Burnham's Celestial Handbook***, 1978 (I count the three volumes as one book – hey, it's my game). How could this classic not be on the list? This set will provide a never-ending source of interesting astronomical reading. It's loaded with the astrophysics of deep sky objects, history, and mythology of all 88 constellations. You can open it to any page and start reading fascinating information and not lose a beat. Yes, a bit out of date but who cares? It's still a great tome.

2) ***Astronomy Today***, 2007, Chaisson/McMillan, Prentice Hall. You'll want one general astronomy college text on hand. My favorite used to be George Abell's Exploration of the Universe, but I believe the latest edition is 1995. Thus I go with the more recently published Astronomy Today which I find comprehensive yet digestible for the layperson.

3) ***Stars and Planets***, Ridpath/Tirion, 2007, Princeton University Press. Not to be confused with the other Stars and Planets by Pasachoff below, this is the latest edition of my old beat-up 1984 Universe Guide to Stars and Planets which served me well all

Continued on page 2

Upcoming Events:

Powell Jr. High Star Party – April 3

Butler School Star Party – April 4

All-Arizona Messier Marathon – April 5

Desert Shadows Middle School Science Fair – April 8

Public Star Party in Gilbert – April 11

Sidewalk Astronomy Night – April 12

Red Mountain High School Relay for Life – April 12

General Meeting at Southeast Regional Library in Gilbert – April 18

Local Star Party at Boyce Thompson – April 26

Scottsdale Stadium Starlight Sleepover – April 26

The Backyard Astronomer

Continued from page 1

these years. Its strong point is the middle third section showing each constellation on the right page, and its history and list of deep sky objects on the left page. A very handy quick reference for observing or night sky lectures. See my review of this book at www.eastvalleyastronomy.org.

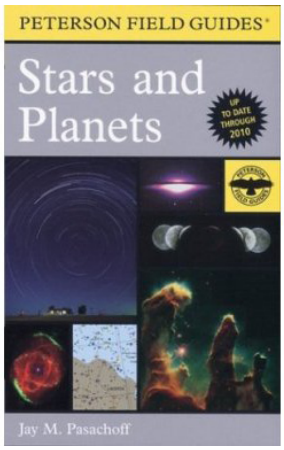
4) ***Stars and Planets***, Pasachoff, 2000, Peterson Field Guides, Houghton and Mifflin. Editions go back to at least 1986 when I took it along on a Halley's Comet tour to Australia, where it helped me find the southern hemisphere's constellations and their interesting deep sky objects. This book is quite different from the Ridpath book. It's like a little encyclopedia-ephemeris for astronomy, loaded with astro-information, yet not much bigger than the Ridpath book. The star maps are in sections of the sky, rather like a small version of Sky Atlas 2000, with stars to the 7th magnitude, one fainter than Ridpath's. It also has more elaborate text accompanying its moon maps which allows me to drop Charles Wood's The Modern Moon from this list to make room for another book!

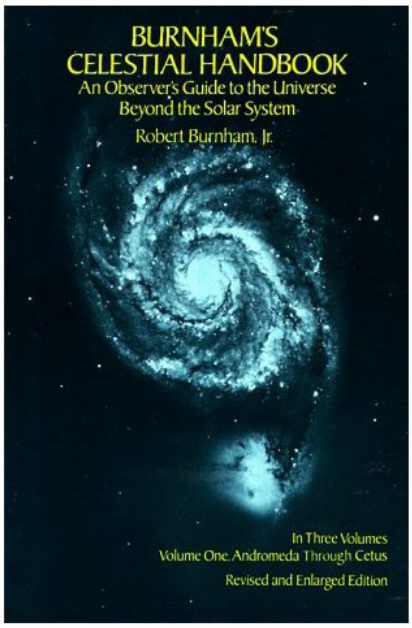
5) ***Star Lore***, William Olcott, 1911, reprinted by Dover Publications, 2004. I wanted at least one book on the history of the constellations and this was a tough call. Its competition was Staal's The New Patterns in the Sky, 1988. Both go into wonderful detail about the subject. But Olcott's turn of the century style of writing won me over. His writing just seems warmer and friendlier than Staal's. This would be a pleasant read on cloudy nights at Guantanamo Bay or St. Helena or where ever you're sending me.

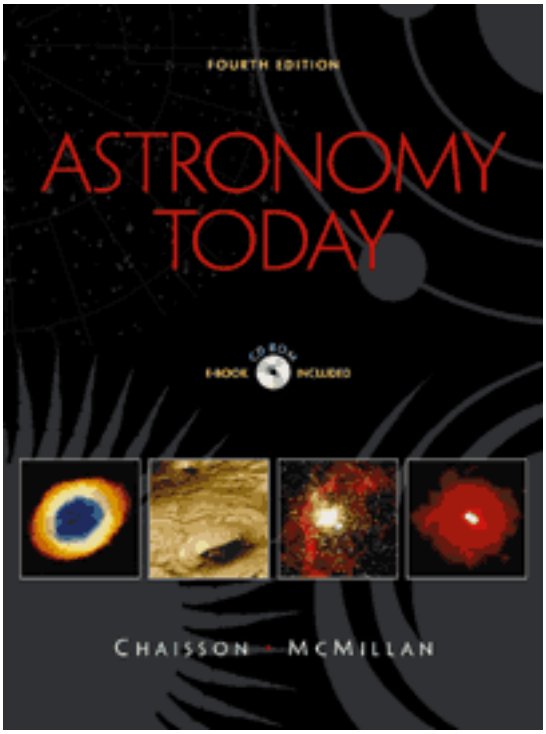
6) ***Double Stars for Small Telescopes***, Sissy Haas, 2006, Sky Publishing. I could have picked a nice sky atlas like Sky Atlas 2000 or S&T's Pocket Sky Atlas for my last pick but the two Stars and Planets books above have good enough charts (especially the Pasachoff one) so why waste a pick? Since I have become a fan of double star observing in recent years, I thought it best to include this book which I find myself referring to often. It has only seven pages of text on the subject at the beginning, but then 160 pages follow with listings of 2,100 double stars in both hemispheres. The constellations are in alphabetical order. The doubles are in order of right ascension. So it's very easy and fast to look up a double you're interested in.

