



Newsletter of the Pomona Valley Amateur Astronomers

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nightwatch

February 2014

President's Message

There's a lot going on **Up There** this spring.

Mars is coming into opposition, the point in its orbit when it comes closest to Earth. The closest approach will be in the first half of April, but the red planet is already starting to yield some details to backyard stargazers. Because of the eccentricity of Mars' orbit, some oppositions are better than others. This year's is not fantastic, but it's not bad either, and Mars comes around so infrequently—about once every year and a half—that beggars can't be choosers.

Exciting things are happening on Mars, too. Our rover Curiosity has just celebrated the tenth anniversary of its landing. NASA's proximate goal was to have the rover last for at least a 90-day primary mission; it has now been “wheels down” on Mars for more than 3670 Earth days. Even considering the months it spends dormant every Martian winter, that's a heck of an accomplishment.

Looking farther out, astronomers both professional and amateur have been excited by not one but two supernovae in nearby galaxies. I think nearby supernovae have a lot in common with bright comets: everybody's wild about them, but there's no telling when they'll come around. All you can do is keep watching and hoping.

If anyone appreciated the value of spending a lot of time looking up, it was John Dobson, who passed away last month at the age of 98. Dobson is best known for having popularized the simple alt-az mounted Newtonian reflectors that are now universally known as Dobsonians, and for having essentially invented the idea of sidewalk astronomy. Dobson could be gruff

and his cosmological ideas were out of step with the mainstream, but his impact on amateur astronomy was immense and mostly positive. He will certainly be missed.

We moved our general meeting back one week, to February 21, so it wouldn't fall on Valentine's Day. Our speaker this month is Ian Beardsley. I hope to see you there!

Matt Wedel

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PVAA General Meeting 01/17/14

Matt Wedel started the first new meeting of the year on time at 7:30pm. We were locked out of the building until 15 minutes before it started. Fortunately a professor happened by and unlocked the doors.

Lee wasn't there to give his "What's up" presentation so Matt talked about his trip to the Science and Astronomy Expo at Tucson, Arizona. He and his son ate at the Space Age Restaurant, and had fun going to all the vendor booths. He picked up a lot of Eclipse glasses and is offering a pair to anyone who would give a short presentation at one of our next meetings.

On a sad note, John Dobson, inventor of the Dobsonian Telescope, died January 15th. At our next meeting we will have a time for members to share any events they had with him. John Dobson quite literally brought astronomy to the masses.

During the break we got to look at several items Frank Busutil brought in that he uses when having a star party for the blind. It is called "Project Bright Sky."

Our featured speaker was UC Riverside Assistant Professor Brian Siana. He titled his presentation "Finding the Faintest Galaxies in the Universe Using Gravitational Lenses." Professor Siana is using data from the Hubble Telescope to search for "hidden" galaxies in the pictures of other galaxies. Hubble can currently get images as faint as the 29th magnitude. Using gravitational lensing, you can actually see galaxies down to the 32nd magnitude. He is interested in just how galaxies formed. Using the super computer at UC Santa Cruz, they came up with a computer model of how the Milky Way was formed.

Their biggest problem is seeing anything beyond 10 billion years ago. He had a chart of Luminosity Functions with a graph showing what we know, and extending the graph into the realm of what we do not know. Almost half of the Gamma Ray Bursts from Super Novas come from galaxies that we can't see. We see the burst, but then we have Hubble look at that area, and there is nothing there. He also mentioned the fact that it takes about 100 million dollars per year to operate and manage the Hubble Space Telescope. He is on the board that decides who gets time on the telescope.

Gravitational lensing and Einstein's General Relativity theory was proven during the 1919 solar eclipse by Sir Arthur Eddington. The Sun actually moved the apparent positions of the stars next to it due to its gravity. The Einstein Cross is also caused by gravitational lensing. An elliptical galaxy is in front of a distant galaxy, forming a cross. The good things about gravitational lensing are that it is not wavelength dependent (doesn't affect the red shift), it magnifies the object and its light, and it filters out the ultraviolet from the nearby galaxy doing the lensing; presenting a clearer picture of the galaxy further away. Of course the bad thing is that you can only "lens" where there is a galaxy, or group of galaxies, in the forefront. However, they are trying to use Dark Matter clumps -Dark Matter not associated with any stars or galaxies to lens a far away galaxy.

We had a very interesting question and answer period after the presentation – and a lot of interaction during the presentation. Thank you Professor for a very lively presentation!

