September 2007

The Observer

East Valley Astronomy Club

Volume 21 Issue 9

Inside this Issue:

From the Desk of the President
by Claude Haynes

Monsoons – while I complain about the clouds, the sunsets are spectacular. I'm sitting in a ramada at the Riparian area. The dome is glowing and the moon is peaking out of the clouds. Hopefully our guests will have a chance to see a few objects tonight. With the honking of the ducks in the background and the last rays of the sun glistening on the water, it is a beautiful site for the observatory.

Win Pendelton worked diligently to see this project through. He is moving to Colorado and his activities with the Riparian area will cease in October. If you happen to see him, say "thank you" for all his hard work.

It was great to see Steve Aggas at the last meeting and to catch up on his telescope building. The September meeting has our board member Henry De Jonge discussing his recently completed Master's degree in astronomy and radio astronomy.

The All Arizona Star Part is rapidly approaching. We are looking for items to raffle, and for volunteers to assist with set up and hospitality. Please email me if you can help. Thank you to all who can join us.

Keep looking up
Claude Haynes

In accordance with the club's constitution and bylaws, nominations for Officer or Board positions shall be opened at the October general meeting and shall be publicized prior to the November general meeting. Nominations will be closed at the start of the November general meeting. Officers shall be elected by a simple majority of the General Assembly present at the November general meeting. Is this the year you get involved? The future of EVAC depends on you. Contact a current officer for more information.

The Backyard Astronomer
False Comets *by Bill Dellinges*

Watch out for false comets! The night sky is loaded with them. Many deep sky objects can mimic a comet and give a backyard astronomer a heart attack. A real comet will betray itself by showing movement relative to background stars after a few minutes. If it doesn't, you have been victimized by… a false comet. Let's look at six of the more notorious impostors lurking in the firmament.

NGC 404: [01h 09.5m +35° 43'] A small (4.4') 10.3 magnitude galaxy in Andromeda 8 million light years away. Sky Atlas 2000 Companion states "Often reported as a new comet." Its proximity to Beta Andromeda (Mirach) and the galaxy's small smudge–like appearance combine to trick observers into thinking they've come across an uncharted comet. In my 11" SCT at 70x, I see a blur about a quarter of the way from the centered star to the edge of my 0.9 degree field. At 233x, the object still does not look like a galaxy. Glare from Mirach is annoying. Try placing the star out of the field and see what results you get. Photo: See www.schursastrophography.com under "Galaxies."

NGC 1931: [05h 31.4m +34° 15'] A small (3') 11.5 magnitude diffuse nebula in Auriga 4000 light years away. Located between M36 and M38, near Psi Aurigae, just east of the "Fish" asterism, this is a very compact round nebula with several stars within it. In the 11" at 70x, it's very comet–like. Closer inspection reveals a double star in this gas ball, and at 200x a third star appears (more convincing at 280x). An OIII filter doesn't seem

Continued on page 2

Upcoming Events:

Local Star Party at Boyce Thompson – September 8

Public Star Party in Gilbert – September 14

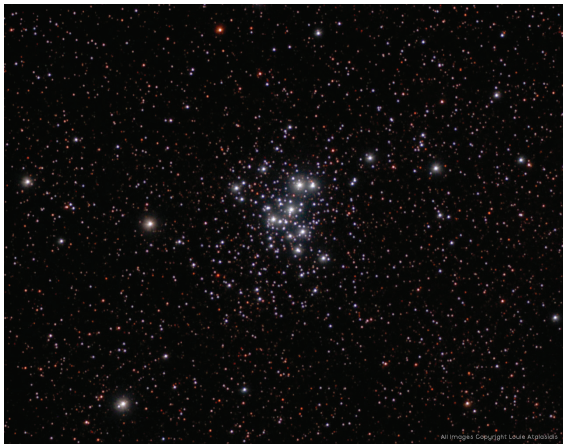
Deep Sky Star Party at Vekol Road – September 15

Montessori School Star Party in Tempe – September 19

General Meeting at Southeast Regional Library – September 21

The Backyard Astronomer

Continued from page 1 to help bring out the nebula. The overall look then is that of a very small, round nebula with three stars in it. Photo: Chris' web site above, under "Emission Nebulae." ***NGC 2158***: [06h 07.5m +24° 06'] A small (5') dim (8.6 magnitude) open star cluster adjacent to M35 in Gemini. Look for it 0.4 degrees southwest of M35. NGC 2158 is nearly in the same line of sight as M35 but about six times further away (16,000 light years vs. 2,800 light years). Many observers miss it because of its dimness or being outside their eyepiece's field. Even Walter Scott Houston (1912-1993), former Sky and Telescope columnist thought he may have stumbled upon a comet when he first detected NGC 2158 in his telescope (Deep - Sky Wonders, James O'Meara, p. 55). Its star magnitudes are in the 13 to 15th magnitude range appearing powdery at high power. In the 11" at 70x, the cluster is unresolvable and most comet–looking. A hint of resolution can be had at 104x. Averted vision with 165x begins to bring out stars while 200x leaves no doubt this is an open star cluster. Photos: Chris' web site under "Open Clusters"; Astronomy magazine, September 2007, page 98; Deep – Sky Wonders, page 53. ***NGC 2261***: [06h 39.2m +08° 44'] Hubble's Variable Nebula in Monoceros is an unusual looking reflection nebula shaped just like a comet. This 10th magnitude object displays a fan–like 2' by 1' nebula thought to be a Herbig–Haro Object emanating from the T Tauri star R Monocerotis, 3000 light years away. Changes in its shape can be discerned in as little as a year's time. Look for it one degree southwest of 15 Monocerotis. In the 11" (with a reversed field) at 70x, I saw a small fan going off to the upper left from the buried star R Monocerotis which acts as the "comet's" nucleus. At 200x, the view improved but I needed averted vision to see it well. Nebula filters (UHC and OIII) didn't help, as the cloud is mostly dust. Photos: Chris' web site, under "Reflection Nebulae"; Burham's Celestial Handbook, Volume two, page 1203; Astronomy magazine, September 2007, page 97. ***NGC 6231***: [16h 54m -41° 48'] Along with nearby Collinder 316 and Trumpler 24, in southern Scorpius, this is the Grand Lady of False Comets. While other objects discussed here appear similar to comets in a telescope, this object is different in that it only looks like a comet with the naked eye or small binoculars. Years ago, at Glacier Point in Yosemite National Park, a professor of astronomy leading a stargazing seminar asked me if I knew of a comet that might be hanging out in Scorpius. He had noticed a peculiar comet shaped blob just below Mu Scorpii. After a quick look with my mid-sized binoculars, I told him no, it was just a bunch of star clusters. That was my first introduction to this often overlooked area of Scorpius. Put even a modest telescope on this region and you will be rewarded with a spectacular array of single stars and clusters. The glory begins on the southern end of the complex with Zeta[1] & Zeta[2] Scorpii, two piercing orange and blue stars; a third dimmer star below them creates an intriguing triangle. These stars and NGC 6231, half a degree above them, form the "comet's nucleus." From there a large splash of stars (Collinder 316 and Trumpler 24) fan out to the northeast forming the "comet's tail." Touching Tr 24 on its northeast side is IC 4628, an emission nebula I don't recall seeing visually. The whole thing ranges across two and half degrees, so your telescope may not get everything in. If not, switch to binoculars ["Too close for missiles, switching to guns." I digress]. I think the best overall view of the False Comet requires something with a five degree real field, like my 10x70 binoculars. Don't forget to zero in on NGC 6231 with your telescope. This is one beautiful open cluster, certainly one of my favorites. Because of its low altitude, our atmosphere causes its stars to scintillate and appear to resemble sparkling colorful gems – a northern hemisphere version of Crux's "Jewel Box." Photos: Chris' web site, home page; Observing the Constellations, John Stanford, page 155; Night Sky Observer's Guide, Sanner & Kepple, Vol. 2, page 341. Burnham's Vol. 3, page 1727. ***NGC 6441***: [17h 50.2m -37° 03'] A globular star cluster adjacent to G Scorpii located southeast of the Scorpion's Stinger. Magnitude 3.2 G Scorpii is just bright enough to add a difficulty factor in spotting this magnitude 7.2 globular 4' east of the star. Its remoteness, 34,000 light years and low altitude, produce a small round comet-like image. My 8" SCT could not resolve it at 83x or 163x. No photo, see it for yourself! And remember, beware of false comets! I hope you find the real McCoy someday!