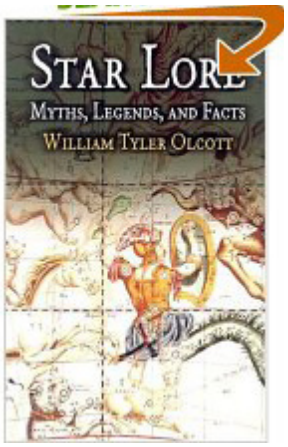
So there you have my six choices. Why not play this "game" and come up with your picks?

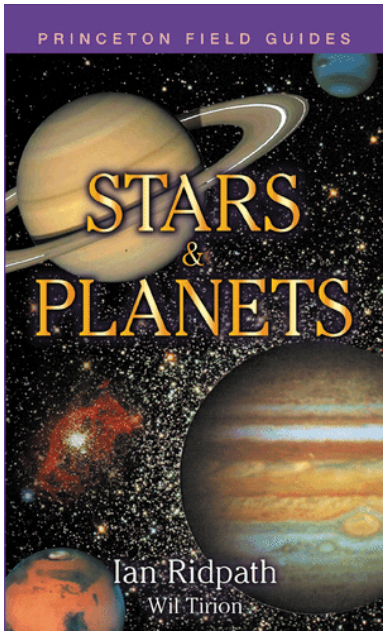
I hope the books will fit in the overhead bin. You did say you're flying me first class, didn't you? Hey, what's that parachute for?











Solar UV Biology, Sun Tanning and Protection

by Henry DeJonge IV

Continued from last month's issue

For this final installment we will discuss solar UV radiation in terms of interaction with biological organisms. It is the damage that UV light can cause by this absorption that we will discuss. All UV radiation is not harmful as UV radiation also enables the production of vitamin D in the human body. It is the breaking of the molecular bonds by UV radiation that causes damage to cellular structures. As we have seen the UV-B and the UV-A bands are the bands that can reach the earth's surface and can cause biological damage. The UV-C band, which is almost completely absorbed by ozone, is used to kill harmful biological organisms via germicidal lamps and new UV water purifiers. While the UV-B band is responsible for sunburn the UV-A band, although not very harmful, is a contributing cause of "age spots" or so called "liver spots" that appear on our skin. UV-A radiation has a noticeable effect on subcutaneous tissue of the skin and can alter the structure of collagen and elastin fibers.

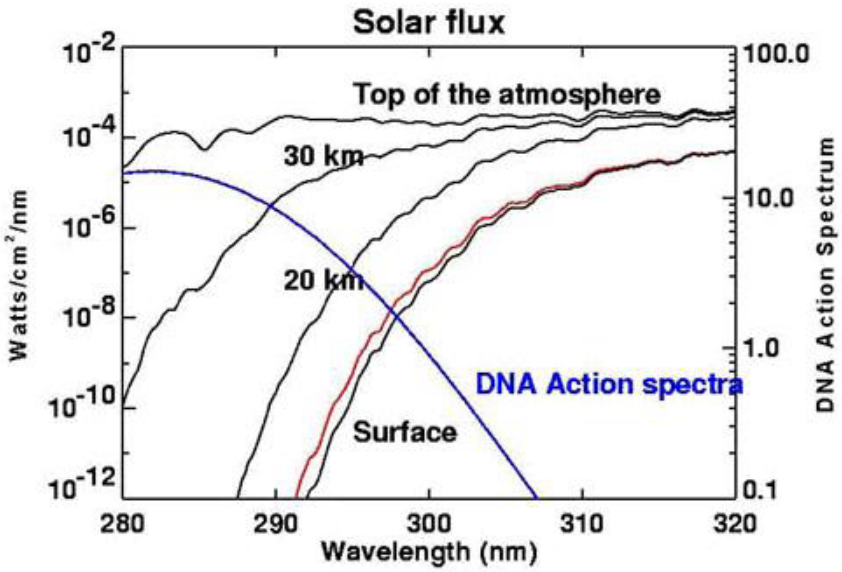


Figure 1: Showing the action spectrum for DNA in the blue line with the solar flux at different altitudes in the atmosphere. Note the decrease of UV intensity closer to the surface due to ozone absorption in the upper atmosphere. The red line shows the model predicted UV spectrum if there was a 10% reduction in stratospheric ozone, which would correspond to a 22% increase in UV DNA damage.

When discussing biological damage by radiation we must consider the wavelength, (or energy) of the radiation and the radiation flux or irradiance. The higher the energy of the photon, the more likely damage may occur and the more photons that interact , (irradiance) the greater the chance of damage as well. Photons at wavelengths of less than 320nm are very effective at breaking molecular bonds and usually the most destructive wavelengths are between 305nm and 310nm. This UV radiation is energetic enough to break the bonds of the DNA molecule and thus cause damage to cells. Most of the time plants and animals can repair or destroy the damaged cells but occasionally this damage is not repaired. This can cause damaged cells to replicate and lead to various forms of cancer. Skin cancer is a common result of this damage.

Since the DU is a measure of the column ozone it is also a measure of the UV reaching the surface of the earth. Clearly, all else constant, the lower the DU measurement the faster you will get sunburned! Scientists have also defined another parameter to measure the relationship between UV-B radiation and ozone called the "radiation amplification factor", (RAF). This is the percent change in UV-B intensity for a 1% change in the total column ozone. Typical RAF's are in the range of 1.1-1.3.

It is obvious that on a clear, sunny, day we can easily feel the energy from the sun and get tanned or burned. This can also happen on a cloudy day if enough UV radiation gets through the clouds and atmosphere to cause the same effects. In any case, the largest dose of UV radiation one can receive at any one location, is always when the sun is at its highest point above the horizon, (local noon).

How do measure the damage caused by UV radiation. An "action spectrum" is a characteristic of radiation damage. It gives us a measure of the relative effectiveness of radiation in generating a certain biological response over a range of wavelengths, (see figure 1). It is also sometimes called a "damage spectra". This action spectrum is organism specific. This biological response may be sunburn, (erythema), changes in plant growth, or changes in molecular DNA. It represents the probability of DNA damage by UV radiation at the various wavelengths. We see that where the action spectrum, (potential of UV caused DNA damage) is the highest, the UV absorption due to ozone is the strongest. Again we see the importance of ozone for our UV protection.

