Newsletter of the Pomona Valley Amateur Astronomers

The stars are scattered all over the sky
like shimmering tears...
Georg Buchner

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President's Message

So much going on right now! Exoplanets are always interesting and NASA just launched the Transiting Exoplanet Survey Satellite (TESS) on Wednesday, April 18. Unlike the preceding Kepler mission, which was designed to survey a huge group of stars far from Earth to find out how common Earth-like exoplanets might be in the galaxy, TESS will look for planets around nearby stars, all over the sky. Kepler found nearly 1300 exoplanets, but TESS is expected to find more than 20,000. TESS was the first NASA space probe to fly on a Falcon 9. It was the 53rd successful Falcon 9 launch and the 24th successful landing of a Falcon 9 first stage.

We had a near miss on Sunday, April 15, when a football-field-sized asteroid, 2018 GE3, zipped by the Earth at less than half the distance to the moon. The asteroid had only been discovered one day before, by the Catalina Sky Survey. If it had hit Earth, it would probably have caused Tunguska-level (multi-megaton) damage. That was eerie timing - I had just given a talk on Saturday about impacts and their role in mass extinctions, at the Alf Museum here in Claremont.

In happier news, this is a good time of year to catch the winter constellations for the last time as they sink into the west. The summer constellations are already up before dawn.

Speaking of time passing, it's time for club elections again. Board members Ron Hoekwater and Cori Charles are safe this year - it's an off year for them - but all of the other officers and board members are up for re-election. One position we'll need to fill is that of Secretary. After many years of faithful service, Howard Maculsay is stepping down as club secretary. Thank you, Howard, for all of your work on behalf of the club. If anyone is interested in the secretary position - or any other position for that matter - please let me know, by phone, email, Facebook, or at the club meeting.

Our meeting this Friday, April 27, will be back in Beckman B126. It's Alumni Weekend at the Claremont Colleges and our usual digs are occupied. We'll be back in Shanahan B460 next month. Our speaker this month is club member Steve Sittig, who will tell us about the origin of gold and other heavy elements in the universe in a talk titled, "Kilonovae: The Fort Knox of Space". I'll also give a short talk on weird meteorites. I hope to see you there!

Matt Wedel

PVAA Officers and Board

Officers

President ….....	Mathew Wedel	909-767-9851
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Launch Alerts

Now that Vandenberg Air Force Base is seeing more activity than usual with frequent SpaceX liftoffs as well as the United Launch Alliance rocket that sent the InSight Lander on its way to Mars the morning of May 5th, here is easy way to tell – in advance – when these launches are going to take place.

Below are two links with steps to sign up for the Launch Alert e-mail list. It will inform you of upcoming launches as soon as they are on the Vandenberg schedule. Usually this is weeks to months ahead of time though occasionally, due to security concerns, missions are only publicized hours before launch time.

http://www.spacearchive.info/newsletter.htm

Rockets trajectories from Vandenberg are usually to the south and are used when satellites are destined for polar orbits. Those launched from the East Cost have to contend with Florida weather and hurricanes, but are used when the vehicle is headed for orbit around the equator and for most interplanetary missions. The West coast was chosen for the InSight launch due to the much less crowded Vandenberg launch schedule compared with the full Cape Canaveral calendar. For more on the physics of launch locations and scheduling concerns, see the articles below.

https://www.accuweather.com/en/weather-news/why-does-nasa-launch-rockets-from-cape-canaveral-florida/70000391

https://www.wired.com/story/why-is-nasas-insight-mars-mission-launching-from-california/

Cloud and fog cover permitting, launches that take place near dawn and dusk can sometimes be seen from hundreds of miles away. I've been able to see two Vandenberg launches from the Sacramento area and my strategy is to get together warm clothes, shoes, red flashlight, binoculars, and phone battery backup the night before. Then I check the Vandenberg or SpaceX website from my phone before even leaving the warmth of my bed. If all it still a go I head out 10 minutes ahead of time and stake out a clear view to the south-east where Google Maps and my phone's compass says the launch should be.

One caveat – launch windows are sometimes instantaneous so the launch will either go at the scheduled time or not, and you can get right back to bed in any case. Others however can last for hours. InSight for example, had a 2-hour launch window which lasted from 4:05 – 6:05am and had the launch not taken place on May 5th there were opportunities all the way until June 8th. Observers lucked out that the launch took place at 4:05am on May 5th but a lot of waiting and watching in vain could have been in store. I recommend having online access to a countdown site for this reason, so you can get on with your life if the mission is scrubbed for the day.

