

Focused

The Valley of the Moon Observatory Association Newsletter
(a non-profit science and astronomy education organization)



Fall 2006

Volume IX Number 4

The Good Old Days of the Solar System

By Robert Davis

You kids these days with your Kuiper Belt objects and Oort Cloud. When I was your age I never had a Dwarf Planet. Ok, so while the theme sounds familiar the subject matter doesn't seem to fit. The thing is, the solar system is much more complicated now than when I (and at least a few of you) were children. Back then we just had the sun, nine planets, an asteroid belt and an occasional comet or two. Today we have the same sun but only eight planets, a few dwarf planets, planetoids, minor planets, mesoplanets, the Kuiper Belt, Scattered Objects, the Oort cloud, plutinos, cubewanos, Trans-Neptunian objects, Centaurs, Trojans and Damacloids. When I was in third grade I learned the mnemonic "Mary Visits Every Monday Just Stays Until Noon Period" as an aid in remembering the order of the planets. The hardest part was trying to remember if Mary or Monday was for Mercury or Mars. That obviously stuck with me all these years but now I have no way to end the sentence because I lost the "Period". Back in August, Pluto was demoted from its long standing status of planet to a Dwarf Planet. I'm not really going to discuss whether or not Pluto should still be a planet or not but in the process of describing the "Solar System of Today" I may shed some light on why the question even came up. I will sneak in my two cents worth and say that it might have been a little less confusing if the title for this new breed of Not-A-Planet type object didn't contain the actual word "planet".

Anyway, back to the latest version of the solar system. This is just a basic overview because, as I found out researching this stuff, there is a lot going on out there. Informally, the solar system can be divided into three sections: the inner solar system, outer solar system and Trans-Neptunian. The inner solar system is where we live and we seem to have a pretty good handle on what is going on in this region. We have the sun, Mercury, Venus, Earth, Mars and the asteroid belt. The outer solar system houses the gas giant planets Jupiter, Saturn, Uranus and Neptune and then everything from about 30 AU (1 AU is about 150,000,000 km or 93,000,000 miles) out to the maximum orbit distance of about 1 light year (roughly 9.5 km or 6 trillion miles) is the Trans-Neptunian region. This division is not an "official" system and you may find some references to the inner solar system as being from the sun to 30 AU and everything beyond that as the outer solar system. The Trans-Neptunian region is then divided into the Kuiper Belt, Scattered Disc (or Disk) Objects and the Oort Cloud. The objects in this region are occasionally perturbed by external forces (maybe a gravity wave from two black holes colliding or something) and sent into the inner solar system and a comet is born. I wonder if Pluto got pushed if it would then be reclassified a "Gargantuan Comet".

The Kuiper Belt is similar to the asteroid belt in that the objects it contains orbit about in

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<http://www.rfo.org>

Public Viewing at Robert Ferguson Observatory

September 23, Saturday

Public Observing Night 8 pm
Public Solar Observing noon – 4 pm

October 21, Saturday

Public Observing Night 8 pm
Public Solar Observing noon – 4 pm

November 16, Thursday

Leonid Meteors 7 pm
Deep sky observing through telescopes
before peak of meteor shower 2 to 4 am

November 18, Saturday

Public Observing Night 6 pm
Public Solar Observing 11 am – 3 pm

November 24, Friday

Public Solar Observing 11 am – 3 pm

No public viewing events in December

Evening public viewing is \$2 per adult, 18 years or older, plus \$6 per car State Park fee. Donations accepted. Dress for cold nights! For current observatory information call (707) 833-6979.

Fall Classes (see Page 3)

Fall Night Sky Series

Sept. 19 & 26, Oct. 17 & 24
Nov. 14, Dec 12

Observing Labs

Binaries October 18

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Editor: (open)
Editorial Asst.: Colleen Ferguson
Publisher: George Loyer

Contributors: Robert Davis
Colleen Ferguson
George Loyer
Jack Welch

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cferguson@rfo.org

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cferguson@rfo.org

VMOA Mission Statement

The VMOA is a group of volunteer amateur and professional astronomers organized as a non-profit association to provide educational programs about science and astronomy for students and the public. To that end, the VMOA operates the Robert Ferguson Observatory in Sugarloaf Ridge State Park in association with California State Parks.