Since sunburn is a frequent outcome of too much UV exposure scientists have also defined the "minimal erythemal dose" or MED, to describe the erythemal, (or UV induced reddening) potential of UV radiation. One, (1) MED is defined as the effective UV dose that causes a perceptible reddening of previously unexposed human skin. Due to the differences in human skin responses 1 MED can vary in a range from roughly 200-joules/square meter to 500-joules/square meter.

The most damage to humans from UV radiation is usually seen in the eyes and on the skin. Hair and nails are also affected but are far less damaged. Other chronic effects of UV exposure include erythema, (sunburn) and photokeratitis, (snow blindness or welders flash) as well as skin cancer, premature aging of the skin, cataracts, and other eye problems. It is estimated that UV radiation causes about 20% of all cataracts and 90% of all skin cancer cases. Harmful effects of UV-B radiation on aquatic organisms such as phytoplankton in the Antarctic have also been demonstrated. These organisms are particularly important in the food chain and in the absorption of CO2.

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Solar UV Biology, Sun Tanning and Protection

Continued from page 3 How can we determine how much UV radiation we have been exposed to? How much is enough? To convey to the public a relatively useful measure of the amount of UV exposure scientists have developed the "UV index" parameter, (UVI). It is related to the well-known effects of UV radiation on human skin and has been internationally accepted and defined by many organizations, although different methods are used to predict the UVI. It is widely used in weather reports and forecasts. To see how the UV index can vary across the US at high noon in March, see figure 2 below.

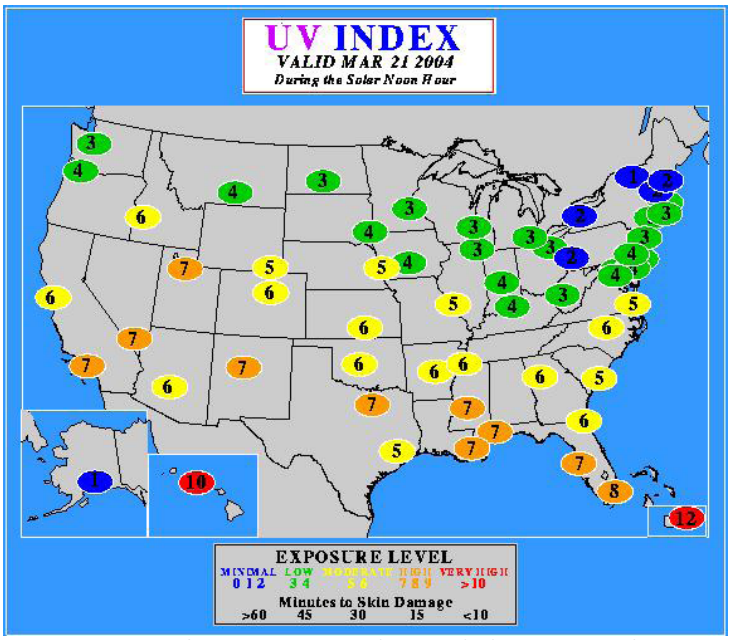


Figure 2: UV index variations across the US at high noon in March 2004.

It is defined formally as "the effective irradiance obtained by integrating the spectral irradiance weighted by the CIE, (1987) reference action spectrum up to and including 400nm, normalized to 1.0 at 297nm". This is basically the area under the curve, which represents the total energy in the UV band. It is defined numerically, as multiplying the time weighted average effective irradiance in W/square meter by 40. An effective irradiance of 0.2W/square meter would give a UVI of 8.0. In the newspapers when we see the maximum UVI for the day, this represents a 30 min time average value of the effective irradiance.

Some have concerns that since the UVI is defined as exposure to a horizontal surface it is not a true reflection of UV exposure since most people are at an incline when exposed to the sun.

What this means is that a UVI of 0-2 indicates very little danger from UV exposure, with about 1 hour of noontime sun required for sunburn. UVI of 3-4 indicates a low risk so that an average person would need about 30 minutes to 1 hour of noontime sun in order to burn. UVI from 5-6 indicates a moderate risk, which translates into 20-30 minutes of noon time exposure before a burn. UVI of 7-9 indicates a high risk of UV danger with a caution to stay out of the sun from 10am to 4pm. This UVI reading would require 13-20 minutes for sunburn at noon. A UVI reading of 10-15 indicates a very high risk of harm for unprotected skin and may cause a burn in less than 13 minutes under a noon sun.

As we have seen clouds, altitude, and aerosols can also affect the amount of UV radiation reaching the surface of the earth. If for a fixed altitude, we define UVI-0 as the UV index for a cloud free sky, the following equation may be used to find the UVI for a cloudy sky at another altitude. This is UVI = (UVI-0) x (CMF) x (1 + .08 x dH) where CMF is the cloud modification factor, (a number between 0 and 1, and dH is the difference in altitude, in km, from the reference altitude UV-0. For reference, a clear day with little or no clouds has a CMF of 1.0, a partly cloudy day has a CMF of about .8, a mostly cloudy day has a CMF of .5, and a very cloudy day has a CMF of .2.

From this equation we can see that if on a clear day in Phoenix, (elevation .06km) the UVI =8, then for a slightly cloudy day in Flagstaff, (elevation 1.6km higher) the UVI would be 7.21, but for an equally clear day in Flagstaff, the UVI would be an even higher 9.0 due to the higher altitude.

Since human skin types and sensitivities are so different we must also consider this when predicting risks from UV exposure. Human skin is classified into roughly 4 groups according to the ability to tan as seen in the table below, (figure 3). Here we also see the dose in MED that is required to redden the skin of the various types.

A suntan is merely the production of protective pigments in the skin caused by UV radiation. The top layer of skin called the epidermis produces melanin in response to UV radiation, which migrates to the lower layers of the skin and causes a tan which helps protect against further UV exposure. Sunburn is actual skin damage, (injury to the epidermis) and can be roughly calculated for each skin type from the UVI and MED values. In figure 4, we see the rough time required to sunburn for different UVI and MED values and skin types. Remember that the value of 1 MED is not precisely determined for each skin type or individual and can vary.

Skin type	Tan	Burn	Hair colour	Eye colour	1MED
I	never	always	red	blue	200 J/m²
II	sometimes	sometimes	blond	blue/green	250 J/m²
III	always	rarely	brown	gray/brown	350 J/m²
IV	always	never	black	brown	450 J/m²

Figure 3: Showing skin types and the MED required to redden. Definition of basic skin types for the European population.

