

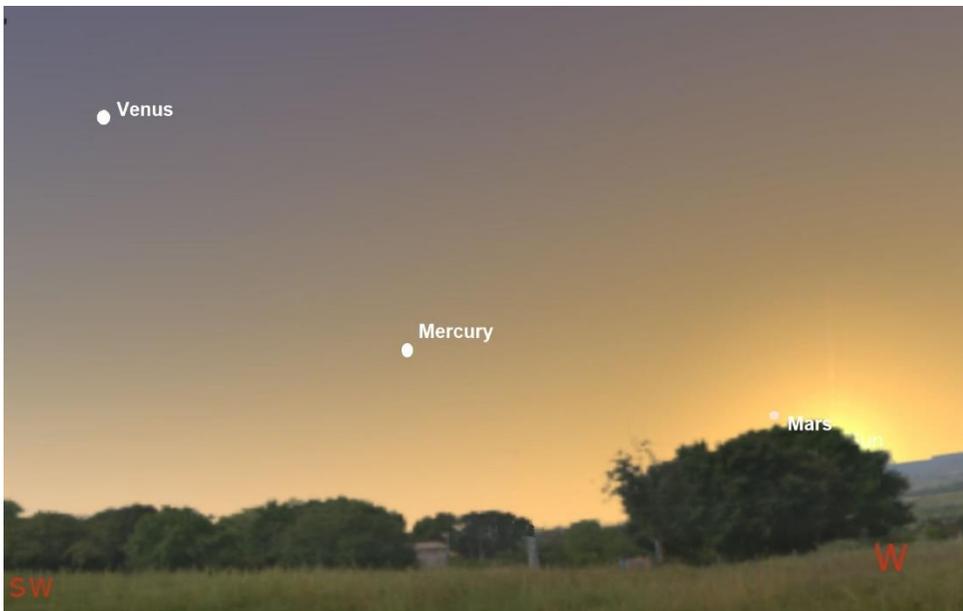
The Boys are Back!

Fall 2021

While few astronomical displays can match the **“planetary panorama” of summer 2018**, the **Fall Planetary Parade of 2021** certainly brings a stunning visual opportunity of its own. Consider also that Saturn – one of the “stars” of this year’s show – is heading toward a disappearing act of its own, so it’s important to get your looks in now while the viewing is still good. More on this a bit later. For this newsletter, I’ll review the cast in the planetary show of 2021. I hope to offer some details on how to observe the planets, what features we might be able to see, and maybe, just maybe, we’ll “drop the mike” on a few planetary facts and updates!

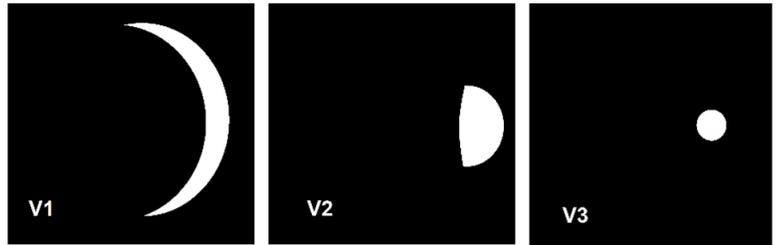
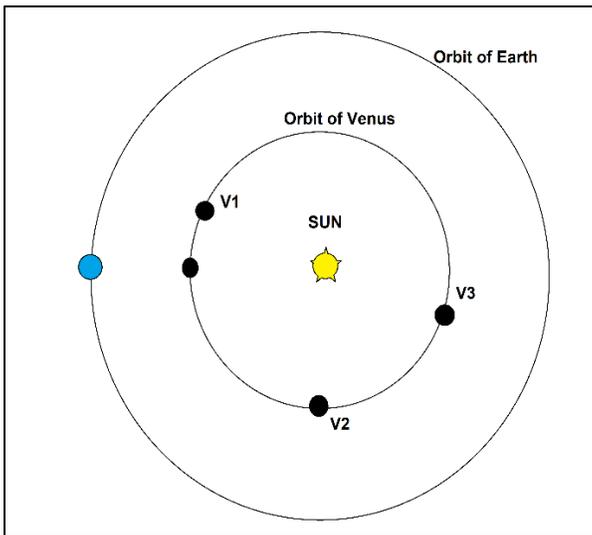
So, let’s start with the most challenging targets you can bag during the planetary hunt of early fall 2021. First up is **Mars** low, low in the western evening sky immediately after the sun sets. The “Warrior God” is closely followed by my fleet **Mercury**. At this time, neither of these planets is high enough or bright enough to offer a view of any real quality. Hampered by proximity to the Sun (NEVER, EVER look at the Sun without solar protection!), atmospheric conditions just above the horizon, and small disk diameter, consider yourself lucky to see them at all. However, maybe it’s a **“Planetary Messier Marathon”** you seek, where it’s the quantity and not the quality of objects you hope to snag in your eyepiece. If that’s the case, the earlier the better, because by the end of September, both of these challenging objects will set with the Sun.

