August 2008

The Observer

East Valley Astronomy Club

Volume 22 Issue 8

From the Desk of the President
by Claude Haynes

I am vacationing and enjoying a beautiful pairing of the Moon and Jupiter in a clear Nevada sky. Unfortunately I am in downtown Las Vegas and they are the only things I can see. Even mighty Arcturus and Antares can't fight through the glare. The only "stars" I see are transiting in and out of McCarren Field. Hopefully Congress will realize that the heavens are a national treasure and protect the vistas at our national parks. It reminds me of a conversation with a friend who had returned from a tour of duty with the Peace Corp. One of the things she discovered was "electricity is a luxury". Having recently gone through a week with my place of work virtually closed because of an electrical problem, I have to conclude that we are not just "addicted to oil" – we are addicted to electricity.

Thanks to Tom Polakis for a great presentation on imaging. Beautiful shots, and locating the Apollo landing sites on the image of the Moon was a great reference. I am looking forward to the presentation by Fulvio Melia on Supermassive Black Holes at the August meeting. It was certainly great to have such a large meeting attendance in the middle of the summer vacation season.

Thanks again to Peter Argenziano, Marty Pieczonka and Martin Thompson for their work in moving the website to a new host. Check out the forums, and sign up for the email list. The email list does require a reply (not reply all) to set up your account, but it is a great way for members to communicate quickly to see if people are heading out to an observing site on a night with marginal seeing.

Keep looking up (it is less expensive that looking at slot machines)

Claude Haynes

Inside this Issue:

The Backyard Astronomer
Scorpion in the Sky *by Bill Dellinges*

We know summer has arrived in Phoenix when it feels like we're on a rotisserie or we see a scorpion scurry across our star chart. But the larger than life Scorpion above the southern horizon is always a welcome sight.

In one version of Greek mythology, the Scorpion was sent by Artemis, God of the Wild Animals, to kill Orion the Hunter after he boasted he was skilled enough to slay all the animals on Earth. No longer on friendly terms, they are placed in opposite parts of the sky – Scorpius in the summer sky, Orion in the winter sky. When one sets, the other rises.

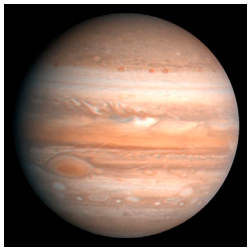
Scorpius is one of the few constellations to look like what it's supposed to be – more so, in my opinion, than any of the other 88 constellations.

There is no mistaking the long curving string of stars ending with a stinger. Until Roman times, its claws were the stars of what we now call Libra. Thus the arachnid now has somewhat truncated claws comprised of the stars Beta, Delta, and Pi Scorpii.

Beta Scorpii is an optical double (chance alignment, not a real binary) easily split in small telescopes. The AC stars are magnitude 2.6 and 4.9 with a separation of 13.6" (arc seconds).

Just below Beta is a cute naked eye pair of unrelated stars, Omega One and Two. For a real double star challenge, try Nu Scorpii just east of Beta. This is a quadruple star. The two pairs are sepa-

Continued on page 2



Upcoming Events:

Deep Sky Star Party - August 2
Public Star Party - August 8
General Meeting - August 15
Local Star Party - August 23
Deep Sky Star Party - August 30

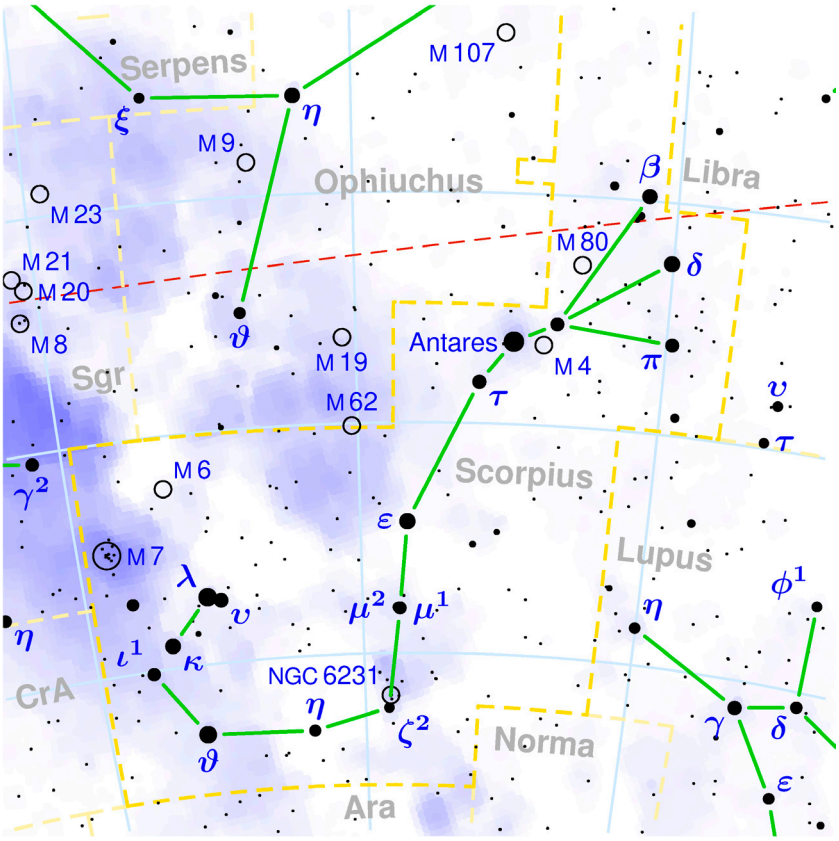
The Backyard Astronomer

Continued from page 1 rated by 41.5" – no problem there. The wider CD pair isn't too hard to split with a separation of 2.3". But the AB pair is only 1.3" apart and the best I've been able to get on these mag 4.1 and 5.2 stars from my Apache Junction location is elongation in my C-14 at 230x. However, my observing notes indicate I split this tough pair at the Grand Canyon with a C-8 at 290x.

Let's continue our exploration of the scorpion by crawling down its back (Yuck!). Moving southeast towards the creature's heart, Antares (appropriately reddish), a finder will sweep up M4, a magnificent globular cluster just west of Antares and considered to be the nearest globular cluster to us at a distance of 5600 light years.