Despite the protection of ozone, clouds, and atmospheric particles, some UV radiation makes it to the earth's surface. How can we further protect ourselves from its potentially damaging influence?

Clothes are the best protection. A shirt, (one can buy special UV protecting shirts and pants today), hat, and long pants offer the best protection. For the eyes UV-A and UV-B protecting sunglasses are recommended. For lateral exposure, (from reflections) a wrap around style is preferred. It is also known that children have a higher UV transmission through the eye and

Continued on page 13

April Guest Speaker: Kevin Schindler

Kevin Schindler has been at Lowell Observatory for 13 years, where he manages the education program. Prior to this, he worked at the Florida Museum of Natural History in Gainesville, Florida, studying invertebrate paleontology. Perhaps his destiny to work at Lowell Observatory was sealed when he was born on November 20th, 1964 - 75 years to the day after the great 20th century astronomer Edwin Hubble.

In his spare time, he is the "Sheriff" of Westerners, a group devoted to western American history; serves on several boards; writes history and astronomy columns for magazines and the local newspaper; and gives various presentations on topics ranging from baseball to Theodore Roosevelt (and, of course, astronomy).

Kevin standing next to the 6-inch telescope used by Andrew Douglass during the 1894 Lowell Expedition.

In 1894, Bostonian Percival Lowell established an observatory in Flagstaff to study Mars and other celestial bodies. Kevin's talk, entitled *The Lowell Observatory*, will take an anecdotal look at the history of Lowell's observatory. Vignettes include the expedition into rough and tumble Arizona Territory that led to the founding of the Observatory, the reasons for Percival Lowell's studies of Mars and belief of intelligent life on that planet, the exhaustive search that led to the discovery of Pluto, and more. He will also move forward to the present and into the future, highlighting current research and the status of the Discovery Channel Telescope, set for first light in 2010.

Robert Burnham Jr. Memorial Fund

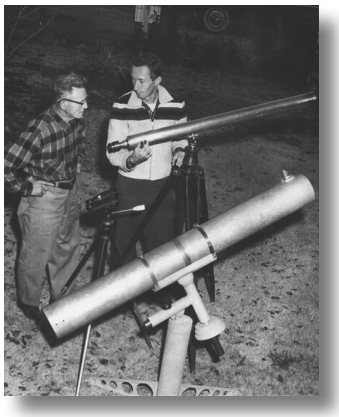
You can be a part of history as people from all walks of life coordinate their efforts to pay tribute to one of the most influential people in amateur astronomy. The East Valley Astronomy Club is proud to serve as fiduciary agent for a drive to place a permanent memorial to Robert Burnham Jr on the grounds 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

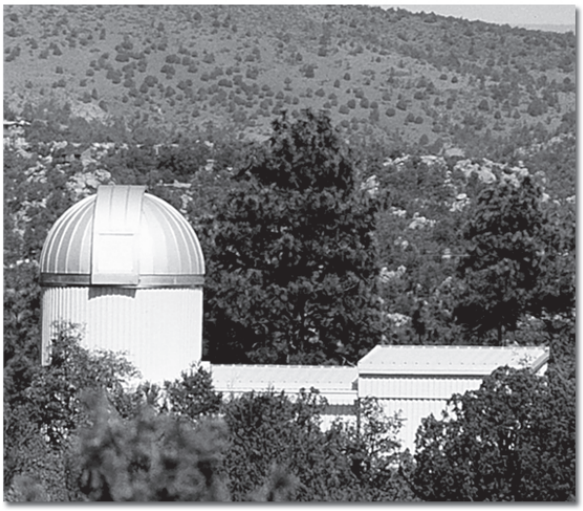
New Moon on April 5 at 20:56

First Quarter Moon on April 12 at 11:32

Full Moon on April 20 at 03:25

Last Quarter Moon on April 28 at 07:12

PRESCOTT OBSERVATORY FOR SALE



Beautiful adjoining home. Superb views, dark skies, privacy.

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The two-level home, approximately 3300 sq. ft., includes passenger elevator. Upper level features master suite/full bath, living/dining, kitchen, pantry, two study/offices, 3/4 bath, laundry, wood floors, 9 ft. ceilings, skylights, large deck. Lower level features two bedrooms, bath, two-car garage, workshop, storage, utility room, small deck, hot tub. Stucco exterior with block pillars. $675,000

For details contact Cheri Carey • West USA • 231 N. Marina St. • Prescott, AZ 86301
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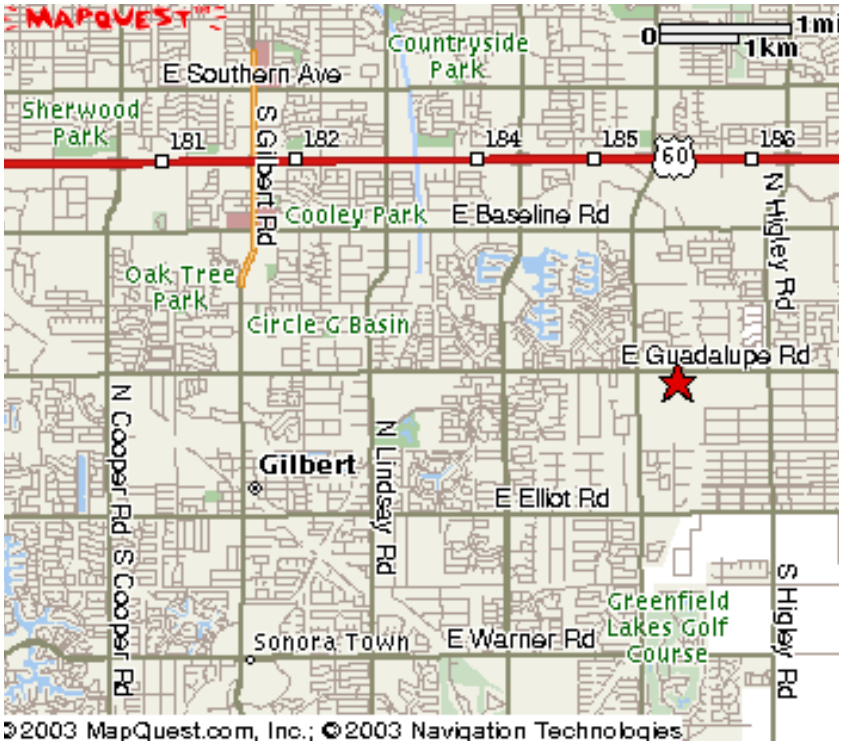


