Focused

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

ROBERT FERGUSON OBSERVATORY

Spring 2017 Volume XX Number 2

Things to do on a Cloudy Day

By Loren Stokes

Over the past ten years as an RFO docent, I have come up with a few activities for children on cloudy days. Recently, several field trips and day camps were on cloudy days. With our new solar posters in the East Wing, we can show what we would see with clear skies. But that takes just a few minutes.

I have an eight-ounce iron-nickel meteorite about the size of a golf ball that I pass around. They have to figure out what it is. As it is passed around, hands drop a few inches not expecting it to weigh so much. It doesn't take long to identify it as a meteorite. I tell them it fell about 3,000 years ago in Argentina (a Campo del Cielo meteorite). When I ask how old it is, I don't think I have ever heard the correct answer – older than the planet Earth. By the way, eight ounces is about as heavy a meteorite I would recommend for children. A larger one, say one pound, if dropped on one's toes, would be like dropping a hammer on one's toes.

Iron-nickel meteorites are from cores of proto-planets. Perhaps one thousand proto-planets existed in the early Solar System. Their diameters varied from hundreds to thousands of miles. Ones large enough to melt from the heat of accretion and radioactivity differentiated, with heavy elements forming a metallic core and lighter rocky components forming an outer crust. Consider the 8,000-mile diameter Earth. It would take one thousand objects of diameter 800 miles to form the Earth.

Of all the iron-nickel meteorites found on Earth, they are traceable to just fifty different proto-planet cores. That is, there are only fifty unique ratios of iron, nickel, and trace metals, including isotopic ratios. The rest of the proto-planets accreted to form the planets we know. A few broke apart from collisions scattering parts of their cores in space. The two largest asteroids, Ceres and Vesta, have iron cores and are perhaps two remaining proto-planets.

Occasionally I set up a stepladder in the East Wing near the white calibration flat. Climbing a few steps puts one's head in line with the parked 14-inch robotic telescope. Looking into the telescope shows one's enlarged, upside-down head.

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http://www.rfo.org

Public Events at Robert Ferguson Observatory

April 8, Saturday
Public Solar Observing 11 am – 3 pm
Public Observing Night 8 pm
Special Lunar Observing Program

April 22, Saturday
Public Solar Observing 11 am – 3 pm
Public Observing Night 8 pm

April 29, Saturday
Public Solar Observing 11 am – 3 pm
Public Observing Night 8 pm
Special Astronomy Day Program

May 20, Saturday
Public Solar Observing 11 am – 3 pm
Public Observing Night 8 pm

June 17, Saturday
Public Solar Observing 11 am – 3 pm
Public Observing Night 8 pm

June 24, Saturday
Public Solar Observing 11 am – 3 pm
Public Observing Night 8 pm

Evening public viewing is $3 per adult, 18 years or older, plus $8 per car parking fee. Donations accepted. Dress for cold nights!

RFO Classes **(see Page 3)**

Night Sky Spring Series
April 17 April 24

Night Sky Summer Series
May 22 June 19 June 26
July 17 July 24 August 14

Be sure to check out our website at http://www.rfo.org for the RFO weather forecast and other interesting information.

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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 Steve Smith

Astronomers are keen and patient observers, all the more remarkable given that they're often painfully contorting themselves, Gumby-like, just to get their eye to the telescope. While many Earth-bound scientists bend down, studying the actual planet they're standing on, astronomers gaze up, paying an added tax of sore quads and stiff knees.

Many scientific discoveries are made by observing a change in something, measuring the change very carefully and repetitively, and then spending some time—often, a great deal of time—trying to figure out what just happened. Was there something else that happened at the same time as the observed change? Can that "something else" be a direct cause of the change, or is the "something else" merely a coincidence?

In the case of a supernova, the "something else" is most often the core collapse of the star, and that change happens only once because after the explosion, the star ceases to exist in its original form: it collapses to form a neutron star, or collapses even more to form a stellar black hole.