VMOA Board of Directors

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Secretary: Colleen Ferguson
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Bill Russell
Gordon Spear
Cecelia Yarnell



President's Message

By George Loyer

This quarter, as we wind up the busy summer season, I want to take a moment to let you know about a few events that are coming up and progress on our long term project.

On November 8, 2006, Mercury will transit across the disk of the Sun, visible here in Sonoma County. The VMOA will set up telescopes in places that are better suited

for observing the event than the observatory, and will have our solar viewing during the day at RFO as well. Stay tuned for more information about this event and our plans to observe it this Fall.

Project 40 is making slow but steady progress. The 40 inch mirror is, at last, starting to be ground. Steve Follett has completed adjustments on the grinding machine and has begun the process of grinding to the fine grits that will precede the polishing stages. It's been a long road to get the machine ready and operating reliably enough to feel that the mirror is safe in its "hands". In the meantime, the design committee continues to make progress on the mount design for the 40-inch telescope. Details of the piers and the trusses have been completed, and the next thing to be tackled will be the holder for the tertiary diagonal flat mirror.

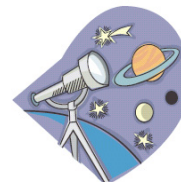
The VMOA is making plans to celebrate 10 years in operation - this coming February marks the tenth anniversary of the observatory opening its doors. If you have any thoughts about how you think we should celebrate, please pass them along to me at gloyer@rfo.org. We expect to make it an intimate affair for those who have followed our progress over the last 10 years. I'd appreciate your ideas!

New VMOA Board Member

The Valley of the Moon Observatory Association added Cecelia Yarnell to the Board of Directors on July 22, 2006. In addition to being an active docent at RFO, Cecelia is a Sonoma County Astronomical Society board member and produces its newsletter *Sonoma Skies*. Her long-time interest in astronomy blossomed during the Shoemaker-Levy 9 comet impacts in 1994. Cecelia borrowed a telescope and observed the changes in Jupiter. Experiencing public viewing at RFO made her an avid fan of the observatory. Cecelia is a professional graphic designer when she's not looking through her telescope.

Focused Now Available Electronically

Would you like to receive the quarterly newsletter Focused with color photos and without another piece of paper in your mailbox? If so, please send an e-mail message to cferguson@rfo.org stating that you would like to receive Focused electronically. This will save RFO money and be better for the environment. Thank you to all those who already made the switch!



Fall

2006 RFO Class Schedule

Night Sky Series

Each class includes a lecture on the constellations of the season, their history and mythology, and how to find objects within them. Learn the bright stars, deep-sky objects, and visiting planets of the summer and fall skies. After each presentation (sky conditions permitting), you will enjoy a review of the constellations in the actual night sky and learn how to find them for yourself. The constellations, and the objects within them, will be viewed through binoculars and telescopes, including the Observatory's 24-inch reflecting telescope, until or beyond 10:30 pm (depending upon interest and enthusiasm).

Fall classes will be held on Tuesdays at 7 pm
on September 19 & 26, October 17 & 24, November 14, and December 12.

Fee: \$75 for 6-class series or \$23 for single class

E-mail: nightsky@rfo.org to reserve a space in this popular class

Observing Labs

An intensive telescope observing session after a brief presentation on the night's theme. Handouts/Observing lists provided. Attendance limited to 6.

Fee: \$30.

For reservations, email: nightsky@rfo.org

Binaries (Fall): Binaries and Multiple Stars

Wednesday, October 18, 6:30 pm [Raincheck date: Wednesday, October 25]

RFO and SCAS at Downtown Santa Rosa Market

By Colleen Ferguson

RFO docents and members of the Sonoma County Astronomical Society (SCAS) participated in the Downtown Santa Rosa Market on Wednesday, August 2, from 5:30 to 8:30 pm to promote the observatory and the local astronomy club. The display included the ½"=1' scale model of the observatory, a standing display demonstrating light reflection and some posters, and an 8" Schmidt-Cassegrain telescope. We distributed RFO pocket schedules and RFO and SCAS brochures.