2008 Meeting Dates

April 18

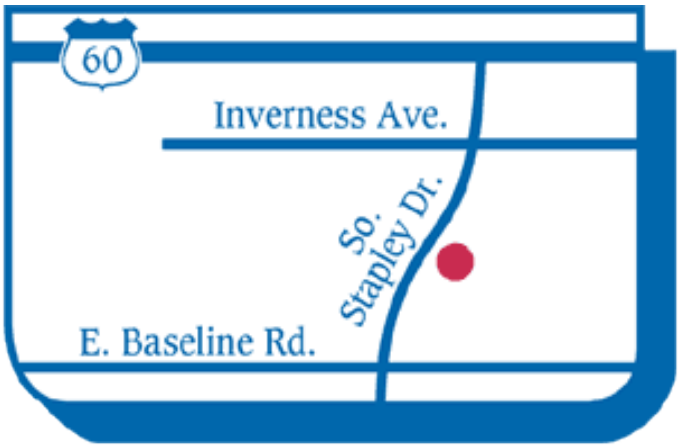
May 16

June 20

July 18

August 15

September 19

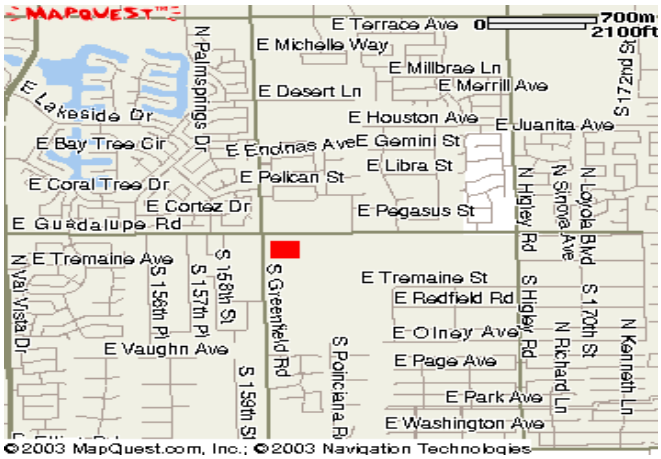


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

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.

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

April 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			

April 3 - Powell Junior High School Star Party

April 4 - Butler School Star Party

April 5 - All-Arizona Messier Marathon

April 8 - Desert Shadows Middle School Science Fain

April 11 - Public Star Party at Riparian Preserve in Gilbert

April 12 - Sidewalk Astronomy Night

April 12 - Red Mountain High School Relay for Life

April 18 - General Meeting at Southeast Regional Library in Gilbert

April 19 - Adopt-a-Highway on US60

April 26 - Local Star Party at Boyce Thompson Arboretum State Park

April 26 - Scottsdale Stadium Starlight Sleepover

Twice each year the club participates in the Adopt-a-Highway program. We pick up litter along both sides of our one mile of adopted highway near Florence Junction. The more participants, the faster we complete the task! Garbage bags and visibility vests are furnished. You will want to bring gloves, a hat and sunscreen. Plan to meet at the Village Inn Restaurant in Apache Junction on Old West Highway (Apache Trail), ½ mile east of Ironwood on the south side of the street, at 7:15 am. We will carpool from there, leaving around 7:30 am. Alternatively, you may meet us on highway 60 around mile 210.5 at 7:45 am. We will have a short meeting to review safety issues, and plan to start at 8:00 am. After completion, the club pays for brunch for the attendees at the Village Inn in Apache Junction. Please consider attending! RSVP to president@EastValleyAstronomy.org to confirm your attendance.

The Adopt a Highway Program offers several benefits to Arizona cities and communities. It provides a clean environment, gives civic pride to the community, serves as a reminder not to litter, and saves taxpayer's money.

Please join us on Saturday, April 19th

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

---

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***

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Tracking Wildlife from Space

by Patrick Barry

It's 10 o'clock, and do you know where your Oriental Honey Buzzard is?

Tracking the whereabouts of birds and other migrating wildlife across thousands of miles of land, air, and sea is no easy feat. Yet to protect the habitats of endangered species, scientists need to know where these roving animals go during their seasonal travels.

Rather than chasing these animals around the globe, a growing number of scientists are leveraging the bird's-eye view of orbiting satellites to easily monitor animals' movements anywhere in the world.

The system piggybacks on weather satellites called Polar Operational Environmental Satellites, which are operated by the National Oceanic and Atmospheric Administration (NOAA), as well as a European satellite called MetOp. Sensors aboard these satellites pick up signals beamed from portable transmitters on the Earth's surface, 850 kilometers below. NOAA began the project—called Argos—in cooperation with NASA and the French space agency (CNES) in 1974. At that time, scientists placed these transmitters primarily on buoys and balloons to study the oceans and atmosphere. As electronics shrank and new satellites' sensors became more sensitive, the transmitters became small and light enough by the 1990s that scientists could mount them safely on animals. Yes, even on birds like the Oriental Honey Buzzard.

"Scientists just never had the capability of doing this before," says Christopher O'Connors, Program Manager for Argos at NOAA. Today, transmitters weigh as little as 1/20th of a pound and require a fraction of a watt of power. The satellites can detect these feeble signals in part because the transmitters broadcast at frequencies between 401 and 403 MHz, a part of the spectrum reserved for environmental uses. That way there's very little interference from other sources of radio noise.

The ARGOS program tracks the whereabouts of endangered migrating animals via miniature transmitters on the animals and the POES satellites in orbit.

"Argos is being used more and more for animal tracking," O'Connors says. More than 17,000 transmitters are currently being tracked by Argos, and almost 4,000 of them are on wildlife. "The animal research has been the most interesting area in terms of innovative science."

For example, researchers in Japan used Argos to track endangered Grey-faced Buzzards and Oriental Honey Buzzards for thousands of kilometers along the birds' migrations through Japan and Southeast Asia. Scientists have also mapped the movements of loggerhead sea turtles off the west coast of Africa. Other studies have documented migrations of wood storks, Malaysian elephants, porcupine caribou, right whales, and walruses, to name a few.