But other stars show periodic changes in their behavior and are called "variable stars" for obvious reasons: their light varies over time, due to either intrinsic forces within the star or extrinsic forces acting upon the star. Making analysis more difficult, many variable stars have a number of different forces acting on them at the same time: parsing out which force is causing what light change is tricky. And as if that's not enough, a single one-time anomaly, such as a star quake, can cause a blip in the data.

Studying a star over a long period of time gradually reveals its secrets, and part of that unveiling involves a very close look at timing. To determine what's going on with a star's variability, astronomers look at how often, how regularly, and how intensely, a star's light varies. These cyclical variations, if their analysis is refined enough, give astronomers an understanding of the physical and chemical mechanisms driving a star's behavior.

Those of us Earth-bound dwellers are cycle-bound as well. We generally get up and go to bed at the same time, maybe grab that second (or seventh) cup of coffee at about the same time every afternoon. The dog needs to be walked every morning, and if you forget, he'll be sure to remind you. New oil goes in the car every 5,000 miles. Periodicity is a feature of life, for all creatures.

Other cycles are part of our lives as well: the days of the week repeat themselves endlessly, as do the months and seasons, while away from the Earth but still very local, we have the 11-year solar cycle, the orbits of planets and asteroids, and short-period and long-period comets.

(turn to **PRESIDENT** *on Page 3)*

RFO 2017 Class Schedule

Night Sky Classes

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 and deep-sky objects 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 40-inch reflecting telescope, until or beyond 10:30 pm (depending upon interest and enthusiasm).

The continuing Spring Series classes will be held on Monday, April 17 & 24 at 7:30 pm.
The upcoming Summer Series classes will begin on Monday, May 22 at 8 pm.

Fee: $75 for 6-class series or $23 for a single class.
To reserve a space in this popular class, email: nightsky@rfo.org
Find more information about RFO's Night Sky Classes online at http://www.rfo.org

Observing Labs

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

Star Death: The End of Stellar Fusion
Saturday, September 16, at 7 pm [Raincheck date: Wednesday, September 20]
Attendance limited to 10.

Fee: $30.
For reservations, email: nightsky@rfo.org
Find more information about RFO's Observing Labs online at http://www.rfo.org

Focus Nights

Focus Nights are a personal learning and viewing experience at Robert Ferguson Observatory. Focus Nights will be limited to 20 guests and will offer a more intimate and thorough introduction to astronomy. The program will start at dusk with an in-depth presentation that is the evening's "focus." After the presentation, guests will begin viewing the skies using our three featured telescopes. Focus Nights subjects can include planets, star clusters, galaxies, and nebulae.

Find more information on upcoming Focus Nights in the next issue of 'Focused' or online at http://www.rfo.org

Fee: $25. Tickets available through Brown Paper Tickets.
Find more information about RFO's Focus Nights online at http://www.rfo.org

RFO's 2016 Docent of the Year: Nancy Cummings

The VMOA volunteers have selected Nancy Cummings as the 2016 Docent of the Year. Nancy's work at RFO includes public relations and public outreach, doing presentations for Focus Nights and Star Parties, making comets with kids using the Night Sky Network toolkit, training new docents on the 8" Dominican refractor. Nancy is also often found with her own telescope, Henrietta, showing the night sky to observatory visitors. Besides all that, Nancy's powerful and upbeat personality, fantastic friendliness, and wonderful wit, make her a great asset to the RFO.

A truly well deserving recipient of this award, the VMOA congratulates Nancy on her many accomplishments.