Here are two shots I took with my iPhone of the February 22nd launch of a Falcon 9 rocket from Vandenberg AFB. It took Spain's Paz earth-imaging satellite into a polar orbit. The window was relatively short because Paz had to be precisely positioned relative to other earth-observation spacecraft.

Claire Stover

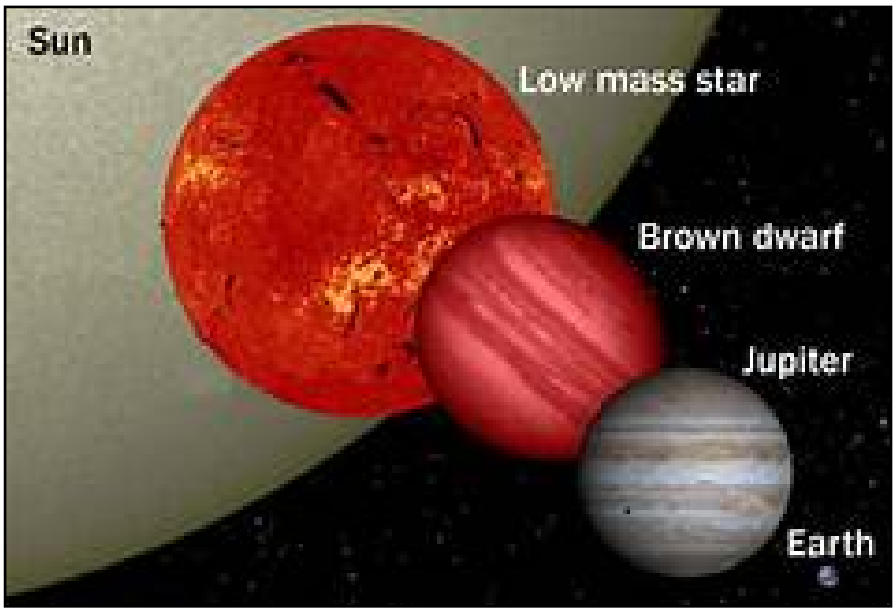
What's Up? - Weird Brown Dwarfs

Brown dwarfs are not characters out of Lord Of The Rings. But I like the creepy folk tale name. They're substellar dwarf stars that are smaller than relatively brighter red dwarf stars, but larger than Jupiter size gas giants. They may be 80 to 100 times larger than the size of Jupiter. Unlike main sequence normal stars, brown dwarfs aren't big enough to sustain nuclear fusion to burn as those visible stars we know.

They're stellar objects that glow so dimly that they are hard to see, locate and catalogue. The first brown dwarf was found in 1963 with about 5% of the Sun's mass. More have been found recently with new powerful telescopes. They are quite probably much more numerous than our well known bright flaming real stars. Brown dwarfs are very odd objects that may represent a missing link between star formation and giant planet formation. They are typically only half the radius of our Sun.

A brown dwarf starts its existence as do all stars in a ball of matter condensed from a swirling cloud of hydrogen. It's cloud of birth is too big to form a warm gas giant but not massive enough to sustain the very hot nuclear fusion of hydrogen to helium that enflames a true star. Born with no internal energy source to balance its gravity forces brown dwarfs will collapse slowly inward. This is a force that produces some heat that makes a brown dwarf shine in what may be an odd magenta like color. Most of what they radiate is in the infrared. But it's never the flaming fusion power of a real star. After a few hundred million years the brown dwarf's core becomes so dense that gravity will crush it to half its diameter, it will collapse and vanish into darkness. Practically invisible brown dwarfs may contribute to the mysterious gravitationally dark matter of our galaxy.