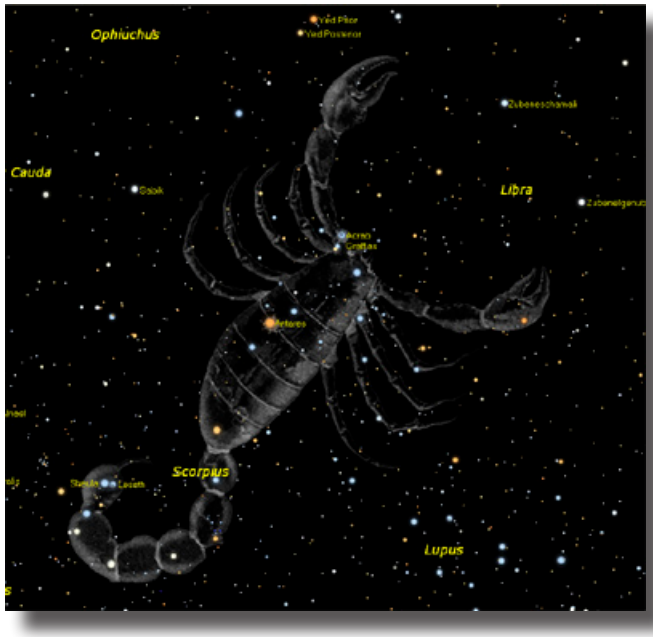
First magnitude Antares (Greek: "Rival of Mars" due to its ochre color) is a red supergiant star 600 light years away. Like Betelgeuse, another red supergiant, Antares is huge. Various books put its diameter anywhere from 400 to 700 times the size of the sun. Even the smaller figure puts its radius out beyond Mars' orbit if it replaced the Sun. Imagine looking up from Earth to see this monster filling your sky (before being vaporized)! A favorite challenge among gazers is trying to spot Antares' magnitude 5.6 green companion 2.65" away (and closing) at position angle 274º. I have split them on two occasions: once in 1996 with a C-14 at 122x and 2003 with a 5" refractor at 260x. It's said the key to success is exceptional seeing.

Following the curving string of stars south from Antares we pass the naked eye optical double Mu Scorpii (Mag. 3.2, 3.6., separation 5' 46"). These two unrelated stars are a good eye test. Can you split them? If not, you better get your eyes checked!



Copyright © 2003 Torsten Bronger.
The yellow dashed lines are constellation boundaries, the red dashed line is the ecliptic, and the shades of blue show Milky Way areas of different brightness. The map contains all Messier objects, except for colliding ones. The underlying database contains all stars brighter than 6.5. All coordinates refer to equinox 2000.0.
The map is calculated with the equidistant azimuthal projection (the zenith being in the center of the image). The north pole is to the top. The (horizontal) lines of equal declination are drawn for 0°, ±10°, ±20° etc. The lines of equal right ascension are drawn for all 24 hours. Towards the rim there is a very slight magnification (and distortion).

Next up –the False Comet. Three degrees south of Mu is a wonderful and often overlooked splendor, NGC 6231 and Trumpler 24. To the naked eye it looks like it might be a comet. Put a scope or binoculars on it and – wow! Anchored by Zeta 1&2 Scorpii, a large complex of stars and nebulae run north-northeast filling the 2.5º field of my 20x100 binoculars (which I think is the best way to observe this gorgeous region). No doubt due to its low altitude, the stars of NGC 6231 seem to sparkle and undulate fighting to pass through so much atmosphere – something we normally detest in stargazing, but in this case I make an exception and enjoy the view of these lovely glittering jewels.



Now the Scorpion's starry body loops around and up to end at its deadly stinger as represented by the stars Shaula and Lesath. I use these two stars as pointers eastward to M7, one of the sky's most spectacular open clusters. In a dark sky it can even be detected with the naked eye as what appears to be a piece of detached Milky Way. This star group contains about 80 stars 780 light years away. Its relative closeness and location in the Milky Way combine to yield an apparent diameter of 1.3 degrees. Since clusters look best framed with some space around them, M7 looks best in binoculars. This cluster is to die for as seen in my 20x100 binoculars' 2.5 degree field where the two eyed view renders a 3-D effect.

About 3 degrees northwest from M7 we find M6, another fine open cluster with the moniker "Butterfly Cluster", as some observers see its stars forming the shape of a butterfly. Being more distant than M7 (1600 light years) it's smaller and less impressive but I suspect it would get more respect if it weren't so close to mighty M7.

Now that we have hit a few of the scorpion's highlights, let's bug out and let him continue his crawl across the sky.

The Local Group, Galactic Evolution and High Velocity Clouds

by Henry De Jonge IV

This article is the second part on the subject by the author. The series will continue in subsequent issues of The Observer.

In this part we will look at our Local Group and HVC's and examine their role in galaxy interactions. Our Local group is a gravitationally bound collection, (which is in turn gravitationally bound to the Virgo super cluster), of about 40 nearby galaxies. It is believed to be representative of the Universe at large and thus the study of HVCs within it is considered to be fundamental in many respects. The largest and best-known members are our Milky Way, the Andromeda galaxy, (M31) and the Triangulum Nebula, (M33).

M31 and our galaxy contain about 98% of the total mass in the Local Group. The small irregular galaxies known as the LMC, (about 50 kpc away from the Milky Way) and the SMC are also members that are orbiting around the Milky Way much as M32 and NGC205 are two small irregular galaxies orbiting around M31. The LMC and the SMC are about 20 kpc apart in the sky, yet still well within each other's gravitational tidal boundary. The Local Group is a fairly typical group of galaxies with a distribution and volume that extends over 1Mpc in diameter. It contains 3 spiral galaxies each about 3-10 kpc in diameter, at least 4 irregular galaxies each about 3-10 kpc in diameter, 4 regular elliptical galaxies 2-5 kpc in diameter, and the remainder mostly dwarf elliptical galaxies, usually less than 2 kpc in diameter.

The dominant theory of how galaxies grow larger is by merging with other galaxies or cannibalizing smaller ones, via gravitational attraction. This is also known as the "hierarchical universe theory". We have evidence that our own galaxy is continuing to grow in this process and also have evidence for this process in other galaxies. One peculiar observation is that we have seen many smaller satellite galaxies orbiting around larger galaxies but this number is quite below what this standard model would predict. While we see 2 or three satellites around an average galaxy the model predicts 10 to 100 times more. This is known as the "missing satellite problem". This missing satellite problem is also seen in other galaxy groups and is not unique to the Local Group.

When galaxies interact and are absorbed, models predict that as these satellite galaxies are orbiting the larger galaxy and being swallowed up, their stars will be pulled off in two directions and form plumes or tails. For example the closer a small dwarf galaxy gets to the Milky Way the stronger the tidal forces, (proportional to mass/radius3) become and the more the galaxy is stretched. This is very similar to what we observe in the structure of the MS, (Magellanic Stream) and in other HVCs about the Milky Way. Eventually the dwarf is dissolved into tidal debris and completely absorbed. One question remaining is why we still we see no stars in these HVCs, (yet).

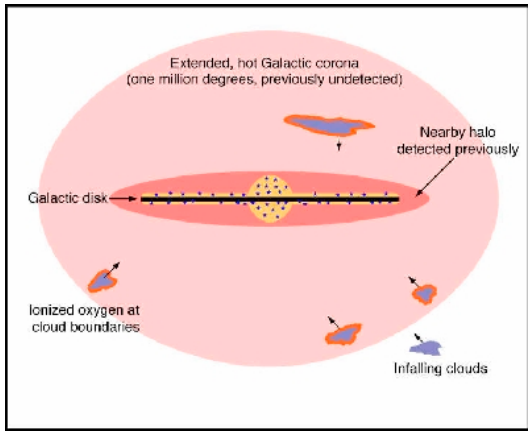
Gas, (as in HVCs) plays an important role in galactic interactions although its role is still not fully understood. Gas can be extremely distorted in morphology and can cause stellar formation as a result of such interactions. In contrast to gas, stars are actually the most likely parts of a galaxy to remain unscathed.