NGC 6231 The Grand Lady of False Comets
Photo reprinted courtesy of Louis Atalasidis

IC 4628 region in Scorpius showing NGC 6231
Photo reprinted courtesy of Chris Schur

◑Last Quarter Moon on September 3 at 19:33
○New Moon on September 11 at 05:44
◐First Quarter Moon on September 19 at 09:48
●Full Moon on September 26 at 12:45

Planetary Magnetic Fields, Part One

by Henry De Jonge IV

Editors note: Due to its length this article will span two issues.

Overview

We will discuss the magnetic fields of the nine major planets, (yes even including Pluto as a planet for this discussion) which planets have them, which do not, and offer possible explanations why. We will also look at some of the planetary moons that have their own magnetic fields as well. We begin by discussing what magnetism is and how it works including the dynamo theory. This is the most accepted explanation for the existence of planetary magnetic fields we have at the moment. How a planetary magnetic field helps to create and influence the magnetosphere of a planet is next for discussion. We then look at how the magnetic field and its strength are related to the planets internal structure, (magnetic material) and its rotation rate, (currents). Throughout this paper are questions proposed which still have no clear answers. A conclusion will be shown that will comment on our present understanding of planetary magnetic fields and the tremendous lack of knowledge we currently have about the formation and interactions of planetary magnetic fields. We will only briefly be mentioning the planets magnetic axis in relation to its magnetosphere or rotational axis, as there are theories, (in particular with regards to neutron stars) that indicate there is no fundamental reason for these two axis to coincide, [1]. We will see that all the planets have some sort of offset with regards to these two axes. Saturn's offset is within 1 degree though, and does present a bit of a dilemma for the dynamo theory.

Magnetism & Magnetic Fields in Planets

In physics class we all learned the interesting properties that 1) a moving current generates a magnetic field and 2) a changing magnetic field creates electric current, (field). It is obvious that electricity and magnetism are intimately related. We all make use of these principles in our everyday lives constantly. The electric and magnetic fields also share this intimacy. An electric or magnetic field alters the region of space about them so that they can exert forces on distant objects, [3]. Any electric charge or magnet will respond to the field immediately surrounding it. This is similar to the gravitational field and its effects on all matter. James Maxwell put these ideas together mathematically in the mid 1860's. He also showed that these changing fields should move at the speed of light and that light is an electromagnetic wave. According to our current understanding of magnetism, scientists believe that there are two essential ingredients for generating a planetary magnetic field. They are 1) magnetic material and 2) currents, [2]. For example a bar of iron can be made into a magnet by wrapping it with wires and running an electric current through the wires, (an electromagnet).

In a classic experiment, we see that when we put fine iron filings around a simple bar magnet, the filings form along the magnetic field lines. These lines represent the magnetic force and have a sense of direction and strength. Where the lines are close together the force of magnetism is stronger and where they are far apart it is weaker. We see the concentration of field lines at either end of the magnet. One end of the magnet we call the positive, (north) side or pole, where by convention the lines of force point outward. The other end of the magnet we call the negative, (south) side or pole, where by convention the lines of force point inward. One can see how the force of magnetism "flows" from pole to pole. So far as is known, the force of magnetism has always exhibited two or more poles. We have no evidence for a single pole magnet, (monopole). Opposite poles attract, while like poles repel. This is the same principle that "forces" the needle of a compass to align itself with the magnetic filed lines of the earth and point to a pole. An interesting point is that in actuality, on the earth the positive, (north) magnetic pole is actually at its geographic South Pole! The same compass needle near a bar magnet always points away from the positive, (north) pole of the magnet!

The strength of a magnetic field can be measured in different ways but one of the more common is the Gauss, (G). For example the sun measures about 1G, while the earth measures about 0.7G, [1]. A toy magnet can measure 100G.

The Dynamo Theory

The most prevalent theory of planetary, stellar, and galactic, magnetics is called the dynamo theory. Dynamo theory is a branch of magnetohydrodynamics that is concerned with the self-excitation of magnetic fields in any large rotating mass of conduction fluid in motion. This is believed to account for the existence of magnetic fields in astrophysical systems. It states that the current in the system, (planet) generates the magnetic field, (without the help of an external source) and motion of a conductor across the field generates the current that maintains it. This is basically a self-excitation process, which occurs when fluid motion across a magnetic field generates the current, which is itself, the source of the given magnetic field, [4]. Basically, the circulating of the electrical charges produces a magnetic field. Thus as far as we know, for a planet to have a magnetic dynamo it must have a large region that is fluid, electrically conducting and maintaining sufficiently vigorous convective, (internal) motion. Therefore the internal composition of the planet provides the magnetic material, (conducting material) and the rotational motion of the planet provides energy for the currents. We would expect not to find planetary magnetic fields (or possibly only weak remnant fields) in planets that have solidified interiors or spin too slowly. There is also an interesting theorem that was stated in 1931 by Thomas Cowley that a planetary dynamo field cannot be axially symmetric, (with the axis of rotation), [7].

