

# Focused

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



Fall 2017

Volume XX Number 4

## Into the Path of Totality

*By Loren Stokes*

There have been or will be 67 total solar eclipses in the 21<sup>st</sup> century. That is about one every 18 months. In addition there are numerous annular and partial solar eclipses such that one of these three events occurs every six months.

If one were to stay in one place, say Sugarloaf Ridge State Park, one would have to wait, on average, nearly 400 years to witness a total solar eclipse. So traveling to one is the better strategy.

One of my high school friends lives on a ranch 15 miles south of Madras, Oregon, and 20 miles south of the path of totality centerline of the August 21 total solar eclipse. Just another 10 miles south is the southern edge of totality. As circles work, the ranch had a duration of totality of nearly 75% of that 20 miles north, or 1 minute and 32 seconds (2 minutes and 3 seconds duration at Madras).

Seven from the Sonoma Valley High School class of 1972, and fourteen affiliated with Reed College in Portland, converged on the ranch Sunday, August 20. Smoke from a nearby fire west at Sisters was blowing south to California and away from out sky. Sunday night, with no moon of course, was breathtaking. With no streetlights for miles, the

Milky Way was bright down to the horizon. I gave Lynn Anderson's eclipse presentation in the evening with lots of good questions (why does the moon's shadow travel from west to east?)

The next morning I set up my Coronado hydrogen-alpha telescope. There were two sunspot groups and three large prominences on the sun's western limb. Although this was my first total solar eclipse, I have read so much and talked to Lynn about them that the event was not as shocking as it was to the others, with one exception. The sun's corona, visible during totality, is one million times dimmer than the sun (comparable to the full moon, which is 400,000 times dimmer than the sun). As totality approaches with the last one percent of the sun's surface visible, the sun become 10,000 times dimmer in a matter of seconds! This is completely beyond our experience.

The corona extended from the sun's equator (tilted at 10:20 AM) with another extension facing north. The corona was about four solar diameters wide. Those three prominences were naked-eye-visible,

*(turn to PATH on Page 3)*

<http://www.rfo.org>

## Public Events at Robert Ferguson Observatory

**All Scheduled Events at RFO are tentative due to wildfires in much of Sonoma County**

### January 13, Saturday

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

### February 10, Saturday

Public Solar Observing 11 am – 3 pm  
Public Observing Night 7 pm

### March 17, 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 Fall Series

October 16	October 23
November 13	November 20
December 11	

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

**Focused**

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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 educa-  
tional 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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## President's Message

By Steve Smith



*“Someone’s sitting in the shade today because someone planted a tree a long time ago.”*

*“A goal without a plan is just a wish.”*

*“If you don’t know where you’re going, you’ll end up someplace else.”*

There’s an obvious common thread to these sayings (the authors are cited at the end of this article): the importance of planning ahead to ensure one’s own future and the future of loved ones. The family of VMOA/RFO volunteers and supporters is perhaps slightly larger than your immediate family, so inviting them all for Thanksgiving dinner would be a logistical nightmare—where to park all the cars, where to seat everyone, and making sure you have enough pumpkin pie to go around--but no worries: VMOA isn’t hosting a Thanksgiving Dinner at the observatory.

But, a group of six very dedicated and caring individuals from the VMOA family are gathering cranberries of a different sort. George Loyer, Greg Reynolds, Berta Campos-Anicetti, Michael Eckstein, Gordon Spear, and yours truly have been hard at work this year to help ensure the future of RFO. Those half-dozen

folks form the VMOA Strategic Planning Committee (SPC), and have been peering into an astronomical crystal ball, trying to envision the future of the observatory. Under the apt leadership of Berta and Michael, the team has met several times this year and are in constant email contact, exchanging ideas, researching options, and doing their best to look not just down the road, but over the horizon.

Superficially, it’s a simple task: how do you get from where you are now to where you want to be in the future?

The SPC has garnered input from its board, volunteers, and the general public, with the goal of answering two questions: what are Points A and B? Where is RFO now? What does it do? How well is it doing the things it does? And then: What should RFO be in the future? What things could or should we do that we’re not doing now? What do we WANT to be doing in the intermediate and long-term future?