In 1993 it was discovered that our galaxy is absorbing the Sagittarius dwarf galaxy, which was hidden behind our bulge. It is located about 16 kpc from our galactic center. It is thought to be moving in a polar orbit with a period of 0.7-1.0 billion years and a mass of about 109 solar masses. It is expected to completely disrupt over the next few orbits and be absorbed into our galaxy. There are at least 11 ongoing disk mergers in the 4000 plus galaxies in the NGC and their median age is about 500 million years. Thus we see that galactic mergers and interactions are an ongoing process in and out of the Local group.

In terms of galactic structure our spiral galaxy is composed of a disk with a central bulge. Surrounding the entire galaxy is a nearby halo of hot gas, (associated with the disk of the galaxy) with an extended, hot, ionized, galactic corona. Any clouds of gas that would pass through this corona or halo will be heated as they interact with the matter therein, much as a meteor is heated as it passes through the earth's atmosphere. Interestingly, this corona was detected by using another method of determining where HVCs are located. Scientists used distant quasars as a background source and looked for absorption lines, (in oxygen for example) in their spectrum caused by the intervening gas, (via the FUSE satellite). It is suspected that the incoming surface layers of the infalling HI gas clouds are being heated by this interaction with our galaxy's extended halo and corona, thus causing the oxygen to ionize, (and its absorption to be detected) and inferring the presence of the extended corona. This method of determining where HVCs are located has shown them to be in over 50 different directions and widely distributed about our galaxy. One question is why we do not see very much neutral H in other orbiting globular clusters and small satellite galaxies in the galactic halo. Has it already been tidally disrupted or stripped by ram pressure or supernova?

This corona around our galaxy is hot but with a very low density, (much like the solar corona). It is estimated to be 1 million degrees C with a density of about 1 particle per 10,000 cc on average. This corona gradually extends to and over the Magellanic Clouds, over 150,000 ly away. It may extend out to about 100 kpc.

There is also escaping radiation from our galaxy that has the potential to ionize HVCs. This ionizing radiation may reach distances of 100 kpc and be detected by the H-alpha emission of the neutral H it encounters.



The image at left shows clearly the hot halo and the extended corona of rarefied hot gas that also surrounds the Milky Way with infalling HVCs.

The best-known and most observed

Continued on page 4

High Velocity Clouds

Continued from page 3 HVCs are located in our Local Group and particularly around the Milky Way. As we have mentioned a well-known example of an HVC in the Local Group is the Magellanic Stream, (MS). It was discovered in the 1970's. The MS is composed up of 6 elongated clouds or clumps which are named MSI to MSVI, that are associated with each other to form a path of H1, (defined by the 21cm emission) which stretches more than 100 degrees across the Southern sky. One end is tied to the diffuse H1 about the Magellanic Clouds, both LMC and SMC together. The MS is observed to be much larger than originally thought. There is also a "counter stream" on the other side of the clouds. These two parts represent a tidal tail and bridge gravitationally drawn, (according to the tidal model) from the gas of the Magellanic Clouds during a close encounter with the Milky Way about 1-1.5 billion years ago. The Magellanic Clouds are expected to fully merge with the Milky Way in about 7-8 billion years, while absorbing the MS as well.

In terms of physical properties, the mean column density of the MS decreases gradually as one goes further from the MC's from roughly 1020 atoms/cc to 1019 atoms/cc. The radial velocity also varies along its length from nearly 0 km/sec near the MCs to 200 km/sec at the tip. The metal content of the MCs is on the average a bit lower than the mean metal content of our galaxy.

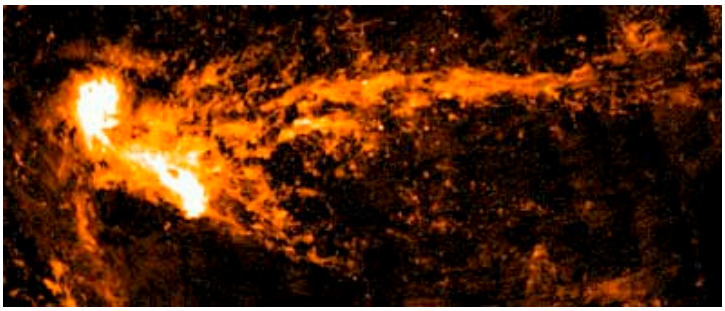
It has also been suggested that to better explain this debris trail, (the MS) another physical mechanism would have to have been required, such as "ram-pressure stripping". This occurs when the neutral gas is pushed out via the movement of the LMC and SMC, through the gaseous and ionized halo, (and extended corona) of our galaxy. This is thought to have occurred about 500 million years ago when the MCs were about 65 kpc from the Milky Way and "collided" with it, (interacting via the halo and corona). There are questions with this model such as the emission of low energy x-rays, which seems to be an order of magnitude lower than calculated. Nor does this model explain the clumpy nature of the MS as well as expected. It may well be that the MS is caused by both of these methods working together.

We still are not sure of the extent of the interaction of the MS and our galaxy's parts, (nor of the extent of our galaxy's corona for example). What would define the intersection of such events or physical states and what are the mechanisms and their order for such interactions?

One observation is that the leading edges of the clouds closest to the Milky Way show noticeable H-alpha emission, which may be due to the shocks generated by the MS as it moves through the low-density gas of the corona. This is also reinforced by the shape of the density gradients in some of these clouds in the stream, which resemble bow shocks. There is also some ionizing UV radiation escaping from our galaxy which is thought to be ionizing the HI gas in the MS as well. This would consist of reemitted energy in the Lyman series, (from the energy level 1 in hydrogen to the other energy levels accordingly).

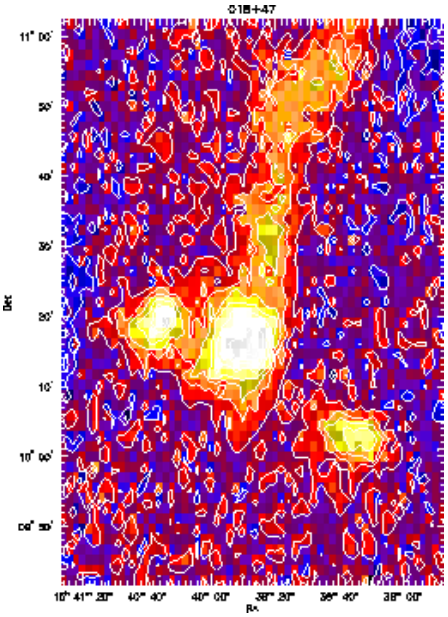
The MS has some other unusual properties and morphology. It contains some head–tail clouds that also have velocity and density gradients which appear to be interacting with the galactic halo where thinner material is stripped off and slowed down. These faint tails are often called velocity bridges, (VB). Thus we see that the MS has individual components that vary in motion, mass, and morphology. Not all of the clouds and features in the MS can be explained by one theory only.

Below we see another image of the LMC, (on the left) and SMC with the MS trailing behind them. This was made with the 64m CSIRO Parkes radio telescope.