The larger planets and some moons are expected to have differentiated cores of electrically conducting liquids. Their larger size permits them to cool more gradually and allow the liquid interiors to persist. We would also expect to see the size of the magnetic field to correspond roughly to the size of the planet. These cores may consist of liquid iron and alloys, liquid "metallic" hydrogen, and liquid water-ammonia-methane mixtures, [6].

We shall examine the planets and some of their moons according to the dynamo theory and see how well the predictions are fulfilled. As we shall see, this may be the best theory we have currently to explain planetary magnetism but it is far from complete

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Planetary Magnetic Fields

Continued from page 3

in its range of applications and predictions.

Magnetospheres

A planet's magnetic field forms a kind of shield or cavity protecting the planet's surface from energetic, charged particles coming from the sun, (solar wind) and other places, [3]. This is called the planet's magnetosphere. A planetary magnetosphere can also be thought of as the region surrounding a planet within which its own magnetic field dominates the behavior of electrically charged particles. The solar wind is constantly emanating from the sun. It consists mostly of ionized particles, electrons and protons moving at high velocity, (about 400km/sec.). When the particles run into a magnetic field they are deflected and spiral around the magnetic field lines.

Upstream of the magnetosphere in the solar wind there is a bow shock, a standing wave of sorts, due to the fact that the incoming solar wind is traveling at supersonic speeds, (faster than the speed of sound in the interstellar medium). After passing the bow shock this solar wind flows along the sides of the magnetic barrier. The magnetopause is the interface between the solar wind and magnetospheric plasmas, [6]. Some of the solar wind plasma can leak into the magnetospheric cavity. After passing the planet, the solar wind plasma merges with the magnetic field of the planet and stretches it out to make a long magnetotail or wake on the downwind side of the planet. Spacecraft have determined that this wake can extend for up to 100 times farther down stream than the extent of the magnetopause in front of the planet. This gives the whole structure the look of a comet with a tail. Dynamo theory says if the rotation of the planet is not roughly aligned with either the magnetic axis or the solar wind flow then there is no reference frame in which the plasma flow is steady, [6]. This unsteadiness can cause complete reconfigurations of the magnetosphere and extremely complex interactions with the solar wind, (like with Uranus and Neptune). If the planet does not have an intrinsic magnetic field then this interaction with the solar wind depends on the electrical conductivity of the planet. If the planet's interior or atmosphere is conductive then electrical currents can flow through the planet and into the solar wind where they may create forces that also slow and divert the solar wind. This is called an induced magnetosphere, [6].

One example of this interaction between the solar wind and a planet's magnetic field on the earth are the aurorae. The aurorae are the shimmering displays of light that occur mainly at the poles of the earth's magnetic field, (Northern and Southern lights). This happens because the solar wind particles are following the magnetic field lines of the earth and concentrating at the poles as they do so. These particles collide with other particles, (mostly molecules) in the upper atmosphere. These collisions excite the molecules in our atmosphere, (moving their electrons to higher energy orbits) which shortly drop down to a lower energy state by emitting energy, (light). Other planets also have magnetospheres and experience aurorae. The Hubble Space telescope has even taken photographs of them, [5].

When we discuss planets and their magnetic fields we will also be discussing their associated magnetospheres, as they are so intimately related.

The Nine Planets in Summary

We will now look at the nine planets and see which ones have a magnetic field. Each planet will be discussed in detail as to its magnetic field or lack of one. The following chart will give a summary of the planets and their associated magnetic fields. The strength given is in multiples of the strength of the magnetic field of the earth, (being equal to 1), [3].

Planet	*Magnetic field strength*
Mercury	*.006*
Venus	*0.0 (may have small-induced magnetic field)*
Earth	*1.0*
Mars	*0.0 (may have small-induced magnetic field)*
Jupiter	*19,519*
Saturn	*578*
Uranus	*47.9*
Neptune	*27.0*
Pluto	*0.0*

As we see from the chart above, Jupiter, Saturn, Uranus, Neptune, Mercury and the Earth all have magnetic fields in their own right.

Mercury the smallest of the terrestrial planets surprisingly, has a large iron core, (this is derived from its very high density) and a magnetic field, [1]. It is estimated that this iron core occupies about 42% of the planets volume. The diameter of this iron core is about 75% of the planets diameter. There are many theories to account for this large iron core but none fully accepted as yet. In order for the dynamo theory to apply to Mercury it must have at least part of the core in liquid form and have an energy source to cause the material to flow within this core and create currents. The planet's rotation helps to create energy while the liquid material in the core becoming solid and releasing energy, helps to stir up the interior motions and create currents. This is supposedly similar to what happens in the earth's core. Disappearing radio emissions during certain phases indicate a time varying component to the magnetic field of Mercury, [8]. Could this be related to liquid current fluctuations? The magnetic field is also inclined about 14 degrees to the axis of rotation.

Mercury's surprisingly strong magnetosphere does deflect the dense solar wind and keep it from pounding the surface. It is not strong enough though to allow it to capture particles like on the earth. It has no aurora or Van Allen belts like the earth, [1]. It does contain sodium which may help it to generate electricity, [8].

There are still many questions regarding the magnetic field and the dynamo theory with respect to Mercury. The high iron content is a mystery for one. How much, (if any-since this is a guess based upon the dynamo theory) of the core is liquid? Being so small, one would think the planet had cooled off long ago, to be completely solid. The rotation rate is also not as fast as one would like to see with the dynamo theory. Does its proximity to the sun have any bearing on its interior or magnetic field? Is the core comprised of a new type of material? Could the sun regulate the time varying radio emissions? Also there was recently a report of auroras on Mercury, [8]. Is this data real? These questions and more are giving a bit of a chal-

Continued on page 13

September Guest Speaker: Henry De Jonge

Henry De Jonge is currently a semiconductor sales engineer, having been in the high tech industry since 1980 where he started as a semiconductor engineer. He has a BS in Mathematics and an MBA. He recently received his MS in Astronomy from Swinburne University of Technology. He has been interested in astronomy since childhood and has also studied astronomy as both an undergraduate and a graduate student at ASU. He particularly enjoys studying galaxies, black holes, and cosmology. He is also an avid Grand Canyon hiker. He gazes at the heavens with the naked eye and binoculars, and is currently saving up for a telescope.