Gary Thompson

Club Events Calendar

February 21, 2014, General meeting, Ian Beardsley

February 22, 2014, Star Party, Mecca Beach, Salton Sea

March 6, 2014, Board meeting, 6:15

March 14, 2014, General meeting

March 22, 2014, Star Party, Cottonwood Springs, Joshua Tree

March 29, 2014, Children's Festival, Claremont Library 1-4pm

April 3, 2014, Board meeting, 6:15

April 11, 2014, General meeting

April 26, 2014, Star Party, Anza Borrego State Park

May 8, 2014, Board meeting, 6:15

May 16, 2014, General meeting, Vatche Sahakian

May 22-26, 2014, RTMC

June 5, 2014, Board meeting, 6:15

June 13, 2014, General meeting

June 28, 2014, Star Party, White Mountain, Bishop



A Two-Toned Wonder from the Saturnian Outskirts

Although Saturn has been known as long as humans have been watching the night sky, it's only since the invention of the telescope that we've learned about the rings and moons of this giant, gaseous world. You might know that the largest of Saturn's moons is Titan, the second largest moon in the entire Solar System, discovered by Christiaan Huygens in 1655. It was just 16 years later, in 1671, that Giovanni Cassini (for whom the famed division in Saturn's rings—and the NASA mission now in orbit there—is named) discovered the second of Saturn's moons: Iapetus. Unlike Titan, Iapetus could only be seen when it was on the west side of Saturn, leading Cassini to correctly conclude that not only was Iapetus tidally locked to Saturn, but that its trailing hemisphere was intrinsically brighter than its darker, leading hemisphere. This has very much been confirmed in modern times!

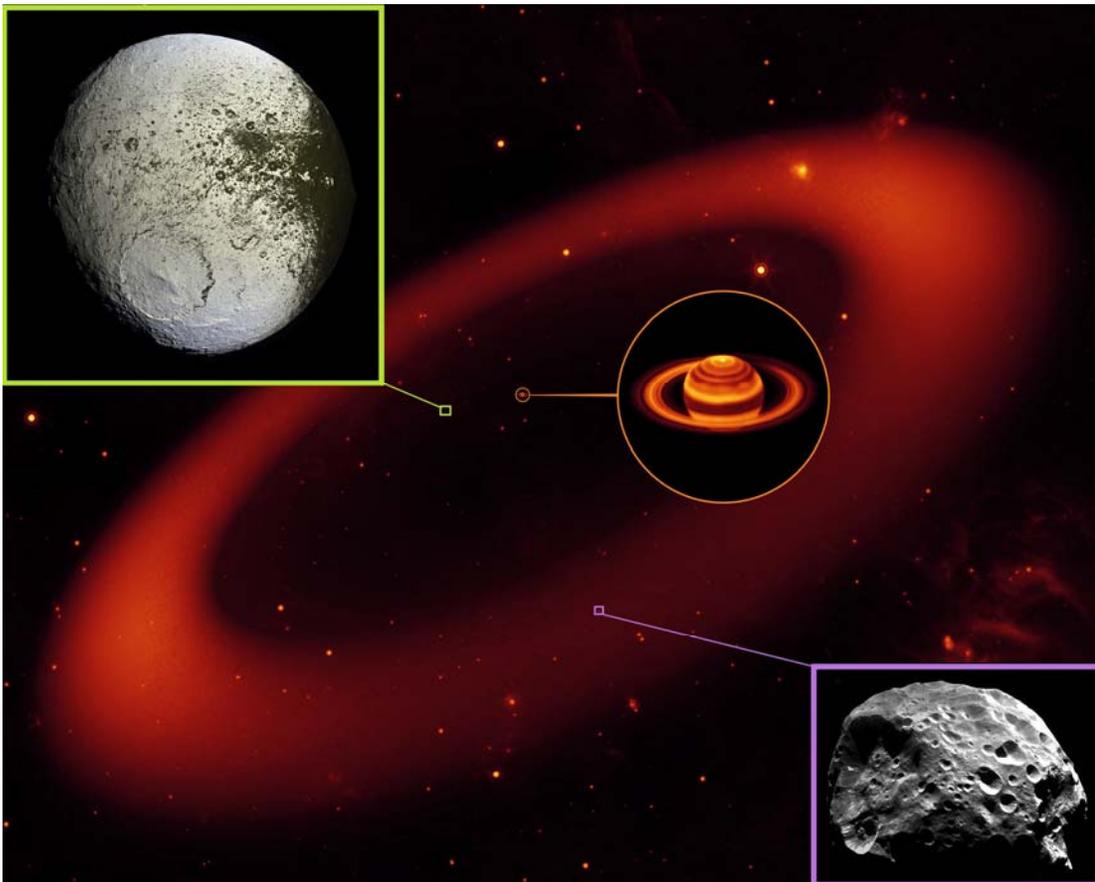
In fact, the darkness of the leading side is comparable to coal, while the rest of Iapetus is as white as thick sea ice. Iapetus is the most distant of all of Saturn's large moons, with an average orbital distance of 3.5 million km, but the culprit of the mysterious dark side is *four times* as distant: Saturn's remote, captured moon, the dark, heavily cratered Phoebe!

Orbiting Saturn in retrograde, or the opposite direction to Saturn's rotation and most of its other Moons, Phoebe most probably originated in the Kuiper Belt, migrating inwards and eventually succumbing to gravitational capture. Due to its orbit,

Phoebe is constantly bombarded by micrometeoroid-sized (and larger) objects, responsible for not only its dented and cavity-riddled surface, but also for a huge, diffuse ring of dust grains spanning *quadrillions* of cubic kilometers! The presence of the "Phoebe Ring" was only discovered in 2009, by NASA's infrared-sensitive Spitzer Space Telescope. As the Phoebe Ring's dust grains absorb and re-emit solar radiation, they spiral inwards towards Saturn, where they smash into Iapetus— orbiting in the opposite direction—like bugs on a highway windshield. Was the dark, leading edge of Iapetus due to it being plastered with material from Phoebe? Did those impacts erode the bright surface layer away, revealing a darker substrate?