After almost 10 years in operation, it's amazing how many of the market attendees did not know about the RFO. The most frequently asked question was about "the Mars thing" that people had heard about on the Internet. We explained over and over that this is recirculated old news from a few years ago and that Mars is not particularly interesting this year. Some visitors expressed interest in classes at the RFO and others hoped to learn more about operating or repairing their telescopes by visiting RFO.

Most of the evening there was too much light for astronomical viewing (and the moon was not visible) so the telescope was just pointed at a tree branch to show the power of looking at objects with magnification. But just before the market ended we were able to get Jupiter and three moons in the eyepiece. That was a big hit with vendors from nearby booths as well as passersby. Staffing a non-profit table at the market was a worthwhile promotional activity and lots of fun, too. It's something we'd like to do again next year.

Watching the Fall Sky

by Jack Welch

There is so much happening in the sky this fall that you are going to need to use up all your sick time at work to take it in! In particular, there are several planetary conjunctions (close together in the sky) and many lunar occultations, including three (!) of the *Pleiades*. I will save the occultations for the end of this article.

On 10/6 the full moon occurs near perigee (closest orbital point to Earth) causing large tides at the coast. Also, we have two opportunities to view the *Zodiacal Light*, which is sunlight reflecting off dust and debris in the plane of our solar system. When it falls in a dark region of sky on moonless nights near predawn (or post-dusk) twilight, we have a chance to view it. You will need to be in a dark location without any light pollution in the eastern half of the sky and no haze or clouds. Look due east around 5:00am between 9/21 and 10/4, or around 5:30am between 10/20 and 11/2. It will appear as a tall, thin, tapering glowing triangular region somewhat like the glow of the Milky Way. The base will be near Saturn and the bright star Regulus in Leo. It will rise through Cancer and get lost in the glow of the Milky Way in Gemini.

Another *very special event* occurs during the day of 11/8: Mercury will transit the sun! Observing this event requires suitably large telescopes equipped with special filters for viewing the sun. DO NOT attempt to view the sun directly yourself! I am certain the event will be carried live at various websites (try NASA or do a web search). Transits of the sun's disk by Mercury only occur about 13 times each century. The approximate (± 1 minute) times are: 11:12am (leading edge contact inward); 11:14am (trailing edge contact inward); 4:08pm (leading edge contact outward); 4:10pm (trailing edge contact outward).

On the evening of 9/27, the crescent moon is near the star Antares in the southwest after sunset. On the morning of 10/16, the crescent moon will be near Saturn in the east before dawn. On 10/21, the *Orionid* meteor shower peaks (best viewing from midnight until 5:30am). While not spectacular, there should be many more meteors than usual this night. On the morning of 11/13 the moon will be near Saturn. On 11/14, the second-brightest asteroid *Iris* is at opposition and reaches magnitude 6.8, providing a good opportunity for telescope observers. It is located in Aries (consult finder's charts). On the morning of 11/17, the *Leonid* meteor shower peaks. This is always one of the year's best meteor showers and is sometimes awesome (though that's not expected this year). *RFO will be open* for general night observing on Thursday, 11/16, starting at 7 pm and people are welcome to stay until dawn to watch the meteors.

From about 11/19 to 12/7 or so, Mercury will have its best morning appearance of 2006, with greatest elongation west on 11/25. Begin looking about an hour to 45 minutes before sunrise. At the very end of its appearance, there will be some spectacular conjunctions. On the mornings of 12/9 and 10, Mercury will be near Mars. On the mornings of 12/10 and 11, Mercury will be *very near* Jupiter (0.1° at the closest ... use binoculars). At their closest on 12/10, these three

planets will fall within a circle 1° across. *This is the closest grouping of 3 naked-eye planets since 1980 and another such grouping won't occur until 2050!* Observing these conjunctions will be a challenge. The three planets will be very low (6° altitude) in the east-southeast 30 minutes before sunrise. Select a site with a very clear ESE horizon. Begin looking by 6:45am (in Sonoma County... time will vary elsewhere). You will have a brief time to spot the planets before the sky becomes too bright (use binoculars). Jupiter is brightest (mag -1.7), then Mercury (mag -0.6), then orange-red Mars (mag 1.5). Meanwhile, on the morning of 12/10 the waning gibbous moon will be very close to Saturn.