Henry serves on the EVAC Board of Directors, is a member of the Gilbert Rotary Centennial Observatory staff and is a regular contributor to The Observer.

Henry will discuss his experience with the online educational opportunities provided by Swinburne University of Technology in Australia. He will also present a sample lesson on an *Introduction to SETI* from a Swinburne course on radio astronomy.

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

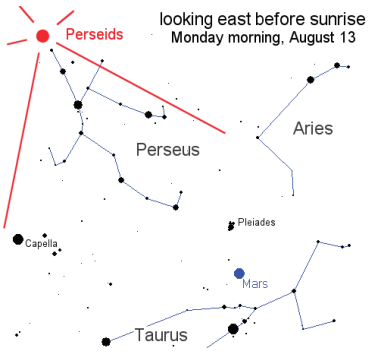
If you wish to make a donation by mail, please make check payable to Burnham Memorial Fund and mail it to EVAC, PO Box 2202, Mesa, Az., 85214-2202... or you can donate at a club meeting.

Robert Burnham Sr and Robert Burnham Jr at the telescope

Break in Monsoon Weather for the Perseids

A meteor shower occurs when the Earth moves through the stream of dust left ejected from a comet. This shower, the Perseids, is caused by the crossing of the relatively young wake of comet Swift-Tuttle. The radiant, or the point from which they seem to originate, is the constellation Perseus.

Since the peak for this year's shower coincided with a moonless night the club decided to host a viewing session. Club member Frank Pino offered the use of the field behind his observatory in Queen Creek and the event was scheduled. Participants eager to witness a good meteor shower started assembling in the field around 11:00 pm on Sunday night, August 12th. Those in attendance included Frank, Randy, Claude, Dave, Bryan, Judi, Irene, Eric, Bev, Belinda and Peter.



There were some wispy cirrus clouds early on, but they moved across the sky quickly.

With everyone seated and sufficiently lathered in insect repellant, the *official* counting began at 11:30 pm and concluded at 4:00 am.

We observed a total of 167 meteors over the 4½ hours for an average of just over 37 per hour. The hourly tally is represented in the table below.

Time	Count
23:30 - 00:00	15
00:01 - 01:00	32
01:01 - 02:00	54
02:01 -03:00	29
03:01 - 04:00	37
Total	**167**

Classified Ads

10" Deep Space Hunter

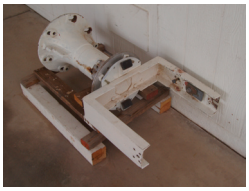
A very nice Dobsonian from Hardin Optical. Included in the sale are a finder scope and Telrad. Three eyepieces are also included: 9mm and 25mm (1¼" diameter) and 32mm (2" diameter). Asking price $400.

Peri Cline
480-981-5203 between 6 pm and 9 pm weekdays
peri_cline@cox.net

For Sale by EVAC

Optical tube assembly – Newtonian with focal ratio F7, includes one helical and one Crayford style focuser. There is some chipping on the mirror and quite a bit of dust. Tube is 18½" in diameter and 64" in length.
$75 or best offer

Mount – HEAVY duty mount build from a tractor axle casing.
$25 or best offer



Contact: president@eastvalleyastronomy.org

Orion StarMax 102mm Maksutov-Cassegrain

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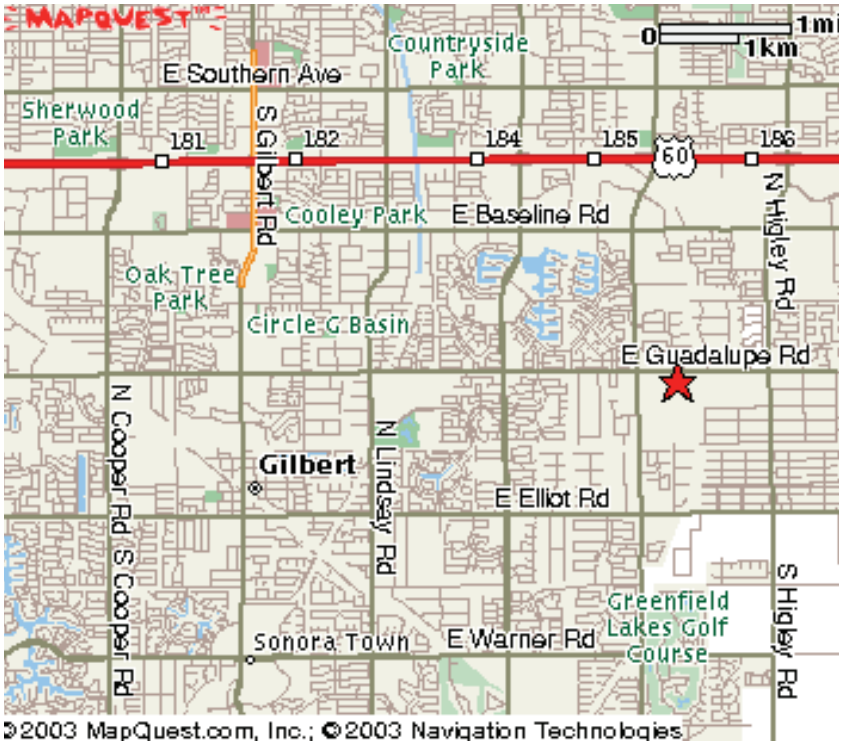


