Focused

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

ROBERT FERGUSON OBSERVATORY

Fall 2011 **Volume XIV Number 4**

Not since the days of Galileo

By Robert Davis

Not since the days of Galileo have we seen Jupiter like this. I'm not for one second suggesting that Galileo Galilei had a better telescope than we have these days. What I'm talking about is the space craft named in his honor that was launched in 1989 and ended its mission with a death dive into Jupiter. During its 8 years in orbit it discovered intense radiation belts, volcanism on Io and evidence for water under Europa's icy surface. We did get a brief visit when New Horizons flew by Jupiter on its long voyage to Pluto and the Kuiper belt (ETA July 14, 2015). But now we are on our way back to visit Jupiter once again with a mission named Juno. According to Roman mythology, Jupiter (or Zeus to the Greeks) veiled himself in clouds to hide his, shall we say "mischief". Jupiter's wife Juno (or Hera) was able to peer through the clouds and reveal his true nature. And now we have reality imitating fiction as the Juno probe attempts to reveal the planet Jupiter's true nature.

Juno was launched on August 5, 2011. It will do a little sightseeing as it goes around the Sun and catches back up with Earth in October of 2013 at which time Earth's gravity will give it a big boost and fling it on out to Jupiter. Juno is scheduled to arrive in July of 2016, orbit Jupiter 33 times, in a polar orbit so it can explore Jupiter's north and south poles, and then it will end its mission the same way Galileo did – plunging head first into the thick atmosphere. I don't know that it actually has a head but you get the idea. The reason for crashing the probes into the planet is so they don't accidentally end up crashing into one of Jupiter's 64 satellites. We especially don't want to contaminate Europa with Earthly bacteria because there may be some form of life (like the tube worms that we've found near the thermal vents on the bottom of the ocean or maybe even the weird plant creature that destroyed the *Tsien* in A.C. Clarke's 2010) living under the ice. In any case, Juno's mission is to "improve our understanding of the solar system's beginnings by revealing the origin and evolution of Jupiter.

Juno has four main tasks the first of which is to determine how much water is in Jupiter's atmosphere. This should help us determine which

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http://www.rfo.org

Public Viewing at Robert Ferguson Observatory

September 24, Saturday
Public Solar Observing noon – 4 pm
Public Observing Night 8 pm

October 29, Saturday
Public Solar Observing noon – 4 pm
Public Observing Night 7 pm

November 19, Saturday
Public Solar Observing 11 am – 3 pm
Public Observing Night 6 pm

November 25, Friday
Public Solar Observing 11 am – 3 pm

Evening public viewing is $3 per adult, 18 years or older, plus $8 per car State Park fee. Donations accepted. Dress for cold nights! For current observatory information call (707) 833-6979.

Be sure to check out our new website at http://www.rfo.org for more interesting astronomical events and information.

RFO Classes (see Page 3)

Night Sky Fall Series

September 27

October 18 & 25

November 22 & 29

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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.

President's Message

by Colleen Ferguson

It's a strange world – here we are operating a very popular and busy observatory in a park that is to be closed. How can this be? Lately I have been attending a lot of meetings and talking to park visitors about Sugarloaf Ridge State Park. People consistently tell me what an amazing resource the observatory is to the community and what a unique and wonderful asset RFO is to the park. One of my favorite comments when I told someone I volunteer at RFO was "I love that place!" followed by a description of camping in Sugarloaf every year for the Perseid meteor shower. So many people love Sugarloaf Ridge for stargazing, camping, hiking, bicycling, nature immersion and waterfall watching that I have to believe that we're going to find a way to keep this park open. At this point many different ideas are being discussed; there is not one obvious path to follow. VMOA is actively participating in these discussions to make sure that the observatory is being considered in any potential plans for Sugarloaf Ridge and to actively support any efforts to keep the park open.