On the morning of 12/15 the crescent moon will be very near the bright star *Spica* in Virgo. Then, on the mornings of 12/18 and 19, Mars will be near the star *Antares* in Scorpius. This will be difficult to view (exactly as in the paragraph above). Jupiter is just above them, and a thin crescent moon joins the group on 12/18. In the following weeks, Mars begins moving away from Antares, but they will rise a bit earlier and higher in the sky prior to sunrise. The name "Antares" means "rival of Mars" since this orange-red supergiant star much resembles Mars. We have this opportunity to make our own comparison. The slightly variable Antares will be slightly brighter than Mars. On the morning of 12/22, the *Ursid* meteor shower peaks.

Finally, those lunar occultations! [Note: Space limits the details I can present here. Join the RFO email list by sending a request to nightsky@rfo.org to get more detailed messages.] On 10/4, 9:25pm, mag 5.5 *83 Aqr* disappears behind the moon's dark limb, and a few hours later, 10/5, 3:14am, mag 4.2 *phi Aqr* does the same (both telescope only). On the morning of 10/9, the close ($1.4''$ separation) equal binary star *epsilon Ari* disappears behind the bright limb at 4:24am and reappears from the dark limb at 5:30am (telescope required and the disappearance is challenging).

On the evening of 10/9 is the first of three occultations of the *Pleiades* star cluster. While telescopes are best, this will reward binocular views as well. Already in progress when the moon rises in the east-northeast, it continues until about 11:30pm. Stars will disappear (D) on the bright limb and reappear (R) on the dark limb. Events: 17 Tau R 9:31; eta D 9:44; 23 R 10:06; 27 D 10:26; 24 R 10:35; eta R 10:38; 27 R 11:02; 28 R 11:13.

On 11/28, *phi Aqr* disappears (dark limb) at 5:33pm and reappears at 6:47. Between, at 5:54, a mag 7.5 star will disappear. At 9:08, *96 Aqr* disappears, followed by a mag 7 star at 10:31.

On the early morning of 12/3, the binary *epsilon Ari* (see above) disappears behind the dark limb at 12:40am, its companion disappearing about 2 seconds before the primary (use high magnification!). Then, at 12:48, the asteroid *Iris* (mag 7) disappears. At 1:40am, *epsilon Ari* reappears from the bright side (difficult).

On the evening of 12/3, our second occultation of the *Pleiades* occurs in the east-northeast very much as before except that stars will disappear on the dark limb and reappear on the bright limb: 23 D 5:14pm; 17 "near miss" 5:17; 24 D 5:43; eta D 5:45; 23 R 6:09

(difficult); 28 D 6:24; 27 D 6:24; mag 7 star D 6:40 (difficult); eta R 6:41; 27 R 7:11.

On 12/27 we have: 62 Psc D (dark) 9:49pm; *delta* Psc D 10:30; *delta* R 11:11 (difficult).

Finally, our third *Pleiades* occultation on the morning of 12/31, with the moon low in the west-northwest: 16 Tau D (dark) 3:31am; 17 D 3:36; 19 D 3:49; 20 D 3:56.

The Good Old Days of the Solar System

(continued from Page 1)

the plane of the solar system, or the ecliptic, something like a flat doughnut. The Scattered Disk area contains objects with orbits that are more eccentric and inclined and the Oort Cloud is more like a bubble that encapsulates the entire solar system. To get some idea of how these things got there, we can think a bit about how the solar system was formed. The basic idea is that it started out as a big cloud of gas and dust. As time passed by, gravity started pulling these particles together and when enough particles were forced into a small enough space the pressure ignited the sun. The sun started generating the solar winds which blew most of the lighter stuff farther out. The heavier stuff stayed closer in and coalesced into the inner planets while the lighter stuff formed the gas giant outer planets. The rest of the flotsam and jetsam make up the Trans-Neptunian Objects. What is interesting about these TNOs is that they are, in essence, the primordial soup of the solar system. They are made up of the most basic building blocks of what was used to form the solar system.