Argos data is available online at www.argos-system.org, so every evening, scientists can check the whereabouts of all their herds, schools, and flocks. Kids can learn about some of these endangered species and play a memory game with them at spaceplace.nasa.gov/en/kids/poes_tracking.

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

April 2008

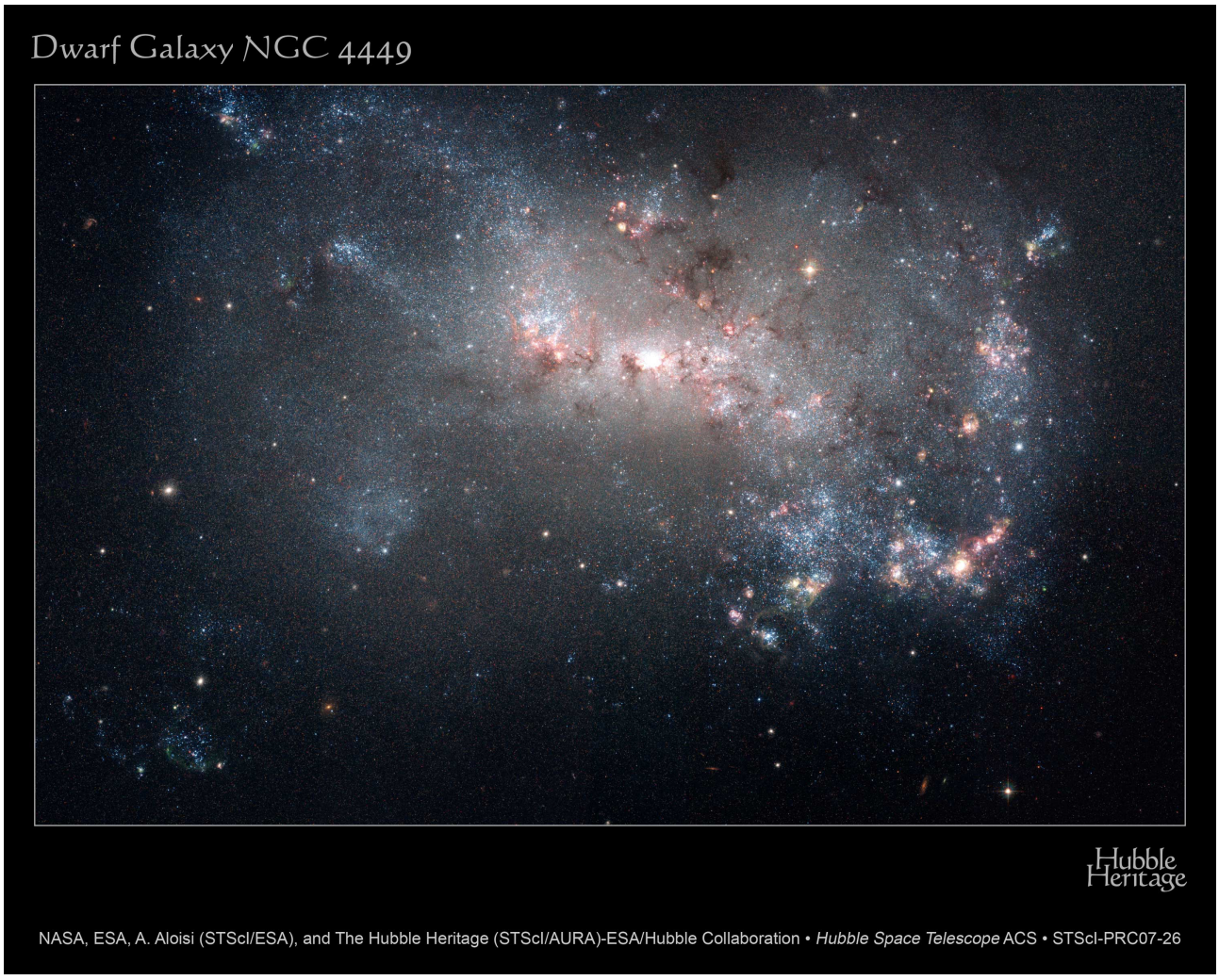
Shamelessly stolen information from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find info. When gauging distances, remember that the Moon is 1/2 a degree or 30 arc minutes in diameter. All times are Mountain Standard Time unless otherwise noted.

On Saturday, April 5, it is new moon so you can hunt for faint fuzzies all night.

On Tuesday, April 8, about 8:30 PM, you can see the Moon near the Pleiades. With binoculars look 20 degrees above the west horizon for the thin crescent moon. The star cluster should be just below it.

On Friday, April 11, after dark, the Moon approaches Mars, getting closest near midnight. Look in the west for the almost half moon.

On Saturday, April 19, at 6:48 PM, the full Moon rises (17 minutes before sunset) spoiling any chance of seeing faint fuzzies.



On July 4, fireworks blaze over the skies of American cities in the annual Independence Day celebrations. But nearly 12.5 million light-years away in the dwarf galaxy NGC 4449 stellar "fireworks" are going off all the time. Hot bluish-white clusters of massive stars are scattered throughout the galaxy, interspersed with numerous dustier, reddish regions of current star formation. Massive dark clouds of gas and dust are silhouetted against the starlight.

NGC 4449 has been forming stars for several billion years, but currently it is experiencing a star formation event at a much higher rate than in the past. This unusually explosive and intense star formation activity qualifies as a starburst. At the current rate, the gas supply that feeds the stellar production would only last for another billion years or so. Starbursts usually occur in the central regions of galaxies, but NGC 4449 has more widespread star formation activity, since the very youngest stars are observed both in the nucleus and in streams surrounding the galaxy.

A "global" starburst like NGC 4449 resembles primordial star forming galaxies, which grew by merging with and accreting smaller stellar systems. Since NGC 4449 is close enough to be observed in great detail, it is the ideal laboratory for the investigation of what may have occurred during galactic formation and evolution in the early universe.

This image was taken in November 2005 by an international science team led by Alessandra Aloisi of the Space Telescope Science Institute (STScI) in Baltimore and the European Space Agency (ESA). Other team members include Francesca Annibali (STScI), Claus Leitherer (STScI), Jennifer Mack (STScI), Marco Sirianni (STScI/ESA), Monica Tosi (INAF-OAB), and Roeland van der Marel (STScI).

