Temecula Valley Astronomer

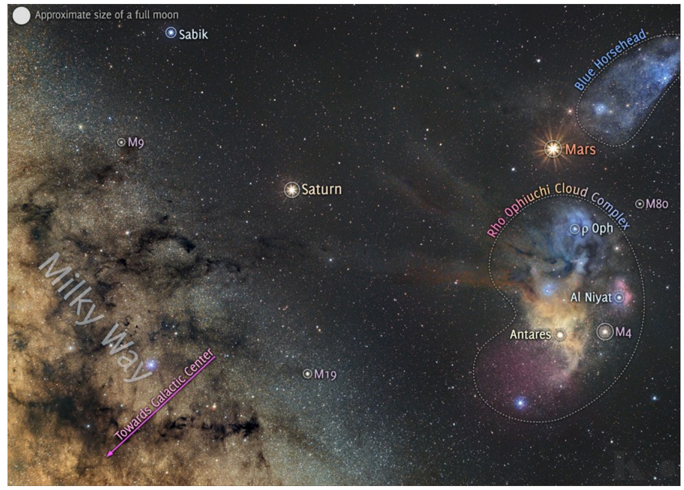
The monthly newsletter of the Temecula Valley Astronomers June 2016

Events:

General Meeting : Monday, June 6, 2016 at the Temecula Library, Room B, 30600 Pauba Rd, at 7 pm.

President Mark Baker will present his usual opening comments followed by a short show on the Mars Reconnaissance Orbiter (MRO). Our main speaker, Sam Pitts, will do a presentation on "Astronomy for the Beginner."

For the latest on Star Parties, check the web page.



NASA APOD 10 May 2016 - Saturn and Mars visit Milky Way Star Clouds - Image Credit & Copyright: Carlos Eduardo Fairbairn - Rollover Annotation: Judy Schmidt

WHAT'S INSIDE THIS MONTH:

Send newsletter submissions to Mark DiVecchio <markd@silogic.com> by the 20th of the month for the next month's issue.

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General information:
Subscription to the TVA is included in the annual $25 membership (regular members) donation ($9 student; $35 family).

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Cosmic Comments – June/2016
by President Mark Baker

Every so often, an opportunity comes along to take the TVA Show on the road to areas that can be considered "underprivileged". I enjoy all Outreach events but these even more so…

My recent foray to the San Diego area was just such an opportunity. It was a daytime presentation followed by solar observing and it served as a humbling experience as well. To see a real hunger for knowledge in the eyes of 5th and 6th graders is so gratifying…they hung on every word and asked some very astute questions. Then, for the vast majority, their ability to look through the telescopes was their first ever… in fact, several students went and got their siblings to have them participate. Kids that usually are literally gone at the bell, hung around for quite a while afterward…we ran way overtime but it was well worth it. And I hear they are still talking about their adventure involving things celestial…

So again, here's to what we do…and yes it does make a difference in our communities, often long after we have packed up and went home. We plant seeds and fan sparks…

Clear, Dark Skies my Friends…

Looking Up – June 2016
by Curtis Croulet

New Moon is June 4 at 8:00 PM PDT; **First Quarter Moon** is June 12 at 1:10 AM PDT; **Full Moon** is June 20 4:02 AM PDT; **Last Quarter Moon** is June 27 at 11:19 AM PDT.

Mercury is in the pre-dawn sky most of June. Greatest western elongation (angular separation from the Sun) is June 5, but Mercury is highest above the morning horizon on June 12.
Venus reaches superior conjunction (far side of the Sun) on June 6. After that, it'll slowly creep into the evening sky, but you probably won't be able to find it until mid-summer.

Mars is in the evening sky. It reached opposition on May 22, 2016, but it's closest to Earth on May 30. The "red" planet is in eastern Libra all of June, having retrograded (gone "backwards") from Scorpius. Retrograde motion ends on June 20. **Mars** begins to shrink and dim as June proceeds, but it remains larger and brighter than it has been in years.

Jupiter is high overhead as night falls. It dims and shrinks slightly through the month.

Saturn reaches opposition on the night of June 2-3. The ringed planet is not very far east of Mars. It looks like it's in Scorpius, but actually it's in southernmost Ophiuchus. I have more about Saturn below.

Uranus and **Neptune** are post-midnight objects. **Neptune** is in Aquarius, and **Uranus** is in Pisces.

But everybody's favorite dwarf planet, **Pluto**, is reaches opposition on July 7. That being the case, you can profitably hunt for it during the middle of the night. **Pluto** is in eastern Sagittarius.

We have two very minor meteor showers: **Arietids** (centered in Aries), peaking on June 7, and **June Boötids**, peaking on June 27.

Let's look up.