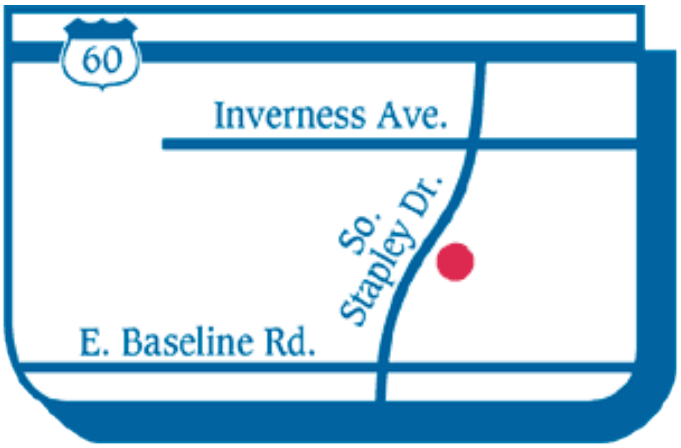
2007 Meeting Dates

September 21

October 19

November 16

December 21

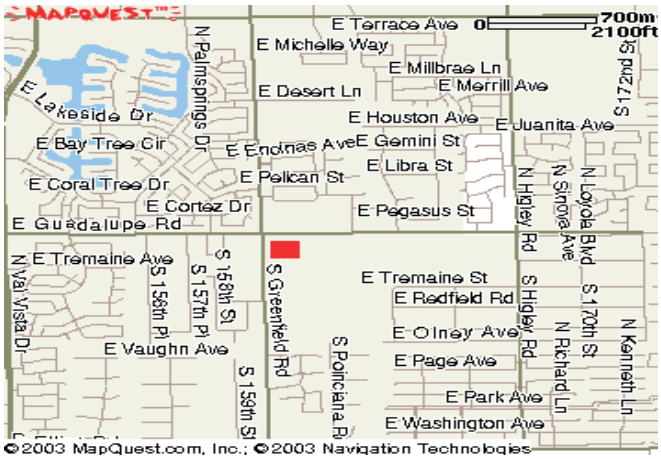


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

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

September 2007

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						

September 8 - Local Star Party at Boyce Thompson Arboretum

September 14 - Public Star Party at Riparian Preserve in Gilbert

September 15 - Deep Sky Star Party at Vekol Road

September 19 - Star Party at Montessori School in Tempe

September 21 - Monthly Meeting at Southeast Regional Library in Gilbert

August 17 General Meeting Minutes

President Claude Haynes began the meeting with the introduction of club officers. He then invited guests to introduce themselves.

Bill Houston's treasurer's report showed a slight decrease in bank balance to about $8200. This was due to spending $292.74 compared to an income of $143.00 for the month of July. This slight decrease in bank balance is normal for this time of year.

The Rob Burnham Memorial Fund received $13.45 this past month bringing the total to $1647.01. This current balance reflects two previous generous gifts by Horkheimer and T. Ortega towards a goal of 25 thousand dollars. There is a link on the EVAC website for those wishing to contribute.

Martin Thompson, GRCO Manager, reported that attendance at the Gilbert Rotary Centennial Observatory is healthy with 187 visitors this past Friday evening. The observatory continues to receive coverage by the East Valley Tribune with a reporter on site recently. Any person interested in participating in the operation of GCRO by becoming an operator should contact Martin.

Randy Peterson reported on upcoming events:

- August 28 will be a lunar eclipse. Umbra contact at 1:49 am, maximum at 2:52 am, departs umbra at 5:23 am (just before sunrise).
- September 8: Local Star Party at Boyce Thompson
- September 14: Public Star Party at the Gilbert Riparian Preserve
- September 15: Deep Sky Star Party
- October 12, 13: All Arizona Star Party. If you would like to help set up (Tent setup at noon on Friday) and / or take down, Randy would really appreciate the help. Saturday, EVAC will provide coffee and donuts between 8 and 10 am. Dinner Saturday evening will be provided at a cost of $5. Raffle tickets will be $1 each for door prizes. Sunday, coffee and donuts will again be provided at 7 am prior to the drive home.

The recent Perseid Meteor Shower attracted about a dozen persons to Frank Pino's property in Queen Creek. The group observed from 11:30 Sunday evening until 4 am Monday morning counting a total of 167 Perseids.

Instead of Q&A for this meeting, some members reported on "How did you spend your summer vacation?" Howard gave talks at Lowell observatory to the visitors. Frank Pino attended the SLOOH conference in Japan. He was treated by the astronomers who use his telescope remotely. Another member visited the facilities near Cloudcroft, NM. Several members attended the Grand Canyon Star Party at the National Park in June.

Our next meeting on September 21 will feature guest speaker Henry De Jonge discussing the SETI Telescopes.

For awards, Peter presented Joe Goss two awards, one for Lunar Certification and one for Berkeley Open Clusters. Joe shared that the Lunar award was the most gratifying since he started it 6 years ago in the backyard with his grandson.

After a short break, Howard introduced the guest speaker for the evening, past president Steven Aggas. Steven shared his latest project as well as appropriate pieces of previous projects. Steven now has an operational 36" Newtonian reflector, f/4.5 in an observatory on the rim. Steven gave a very impressive presentation including many details of how he completed the many aspects of the project.

Wayne Thomas, Secretary

East Valley Astronomy Club -- 2007 Membership Form

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

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

Select one of the following:

☐ New Member ☐ Renewal ☐ Change of Address

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

☐ **$30.00 Individual** January through March

☐ **$35.00 Family** January through March

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$37.50 Individual** October through December

☐ **$43.75 Family** October through December

Includes dues for the following year

Renewal (current members only):

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

Magazine Subscriptions (include renewal notices):

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

Name Badges:

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

Name to imprint: _____

Total amount enclosed: _____

Please make check or money order payable to EVAC

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

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Name: _____ Phone: _____

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

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

Areas of Interest (check all that apply):

☐ General Observing ☐ Cosmology

☐ Lunar Observing ☐ Telescope Making

☐ Planetary Observing ☐ Astrophotography

☐ Deep Sky Observing ☐ Other

Please describe your astronomy equipment:

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

How did you discover East Valley Astronomy Club? _____

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

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

Liability Release Form

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

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

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

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

Please print name here ***Date***

Please sign name here

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NASA's Space Place

Cosmic Cockroaches

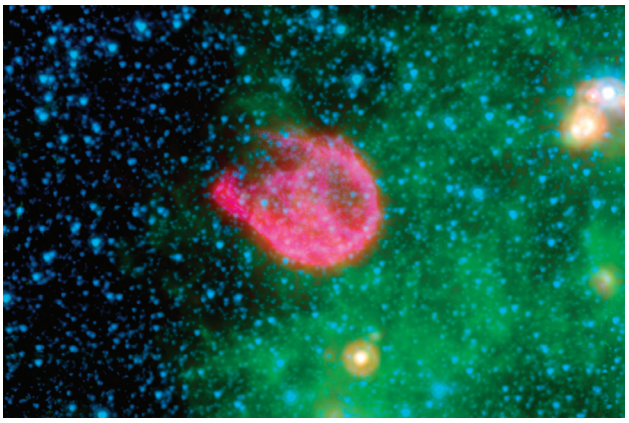
by Dr. Tony Phillips

Cockroaches are supposed to be tough, able to survive anything from a good stomping to a nuclear blast. But roaches are wimps compared to a little molecule that has recently caught the eye of biologists and astronomers—the polycyclic aromatic hydrocarbon.

Polycyclic aromatic hydrocarbons (PAHs for short) are ring-shaped molecules made of carbon and hydrogen. "They're all around us," says Achim Tappe of the Harvard Center for Astrophysics. "PAHs are present in mineral oils, coal, tar, tobacco smoke and automobile exhaust." Aromatic, ring-shaped molecules structurally akin to PAHs are found in DNA itself!