Lee Collins



Club Events Calendar

May 16 Board Meeting
May 24 – 28 RTMC

June 1 General Meeting
June 9 Star Party – White Mtn

July 14 Star Party – Cow Canyon Saddle
July 18 Board Meeting
July 27 General Meeting

Aug 11 Star Party – Angeles Oaks
Aug 15 Board Meeting
Aug 24 General Meeting
Sept 8 Star Party – Anza Borrego

Sept 12 Board Meeting
Sept 21 General Meeting

Oct 6 Star Party - Joshua Tree National Park
Oct 17 Board Meeting
Oct 26 General Meeting

Nov 10 Star Party – Mecca Beach
Nov 14 Board Meeting
Nov 30 General Meeting

Dec 8 PVAA Holiday Party

This article is provided by NASA Space Place.
With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.
Visit spaceplace.nasa.gov to explore space and Earth science!

Measuring the Movement of Water on Earth

As far as we know, water is essential for every form of life. It's a simple molecule, and we know a lot about it. Water has two hydrogen atoms and one oxygen atom. It boils at 212° Fahrenheit (100° Celsius) and freezes at 32° Fahrenheit (0° Celsius). The Earth's surface is more than 70 percent covered in water.

On our planet, we find water at every stage: liquid, solid (ice), and gas (steam and vapor). Our bodies are mostly water. We use it to drink, bathe, clean, grow crops, make energy, and more. With everything it does, measuring where the water on Earth is, and how it moves, is no easy task.

The world's oceans, lakes, rivers and streams are water. However, there's also water frozen in the ice caps, glaciers, and icebergs. There's water held in the tiny spaces between rocks and soils deep underground. With so much water all over the planet—including some of it hidden where we can't see—NASA scientists have to get creative to study it all. One way that NASA will measure where all that water is and how it moves, is by launching a set of spacecraft this spring called GRACE-FO.

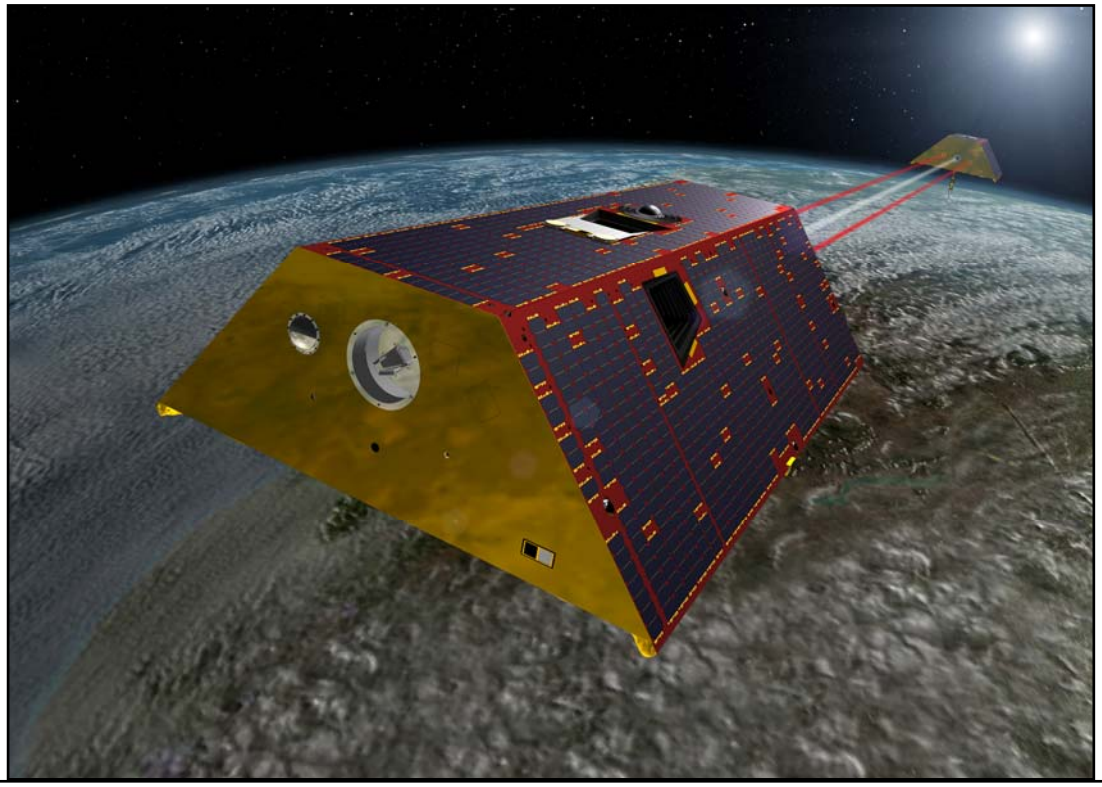
GRACE-FO stands for the "Gravity Recovery and Climate Experiment Follow-on." "Follow-on" means it's the second satellite mission like this—a follow-up to the original GRACE mission. GRACE-FO will use two satellites. One satellite will be about 137 miles (220 km) behind the other as they orbit the Earth. As the satellites move, the gravity of the Earth will pull on them.