In June we celebrate the last of our spring oppositions. This month it's everybody's favorite planet, Saturn. Jupiter is nice, and Mars is good if you have a great scope and steady skies. But Saturn always brings gasps. Star party visitors often accuse us of placing a picture somewhere in the telescope or in front of it. There was an occasion, decades ago, when we did exactly that. But that's a story for another time.

While everybody loves a crisp view of Saturn, one comment I often hear from visitors at star parties is how small it is. Saturn at opposition is twice as far as Jupiter during its opposition. This means that at opposition the visible span of Saturn, with its rings, is about the same as the width of Jupiter at its largest.

Saturn's year is 29.457 Earth years. From year to year, Saturn moves slightly less than half a zodiacal constellation. Right now Saturn is almost as far south as it can go, and it won't be until 2032 that it arrives at its northernmost point (Gemini).

Saturn's rings are composed of ice and rocks. The particles range in size from dust-sized to the size of mountains (source: NASA). The rings are only about 0.6 miles thick, but they span 175,000 miles. There are seven recognized rings, but there are only four that concern us here. They are lettered A through D, with the A Ring being the outermost. The brightest and broadest is the B Ring. The D Ring is the innermost and the most difficult to see. The D Ring is often called the Crepe Ring. The big black gap in the rings is the Cassini Division. Cassini's Division is not really empty, but its orbiting particles are much less dense than in the rings. You may also see – with difficulty -- Encke's Division in the outermost ring, the A Ring.

Saturn is tilted 26.7 degrees with respect to the plane of its orbit. Since the visible rings lie on Saturn's equatorial plane, it follows that the view of the rings from Earth changes continuously. From year to year, and even within an observing season, the position of the rings changes slightly. About every 14-15 years they appear edge-on to us, and then they open up. They are almost at their most open aspect right now. Following 2017, they will appear to gradually close to an edge-on aspect in 2024. Then they will open up again, becoming most open again in 2032.

Saturn itself is a gas giant, similar to Jupiter. It has no solid surface. You couldn't walk on Saturn. The planet consists mostly of gaseous hydrogen and helium, with some methane. Saturn has belts and zones like Jupiter, but they are much more subtle and harder to see. Occasionally white spots appear on Saturn, but the magnificent swirls and multiple spots that appear on Jupiter are absent from Saturn. To my eyes, Saturn in the telescope is a very pale yellow or vanilla color, but most star party visitors say it's white. Saturn's equatorial diameter, exclusive of the rings, is about 72,300 miles. Its rotational period is 10.7 hours, but, unless there's one of those white spots, you probably won't see any sign of rotation.

Saturn has 53 moons, with another nine moons still unconfirmed. There are four moons that can be observed in amateur telescopes, depending on the aperture. The brightest moon is Titan, which is visible in most amateur telescopes. Much fainter, in order from brightest to faintest, are Rhea, Tethys, and Dione. In my 101mm (4-inch) TeleVue refractor, Rhea can usually be glimpsed, but Tethys and Dione are usually seen only fleetingly. All four moons are consistently visible in my 8-inch reflector. Larger amateur telescopes may show Enceladus, Iapetus, and Mimas. These fainter moons aren't necessarily "faint" in an absolute sense – Mimas is about mag 12 – but the eye has trouble seeing them when the planet is in the same field-of-view. Naturally, larger scopes will have an advantage. Iapetus's visibility is complicated by its division into light and dark hemispheres. If the dark hemisphere is facing us, then Iapetus is much harder to see.
Saturn season is upon us.

Clear skies.

Random Thoughts
by Chuck Dyson

I was so shocked that I thought of getting out of astronomy completely the other day when I had finished reading several papers on planetary formation and detection of planets by our present crop of satellites. I came to realize, much to my chagrin, that there is much bullying and discrimination going on in astronomy these days and indeed in days past also. And I thought that we lived in a nice quiet and civilized suburb of the Milky Way Galaxy, what is going on?

Let's start with the discrimination issue first. Although there are several methods that are used to detect exoplanets the most productive is the transit method and in a distant second place is the radial velocity method. Both of these methods work best with large planets that are close to their stars. Now the second most common type of planet that is found by the transit and radial velocity methods are the Jupiters and yes you would expect this as larger planets would have a larger radial velocity change on the host star for a given distance from the star or would block more of the host star light during a transit for a given distance than smaller Earth or Mars sized planets. What was not expected was a significant percent of these Jupiters would be Hot Jupiters, these are gas giants with a semi major axis of 0.5 AU to 0.015 AU and just for reference Mercury orbits at 0.39 AU. There are so many hot Jupiters that astronomer are now asking the question "do Jupiters always form far away from their suns and then move in or do some Jupiters form close in to the host star?" OH yes, there are also several hot Jupiters in retrograde motion around their stars, how did that happen? No clue.