The largest HVC in we know of currently is called Complex C. It covers over 1600 square degrees in two quadrants of the Milky Way. It also has a low metal content. As with most HVCs the total mass and distance also to this cloud are uncertain. Some estimates based upon Ca II absorbance, bracket the distance from 1.2 kpc to 6.1 kpc.

Below we see an image of an HVC called HVC 57, which shows the HI column density, (21 cm line). The giant radio telescope Arecibo clearly resolves the HVC and shows three clumps connected by weak bridges, (VB).



HVCs contain the primordial elements of our Universe and are much more abundant and varied than expected. Their role in galaxy interactions and formation is still not completely understood. They obviously at a minimum, contain much fuel for further stellar birth in galactic interactions. In the next installment we will examine their possible origins and more about their role in galactic evolution.

August Guest Speaker: Fulvio Melia

Fulvio Melia is an Italian-American physicist/astrophysicist and author. He is Professor of Physics and Astronomy at the University of Arizona and Associate Editor of the Astrophysical Journal Letters. A former Presidential Young Investigator and Sloan Research Fellow, he is the author of six books and more than 230 articles on theoretical astrophysics.

Melia was educated at Melbourne University and The Massachusetts Institute of Technology, and held a post-doctoral research position at the University of Chicago before taking an assistant professorship at Northwestern University in 1987. Moving to the University of Arizona as an associate professor in 1991, he became a full professor in 1993. From 1988 to 1995, he was a Presidential Young Investigator, and then an Alfred P. Sloan Research Fellow from 1989 to 1992. He became a Fellow of the American Physical Society in 2002. He is also a Professorial Fellow in the School of Physics, Melbourne University.

From 1996 to 2002, he was a Scientific Editor with the Astrophysical Journal, and since then has been an Associate Editor with the Astrophysical Journal Letters. He is also the Chief Editor of the Theoretical Astrophysics series of books at the University of Chicago Press.

In a career that has seen him publish over 230 research papers and several books, Melia has made important contributions in High Energy Astronomy and the physics of supermassive black holes. He is especially known for his work on the Galactic center, particularly developing a theoretical understanding of the central supermassive black hole, known as Sagittarius A*. With his students and collaborators, he was the first to propose imaging this object with millimeter-interferometry, which should be feasible within a few years, proving beyond any doubt that it possesses an event horizon, as predicted by Einstein's theory of general relativity. He is also a well-respected and popular publicist of astronomy and science in general, delivering many lectures at public venues, including museums and planetariums. His books have won several awards of distinction, including the designation of Outstanding Academic Books by the American Library Association, and selection as world-wide astronomy books of the year by Astronomy (magazine).

Dr Melia will give a presentation centering on his most recent book *The Galactic Supermassive Black Hole*. The plethora of research on Sagittarius A* since its discovery in 1974 has long seemed an interwoven pattern of loose threads. No one has successfully synthesized this growing body of work into a manageable, coherent book for professional researchers, students, or anyone fascinated with black holes and galactic nuclei -- until now.

East Valley Astronomy Club Email Discussion List

As you probably know by now, EVAC switched webhosting companies last month. You can now use either of our domain names to access the website:

http://www.eastvalleyastronomy.org
http://www.evaconline.org

In concert with the move from one webhost to another the club decided to take full control of our email discussion list. Through the generosity of GRCO Manager Martin Thompson we now have complete control over the list by acquiring Xtreeme MailXpert software and running it on one of his servers. Thanks to Joan and Martin!

If you haven't yet done so, you can subscribe to the EVAC Discussion List by addressing an email to evac@evaconline.org with nothing but the word SUBSCRIBE on the subject line. You will then receive a confirmation email to which you must reply to complete the subscription process.

Unsubscribing is accomplished by sending an email to evac@evaconline.org with nothing but the word UNSUBSCRIBE on the subject line.

New Moon on August 1 at 03:13

First Quarter Moon on August 8 at 13:21

Full Moon on August 16 at 14:17

Last Quarter Moon on August 23 at 16:51

Celestron CPC 1100 GPS For Sale

Celestron CPC 1100 GPS

Telescope has XLT coatings.
Extras include 12-v battery, counter-weights, 110-v power supply, Telrad.

List price is $2899, without extras
My price is now $2250 with extras

Contact: Frank Pino 480-882-3485
Email: f.pino@mchsi.com

For Sale

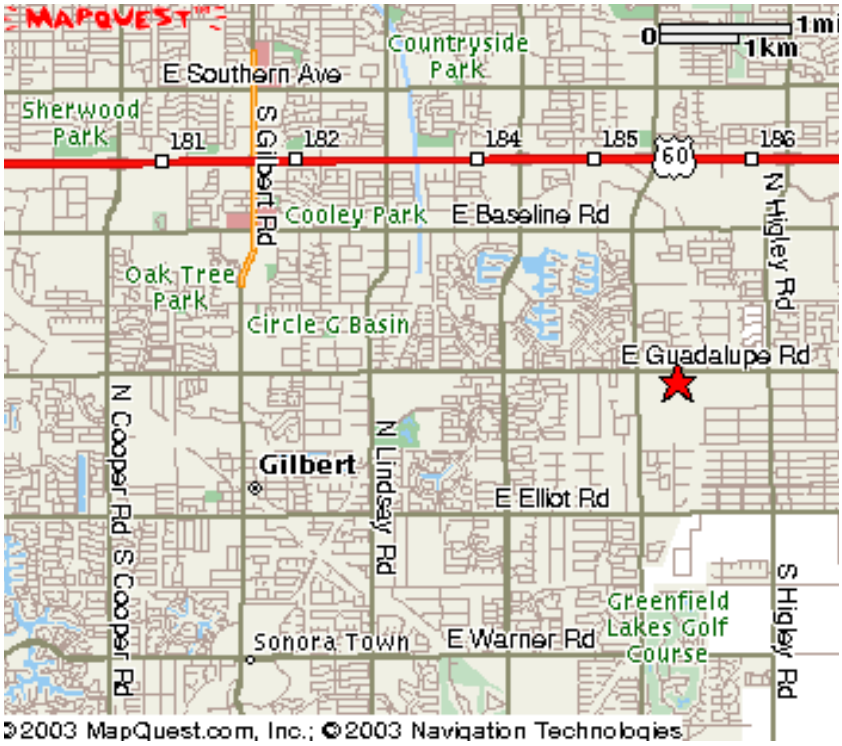
Meade DS-2000 series aliminum tripod & motorized mount with rings to fit 4.5” to 6” scope. Includes accessory tray. (non-GoTo) $50

Meade dual-axis 4-speed controller (non-GoTo) $10

Meade #494 computerized GoTo hand controller $40

Brian O’Neil
aviator79@qmail.com
480-363-8963

www.eastvalleyastronomy.org/grco/obs.asp

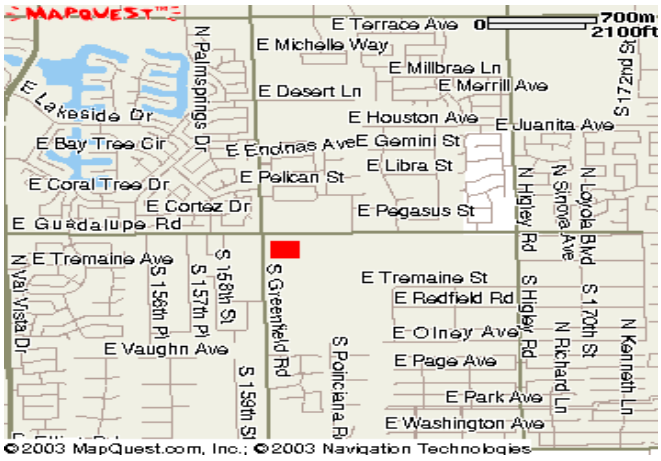


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

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!