According to Wikipedia, asteroids, minor planets and planetoids are interchangeable and are defined as “minor celestial bodies of the solar system orbiting the sun that are smaller than major planets but larger than meteoroids (commonly defined as being 10 meters across or less), and that are not comets”. They are then broken down into families such as Vulcanoids, Apheles, Arjuna, Amors, Trojans (Jupiter Trojans, Neptune Trojans, etc.) and various planet crossers such as Mercury-crosser, Venus-crosser, etc. Vulcanoids orbit entirely within the orbit of Mercury and currently only exist in the minds of those who have searched for them. Apheles orbit within the Earth’s orbit. Arjuna are vaguely defined as having a similar orbit to Earth. This grouping would include Apheles, Amors, Atens and Apollos. Trojans are asteroids that share the same orbital period as the planet that they get their name from and are found in the Lagrange point known as L4 and L5 just ahead and just behind the planet. Crossers are easy enough to figure out – the asteroid crosses the orbital path of the planet. Venus-crossers include Mercury-crossers because they have to cross Venus on their way to Mercury but not all Venus-crossers make it to Mercury. Earth-crossers are further broken down into Atens and Apollos. Atens have a semi-major axis of less than 1 AU and Apollos are greater than 1 AU. The asteroid belt itself is even broken down into the Inner Main Belt, the Middle (or intermediate) Main Belt and the Outer Main Belt and clear areas known as Kirkwood gaps. Now what about these Centaurs and Damocloids? Centaurs are a class of icy planetoids that orbit the sun between Jupiter and Neptune. It

is theorized that Saturn’s moon Phoebe may be a captured Centaur. Damocloids are asteroids that have long-period highly eccentric orbits that are commonly found with comets but these objects do not exhibit cometary comas or tails.

I know I have not covered every type of object that was listed at the beginning (and I probably didn’t even get them all) but it seems one would have to write a small book to describe everything we now define our solar system to contain. Long gone are the good old days when “men were real men, women were real women, small furry creatures from Alpha Centauri were real small furry creatures from Alpha Centauri” (Hitchhikers Guide to the Galaxy in case you didn’t know), and the solar system was simple.

From the RFO log...

June 23 OBSERVING LAB: The Summer Session of the “Diffuse Nebulae, Star Formation and Open Clusters” Observing Lab was a lovely observing experience. Besides the usual suspects (Lagoon, Trifid, Butterfly, Wild Ducks, etc.) there were plenty of overlooked and underappreciated objects that we marveled upon. For instance, I saw the open cluster NGC6231 in southern Scorpius for the first time. It just barely rises above the lowest part of the hills to the south and remains visible for probably less than an hour. And, with the horizon turbulence, it looked as if it were on the bottom of a rippling stream. But, somehow, that added to the lovely effect of all those bright and colorful stars.

June 24 PUBLIC SOLAR VIEWING: Solar radio telescope, an h-alpha scope and a prism were set up for the 26 visitors that came by on a very hot summer afternoon.

June 24 PUBLIC NIGHT VIEWING: 52 adults and 25 children visited RFO to look through the telescopes at Jupiter, M13, M57, M81 & M82, M8 and M20.

July 22&29 PUBLIC NIGHT VIEWING: 66 adults and 14 children the first evening/94 adults and 63 children the second evening came up for views of the crescent moon, Jupiter, M11, M51, M22, M8 and M17. Many “wows” over the Whirlpool Galaxy. For one 52 year old visitor it was his first time looking through telescopes.

August 26 PUBLIC NIGHT VIEWING: 69 adults and 26 children looked and learned on a beautiful RFO summer night. Viewing included Jupiter, M11, M22, M51 and M15, Albireo, the Double Cluster in Perseus, the Andromeda Galaxy and Neptune. In addition to viewing, visitors to the CCD heard a great talk on Sagittarius and the Milky Way Galaxy.

September 17 OBSERVING LAB: Our second annual “Star Death: The End of Stellar Fusion” Observing Lab was a success! This year, the CCD scope was in operation for completing the “website” of object images that was available on the classroom computer for the attendees to peruse throughout the evening. The sky was quite clear and lovely. We got nice views of some very difficult planetary nebulae, and got to practice our averted vision skills.

Valley of the Moon Observatory Association

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