There are two organizations that are both important to local park closures and are doing very different things. The organization that is newest and closest to RFO is the Parks Alliance for Sonoma County, which is described in a separate article. The discussions among people brought together through the Parks Alliance are the best hope for getting Sugarloaf off the park closure list in the near future. The other organization, the California State Parks Foundation (CSPF), has the important role of supporting parks statewide and keeping the pressure on Sacramento regarding the park closures. CSPF's Closing Parks is Bad for California campaign includes giant postcards addressed to Governor Jerry Brown and citizen petitions: "We, the undersigned, strongly oppose the closure of 70 California's state parks. This is the wrong move to take at a time when Californians most need access to affordable, available park destinations and will cause an economic ripple effect to the state's budget and struggling local economies. Shutting the doors to state parks is a step backward in California's history of protecting and creating its world-class state park system". RFO did its part to support the Parks Alliance and the CSPF campaign by offering solar viewing every day over the Labor Day weekend, handing out literature and collecting signatures on the giant postcards and the petitions. Solar astronomers Loren Stokes and Merlin Combs were my heroes that weekend, showing up every day in the hot sun to share the observatory with park visitors.

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2011 RFO Fall 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 night 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).
The continuing Fall Series classes will be held on Tuesdays
Classes start at 7:00 pm on September 27, October 18 & 25, November 22 & 29
Look for information on the upcoming 2012 Winter Night Sky Series in the next issue of 'Focused' or online at http://www.rfo.org
Fee: $75 for 6-class series or $23 for a 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

Look for information on upcoming 2012 Observing Labs in the next issue of 'Focused' or online at http://www.rfo.org

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The Value of State Parks

by Juha Siikamaki

State parks in the United States can be a refuge for wildlife, a reservoir of plant diversity, or a source of untamed water. They are also a popular destination for recreation. But recent economic belt-tightening means that budgets for state parks are going under the knife. By analyzing data from five national surveys conducted between 1975 and 2007, Juha Siikamaki, an environmental researcher, attempted to assess the value of one aspect of state parks: recreation. About a third of the time people currently spend on nature recreation in the United States is accounted for in state parks. Although use of state parks has declined over the time period covered in the surveys, the cost of running the parks remains easily outdistanced by the recreation value derived from the parks. Following the conventional approach of valuing recreation time at one-third of paid wage time, the value of nature recreation in state parks reaches about $14 billion annually, whereas annual operation costs total about $2.3 billion. Thus, these sometimes unassuming parks build a network that delivers ecosystem and economic value, as well as just giving us a nice day.

[from Science, Vol. 333, 26 Aug 2011] (Proc. Natl. Acad. Sci. U.S.A **108**, 10.1073/pnas.1108688108 (2011) submitted byGeorge Loyer

Watching the 2011 Fall Sky

by Jack Welch

Before we consider the sky, let's start down here on earth with the tides. Both the September and October new moons occur when the moon is close to perigee (its closest approach to earth) producing unusually large tides. So from 9/27-30 and again from 10/26-29 it will be a good time to explore tide pools. And as it happens, these will also be good times to catch the *Zodiacal Light* in the east before morning twilight. Easily mistaken for light pollution, the Zodiacal Light is a faint glowing band arising from the horizon along the path of the *Ecliptic* and is caused by sunlight reflecting off dust and debris in the plane or disk of our solar system. Look for it around 5am from 9/25 to 10/8 or around 5:30am from 10/24 to 11/6. Your eastern sky view must be reasonably dark. I have observed the Zodiacal Light in the east easily from Sugarloaf Ridge State Park. A planisphere is handy for confirming that the glow you are seeing rises along the line of the Ecliptic, tapering as it ascends higher into the night sky and loses itself in the glow of the Milky Way.

Several planets will be good observing targets this fall. First, *Neptune* was at opposition in August so is well placed for evening observing through at least November. *Uranus* is at opposition on 9/25 so is at its best currently. It will be a good target through the end of the year. The king of the planets dominates the night sky all fall as *Jupiter* reaches opposition on 10/28 and will have an especially large disk size. It is a great observing target into early 2012. There will be a double shadow transit on 12/27 (see below). *Mars* is gradually approaching its March 2012 opposition and is now prominent in the a.m. skies. By the end of the year it will be rising before midnight. Mars passes near the large bright open star cluster M44 (*Praesepe* or the *Beehive Cluster*) on the morning of 10/1. Binoculars should provide the nicest view of this event. On the morning of 11/10 Mars is near the bright blue star *Regulus* in *Leo*. This should provide a lovely color contrast; binoculars are recommended. Try looking around 2am.