Watching the 2017 Spring Sky

by Jack Welch

The two gas giant planets and telescope favorites, *Jupiter* and *Saturn*, are both at opposition this spring. Jupiter has already started to dominate the late evening skies as spring approached and will be visible in *Virgo* near the bright star *Spica* in the evening skies all spring, ending retrograde motion on 6/9. It is at opposition on 4/7 when it will be at its biggest and brightest. There are a great many interesting Galilean satellite events this season that are detailed on our website. (Use the "What's Up in the Night Sky" link on our homepage for these and other items referenced in this article.) Among these will be *double shadow transits* on the evenings of 5/18, 5/25, 6/1 and 6/3. I encourage everyone to observe as many of these various satellite events as you can if you are interested in Jupiter because doing so can help you understand the solar system geometry as things such as the locations of the shadows of the satellites and Jupiter change over time. Also, see if you can determine the tilt of the orbital plane of Jupiter's satellites. To figure these things out, you need to observe carefully over many weeks and think about what you are seeing. It can help to keep notes. For more casual observers, the moon will be near Jupiter on the evenings of 4/10, 5/7, 6/9 and 6/30.

Saturn starts out the spring in *Sagittarius*, rising well after midnight, then moves into *Ophiuchus* in mid-May, by which time it is rising before midnight. This means that Saturn is still relatively low in the southern sky, as it was last year, and thus less than optimal for us northerners. Still, Saturn is always a telescope favorite for everyone! Saturn begins retrograde motion on 4/5 and will reach opposition on 6/15. So, the best observing of Saturn will be in June and July. Saturn's rings are now at their maximum tilt (27°) as seen from Earth. Over the next 7 or 8 years the ring tilt will decrease until they seem to disappear as we see them edge-on. The moon is near Saturn on the morning of 4/5 and the evening of 6/9.

Mercury has its best evening apparition of the year as spring begins. Look for it in the west 30 to 45 minutes after sunset from about 3/21 to 4/10. It will reach a maximum altitude 45 minutes after sunset of 9° on 3/31. There is an extremely poor morning apparition in mid-late May. But, essentially, Mercury is not again viewable this spring after about 4/10.

Venus has ended its reign as "Evening Star" as winter ended and now emerges into the morning sky as spring begins. It will be at its brightest on the morning of 4/30 and reaches greatest elongation west on 6/3. The crescent moon is near Venus on the mornings of 4/23, 5/22 and 6/20.

Last year, *Mars* was at opposition during the spring. Since it is just over two years between Martian oppositions, that means Mars is pretty much not viewable this spring. Now quite far away and dim, it lingers low in the west, mostly in evening twilight, and sinks into the setting sun in early June. It will not emerge into the morning sky until September.

This spring the new moons all occur near perigee, when the moon is closest to Earth. This means that there will be large tides at or just after new moon in April, May and June, with the largest tides in May when the new moon occurs just 5 hours before perigee. This also means that the full moon on the morning of 6/9 occurs near apogee and so is the smallest full moon of 2017. The moon will be near the very bright blue star *Regulus* in *Leo* three times this spring: *VERY* near around 10pm on 4/6; very near around 1am on 5/4; and very near around 10pm on 6/27. Use binoculars to appreciate this colorful star so near the moon. We have two chances early this spring to view very thin crescent moons. First, look for an ultra-thin 1.5% crescent 5° high in the west 30 minutes after sunset on 3/28 (or at 8:00pm calculated for the RFO site). Then there will be a 4.5% crescent around 8:30pm on 4/27.

The moon will occult the bright *Hyades Cluster* star *Hyadum-I* in *Taurus* on the evening of 3/31. Other easy bright star occultations are of *115 Tauri* on the evening of 4/1, *ZC2399* on the morning of 4/15, and *rho Leonis* on the evening of 5/31. Observing details for these and other, more challenging, lunar occultations of bright stars are on our website.

Details are favorable for viewing the *Lyrid Meteor Shower* this year, with the best time being from about 10pm on 4/21 until about 4:30am on 4/22. The peak should be sometime around 5am, though this is uncertain. The rate of meteors at the peaks is about 18 per hour, though this can vary.