Next up is the one planet of the “female” gender – and what a gorgeous sight she is! At 6:30pm in mid-September, **Venus** is the bright and beautiful beacon about 20-degrees over the southwestern horizon. For the next month, Venus struts her stuff, offering stunning views, and her own take on beauty.



At sunset in mid-September, looking to the WSW, Venus, Mercury, and Mars line up roughly to the ten o'clock position from the Sun, with Mars so close as to be nearly invisible. If you hope to catch them, wait until just after the sun sets – never look directly at the sun – and then use low power to help your search. By the end of September, Mars will be down with the sun, followed in the next few days by tiny Mercury.

Venus can often be large enough in the eyepiece to afford a few detailed observations. The first and most obvious are her phases. Often, when I’ve shown an eyepiece view of Venus to guests during my programs on Kitt Peak, the first thing they say is, “It’s the Moon!” Because Venus orbits closer to the Sun than the Earth, she shows moon-like phases ranging from crescent to full and back again. However, showing her independence from Luna, Venus is **BRIGHTEST** during crescent phase, and much **FAINTER** near full phase! This apparent contradiction confuses many observers, until they understand how proximity AND brightness can impact the apparent magnitude of all of the planets.



At left and above, we see that Venus is large and bright during crescent phase, but fainter because it's 7 times smaller when seen at full phase. Venus is closer to us at position V1 than it is at position V3. This accounts for the phases and sizes as seen from the Earth; no other planet shows such a difference in *angular size and magnitude*.

One of the other characteristics that makes Venus so bright is that the planet is almost totally covered with a thick and very reflective blanket of clouds. The cloud-cover on our "twin sister planet" gave rise to the thought that Venus was a type of "jungle planet" – hot, humid, and covered with vegetation, and (according to some early Sci-Fi) inhabited by Amazon Women. Early planetary probes however dispelled these notions as the clouds were found to be poisonous, and they kept the surface hot enough to melt lead – so there goes that fantasy. The clouds do however create some unique viewing opportunities, and one is totally dependent on the planet's phase. Catch her when she shows her slimmest crescent shape, and then just maybe you can snag "**The Horns of Venus**" as they nearly encircle the planet. Partly optical illusion (your eyes "want" to complete the circle), and partly due to the dispersion of light through her thick clouds, this is a very challenging observation!

Moving on from the inner planets out to the "**gas giants**", both **Saturn** and **Jupiter** were at or near opposition on August 1, 2021. Recall that "**opposition**" is when an object rises in the east, just as the sun is setting on the opposite horizon, in the west. This makes opposition the time when planets are closest to Earth, at or near largest angular size in the sky, and up for observation all night long.

While Jupiter is next in line after Mars, Saturn was first to reach opposition this year. Thirty minutes later, Jupiter was also rising over the southeastern horizon. As it happens, my wife's cousin, Sunny, was involved in some type of national scavenger hunt, and she asked if I could get some pictures of Saturn at opposition. Short notice challenge accepted.



The images above were taken with my 8-inch Celestron Edge-HD SCT. While conditions were not at their very best when I took these shots, I was happy to snag them to help out my “cousin-in-law”!