Solar UV Biology, Sun Tanning and Protection

Continued from page 4

can suffer more damage than an adult under the same conditions.

Sunscreens have been developed to help protect our skin from UV radiation. The best sunscreens have both UV-A and UV-B protection, as we have seen that UV-C does not reach the surface of the earth.

The "sun protection factor" or SPF, advertised on sunscreens indicates how effective the product is. The higher the SPF the more protection. During first exposure to the sun a recommended SPF is 30. Note that the effectiveness of sunscreens depends both on their quality and how effectively they are applied to the skin, (frequently and thoroughly). For example a product with an SPF of 15 would need to be applied every 2 hours and more so after activities such as swimming.

Thus we see that the harmful effects of UV radiation exceeding safe limits can be severe, especially for human skin and eyes. It is only with proper protection and precautions, (timing of exposure, clothes, sunglasses, and SPF protective coatings) that we can continue to enjoy the sun and the great outdoors throughout our lives.

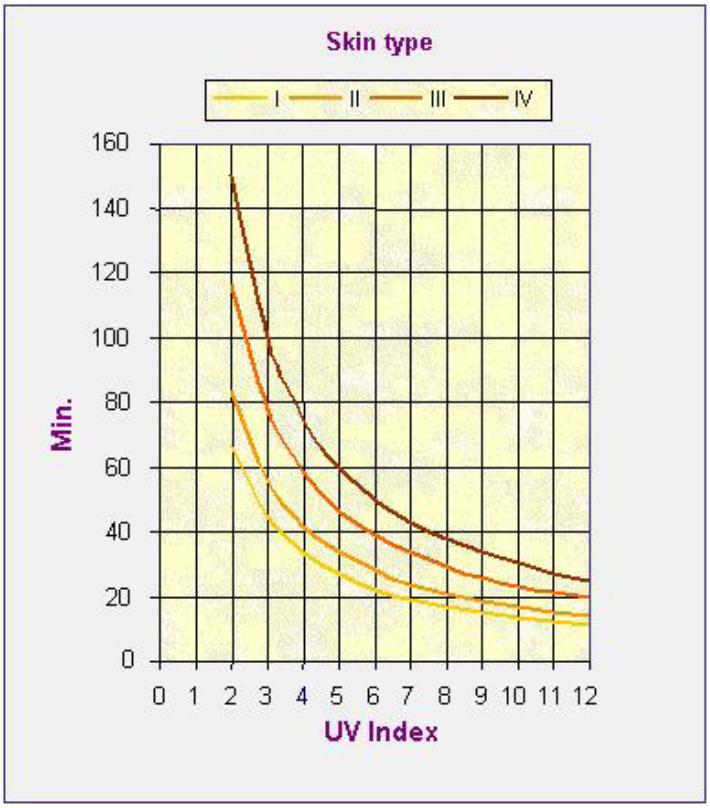


Figure 4: Sunburn times for skin types and I MED, calculated on a clear day.

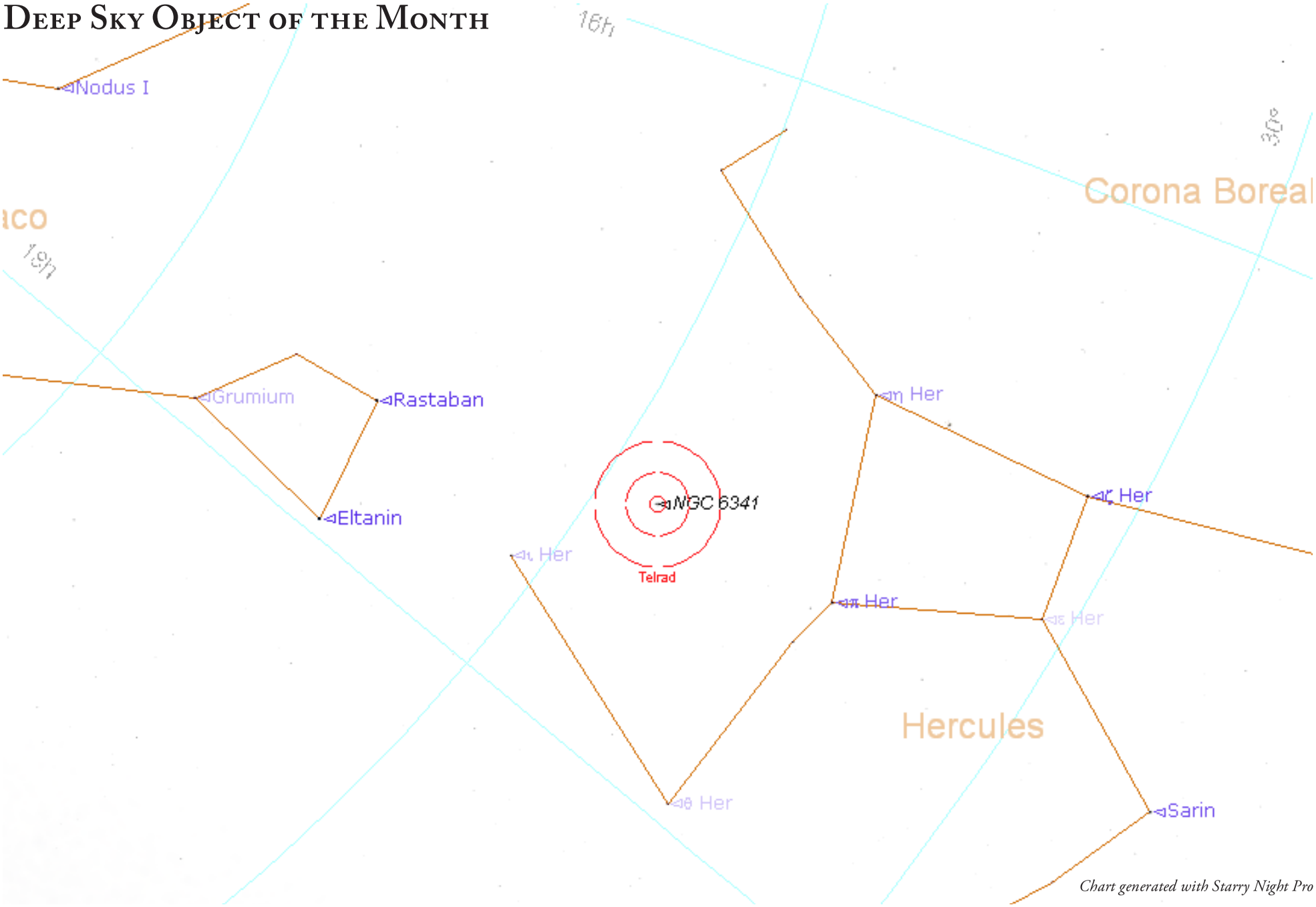
We have seen how one can get sunburn in the summer and also suffer UV damage in the winter and why the time of day plays such an important role in UV exposure. How the atmosphere controls the transmittance of UV radiation in a very complex, yet effective manner. How such a relatively rare yet critical ozone molecule is so important to protecting us from UV exposure, and is both created and destroyed by the same radiation. UV radiation is also seen to create the ionosphere, which we make use of everyday in our electronic lives. We have discussed the possible damage UV radiation can cause to us and described the best methods for UV protection. The time for a tan or sunburn can also be approximated according to our skin type, location, season, and local conditions.