Spring ends at the summer solstice which is at 9:24pm PDT on 6/20 this year.

*(***CLOUDY** *from Page 1)*

Although not very scientific, it is good for a few laughs. A line of children quickly forms to have a look.

A quick tour of the 8-inch refractor in the dome is worthwhile. Being inside the dome room always reminds me of being in a fort.

The 40-inch telescope in the West Wing is also a crowd pleaser. I retract the primary mirror cover and remove the shower cap from the front. As the telescope is parked parallel to the floor, children of any age can look into the scope and see the 40-inch mirror and their distorted reflection. Caution: Young children want to grab the secondary mirror spider while looking, so I must stand nearby to stop them. Again, a line quickly forms to take a look.

We have several astronomy kits from the Astronomical Society of the Pacific. However, many have lots of small pieces and I usually don't use them for brief field trips where longer hikes are included. Often we have only twenty minutes for each class in the observatory.

There are two *Power Point* presentations, prepared by RFO docents, which work well with children of all ages. These are Robert Davis' 'How Big is Big, How Far is Far?' and Lynn Anderson's 'Solar and Lunar Eclipses'. I just don't include the Eclipse slide showing the presentation is for high school, and I skip the math. Also, there are still pictures, acquired by docent Merlin Combs over the years, featuring rainbows, aurora, eclipses, and solar humor, which work well as an old-fashioned slide show. These presentations are all on the classroom computer at RFO.

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

Even the Sun going around the center of the Milky Way is cyclical, but you'd need superhuman genes and ridiculously good health care to make it around even once: its period is 230 million years (mankind has been around, roughly, about seven million years).

RFO has its cycles too, and we're coming out of our quieter wintertime into spring, with loads of scheduled events and lots of activity. Besides the usual ramping up that occurs each spring, we have our normal smaller cycle of being open to the public once a month around the time of the New Moon. But like a variable star with an unexpected star quake, there's an occasional blip, and RFO's happens in April. No worries, it's a good blip: we're not predicting an earthquake.

There are five Saturdays in April, and RFO will be open to the public on three of them: April 8th features lunar observing, April 22nd is a "regular" star party, and April 29th is Astronomy Day. All three of those days will also feature solar observing, but on Astronomy Day, we'll be open all day with events for kids and families. We'll also be doing a docent-led Planet Walk hike, and a crew from RFO will be down at the California Academy of Sciences. Busy day—and night!

As always, our main purpose is to be of service to the community, and the biggest part of that is inviting the community to visit us so we can share the stars with you. We're constantly upgrading, being creative, and finding new ways to bring astronomy to people, and sometimes that means being open on more Saturdays than usual—a blip in our cycle that we're happy to share with you.

So if you haven't made that trip up to RFO in beautiful Sugarloaf Ridge State Park, now's the time! We look forward to seeing you, and hope that you make visiting us part of <u>your</u> regular cycle of events.

'What's Up': A Public/Private Night

"What's Up?" is a new way to enjoy the night sky at RFO. It will be similar to a regular public viewing night but without the possibility of a large crowd. It will also be similar to a private night at the observatory, but without the planning and fees associated with renting the entire observatory.

Tickets will be sold in advance through Brown Paper Tickets, and attendance will be limited to 50 visitors. The first "What's Up?" is scheduled for Thursday, May 25, 2017. The time is from 8 PM to 12 Midnight. In case of cancellation due to weather, this event will be rescheduled for Thursday, July 27th.

Stay tuned for more information on purchasing tickets.

Classes and Camping

Have you been thinking about taking a class at RFO, but don't want to drive all the way home after class? Don't forget that there is a very nice campground in Sugarloaf Ridge State Park, a perfect place to spend the night after a class at RFO. The campground is now offering a discounted rate of $25 a night when attending a Night Sky or other weeknight class at RFO.
Go to www.sugarloafpark.org to reserve a campsite.

Valley of the Moon Observatory Association

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