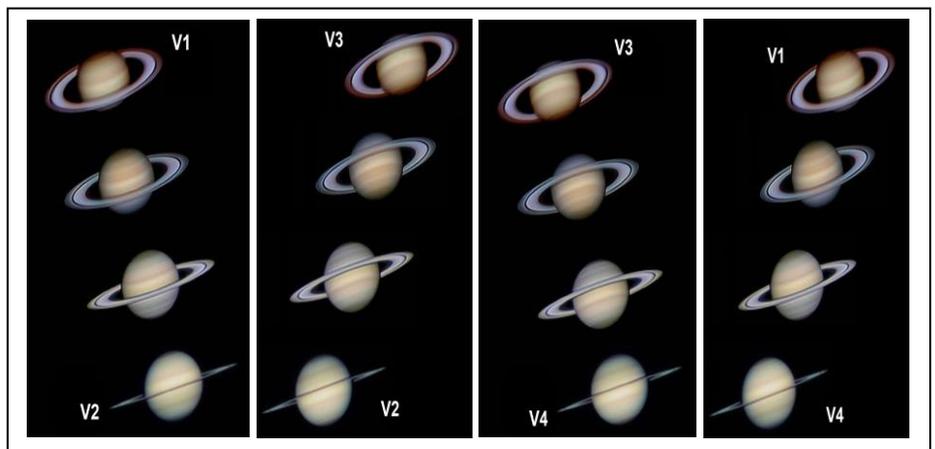
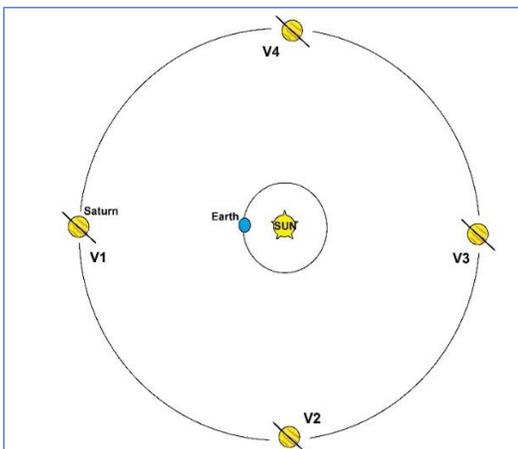
Now, while opposition marks the beginning of a planet hunting season, your best views and steadiest images will not come “right at the moment of opposition”. When dealing with the Earth’s atmosphere, conditions at the horizon make seeing and imaging there a non-gratifying nightmare! Better to wait for your target to rise a bit higher in the sky, where the air is thinner, steadier, and less subject to thermals and dust kicked up near the ground. A few standard observing tips are in order – and not just for planets, but for just about anything you hope to see in a telescope eyepiece.

1. When an object reaches opposition, it will be available for viewing almost all night long.
2. Planets at opposition are also closest, biggest, and brightest. How convenient is that?!
3. The best view is when objects are higher overhead – looking through less atmosphere.
4. Make a short observing list for the night – it’s easy to be distracted and then miss something.

Alright, with a few guidelines under our belt, how about a couple of observing challenges when viewing Jupiter or Saturn? They’ll both be up for a couple of months, and September through October is the best time to catch them. I’ll address Saturn first, because it will be the first to leave our evening skies.

Unquestionably, the main draw for Saturn are the rings. Did you know that while we used to think Saturn was unique among planets with **a ring system**, it turns out that ALL of the gas giants have rings! Jupiter, Uranus, and Neptune all have ring structures, though not as bright or “complete” as Saturn’s. It also turns out that Saturn’s rings are essentially ephemeral. Eventually all of the objects that make up the glorious necklace will either be thrown out of the system, collide/break-up and crash into the planet below, or simply succumb to the planet’s gravity. Now, this will take about 100-million years or so, and I will be sure to give you some notice in a future newsletter!

Another interesting characteristic of Saturn’s rings is that they point in one direction. That is why they disappear twice during Saturn’s orbit around the sun; it’s not because the ringed beauty “rocks” back and forth during its 29-year trip.



Using images by Mick Hyde, we simulate how Saturn’s rings *APPEAR*, from Earth, to rock up and down, but maintain the same angle/orientation. In the first panel, we see the “top” of the rings from V1 until Saturn moves to V2 – and they seemingly disappear. In the second panel the rings flip over, as the planet moves from V2 to V3, and we see the rings from “underneath.” As Saturn orbits from V3 to V4, the rings disappear again, only to complete the 29-year cycle as they open moving from V4 to V1 again.

One final Saturn challenge. While Jupiter's four **Galilean Moons** are large enough to view easily, many of Saturn's natural satellites are larger and more visible than Jupiter's "non-Galilean" moons. For this reason, not only is **Titan** easily visible around Saturn, but many observers report seeing more than just four of the ringed planet's other moons.

And that's a great segue to Jupiter's telescopic delights. Not only are the Galilean Moons (**Ganymede, Europa, Io, and Callisto**) easy to track as they do-si-do from night to night, but they are also large enough to cast visible shadows on their giant host. In fact, **shadow transit** schedules can be found at a number of sites on the internet. Typically, these sites will also list viewing times for the **Great Red Spot (GRS)** as well. The GRS, a giant cyclonic storm high in the Jovian atmosphere, rotates in the southern hemisphere, and circles the planet at approximate intervals of 9 hours and 56 minutes.