The future of our protective ozone layer is still under question although currently presumed to be improving, and hopefully will continue to provide us with safety. More study needs to be done to better understand this current condition as well as to better predict future conditions. The nature of all this interaction is very complex and not fully understood despite our limited success with various models.

Perhaps we will have a bit less UV radiation to worry about in the future as some scientists think that the earth has been receiving less sunlight over the last few decades due to pollution, (scattering) and increased cloud cover, (reflection). This global dimming affects UV radiation as well and thus may lower our overall exposure. More research and study on this potential development needs to be done.

In the meantime I fully intend to continue enjoying the great outdoors but with a renewed sense of caution and with increased levels of solar UV protection overall.

Deep Sky Object of the Month



NGC 6341 (M92) Globular Cluster in Hercules

RA 17h 17m 7.0s DEC +43° 08' 12" Size: 14.0' Magnitude: 6.5

The Vanishing Rings of Saturn
by Dr. Tony Phillips

Saturn: jewel of the solar system, taker of breaths, ringed beauty. Even veteran astronomers can't help but gasp when they see her through a small telescope.

Red Alert: Saturn's rings are vanishing.

Around the world, amateur astronomers have noticed the change; Saturn's wide open rings are rapidly narrowing into a thin line. Efrain Morales Rivera sends these pictures taken through a backyard telescope in Aguadilla, Puerto Rico:

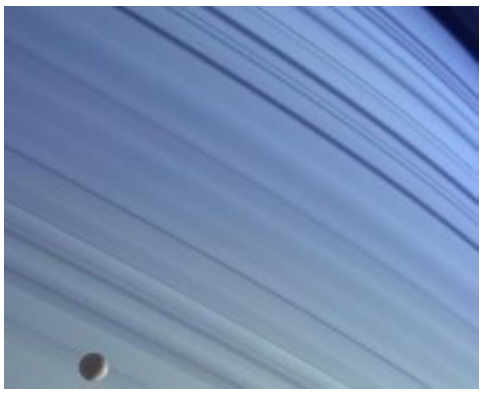
"The rings have narrowed considerably in the last year," he reports. "The Cassini division (a dark gap in the rings) is getting hard to see."

Four hundred years ago, the same phenomenon puzzled Galileo. Peering through a primitive spy glass, he discovered Saturn's rings in 1610 and immediately wrote to his Medici patrons: "I found another very strange wonder, which I should like to make known to their Highnesses…." He was dumbfounded, however, when the rings winked out little more than a year later.

Saturn's rings are wide but very thin. Astronomers using the Hubble Space Telescope captured this image of the rings edge-on in 1995. Star-like objects in the ring plane are icy satellites.

What happened?

The same thing that's happening now: we're experiencing a "ring plane crossing." As Saturn goes around the sun, it periodically turns its rings edge-on to Earth—once every 14-to-15 years. Because the rings are so thin, they can actually disappear when viewed through a small telescope.



Cassini's view of Saturn's blue north.

In the months ahead, Saturn's rings will become thinner and thinner until, on Sept. 4, 2009, they vanish. When this happened to Galileo in 1612, he briefly abandoned his study of the planet. Big mistake: ring plane crossings are good times to discover new Saturnian moons and faint outer rings.

It's also a good time to behold Saturn's curiously blue north pole. In 2005 the Cassini spacecraft flew over Saturn's northern hemisphere and found the skies there as azure as Earth itself. Saturn is a planet of golden clouds, but for some reason clouds at high northern latitudes have cleared, revealing a dome of surprising blue.

For years, only Cassini has enjoyed this view because from Earth, the blue top of Saturn was hidden behind the rings. No more: "Now that Saturn's rings are only open 8 degrees, we can finally view its northern hemisphere's beautiful teal blue colored belts and zones, which really did look blue through my 10-inch telescope," reports Dan Petersen of Racine, Wisconsin, who took this picture on Feb. 24, 2008.

Galileo never understood the true nature of Saturn's rings. He didn't know that they were a disk-shaped swarm of orbiting moonlets ranging in size from microscopic dust to tumbling houses. (Scientists still aren't sure, but they may be debris from a shattered moon.) He didn't even know the rings were rings. Through his 17th-century telescope, they looked more like ears or planetary lobes of some kind.

Yet, somehow, his intuition guided him to make a correct prediction: "they'll be back," or Italian words to that effect. And he was right. Saturn's rings opened up again and scientists resumed their study. In 1659, Christaan Huygens correctly explained the periodic disappearances as ring plane crossings. In 1660, Jean Chapelain argued that Saturn's rings were not solid, but made instead of many small particles independently orbiting Saturn. His correct suggestion was not widely accepted for nearly two hundred years.

Almost 27 ring plane crossings later, we still marvel at Saturn. Even with rings diminished, she is still a breathtaking sight through the meanest of telescopes. Indeed, this is a good week to look. On Tuesday, March 18th (sky map), and Wednesday, March 19th (sky map), the nearly-full Moon and Saturn will be lined up in the same part of the evening sky. That makes Saturn unusually easy to find: Go outside after sunset and look around for the Moon; Saturn is the bright golden "star" nearby.

Point your telescope and, well, just try not to gasp.

Article courtesy of Science@NASA

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Keep Looking Up!

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