These are great and relevant questions for any organization, and the answers for VMOA are emerging from the survey responses. As the future needs and desires of the volunteers, the board, and general public become clear, another equally large question arises: HOW do we get to Point B, that future vision of RFO?

Predicting the future? I should have bought Apple stock in 1997 when it was \$7 a share. In 2009, I should have dumped my savings into some weirdly concocted even-year trifecta bet that the SF Giants would win the World Series in 2010, 2012, and 2014. These are but two examples illustrating that I cannot predict the future. I have no idea where the VMOA Strategic Planning will lead. Maybe

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## 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 Fall Series classes will be held on Monday, October 16 & 23, November 13 & 20, and December 11 at 7 pm. The upcoming Spring Series classes will begin on Monday, January 15 at 7 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](mailto: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.

Find more information on upcoming Observing Labs in the next issue of 'Focused' or online at <http://www.rfo.org>

Fee: \$30.

For reservations, email: [nightsky@rfo.org](mailto: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>

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

Elon Musk will buy a winery in Kenwood, stumble upon RFO, and offer to finance an RFO remote observatory on Mars (hey, it could happen!).

I do know one thing about VMOA/RFO. The volunteers and supporters have diverse skills, talents, opinions, and ideas...but they all share one crucial element: they love the observatory and they work extremely hard to make it a success.

So while my own personal crystal ball seems to constantly fog up, and I don't know what RFO will look like 5, 50, or 500 years from now, I'd place bets that as wonderful as RFO is now, it has an even brighter future.

Thanks to all of you who've made my almost-over two years as VMOA president such a rewarding experience—and thanks also to Warren Buffet, Antoine de Saint-Exupery, and Yogi Berra for unknowingly lending me this article's opening words.

#### **(PATH from Page 1)**

along with a red glow, but only on the western limb. The one and a half minutes of totality flies by and seems like just a few seconds. The diamond ring and Baily's beads soon appeared, eclipse glasses came back on, and in a few more seconds one percent of the sun's surface is visible and it is daytime again.

The following briefly describes the next eight total solar eclipses from 2019 through 2030:

On July 2, 2019 over central Chile and Argentina a total solar eclipse of maximum duration four minutes will occur.

December 14, 2020 over southern Chile and Argentina, over two minutes of totality will occur.

December 4, 2021 one occurs in Antarctica of nearly two minutes duration.