At nearly 90,000 miles in diameter and being "only" 500-million miles from the sun, Jupiter is a monster even in small apertures. In this image we can see many of the characteristics that make Jupiter special to observers everywhere.

First are the atmospheric bands of alternating *dark belts* and *lighter zones*. Sheer forces, upwelling and sinking, and chemical composition all contribute to the existence of these structures.

The Great Red Spot has been observed for 350 years, but its intensity, color, and size have all varied considerably over time.

Finally, watch for the Galilean Moons and their dark shadows on the planet below.

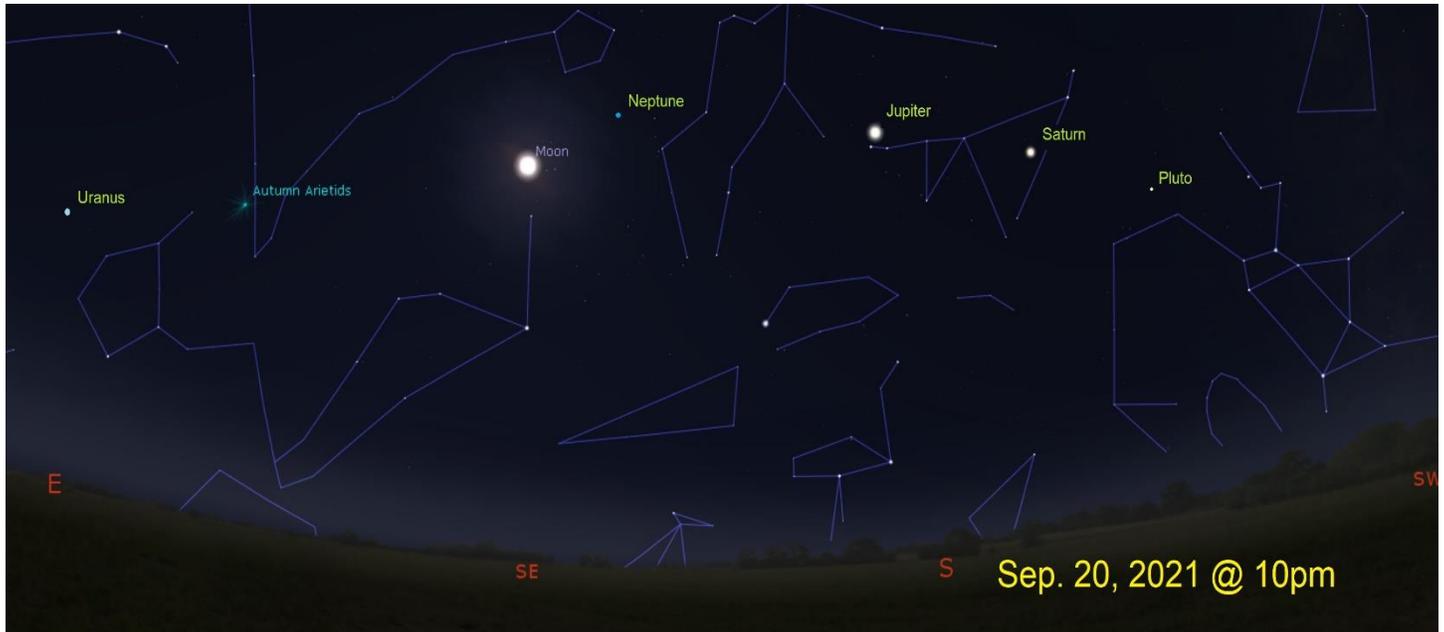
Moving past Jupiter and then Saturn, we come to the two gas giants that are considerably more difficult to observe – **Uranus and Neptune**. By 7pm in late September, Neptune is high enough over the eastern horizon to offer a view in the eyepiece...such as it is. At a distance of 3-billion miles, you need at least a medium sized instrument to catch even a hint of a small bluish "tic-tac." There are times however, under exceptional seeing conditions, to also bag **Triton**, Neptune's largest moon.

If you were successful in catching Neptune, then, just over two hours later, Uranus joins the rest of the gas giants in our fall sky. Uranus is slightly less challenging than its bluish more distant cousin, rising in the east, just south of **Aries'** brightest star. While only 2-billion miles away, the barely discernable disc-shape of Uranus still only appears as a small mint-green marble. Like Neptune though, there is the rare possibility of catching Uranus' largest moon **Titania**.