That's why Tappe's recent discovery may be so important. "PAHs are so tough, they can survive a supernova."

The story begins a few thousand years ago when a massive star in the Large Magellanic Cloud exploded, blasting nearby star systems and interstellar clouds with hot gas and deadly radiation. The expanding shell, still visible from Earth after all these years and catalogued by astronomers as "N132D," spans 80 light years and has swept up some 600 Suns worth of mass.



Using the IR spectrometer on the Spitzer Space Telescope, scientists found organic molecules in supernova remnant N132D.

Last year "we observed N132D using NASA's Spitzer Space Telescope," says Tappe. Spitzer is an infrared (IR) telescope, and it has a spectrometer onboard sensitive to the IR emissions of PAHs. One look at N132D revealed "PAHs all around the supernova's expanding shell. They appear to be swept up by a shock wave of 8 million degree gas. This is causing some damage to the molecules, but many of the PAHs are surviving."

Astronomers have long known that PAHs are abundant not only on Earth but throughout the cosmos—they've been found in comet dust, meteorites and many cold interstellar clouds—but who knew they were so tough? "This is our first evidence that PAHs can withstand a supernova blast," he says.

Their ability to survive may be key to life on Earth. Many astronomers are convinced that a supernova exploded in our corner of the galaxy 4-to-5 billion years ago just as the solar system was coalescing from primitive interstellar gas. In one scenario of life's origins, PAHs survived and made their way to our planet. It turns out that stacks of PAHs can form in water—think, primordial seas—and provide a scaffold for nucleic acids with architectural properties akin to RNA and DNA. PAHs may be just tough enough for genesis.

Cockroaches, eat your hearts out.

Find out about other Spitzer discoveries at www.spitzer.caltech.edu.

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

Editor's Note:

Pascale Ehrenfreund, a professor of astrophysics at the University of Leiden in the Netherlands, investigates the night skies for signs of life. Rather than a SETI-like search for radio signals, however, the signs she looks for are chemical. There are 143 kinds of molecules in the interstellar medium, and some of them may be important for life's origin –- not just in our own solar system but also for the entire universe.

In a paper soon to be published in the journal Astrobiology, Ehrenfreund and her colleagues suggest that polycyclic aromatic hydrocarbons (PAHs), organic molecules found throughout space, may have played a fundamental role in the origin of life.

These molecules of carbon and hydrogen are called "polycyclic" because of their multiple loops of carbon atoms, and "aromatic" because of the strong chemical bonds between the carbon atoms. PAHs can be found on Earth anytime carbon-based materials are burned incompletely –- from the sooty exhaust of trucks to the black gunk that clogs barbecue grills.

If It's Clear...

by Fulton Wright, Jr.
Prescott Astronomy Club

September 2007

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, September 1, about 4:30 AM, you might see a few Aurigid meteors. With your unaided eye look 50 degrees above the east horizon for the constellation Auriga. The meteors will appear to radiate from there, but can appear anywhere in the sky. The good news is that this usually puny shower is predicted to be especially strong this year (maybe 1 meteor a minute). The bad news is that the peak only lasts for a couple of hours, the uncertainty in the strength of the peak is large, the bright moon interferes, and morning twilight is only minutes away.

On Saturday, September 8, at 8:57 PM, you can see an interesting event with one of Jupiter's moons. With a medium sized (6 inch) telescope, look 20 degrees above the southwest horizon for Jupiter. Europa's shadow falls on the celestial east side of the planet just as Europa itself emerges from in front of the planet on the celestial west.

On Monday, September 10, it is new moon, so you can hunt for faint fuzzies all night.

On Wednesday, September 26, at 6:16 PM (5 minutes before sunset) the full moon rises spoiling any chance of seeing faint fuzzies for the whole night.

On Saturday, September 29, about 6:45 PM, you might be able to see Mercury. With binoculars look very low in the south-southwest for the magnitude 0 planet. This is best chance of seeing Mercury in the evening for many months, but it is a rather poor one because the planet will set 56 minutes after the sun.

Also on Saturday, September 29, about 7:45 PM, you can see an unusual event with one of Jupiter's moons. With a small (3 inch) telescope look 20 degrees above the southwest horizon for the planet. Calisto will be passing just under Jupiter's south pole.

Jupiter and Io
Photo credits: John Spencer (Lowell Observatory) and NASA

Planetary Magnetic Fields

Continued from page 4

lenge to the dynamo theory. Mercury may be a special case of the theory or have other special circumstances we are not aware of. Clearly there remains much more to be learned from this tiny planet about its magnetic field and its origins.

Venus has had no magnetic field detected to date. This is a bit surprising as its size is close to that of the earths and especially with the great evidence of volcanic activity on Venus, [1]. This would indicate some sort of active internal heating and fluid motion. The solar wind impinges directly on the upper atmosphere of Venus. It forms a shock wave when it hits this atmosphere. This interaction produces ions in the atmosphere. The boundary where the pressure from these ions balances the pressure from the solar wind is called the ionosphere, [1]. The ionosphere is very similar to the magnetosphere that surrounds a planet with an intrinsic magnetic field. (thus the small induced field). Also recall that moving electric charges produce magnetic fields. Over time these ions are stripped away from the atmosphere of Venus joining the solar wind. Thus the solar wind both deposits particles and takes them away from Venus.

Its extremely slow spin may account for why it has no intrinsic magnetic field according to the dynamo theory. Venus is almost the size of the earth. Is the interior core already all solid or mostly so? It is still a puzzle why Venus has no detectable intrinsic magnetic field, (or not yet detected). Perhaps it had one in its past and we cannot detect any sign of it now? The surface of the planet is so hot that no magnetic field can be permanently induced in its rocks, [9]. More data will be needed to get all the facts and account for the seemingly lack of a magnetic field.

The Earth has had a magnetic field for millions of years. Our magnetic core model indicates that there is in the earth, a solid inner core of iron surrounded by a liquid iron outer core. According to the dynamo theory model, electric currents moving in the liquid, outer portion of the earth's iron core create this magnetic field. The rotation of earth causes these currents to produce the magnetic field, [1]. The shape, stability, and magnetic pole reversals, (roughly every 500,000 years) of the Earth's magnetic field have been replicated on supercomputers, [1]. Our magnetic field is inclined about 11 degrees to our axis of rotation.