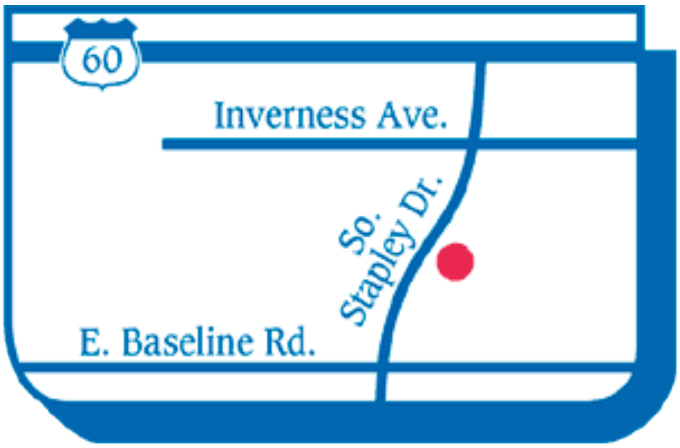
2008 Meeting Dates

August 15
September 19
October 17
November 21
Holiday Party TBD

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 a restaurant to be determined. Our old haunt, Village Inn, has closed. Stay tuned for more info...

Restaurant
to be
determined

August 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						

August 2 - Deep Sky Star Party at Vekol Road

August 8 - Public Star Party at Riparian Preserve in Gilbert

August 15 - General Meeting at Southeast Regional Library in Gilbert

August 23 - Local Star Party at Boyce Thompson Arboretum

August 30 - Deep Sky Star Party at Vekol Road

All-Arizona Star Party

October 25 - 26

Farnsworth Ranch

Arizona City is the site of the annual All-Arizona Star Party. The observing field is located midway between Phoenix and Tucson, west of Interstate 10. The sky conditions are reasonably good, perhaps slightly besting those of the Vekol Road site. The site offers the right combination of dark skies, good visibility and temperate nights that will encourage you to stay up well past your bedtime! There are the predictable glows from Phoenix and Tucson, but not much else to complain about. The nearby cotton fields make this another very dusty place, especially when stirred up by 50 to 100 arriving astronomers. Most of the flora is small creosote bushes, so horizons are very low. It is important to note that this site is on private land. This is a primitive site - so if you need something you'll have to bring it with you! Porta-Potties will be available on site. Attendees are welcome to camp overnight at AASP.


Photo by Andrew Cooper

To get to the site of the All-AZ Star Party: Take I-10 to Exit 200, Sunland Gin Road. Take this road south (a right turn if coming from Phoenix, a left turn if coming from Tucson). Note: this is the closest place for gas and food after leaving the interstate. The paved road continues for 17 miles, then it turns sharply to the west (right). Continue west for 4 miles. The main road turns south (left) just past the "Silverbell Estates" sign. Continue south for 3 miles past the sign, the road veers off to the west (right). Continue on the road for another 5 miles, where it passes through a gate. Take an immediate left after the gate, and continue for 0.7 miles. Take the next right on a road that leads into an open field. Just follow the signs along the road into the observing field. If you must leave early, please park toward the north end of the field. Likewise, if you are spending the night, park to the south.

Complete details here: http://evaconline.org/aasp.htm

N 32° 27' 45.2" W 111° 43' 53.2"

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.

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PO Box 2202
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www.eastvalleyastronomy.org

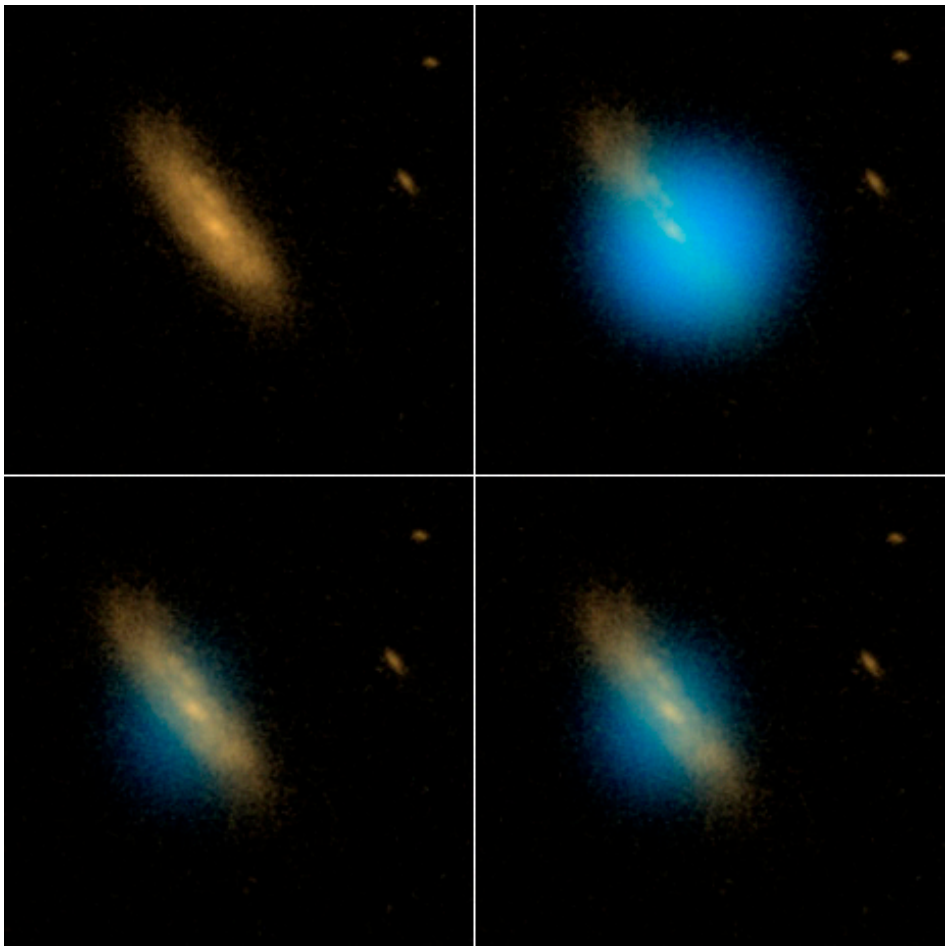
Death of a Supergiant

By all outward appearances, the red supergiant appeared normal. But below the surface, hidden from probing eyes, its core had already collapsed into an ultra-dense neutron star, sending a shock wave racing outward from the star's center at around 50 million kilometers per hour.