You should also know that the most common planet found by the transit and radial velocity searches is the super Earth or mini Neptune these are planets that are about 2times Earth mass and 1.4 times its diameter to about 10 times Earth mass and 4 times its diameter. The main difference between the Super Earth and the mini Neptune is whether the planet is mostly rock with a small atmosphere or a planet with a small rocky core and a large atmosphere, if the planet reaches a mass of 14.5 times the mass of Earth then it is the mass of Uranus and is no longer a mini (Neptune is 17times the mass of Earth so why astronomers do not call these planets mini Uranus is beyond me). Just how do these planets form, what is their composition, and how common are they; we just do not know as we have Earth and we have Neptune and we have nothing in between. It appears, at this time, that what is a common and maybe the most common type of planet in the galaxy does not exist in our solar system. Are we the solar equivalent of the award child, it seems that it should not be possible as our solar system seems so rational with the inner rocky planets, the gas giants just past the ice line and the water giants further out where the ice crystals are larger but fewer in number, and where oh where is our planet that is bigger than Earth yet smaller than Neptune?

There is a third method of locating non stellar objects outside of the solar system I would like to mention and it is called microlensing. As you know massive and dense objects, like black holes, bend light a lot and less massive and dense objects, like stars, bend light less but they still bend it and things like brown dwarfs, super Jupiters, Jupiters, mini Neptunes, super Earths, and even small rocky planets like our Earth all bend light to some degree. If your equipment is sensitive enough then when a body goes in front of a distant star you will get a blip in your light signal from that star (a lensing event) and you get the same signal matter how far the body is from the solar system star or if there is even any star in the neighborhood. Now the main drawback of the microlensing technique is that it does not repeat, it is a one off, but you can get an idea of the number and size of the planets in a solar system that cannot be detected by the transit and radial velocity methods as of 2014 there were 33 objects discovered by microlensing. Several of these objects are not associated with stars and are interstellar objects brown dwarfs and friends or rogue planets if you prefer. The big question is what is the origin on these interstellar wanders?

That question leads us to look at bullying in the solar system. Can bullying happen, Mr. Newton says that Acceleration= Force/Mass so if two bodies interact and exchange energy and one has say ten times the mass of the other well then the little guy has a much bigger change in velocity and/or its vector than the big guy. If the little guy and the big guy are in a harmonic relationship then they will both return to the same spot at the same time and the little guy will get a second nudge in the same direction and with enough nudges the little guy can be tossed out of the solar system or, if he loses energy with every encounter, end up in the sun. Could this really happen in our solar system, yes, remember Jupiter is 317 times more massive than the Earth; so, if Earth and Jupiter were to interact the Earth could go for a wild ride and Jupiter would barely budge. Remember those hot Jupiters, well each hot Jupiter represents a whole lot of planet tossing. In our own solar system if we take the planets and convert them back to dust the densest material is in the ring of dust that represents Mercury because although Mercury is small its ring is very small, moving out the Venus ring is a little less dense and the Earth ring is a little less denser still. The Mars density ring is way less than Earth's and the asteroid belt is way less than the Mars ring, but when we get to Jupiter the density goes back up to what one would expect it to be based on the densities of the three inner planets. Sone one or something has gotten rid of a lot of material in the Mars and asteroid area. Jupiter have you been migrating into and out of that area?

Because super Earths and mini Neptunes are so common in our surveys it is not unreasonable to assume that one or more of these planets formed in our solar system. Because we have good evidence that Jupiters migrate, a lot, and ours migrated some we have the energy source needed to toss one or more of these planets out of our solar system or into our Kuyper belt. All of this makes the planet X proposed by Mike Brown and his team at Cal Tec not only plausible but probable.

And that is the end of my thoughts for this month.

Cheers All
Chuck

NOAA's Joint Polar Satellite System (JPSS) to revolutionize Earth-watching by Ethan Siegel

If you want to collect data with a variety of instruments over an entire planet as quickly as possible, there are two trade-offs you have to consider: how far away you are from the world in question, and what orientation and direction you choose to orbit it. For a single satellite, the best of all worlds comes from a low-Earth polar orbit, which does all of the following:

• orbits the Earth very quickly: once every 101 minutes,
• is close enough at 824 km high to take incredibly high-resolution imagery,
• has five separate instruments each probing various weather and climate phenomena,
• and is capable of obtaining full-planet coverage every 12 hours.