April 8, 2024 is the next great American eclipse of

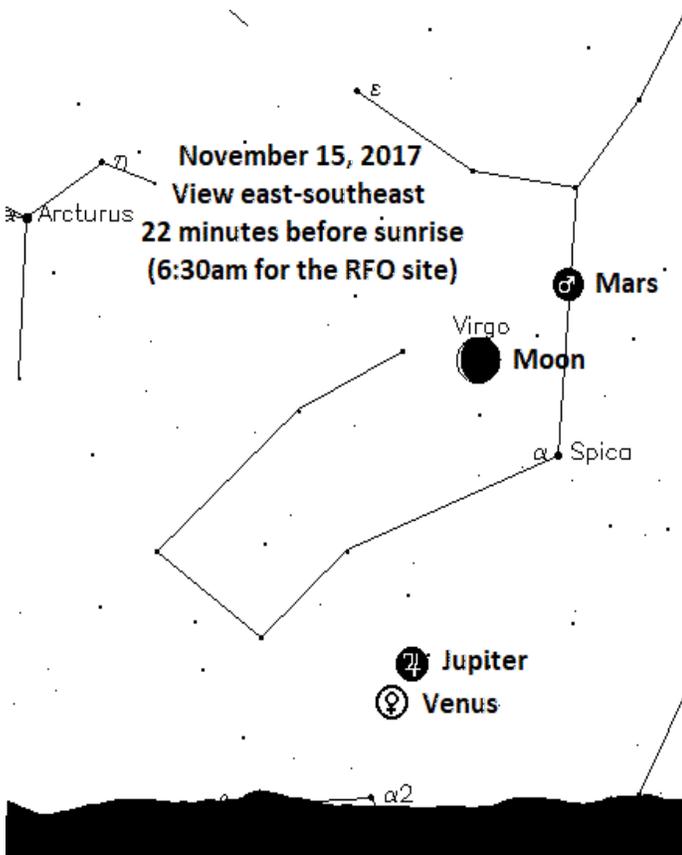
*(turn to **PATH** on Page 5)*

## Watching the 2017 Fall Sky

by Jack Welch

*Venus* ends its reign as “Morning Star” this fall, sinking low into the predawn east and disappearing into the sunrise glare by mid-December. Before it goes, it will have a *very close* ( $0.2^\circ$ ) encounter with *Mars* around 6am on 10/5, and then with *Jupiter* ( $0.4^\circ$ ) around 6am on 11/13 (with *Mars* and the bright star *Spica* in *Virgo* above), though this last pairing will be very low to the horizon before it fades from view. An unobstructed eastern horizon is necessary. The waning crescent moon joins the action on 11/15 (see accompanying illustration), when it is near *Mars* and *Spica*, and again on 11/16, when it will be above the *Mars-Venus* pair. Start watching at least 45 minutes before sunrise in order to spot relatively dim *Mars*. The crescent moon will also be near *Venus*, and *Mars*, around 6am on 10/17

*Mercury* is on the far side of the sun (superior conjunction) in early October then has a very poor evening



apparition in the last week of November (11/23-30) when it will barely reach  $4^\circ$  of altitude 45 minutes after sunset. But once it passes Earth (inferior conjunction in early December) it provides a very nice morning apparition from about 12/19 to 1/15 to end the year, reaching an

altitude of  $10^\circ 45$  minutes before sunrise on 12/29.

*Mars* emerges into the morning sky as fall begins, passing *very near* *Venus* on 10/5 (see above). Leaving *Leo* on 10/12, *Mars* literally spends the rest of the fall in the large constellation of *Virgo*, moving into *Libra* on the winter solstice! In addition to the encounters mentioned above (10/17 and 11/14-15), the crescent moon is near *Mars* around 5:30am on 12/13. *Mars* will be approaching *Jupiter* as December ends.

*Jupiter* is in conjunction with the sun in *Virgo* so not viewable in October. It emerges into the predawn sky in November, passing very near *Venus* (see above) as it does so and entering *Libra* in mid-November. *Jupiter* passes very near the bright star *Zubenelgenubi* on the mornings or 12/20 to 23, nearing *Mars* as the year ends.

*Saturn* is low in the southwest during evening twilight and disappears into the sunset by the end of November.

It is in conjunction with the sun on the solstice, which also means that it is now at its southernmost extreme in the sky. For the next 14 years or so it will move back northward. The crescent moon will be near *Saturn* around 8pm on 10/23 and 24.

For those who like their solar system planets dim and challenging to view, you're in luck! Both *Uranus* and *Neptune* are observable this fall. *Uranus* is at opposition in *Pisces* on 10/19 at magnitude 5.7 and a disk size of  $3.7''$ . It's bright cyan color makes it (almost!) unmistakable. It will be quite near the wonderfully named star *Torcularis Septentrionalis* (*omicron Piscium*), less than  $2^\circ$  WNW, making it fairly easy to locate. It will linger in the evening sky as a good target all fall. Much more challenging *Neptune* is just past opposition as fall begins and can be found very near the star *lambda Aquarii*. By December it will be setting too soon to be a good target any longer.

Besides its encounters with the various planets, as described above, the moon will also visit some nice bright stars. The moon will be *very near* bright orange-red *Aldebaran* in *Taurus* three times: around 8pm on 11/5, 5am on 12/3, and 6pm on 12/30. And the moon visits the bright blue star *Regulus* in *Leo* three times as well. First, it is *very near* around 4am on 10/15. Then, on 11/11 the moon will occult *Regulus*. This is a daytime event so choose an observing spot shaded from the sun for safe viewing by scope or binoculars. *Regulus*

will disappear behind the moon's bright limb at about 8:40am and reappear from behind the dark limb at about 9:46am (calculated for the RFO site, so not necessarily the same at your location!). Then the moon is again near Regulus around midnight on the evening of 12/8. Use binoculars or a scope to appreciate these bright colorful stars near the moon.