The shock wave superheated the plasma in its path to almost a million degrees Kelvin, causing the star to emit high-energy ultraviolet (UV) radiation. About six hours later, the shock wave reached the star's surface, causing it to explode in a Type IIP supernova named SN-LS-04D2dc.

Long before the explosion's visible light was detected by telescopes on Earth, NASA's Galaxy Evolution Explorer (GALEX) space telescope captured the earlier pulse of UV light — scientists' first glimpse of a star entering its death throes.

"This UV light has traveled through the star at the moment of its death but before it was blown apart," explains Kevin Schawinski, the University of Oxford astrophysicist who led the observation. "So this light encodes some information about the state of the star the moment it died."



Sequence of images shows supernova start to finish. The top left image shows the galaxy before the supernova. At top right, the bright UV flash called the shock breakout indicates a red supergiant has collapsed. At bottom left, moments later, the flash is mostly gone. As the debris expands, it heats up again and becomes brighter (bottom right). The supernova became 10 times the size of the original over the following few days, thus becoming visible to supernova hunters.

And that's exactly why astronomers are so excited. Observing the beautiful nebula left behind by a supernova doesn't reveal much about what the star was like before it exploded; most of the evidence has been obliterated. Information encoded in these UV "pre-flashes" could offer scientists an unprecedented window into the innards of stars on the verge of exploding.

In this case, Schawinski and his colleagues calculated that just before its death, the star was 500 to 1000 times larger in diameter than our sun, confirming that the star was in fact a red supergiant. "We've been able to tell you the size of a star that died in a galaxy several billion light-years away," Schawinski marvels.

"GALEX has played a very important role in actually seeing this for a few reasons," Schawinski says. First, GALEX is a space telescope, so it can see far-UV light that's blocked by Earth's atmosphere.

Also, GALEX is designed to take a broad view of the sky. Its relatively small 20-inch primary mirror gives it a wide, 1.2-degree field of view, making it more likely to catch the UV flash preceding a supernova.

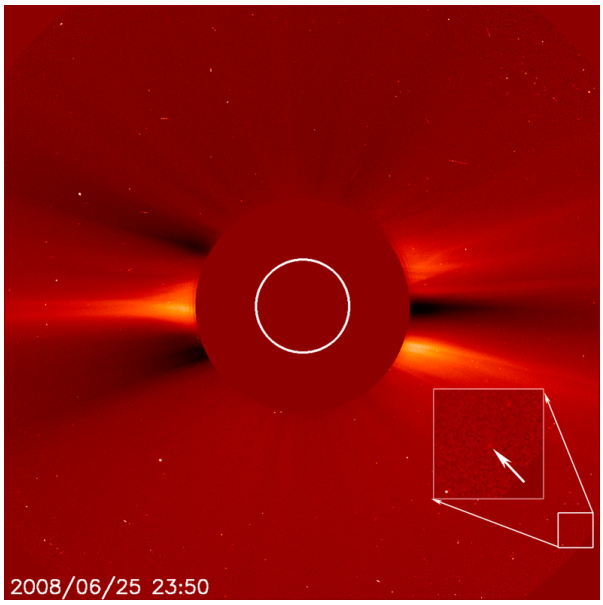
With these advantages, GALEX is uniquely equipped to catch a supernova before it explodes. "Just when we like to see it," Schawinski says.

For more information, visit www.galex.caltech.edu, "Ultraviolet Gives View Inside Real 'Death Star'." Kids can check out how to make a mobile of glittering galaxies at spaceplace.nasa.gov/en/kids/galex_make1.shtml .

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

SOHO Celebrates 1500th Comet Discovery

It's the most successful comet catcher in history. SOHO has just reached a new milestone: It has discovered its 1500th comet, making it more successful than all the other discoverers of comets throughout history put together. Not bad for a spacecraft that was designed as a solar physics mission. SOHO's history-making discovery was made on June 25th 2008 by US-based amateur astronomer Rob Matson. This is Rob's 76th SOHO comet find.



When it comes to comet catching, the SOlar and Heliospheric Observatory has one big advantage over everybody else: its location. Situated between the Sun and the Earth, it has a privileged view of a region of space that can rarely be seen from Earth. From the surface of the planet, the space inside our orbit is largely obscured because of the daytime sky and so we only clearly see close to the Sun during an eclipse.

Roughly eighty-five percent of the SOHO discoveries, and also this one, are fragments from a once great comet that split apart in a death plunge around the Sun, probably many centuries ago. The fragments are known as the Kreutz group and now pass within 1.5 million kilometres of the Sun's surface when they return from deep space.

At this proximity, which is a near miss in celestial terms, most of the fragments are finally destroyed, evaporated by the Sun's fearsome radiation - all within the sight of SOHO's electronic eyes. One of twelve instruments, the Large Angle and Spectrometric Coronograph (LASCO) takes the pertinent images.

Of course, LASCO itself does not make the detections; that task falls to an open group of highly skilled volunteers who scan the data as soon as it is downloaded to Earth. When SOHO is transmitting to Earth, the data can be on the Internet and ready for analysis just 15 minutes after it is taken.

Enthusiasts from all over the world look at each individual image for a tiny moving speck that could be a comet. When someone believes they have found one, they submit their results to Karl Battams at the Naval Research Laboratory in Washington, DC, who checks all of SOHO's findings before submitting them to the Minor Planet Center, where the comet is catalogued and has its orbit calculated.

The wealth of comet information has value beyond mere classification. "This is allowing us to see how comets die," says Battams. When a comet constantly circles the Sun, so it loses a little more ice every time, until it eventually falls to pieces, leaving a long trail of fragments. Thanks to SOHO, astronomers now have a plethora of images showing this process. "It is a unique data set and could not have been achieved in any other way," says Battams.

All this on top of the extraordinary revelations that the solar physics mission has provided over the thirteen years it has been in space, observing the Sun and the near-Sun environment. "Catching the enormous total of comets has been an unplanned bonus," says Bernhard Fleck, ESA's SOHO Project Scientist.

The inaugural Julian Starfest, brought to you by the three local astronomers in association with the Julian Merchants Association and the Julian Chamber of Commerce, will be held August 1st, 2nd, and 3rd at Menghini Winery. Julian has some of the darkest, steadiest skies in Southern California, and at 4,300' elevation, offers superb astronomical viewing. This, to-be-yearly event, will be your opportunity to enjoy some outstanding astronomy while also enjoying the astronomy vendor exhibition area, swap meet, guest lecturers, optional tour of Palomar Observatory and camaraderie that comes with associating with fellow astronomers.

Proceeds from the event will be used to build an observatory for the Julian Union High School District.

Menghini Winery, two miles north of Julian, offers a level, dust free, camping and viewing area for 100 vehicles. Additional parking is available for people interested in only attending for a day. Camping, although somewhat primitive, will have toilets and wash stations available for attendees.

The town of Julian, just a short five minutes away, offers a variety of entertainment, shopping and dining experiences as well as renowned bed and breakfast inns and hotels, for those wishing a bit less 'rugged' accommodations.

Discount day use coupon can be downloaded here: http://eastvalleyastronomy.org/downloads/JSP-EVAC.pdf

Friday, August 1st

Site opens at 10:00 AM for camper and vendor setup.