In reality, the dark particles picked up by Iapetus aren't enough to explain the incredible brightness differences alone, but they absorb and retain *just enough* extra heat from the Sun during Iapetus' day to sublimate the ice around it, which resolidifies preferentially on the trailing side, lightening it even further. So it's not just a thin, dark layer from an alien moon that turns Iapetus dark; it's the fact that surface ice sublimates and can no longer reform atop the leading side that darkens it so severely over time. And that story—only confirmed by observations in the last few years—is the reason for the one-of-a-kind appearance of Saturn's incredible two-toned moon, Iapetus!

Dr. Ethan Siegel



Learn more about Iapetus here:

<http://saturn.jpl.nasa.gov/science/moons/iapetus>.

Kids can learn more about Saturn's rings at NASA's Space Place:
<http://spaceplace.nasa.gov/saturn-rings>.

What's Up? Men In Space

Recently, I visited the Space Shuttle Endeavour in the California Science Center near USC. It's exciting to see a space craft that has gone into earth orbit twenty five times over a period of 20 years (1992-12). It has a British spelling because its named after Captain Cook's (not Captain Kirk) sailing ship that went around the world (1868-71) exploring and watching a solar transit of Venus from Tahiti. The other five Shuttles in the thirty five year program (1976-11) were also named after famed sailing ships. They carried out a total of 135 missions, servicing space stations like Skylab, Mir, and the International Space Station (ISS). They launched innumerable satellites and space probes like Galileo, Magellan, and Ulysses. Most memorable was the servicing of the Hubble Space Telescope.

Endeavour is the only Shuttle on display the western U.S. Enterprise (experimental model) is in New York's Sea-Air-Space Museum. Discovery is in the Smithsonian Air & Space Museum and Atlantis is at the Kennedy Space Center in Florida. Sadly, Challenger and Columbia both came to disastrous ends.

Considering the enormously dangerous speeds and temperatures involved in their flights it's remarkable that more Shuttle explosions didn't occur. Risks were constantly taken. The fuel tank O-rings on Challenger failed in 1986 because of debatable cold. With Columbia's failed reentry a crack had been caused during take off by a little piece of lightweight tank foam smacking into the shuttle's wing (at 500 mph). It had happened before without damage. But this time it opened wider at the 15,000 mph re-entry speeds allowing superheated 3,000 degree air inside the wing. The result was over 100,000 pieces spread over half of Texas

The space stations that Shuttles serviced also had their frightening accidents. Mir (meaning peace) suffered from a fire and a Russian ship that crashed into the station during docking creating both the first outer-space fire and traffic accident. Eventually Spacelab and Mir fell flaming to Earth but not before carrying out many successful scientific experiments and notable astronomical observations (especially solar). With the Shuttle's help they were all fine examples of a thrifty international cooperation necessary after the spend thrift "space race" years. Today only the International Space Station remains. But since the Shuttle program has come to an end it must rely on the Russians Soyuz to supply it.

Commercial Orbital Transportation has come up with replacement programs like Space X Dragon. But federal bureaucratic restrictions and problems like insurance (those falling objects) have put it on a tight leash.

On a more touristy note the current Endeavour display also features the ships actually tires (it won't need them any more) that you

can touch. Also (removed from the ship) the galley, the SPACEHAB (workshop), one of the huge rockets, and most fascinating of all: the Space Potty. The Space Potty had explanations on how to use it but nobody did while we were there. There's an IMAX movie taken during Shuttle flights and many extra pieces of space hardware including satellites, real Apollo landing pods, and a full size replica of the Viking Mars Lander. They promise that the other Shuttle components such as the recoverable Solid rocket Boosters and the huge expendable External Tank will soon be included. That would raise the Shuttle into a vertical position rather than the parking mode it holds today.

The Space Shuttle was developed to be an economic means of doing new things in space. As a manned returnable vehicle it could do much more than other launch vehicles. It was a space laboratory, repair shop, always able to return and deliver payloads (average 50,000lbs). Space travelers included a sultan, the nephew of King Saud of Arabia. NASA funding committee Senators and Congressmen also went into space. Being in their 50's they were used as "old men" guinea pigs. White rats, squirrel monkeys and pine tree seedlings were among other biological experiments conducted in microgravity. Shuttles featured the first woman astronaut (Sally Ride) as well as the first mother and the first black woman. Now when is someone going to give birth in space? My favorite crisis was when woodpeckers pecked holes in the infamous foam. Plastic owls came to discourage them.

Because of the dangers and expense of putting men into space, critics have contended that humans should be replaced by unmanned robotic missions such as those that have gone to Mars and the outer planets. Men in space fulfill a romantic model of the traditional heroic explorer and pioneer but as Carl Sagan once said, "the moment you put people aboard any space mission the top priority changes from doing science to returning those people alive."

Lee Collins>