The type of data this new satellite – the Joint Polar Satellite System-1 (JPSS-1) -- will take will be essential to extreme weather prediction and in early warning systems, which could have severely mitigated the impact of natural disasters like Hurricane Katrina. Each of the five instruments on board are fundamentally different and complementary to one another. They are:

1. The Cross-track Infrared Sounder (CrIS), which will measure the 3D structure of the atmosphere, water vapor and temperature in over 1,000 infrared spectral channels. This instrument is vital for weather forecasting up to seven days in advance of major weather events.

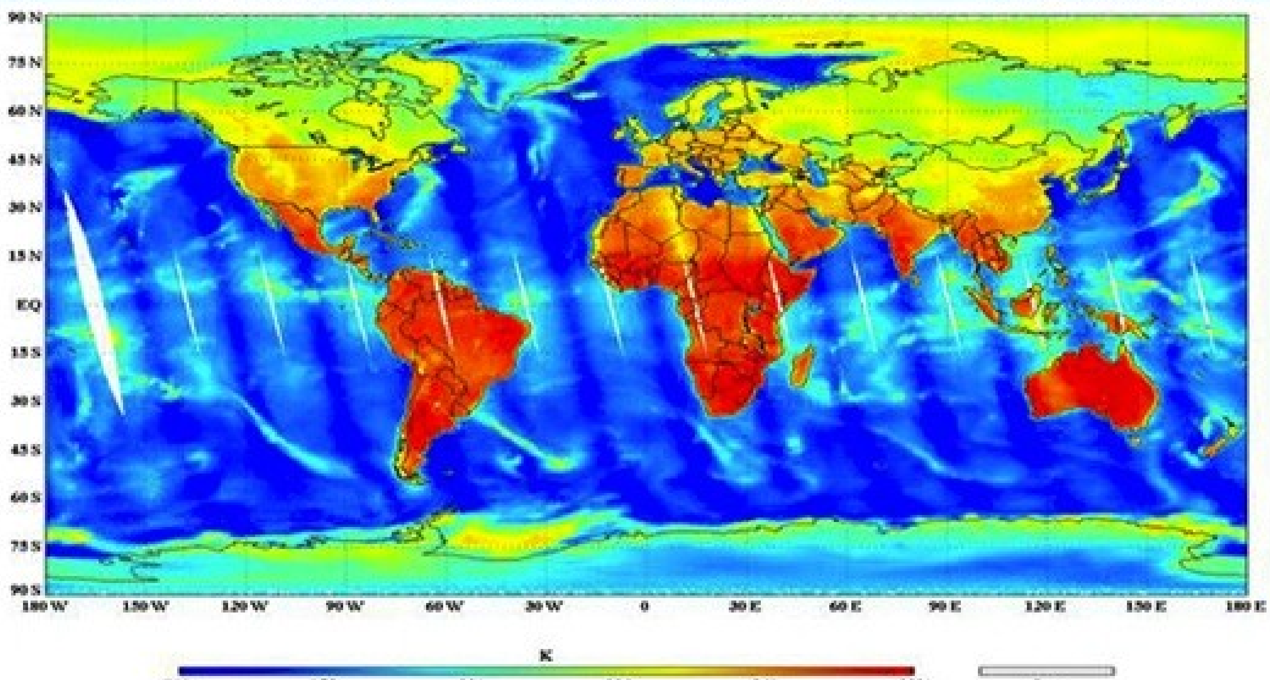
2. The Advanced Technology Microwave Sounder (ATMS), which assists CrIS by adding 22 microwave channels to improve temperature and moisture readings down to 1 Kelvin accuracy for tropospheric layers.

3. The Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, which takes visible and infrared pictures at a resolution of just 400 meters (1312 feet), enables us to track not just weather patterns but fires, sea temperatures, nighttime light pollution as well as ocean-color observations.

4. The Ozone Mapping and Profiler Suite (OMPS), which measures how the ozone concentration varies with altitude and in time over every location on Earth's surface. This instrument is a vital tool for understanding how effectively ultraviolet light penetrates the atmosphere.

5. Finally, the Clouds and the Earth's Radiant System (CERES) will help understand the effect of clouds on Earth's energy balance, presently one of the largest sources of uncertainty in climate modeling.

The JPSS-1 satellite is a sophisticated weather monitoring tool, and paves the way for its' sister satellites JPSS-2, 3 and 4. It promises to not only provide early and detailed warnings for disasters like hurricanes, volcanoes and storms, but for longer-term effects like droughts and climate changes. Emergency responders, airline pilots, cargo ships, farmers and coastal residents all rely on NOAA and the National Weather Service for informative short-and-long-term data. The JPSS constellation of satellites will extend and enhance our monitoring capabilities far into the future.



Images credit: an artist's concept of the JPSS-2 Satellite for NOAA and NASA by Orbital ATK (top); complete temperature map of the world from NOAA's National Weather Service (bottom).

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