Gravity isn't the same everywhere on Earth. Areas with more mass—like big mountains—have a stronger gravitational pull than areas with less mass. When the GRACE-FO satellites fly towards an area with stronger gravitational pull, the first satellite will be pulled a little faster. When the second GRACE-FO satellite reaches the stronger gravity area, it will be pulled faster, and catch up.

Scientists combine this distance between the two satellites with lots of other information to create a map of Earth's gravity field each month. The changes in that map will tell them how land and water move on our planet. For example, a melting glacier will have less water, and so less mass, as it melts. Less mass means less gravitational pull, so the GRACE-FO satellites will have less distance between them. That data can be used to help scientists figure out if the glacier is melting.

GRACE-FO will also be able to look at how Earth's overall weather changes from year to year. For example, the satellite can monitor certain regions to help us figure out how severe a drought is. These satellites will help us keep track of one of the most important things to all life on this planet: water.

Teagan Wall



An artist's rendering of the twin GRACE-FO spacecraft in

You can learn more about our planet's most important molecule here: https://spaceplace.nasa.gov/water

Amazing Facts

Astronauts who have walked on the moon report that moondust smells like spent gunpowder.
The distinctive smell filled the moonlander when the astronauts re-entered it after a moonwalk and took off their helmets.
Scientists have theorized that this is because the smell of gunpowder comes from the “dangling bonds”
of newly shattered molecules. This smell dissipates when the molecules are exposed to oxygen and the electrons bond to it.
As there is very little free oxygen on the moon’s surface, the smell continues to linger indefinitely

wiseGEEK

PVAA Gen Meeting 03/02/18

The March General Meeting was at Beckman Hall, which was our old meeting place. The Shanahan Building was getting some maintenance done. Attendees had to deal with a light rain to attend. All were in good spirits. We had 33 attendees. After the welcome Ludd Trozpek gave a presentation on the club's 34" mirror. We received this as a gift, and we are trying to figure out the best mounting system for it.

Another reminder to get you tickets now for RTMC – Riverside Telescope Makers Conference at Camp Oakes – May 24th – May 28th. You can get more info here:

http://rtmcastronomyexpo.org/

The speaker for the night was Dr. Eric Grosfils of Pomona College. The title of his presentation was: "Modern Mars: Ice & Climate - Is Mars Currently Exiting an Ice Age?" We can only compare Mars to Earth, which had Ice Ages that we know of. Earth's last Glacial Maximum caused a sea level change of 130 meters. Glaciers can move from 2 meters to a whopping 8 kilometers per year on Earth.

NASA's Mars Global Surveyor and Mars Odyssey missions have provided evidence of a recent (in geologic terms) ice age on Mars. On Earth the ice start at the poles and move towards the equator. On Mars, when the poles warm up, the water transports down to the lower latitudes and re-freezes.

Variations in the orbit and tilt produce extreme changes in the water distribution. According to Dr. James Head of Brown University, Providence Rhode Island: "Of all the solar system planets, Mars has the climate most like that of Earth. Both are sensitive to small changes in orbital parameters. Now we're seeing that Mars, like Earth, is in a period between ice ages."

As the Martian poles heat up, the water vapor enters the Martian atmosphere and comes back down at lower latitudes. It comes back as frost or snow, mixed with a lot of Martian dust. The Phoenix lander actually recorded a Martian snowfall. After the snow & ice-rich mixture falls at the lower latitudes, (This can be up to a few meters thick), it creates a mantle that develops a bumpy texture resembling the surface of a basketball. We can see this on Earth in some Antarctic landscapes. When the ice on the top layer sublimes back into the atmosphere, it leaves behind the dust, which forms an insulating layer over the ice underneath.

The Phoenix lander did expose a couple pockets of ice when it scooped out a sample to be tested in its little ovens. The water did not evaporate immediately but took several Martian days.