This is a good opportunity to note that when the moon comes near a particular star, it does so in a flurry of repeat visits over several months, followed by some years of "ignoring" that star. Those of you who observed August's total eclipse might know that the moon (and sun!) were very near Regulus during that event, as well!

The moon will occult some other bright stars this fall. Details are on our website. Of particular note are: mu Capricorni on 10/2; 56 Sagittarii on 10/26; 45 Capricorni on 11/22; and mu Ceti on 11/28.

The moon has a 3-month sequence of large tides due to full moons occurring near perigee in Nov, Dec and Jan, with the largest tides in December. Look for large tides around 11/4-6 and 12/3-7. The full moon on the morning of 12/3 is the largest of 2017.

Dedicated observers may want to try spotting the minor planet *Pallas*, which is at opposition on the evening of 10/28 near the *Eridanus/Fornax* border (ESE of *tau-3 Eri*) at magnitude 8.2.

This fall is especially kind to meteor observers with several favorable viewing opportunities. The *Orionids* are predicted to peak around 4am on 10/21, with about 20 meteors per hour at peak. Start viewing around 11pm on 10/20. Conditions are very good for the famous *Leonids*, though the peak is predicted for after sunrise on 11/17 and the activity is expected to be low this year, maybe only about 10/hr at peak. But meteor showers are unpredictable so start watching around midnight on 11/16. Best of all are the *Geminids* with a peak predicted for 10:30pm on 12/13. Watch for these all night on 12/13 until dawn twilight on 12/14. Around 120/hr can be typical at peak. Finally, conditions are also excellent for the *Ursids* on the evening of 12/21 and morning of 12/22. The peak is predicted for after sunrise and peak activity is often around 10/hr. However, this shower sometimes has unexpected very strong outbursts of meteors, so you never know!

In prior years, I've described the nature of the famous eclipsing binary star *Algol (beta Persei)* or "*The Demon Star*" or the "blinking eye of the severed head of Medusa." It is easy to observe the dimming of this "eerie" star, famous from ancient times for this "creepy" behavior,

especially if you know in advance when it will be at its dimmest. This information is available on our website for the fall and winter months.

The *Zodiacal Light* is viewable in the east from a location with a dark eastern horizon before morning twilight from 10/18 to 11/1. Caused by sunlight reflecting off fine debris in the plane of our solar system, it is a tapering triangular glow similar in brightness to that of the Milky Way and situated along the path of the Ecliptic in the sky. Look for it between about 5:10 and 5:50am (just before twilight begins). The base will be almost due east and will tilt slightly to the south as it rises, passing over the bright star *Regulus* in *Leo* then losing itself in the Milky Way glow in *Gemini*. It can be seen easily from Sugarloaf Ridge State Park.

Fall officially ends here in Sonoma County at 8:28am on 12/21, the *Winter Solstice*.

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(*PATH from Page 1*)

duration over four minutes. Moving northeast from Mexico it crosses Texas, going right over Dallas, and moves up to Maine and then eastern Canada.

August 12, 2026 over Iceland, Portugal and Spain with over two minutes duration.

August 2, 2027 is a great one, traversing the entire northern African continent from Morocco to Somalia, with over six minutes duration of totality.

July 22, 2028 over Australia and New Zealand of duration five minutes.

November 25, 2030 over South Africa and Australia of nearly four minutes duration.

Finally, on August 12, 2045 a total eclipse occurs close to home. Younger docents and children/grandchildren can witness over six minutes of totality. The path goes over Eureka, Redding, Reno and Salt Lake City. It exits the states after passing over Orlando. This eclipse is related to the 2027 African eclipse, both belonging to Saros cycle 136 with similar durations of totality and similar shaped paths of totality.

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The truth may be puzzling. It may take some work to grapple with. It may be counterintuitive. It may contradict deeply held prejudices. It may not be consonant with what we desperately want to be true. But our preferences do not determine what's true. We have a method, and that method helps us to reach not absolute truth, only asymptotic approaches to the truth — never there, just closer and closer, always finding vast new oceans of undiscovered possibilities. Cleverly designed experiments are the key. - Carl Sagan

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