Venus emerges into the evening sky this fall, but stays low to the southwest horizon until late November. Look for the crescent moon near Venus around 5:30pm on 11/26 and again around 6pm on 12/26. *Mercury* has a poor evening appearance from about 11/7 to 11/23, reaching a maximum altitude 30 minutes after sunset of only 5° on 11/15. During the first half of the month Mercury and Venus will be very near each other (Venus is much the brighter of the pair) even if challenging to spot low in the southwestern early twilight. If you spot Venus then try using binoculars to help spot Mercury. Around 11/9 and 11/10, this pair will be near the bright red star Antares. Mercury then provides a very good morning appearance from about 12/10 to 1/11, though it will be rather dim until after mid-December. It reaches a maximum altitude of 12° 30 minutes before sunrise on 12/21. Once again, Antares will join Mercury just before Christmas. A 6% crescent moon is near Mercury on the morning of 12/22, with Antares below this pair. The next morning a very challenging 1.7% crescent moon will be below Mercury near the horizon during the last 40 minutes before sunrise.

The moon is not kind to meteor showers this year! The famous *Leonid* meteor shower peaks on the evening of 11/17, which means that the morning hours of 11/18 are best for viewing. Unfortunately, the moon is at last quarter that morning and will obscure the show considerably.

I already mentioned crescent moons near Venus and Mercury, above. The moon is near bright Jupiter on the evenings of 10/13, 11/9 and 12/6. The moon is near Mars on the mornings of 11/19 and 12/17. With those large-tide-causing new moons in Sep and Oct, it should come as no surprise that the full moon on the evening of 10/11 is the smallest full moon of the year, occurring when the moon is near apogee. Finally, the moon offers us a total eclipse on the morning of 12/10. The moon enters earth's umbra at 4:47am and totality begins at 6:07am, during astronomical twilight. Totality

ends at 6:57, during civil twilight. The sun rises at 7:16 and the moon sets 5 minutes later, before the eclipse ends.

Now for that double shadow transit of Jupiter on 12/27: Europa is already in transit at sunset. At 6:05pm Ganymede's shadow begins to transit. At 7:44, Io is occulted (disappears behind Jupiter). At 7:51 Europa's shadow begins to transit, starting the double shadow transit. One minute later Europa itself emerges from transit. At 7:55, Ganymede's shadow ends its transit, ending the double shadow transit (only 4 minutes with two shadows!). At 10:15, Europa's shadow ends its transit. And for die-hard observers, Io reappears from eclipse in Jupiter's shadow at 11:07pm.

Check the RFO website for additional sky events, such as predicted times of minima of the famous variable star Algol, best observed on those long dark nights of late fall and winter. Fall ends at the *Winter Solstice* at 9:30pm on 12/21.

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*(***GALILEO** *from Page 1)*

planet formation theory is correct (or if we need to think up a whole new theory). It is going to study Jupiter's atmosphere in great detail measuring the composition, temperature, cloud motions and other properties. It will be probing Jupiter's deep inner structure by mapping out the magnetic and gravity fields and it will be taking a look at Jupiter's auroras. More specifically it will be studying the magnetosphere and how Jupiter's enormous magnetic force field affects the atmosphere.

The main idea behind the Juno mission is that hiding behind the dense cloud cover of Jupiter are secrets to the fundamental processes and conditions that governed our solar system during its formation. Getting a better understanding of how Jupiter formed may shed light on not only how our solar system was created and evolved but also how other systems around distant stars were formed. We know from the Galileo probe that Jupiter is mostly hydrogen and helium so the current theory is that it must have formed early on, but how it formed is unclear. The big question is, did a massive planetary core form which in turn captured the gas or, did an unstable region inside the nebula trigger the formation. Apparently the answer could be quite profound in the annals of solar system formation because the creation of Jupiter affected how the rest of the solar system developed. Another fundamental question is how deep Jupiter's colorful atmospheric zones, belts and other features penetrate. Juno will determine the global structure and motions of the planet's atmosphere below the cloud tops for the first time, mapping variations in the atmosphere's composition, temperature, clouds, and patterns of movement down to unprecedented depths. And last but not least, there is the question of what is at Jupiter's center. According to our friend A.C. Clarke it is a giant diamond, but these days we think it is something being called metallic hydrogen. The idea is that the pressure is so great at the center of Jupiter that the hydrogen gas is squeezed into a fluid that acts like an electrically conducting metal. This is believed to the source of Jupiter's magnetic field. By mapping Jupiter's magnetic and gravity fields, scientists are hoping to gain a better understanding of this "remarkable phenomenon".