The magnetosphere of the Earth is also fairly well defined. A shock wave is produced where the supersonic wind is slowed to subsonic speeds on the outskirts of the magnetosphere. Most of the solar wind is therefore deflected around the Earth. The magnetosphere of the earth seems to be quite stable despite the fluctuations in the solar wind. The strength of this magnetic field traps charged particles in two huge doughnut shaped rings called the Van Allen belts, [1]. It also causes great currents to be produced which travel along the magnetic field lines of the Earth towards the North and South magnetic poles. When these high-energy ions enter the upper atmosphere they collide with its atoms and excite them to higher energy levels. These excited atoms release their excess energy in the form of visible light called the auroras.

There are still questions regarding the magnetic field of the earth and its properties. For example the recurring pole reversals on the earth are still not well understood, partly because they seem to occur in different ways, [9]. But overall the dynamo theory describes the earth's magnetic field rather well. Remember though, it was developed for the earth's magnetic field and we have data for millions of years, (in the remnant magnetic fields in rocks for example).

The Mars Global Surveyor found the planet Mars to be magnetized in crustal patches, like the earth's moon but several time stronger, [7]. It does have an iron rich regolith but is still the least dense of the terrestrial planets. Therefore its total iron content cannot be that high. These magnetized regions in the crust of Mars are thought to be remnants of an earlier time when Mars had an active interior and a planetary magnetic field, [1]. It is like a weak magnet with a remnant field. Meteorites from Mars have also showed remnant magnetic fields, [9]. There may also be some induced magnetism due to currents in the ionosphere, (as with Venus). {6]. Its small size probably helped dissipate its internal heat long ago, (yet Mercury seems to have a magnetic field?) and despite its quick spin, without any currents no intrinsic magnetic field can be made according to the dynamo theory. More data obviously needs to be collected to help explain some of these questions.

Jupiter has the strongest and largest magnetic field of all the planets. The detection of synchrotron radiation, (emitted by electrons spiraling along magnetic field lines) from the planet was one of the first clues. Later inspection by satellites confirmed this.

The magnetic field of Jupiter according to the dynamo theory is thought to be produced by the motions of an electrically conducting fluid in its interior like in the earth. This fluid in Jupiter is thought to be a form of hydrogen that acts like liquid metal, [1]. Deep inside Jupiter the pressure is so great that the electrons are stripped from their protons and an ion mixture is formed. Jupiter's very fast rotation and internal convection currents direct the motion of these free electrons. This motion creates an electric current and that is why this particular state of matter is called liquid metallic hydrogen. Hydrogen has been transformed into this special state in the laboratory. The complete model for Jupiter's internal structure is one with three regions. It consists of a rocky core, a layer of liquid metallic hydrogen, and a layer of molecular hydrogen. The cloud patters we see from earth are in the outermost 100km of the exterior layer of the molecular hydrogen, [1]. It is not yet clear exactly where this fluid motion occurs within Jupiter. The magnetic field axis is inclined about 10 degrees from the rotation axis and its poles are the opposite of the earth.

The resulting magnetosphere of this giant planet actually encompasses some of its moons! The shock wave alone that surrounds the magnetosphere is about 30,000,000km across. This magnetosphere also responds to the changing solar wind. It can expand and contract by large factors and seems to do so frequently, [1]. It generates huge sheets of electrical current with all the moving, entrapped charged particles. There are Van Allen Belt type regions also around Jupiter. There are regions of plasma in the inner areas of the magnetosphere with astoundingly high temperatures! The planets fast spin and strong gravitational influence also distort this huge magnetosphere. It seems to be deeply connected to the planets interior and rotates close to the planets rotational period.

In fact the magnetic filed spins so tightly and fast with the planet that when it passes over moons in its in-

Continued on page 15

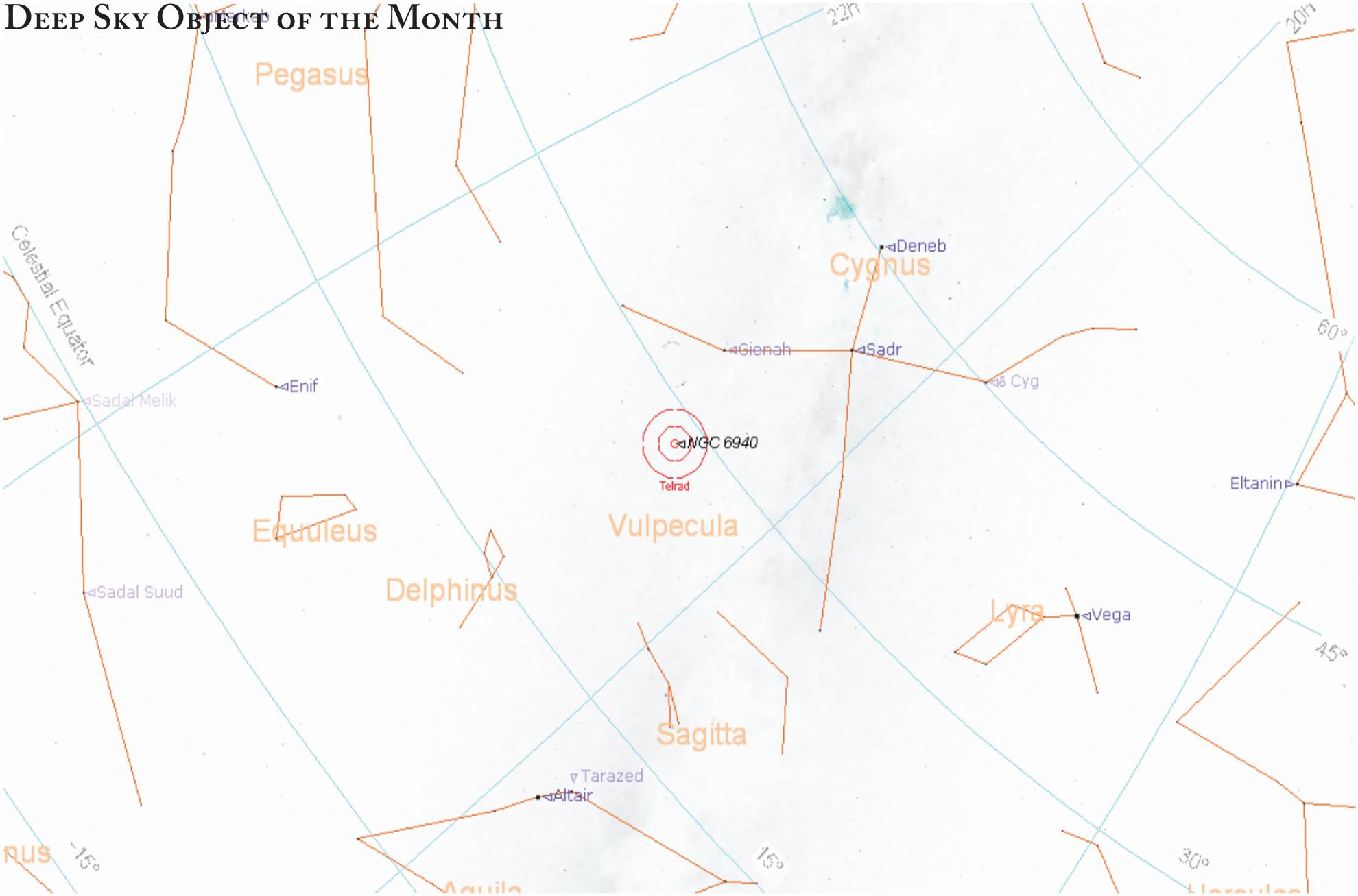


Chart generated with Starry Night Pro

NGC 6940 (Melotte 232) Open Cluster in Vulpecula

RA 20h 34m 35.7s DEC +28° 18' 22" Magnitude: 7.2 Size: 31.0'