Observing begins at dusk

Saturday, August 2nd

9:00 AM: Exhibit Area Opens
10:00: Bus Departs for Palomar Observatory
All Day: Guest Speakers will be announced
5:00 PM: Raffle Drawing

Observing begins at dusk

Sunday, August 3rd

9:00 AM: Exhibit Area Opens
12:00: Swap Meet Opens
All Day: Guest Speakers will be announced

5:00: Site Closes

What's Wrong with the Sun? (Nothing)

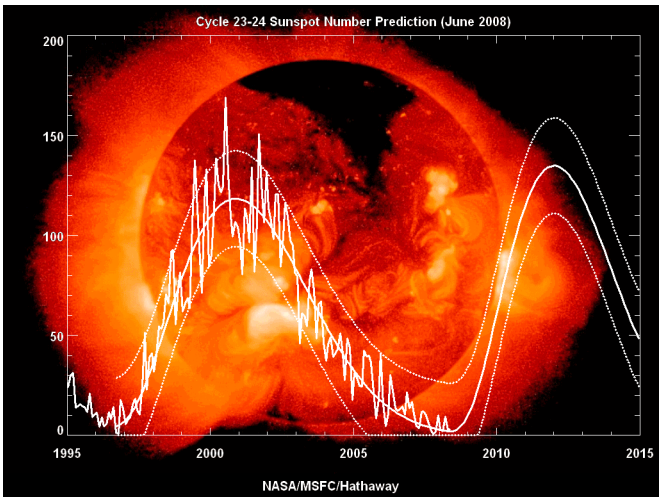
by Dr. Tony Phillips

Stop the presses! The sun is behaving normally.

So says NASA solar physicist David Hathaway. "There have been some reports lately that Solar Minimum is lasting longer than it should. That's not true. The ongoing lull in sunspot number is well within historic norms for the solar cycle."

This report, that there's nothing to report, is newsworthy because of a growing buzz in lay and academic circles that something is wrong with the sun. Sun Goes Longer Than Normal Without Producing Sunspots declared one recent press release. A careful look at the data, however, suggests otherwise.

But first, a status report: "The sun is now near the low point of its 11-year activity cycle," says Hathaway. "We call this 'Solar Minimum.' It is the period of quiet that separates one Solar Max from another."



The solar cycle, 1995-2015. The "noisy" curve traces measured sunspot numbers; the smoothed curves are predictions. Credit: D. Hathaway/NASA/MSFC.

During Solar Max, huge sunspots and intense solar flares are a daily occurance. Auroras appear in Florida. Radiation storms knock out satellites. Radio blackouts frustrate hams. The last such episode took place in the years around 2000-2001.

During Solar Minimum, the opposite occurs. Solar flares are almost non-existant while whole weeks go by without a single, tiny sunspot to break the monotony of the blank sun. This is what we are experiencing now.

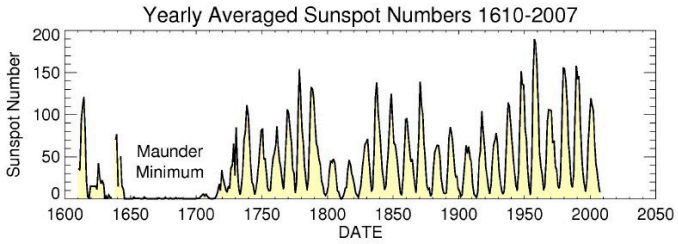
Although minima are a normal aspect of the solar cycle, some observers are questioning the length of the ongoing minimum, now slogging through its 3rd year.

"It does seem like it's taking a long time," allows Hathaway, "but I think we're just forgetting how long a solar minimum can last." In the early 20th century there were periods of quiet lasting almost twice as long as the current spell. Most researchers weren't even born then.

Hathaway has studied international sunspot counts stretching all the way back to 1749 and he offers these statistics: "The average period of a solar cycle is 131 months with a standard deviation of 14 months. Decaying solar cycle 23 (the one we are experiencing now) has so far lasted 142 months--well within the first standard deviation and thus not at all abnormal. The last available 13-month smoothed sunspot number was 5.70. This is bigger than 12 of the last 23 solar minimum values."

In summary, "the current minimum is not abnormally low or long."

The longest minimum on record, the Maunder Minimum of 1645-1715, lasted an incredible 70 years. Sunspots were rarely observed and the solar cycle seemed to have broken down completely. The period of quiet coincided with the Little Ice Age, a series of extraordinarily bitter winters in Earth's northern hemisphere. Many researchers are convinced that low solar activity, acting in concert with increased volcanism and possible changes in ocean current patterns, played a role in that 17th century cooling.



For reasons no one understands, the sunspot cycle revived itself in the early 18th century and has carried on since with the familiar 11-year period. Because solar physicists do not understand what triggered the Maunder Minimum or exactly how it influenced Earth's climate, they are always on the look-out for signs that it might be happening again.

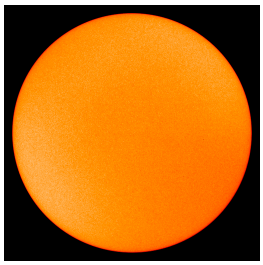
The quiet of 2008 is not the second coming of the Maunder Minimum, believes Hathaway. "We have already observed a few sunspots from the next solar cycle," he says. "This suggests the solar cycle is progressing normally."

What's next? Hathaway anticipates more spotless days, maybe even hundreds, followed by a return to Solar Max conditions in the years around 2012.