There was no new technology developed for the Juno craft. It is using equipment like magnetometers, microwave radiometers, ultraviolet and infrared cameras. Juno is just applying the technologies in a much more focused way that has never been done before on Jupiter. Having said that, I must say that the Juno team did come up with one of the best acronyms ever: The Jupiter Energetic-particle Detector Instrument or JEDI. Juno is heading to Jupiter with a JEDI on board. Now how cool is that?

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*(***PRESIDENT** *from Page 2)*

Juxtaposed with all this action around the park closure is the activity of a thriving observatory with one or two private events every week through the summer and into the fall, well attended Night Sky classes and public events with so many visitors that the parking lot fills up. Undeterred by the threat of park closure, the observatory docents continue not just teaching hundreds of school children and interested adults about astronomy but also giving them the personal experience of interacting with the night sky. It is a strange world, but what happens at RFO makes is a better one. Thanks to everyone who supports the activities at RFO and the park that surrounds it.

The rate of water flow over Niagara Falls is approximately 750,000 gallons per second, or 3,125 tons of water per second. Astrophysicists have estimated that the Sun converts 600 million tons of hydrogen into helium every second.

Is the Sun About to Go Quiet?

By Loren Stokes

The Sun is finally emerging from a quiet two years with very few sunspots. Now, several sunspots are present for all public and private solar observing at the RFO. Sunspots occur when strong magnetic field lines rise from the Sun's interior and emerge from the surface. The magnetic field suppresses heat from rising to the surface, creating a cold spot - a sunspot. Cold is relative, as sunspots are 7,000 degrees F compared to 10,000 degrees F elsewhere on the Sun's surface.

Every eleven years the Sun goes through a sunspot cycle with new sunspots first occurring at high latitudes in both northern and southern hemispheres. As more occur, the sunspots appear at lower latitudes. At the end of a cycle, fewer occur and are located near the equator. After a quiet period, the next cycle starts with new sunspots appearing at high latitudes again. As each cycle is completed the Sun's main magnetic field lines in space running from pole to pole reverses polarity. In a sense, the emergence of a new cycle of sunspots signals a growing magnetic field with the opposite polarity of the previous cycle.

When the sun is at its sunspot maximum, it emits more power per unit area measured above the Earth's atmosphere than when at sunspot minimum - by about 0.1%. That doesn't sound like much of a change, but from 1645 to 1715 few sunspots were present. This event, known as the Maunder Minimum, is thought to have cooled the Earth a bit. Europe had the Little Ice Age.

Sunspot cycles are numbered sequentially starting with cycle 1 in 1760. The present cycle 24 is expected to peak in about two years. So far, it is much weaker than the previous cycle 23 with fewer sunspots, on average, each day.

In June at the annual meeting of the Solar Physics Division of the American Astronomical Society , three studies were presented that suggested the next sunspot cycle 25 may be even weaker than cycle 24, or may not occur at all.

First, the solar jet stream, located about 4,000 miles below the Sun's surface, starts at high latitudes and drops towards the equator as each sunspot cycle unfolds. Sunspots appear above the jet stream. Well before one cycle is over, the next jet stream starts again at high latitudes. The jet stream associated with cycle 24 started in 1997 while cycle 23 was well underway. One would expect the jet stream associated with cycle 25 to start eleven years later, in 2008. But no jet stream has emerged yet at high latitudes.

Second, the hot outer atmosphere of the Sun, the corona, is attracted to the poles as each new jet stream forms. This has failed to occur.