Planetary Magnetic Fields

Continued from page 13 terior in it induces an electric current in the moons. This current helps generate a magnetic field within the moon also. The moons of Jupiter also contribute particles to the planet's magnetosphere, mainly from their volcanic activity and from their surface electrical interactions.

The interior structure of Jupiter that accounts for its huge magnetic field is largely derived from dynamo theory. More information will be needed to confirm this model. Some other interpretations of the data give Jupiter multiple magnetic poles as well, [9]. If the dynamo theory was correct for Jupiter then we should expect Saturn to have a very similar magnetic field, but we will see that it differs in many ways from Jupiter. Saturn has a similar modeled internal structure to Jupiter and also has a strong intrinsic magnetic field. It also has the lowest density of any planet in the solar system! The models suggest that Saturn has a rocky core, (perhaps larger than Jupiter's!?), a mantle of liquid metallic hydrogen, and an outer layer of liquid and gaseous molecular hydrogen, [1]. This structure combined with its rapid rotation and internal convection is thought to be the source of its magnetic field. It does measure weaker, perhaps due to its slower rotation and smaller volume of metallic hydrogen, (more helium?). Since Saturn is further away from the sun it interacts with fewer particles from the solar wind and its moons also do not contribute as many particles to its magnetosphere. It has also been discovered that the icy rings of Saturn absorb charged particles. The planet does show some concentration of charged particles in Van Allen type belts that exist in its magnetosphere. The poles of Saturn are the reverse of the earth.

Its magnetic field is only about 1 degree off from its axis of rotation, (the closest of any planet to its rotational axis), and this is a bit confusing as the dynamo theory predicts that the magnetic axis cannot be aligned with the rotational axis. This discovery was a big surprise to astronomers. Other models of the data also show Saturn with more than one magnetic pole, [9]. Perhaps there is a layer of conducting liquid helium rotating above the dynamo region in Saturn to account for the symmetry in its axial alignments, [9]. There are questions on some of the radio emissions from Saturn as well, that do not fit the standard dynamo theory models, [9]. Thus we see differences from Jupiter as well as incomplete dynamo modeling for Saturn. More data and exploration are needed to resolve these issues. Perhaps another model will be found for these strange planets with their powerful planetary magnetic fields.

Uranus has a magnetic field. It has some rather strange aspects though. One strange aspect of this field is that the magnetic field is oriented 59 degrees to its axis of rotation, (which is tilted 98 degrees to the plane of its orbit). Another strange aspect is that its magnetic field appears to be slightly offset from its center as well. Its poles are also the opposite of the earth. A model of its interior assumes a simlilar structure to Jupiter and Saturn. A rocky core surrounded by a mantle of highly compressed water, with a covering of liquid molecular hydrogen and helium. The usual explanation for the large offset of its magnetic axis and the slightly off center magnetic field is that perhaps a magnetic field, (pole) reversal as taking place. Such reversals are common on the earth. Perhaps there was a traumatic collision in the planets past that could explain this? Since Uranus is not massive enough to form liquid metallic hydrogen another model is needed to form the currents and magnetic material needed for an intrinsic magnetic field according to the dynamo theory. One idea is that the highly compressed water membrane around the rocky core is full of dissolved ions such as ammonia, [1]. Water is an excellent conductor with ions in solution, so that these currents in the conducting solution may give rise to the magnetic field. The magnetosphere is fairly empty out this far from the sun and the rings of the planet also absorb particles, [9]. Thus we need to put another interior model together to fit the data as best we can, based on the dynamo theory. Many unanswered questions remain though. For example, the magnetic field of Uranus seems to rotate around the planet sun-line, which does not occur on the earth, [9]. This unexplained property also causes the magnetic field lines to twist about each other in the tail of the magnetosphere. There are other changes in the planet's magnetic field that we have no explanation for as well. Again we need to gather more data and perhaps develop new theories to better understand this planets complex magnetic field.

Neptune is much like Uranus in having a strange magnetic field. The internal structure is thought to be the same, except it contains a larger solid core, (it is more massive than Uranus). Like Uranus its magnetic field is tilted. It is 47 degrees from its axis of rotation and slightly off center as well. It s poles are also the opposite of the earth. At this distance from the sun there are not many particles in the magnetosphere. The rings of Neptune also absorb particles, [9]. The moon Triton that is within the magnetosphere of Neptune also releases particles from its atmosphere into the magnetosphere of Neptune and contributes to its plasma.

Perhaps the capture of its moon Triton has something to do with the magnetic axis offset? Or Uranus too, could be undergoing a pole reversal. Other interpretations of the data along the dynamo theory lines give different numbers for the center, (still offset) and tilt of the magnetic field, [9]. Some use multiple magnetic poles as well in the modeling. Like on Uranus there are irregular magnetic areas on the surface of the planet, it is not totally homogeneous. What exactly are the ions in each planet that form the conducting fluids? How uniform is their density throughout the layer? Is the offset in both planets caused by the varying of the magnetic layers in the interior? Overall perhaps the magnetic fields of these two planets are more closely related to each other like those of Jupiter and Saturn?

Pluto as far as we know does not have an intrinsic magnetic field. Its small size and far distance from the sun give little hope that it has a molten or convecting core, and any magnetic field may be a remnant. Obviously more data needs to be collected for any definitive answers.

The conclusion of this article will appear next month, in the October edition of the Observer.

The Observer is the official publication of the East Valley Astronomy Club. It is published monthly and made available electronically as an Adobe PDF document the first week of the month. Printed copies are available at the monthly meeting. Mailed copies are available to members for a slight surcharge to offset printing and mailing expenses.

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Keep Looking Up!

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