Whether you are seeking Uranus or the smaller and more distant Neptune, the trick is to use lower power to triangulate their faint star-like image among surrounding stars. Then gradually increase the power to see their colorful small discs and possibly one or two attendant moons.

As this actually is MY newsletter, I'll finish the planetary discussion with what is still the ninth planet in Chuck's Solar System, **Pluto**. I have good reason to include the all-but-forgotten diminutive one. Before Jupiter or even Saturn was even on the stage, Pluto was at opposition in early July. Still sitting west of Saturn in the constellation of **Sagittarius**, Pluto and **Charon** are at their prime early in the evenings of late September. At magnitude 14.4 or maybe slightly brighter due to its large moon Charon,

it is only slightly fainter than Uranus' and Neptune's largest moons – within reach of moderately larger instruments. So, why do we care? Well, if you've been keeping track while reading along, Pluto makes NINE planets (counting Earth of course) all available for viewing by 10pm in late September! That is stunning. Now, let's put things in perspective – unless there are planets particularly close to the Sun, and thereby unseen, you can ALWAYS see all the planets over the course of a single night. Rare is the time, though, when you don't have to stay up to all hours to accomplish the feat. So, bagging them all and getting to bed by midnight? Can you say “Yeah, Baby, that's what I'm talkin' 'bout!”



The panorama above shows where to find all our planetary targets on September 20, 2021, at 10pm. With Pluto the westernmost of the group, try to catch that one first...before it retires for the night. The “God of the Underworld” can be found midway between Saturn and the teapot handle of Sagittarius. The next two targets are bright and easy! Saturn sits near the head of the “sea-goat” Capricorn, while a bright shining Jupiter sits just to the east, off of Capricorn’s tail.

After the joy of Jupiter, you have a trade-off to make. Notice that on 9/20 there is a big bright moon in the sky right near Neptune. A few nights later would allow you to capture Neptune and Uranus under moonless skies, early in the evening. On the other hand, if you were hoping to capture all the planets – including Venus, Mercury, and Mars – in one night, well, then you’ll just have to do battle with *Luna*! In either case, Neptune can be found just under the head of the western-most fish in *Aquarius*. Your final quarry, Uranus, is just under the front feet of *Aries* the ram, and just above the head of *Cetus* the sea-monster. Happy hunting!

It's time now to finish up the newsletter with some upcoming special events...and there are a number of them. And, since I write the newsletter, me first! October is a busy month, and one of the most special events is this year's ***Ninth Annual “Nearly Halloween Star Party”***, hosted by yours truly. It's always a free event, and all my readers and neighbors are invited. This year, we'll be setting up my big girl, Fay, and a host of other telescopes on ***Saturday, October 23rd***. My readers will get a flier soon! Stop by to view the sky, or just to try your hand at cell phone photography in a telescope eyepiece. Send me an email or give me a call if you'd like more information or directions.

Next up, once again this year, **NASA** is presenting and promoting ***International Observe the Moon Night (IOMN) on Saturday, October 16***. This is a world-wide event to promote fellowship, education,

and fun while observing our closest celestial neighbor. Everyone and anyone can participate, join, or lead events and activities. You can use a telescope or binoculars, you can live-stream an event or even just visually observe the moon with any number of friends, neighbors, or even just interested passers-by. If you'd like more info on IOMN, the website set up by NASA is a great resource. Be sure to visit them at: "<https://moon.nasa.gov/observe-the-moon-night/>" to get help with all your questions, or, just send me an email – I happen to know a guy, who knows a guy, who's married to a lady...

And don't forget that there is a monthly free community star gazing event held in Vail, AZ. Dates and times can vary with the sunset and site availability. I was at the last one to observe several of the planets, and it was a great night. Now that monsoons are over, the event will get busy, so be sure to come out early. If you'd like details, you can contact the "**Reach for the Stars**" group that runs the event. Send an email to Carlos Aragon at carlos@rftstars.com, or you can call him at [520-975-8041](tel:520-975-8041).

Finally, I want to remind everyone about the upcoming **Orionid, Leonid, and Geminid** meteor showers of October, November, and December respectively. Be forewarned however, each of these events will be heavily impacted by being within days of a full moon. Still, these are some of the best meteor showers of the year, and there is always the chance of a few big, bright, streakers. Check your calendars for the best nights and times.

Well, That's It Everyone – It's Going to be a Busy Fall,

A handwritten signature in black ink, appearing to read 'Chuck Dugan', with a stylized flourish at the end.

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