Third, the magnetic field strength in the dark centers of sunspots appears to be decreasing in a linear fashion over the last eleven years. In 2000, the average magnetic field strength was 2,500 gauss. Today, it is 2,000 gauss. (For reference, the Earth's magnetic field is 0.5 gauss). When the magnetic field strength on the Sun's surface drops below 1,500 gauss, sunspots do not form. If the field strength continues to drop in a linear fashion, it will reach 1,500 gauss in another eleven years.

What would happen if sunspot cycle 24 did not happen? What about another 70 year Maunder Minimum? The cooling effect of a quiet sun would offset Global Warming. We do not know which effect would dominate. Whether the Earth cools off, or heats up slower than we currently measure, I think this would not be good news. We may become complacent about Global Warming. We may continue to add carbon dioxide to our atmosphere at ever increasing rates. When the Sun finally returns to normal sunspot cycles, a warmer Earth may be inevitable.

You're invited! Shared Docent and Subscribers Night

Saturday, October 22, 2011 Starting at 7 pm

VMOA subscribers and observatory docents are invited to bring a couple friends or family members to RFO for a relaxed evening of stargazing. It's become a tradition to bring some food to share to add to the evening's fun.

The Parks Alliance for Sonoma County

Out of the doom and gloom of park closures came the new and vibrant Parks Alliance. VMOA has been part of the Parks Alliance since their first meeting in June and is actively collaborating with other Alliance members towards keeping Sugarloaf Ridge successfully operating and open to the public. At **parksalliance.com** you can subscribe to their mailing list and donate to specific Sonoma County parks, including Sugarloaf Ridge. The following is excerpted from the Parks Alliance web site:

Our Mission: Engaging the community to keep Sonoma County State Parks Open

The Parks Alliance was created in response to the State Parks Closure announcements in May 2011 in order to address the current and planned closures of State Parks in Sonoma County. When the closures were announced, the outpouring of support from individuals, nonprofits, businesses and public agencies in the county was astounding. Our goal is to harness that energy, bringing the community together to keep the parks open and functioning at a sustainable level.

The Parks Alliance sees this crisis as an opportunity. It is time to create a new model for parks in Sonoma County, and throughout California. We believe that we can bring the community together to create innovative solutions, efficiencies in park operations, and a system of parks, open space and public land in Sonoma County that residents and visitors will enjoy for years to come.

Sonoma County was disproportionately hit by the closure list, with 5 of the 70 parks located here. The State Parks on the closure list not only provide recreation opportunities, camping and access to the outdoors for county residents, but are vital pieces of California history. The 5 parks slated for closure in Sonoma County are:

1. Annadel State Park
2. Austin Creek State Recreation Area
3. Jack London State Historic Park
4. Petaluma Adobe State Historic Park
5. Sugarloaf Ridge State Park

The Parks Alliance for Sonoma County understands the urgent need to protect our State Parks, and to that end, we are supported by an amazing group of nonprofits, county organizations and individuals dedicated to keeping State Parks open. We are also working closely with State Parks staff to ensure access to the most current information, so that we can pass that information on to our partners and the community at large. You will find that information, plus much more as you move through our website, but we also want to hear from you. These State Parks hold a lifetime worth of memories for many of you, and we hope that you will share your experiences with us. Parks and open space are vital to our well-being, a strong economy and a quality of life that makes Sonoma County a great place to live, work and visit. With your support and energy we can and will keep our State Parks open!

Bay Area Science Festival: Unleash Your Inner Scientist

From October 29th to November 6th, the Bay Area will come alive with over 100 science & technology activities – lectures, debates, exhibitions, concerts, plays, workshops, and more. This ambitious collaborative public education initiative brings together our leading academic, scientific, corporate, and non-profit institutions to showcase the region as an international leader in innovation. Science happens all around us and directly impacts our daily lives – are you ready to unleash your inner scientist?

Programs include, Discovery Days, Wonder Dialogues, One City One Science Book, and Science at the Library. Other fun activities include Science Hikes, a Science Pub Crawl, and a Bay Area Wide Star Party.

Go to: www.bayareascience.org for more details about the programs and activities, and a full listing of days and times for all events. See you there.

Valley of the Moon Observatory Association

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