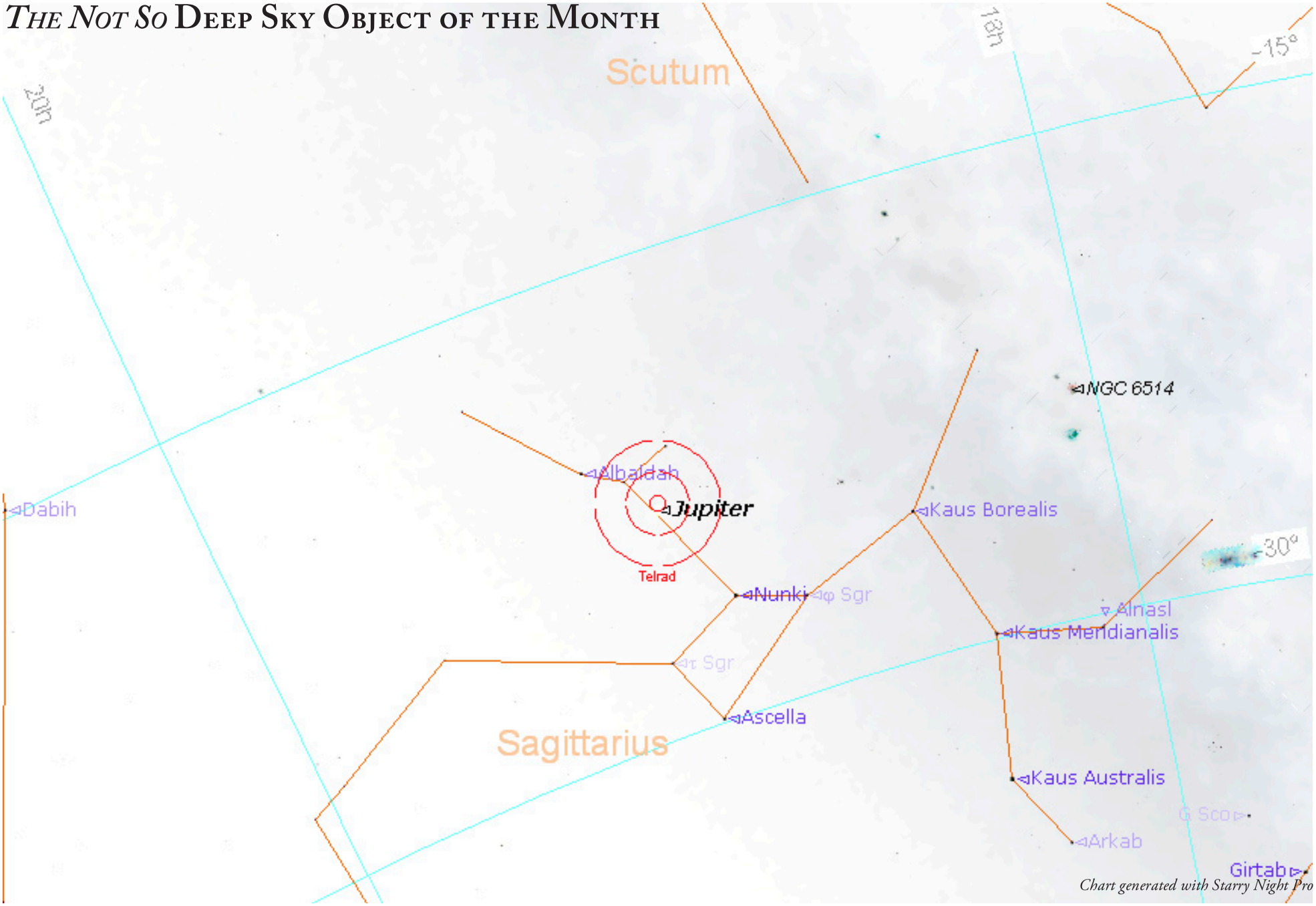
Another way to examine the length and depth of a solar minimum is by counting spotless days. A "spotless day" is a day with no sunspots. Spotless days never happen during Solar Max but they are the "meat and potatoes" of solar minima.

Adding up every daily blank sun for the past three years, we find that the current solar minimum has had 362 spotless days (as of June 30, 2008). Compare that value to the total spotless days of the previous ten solar minima: 309, 273, 272, 227, 446, 269, 568, 534, ~1019 and ~931. The current count of 362 spotless days is not even close to the longest.

What does a spotless day look like? The Solar and Heliospheric Observatory (SOHO) recorded this blank sun on July 1, 2008:



The Not So Deep Sky Object of the Month



Jupiter The Fifth Planet from the Sun

Jupiter is well positioned this month, so observe it whenever the skies allow!

The Tunguska Event -- 100 Years Later

by Dr. Tony Phillips

The year is 1908, and it's just after seven in the morning. A man is sitting on the front porch of a trading post at Vanavara in Siberia. Little does he know, in a few moments, he will be hurled from his chair and the heat will be so intense he will feel as though his shirt is on fire. That's how the Tunguska event felt 40 miles from ground zero.

June 30, 2008 marks the 100th anniversary of that ferocious impact near the Podkamennaya Tunguska River in remote Siberia--and after 100 years, scientists are still talking about it.

"If you want to start a conversation with anyone in the asteroid business all you have to say is Tunguska," says Don Yeomans, manager of the Near-Earth Object Office at NASA's Jet Propulsion Laboratory. "It is the only entry of a large meteoroid we have in the modern era with first-hand accounts."

While the impact occurred in '08, the first scientific expedition to the area would have to wait for 19 years. In 1921, Leonid Kulik, the chief curator for the meteorite collection of the St. Petersburg museum led an expedition to Tunguska. But the harsh conditions of the Siberian outback thwarted his team's attempt to reach the area of the blast. In 1927, a new expedition, again lead by Kulik, reached its goal.

Trees felled by the Tunguska explosion. Credit: the Leonid Kulik Expedition.

"At first, the locals were reluctant to tell Kulik about the event," said Yeomans. "They believed the blast was a visitation by the god Ogdy, who had cursed the area by smashing trees and killing animals."

While testimonials may have at first been difficult to obtain, there was plenty of evidence lying around. Eight hundred square miles of remote forest had been ripped asunder. Eighty million trees were on their sides, lying in a radial pattern.

"Those trees acted as markers, pointing directly away from the blast's epicenter," said Yeomans. "Later, when the team arrived at ground zero, they found the trees there standing upright – but their limbs and bark had been stripped away. They looked like a forest of telephone poles."

Such debranching requires fast moving shock waves that break off a tree's branches before the branches can transfer the impact momentum to the tree's stem. Thirty seven years after the Tunguska blast, branchless trees would be found at the site of another massive explosion – Hiroshima, Japan.

Kulik's expeditions (he traveled to Tunguska on three separate occasions) did finally get some of the locals to talk. One was the man based at the Vanara trading post who witnessed the heat blast as he was launched from his chair. His account:

Suddenly in the north sky… the sky was split in two, and high above the forest the whole northern part of the sky appeared covered with fire… At that moment there was a bang in the sky and a mighty crash… The crash was followed by a noise like stones falling from the sky, or of guns firing. The earth trembled.

The massive explosion packed a wallop. The resulting seismic shockwave registered with sensitive barometers as far away as England. Dense clouds formed over the region at high altitudes which reflected sunlight from beyond the horizon. Night skies glowed, and reports came in that people who lived as far away as Asia could read newspapers outdoors as late as midnight. Locally, hundreds of reindeer, the livelihood of local herders, were killed, but there was no direct evidence that any person perished in the blast.

The location of the Tunguska impact.

"A century later some still debate the cause and come up with different scenarios that could have caused the explosion," said Yeomans. "But the generally agreed upon theory is that on the morning of June 30, 1908, a large space rock, about 120 feet across, entered the atmosphere of Siberia and then detonated in the sky."

It is estimated the asteroid entered Earth's atmosphere traveling at a speed of about 33,500 miles per hour. During its quick plunge, the 220-million-pound space rock heated the air surrounding it to 44,500 degrees Fahrenheit. At 7:17 a.m. (local Siberia time), at a height of about 28,000 feet, the combination of pressure and heat caused the asteroid to fragment and annihilate itself, producing a fireball and releasing energy equivalent to about 185 Hiroshima bombs.

"That is why there is no impact crater," said Yeomans. "The great majority of the asteroid is consumed in the explosion."

Yeomans and his colleagues at JPL's Near-Earth Object Office are tasked with plotting the orbits of present-day comets and asteroids that cross Earth's path, and could be potentially hazardous to our planet. Yeomans estimates that, on average, a Tunguska-sized asteroid will enter Earth's atmosphere once every 300 years.

"From a scientific point of view, I think about Tunguska all the time," he admits. Putting it all in perspective, however, "the thought of another Tunguska does not keep me up at night."

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