



Newsletter of the Pomona Valley Amateur Astronomers

All our knowledge begins with the senses, proceeds  
 then to the understanding, and ends with reason.  
 There is nothing higher than reason...  
*Immanuel Kant*

Volume 37 Number 05

*nightwatch*

May 2017

### President's Message

This is a good time of year for stargazing. The Realm of the Galaxies in Ursa Major, Virgo, and Coma is high overhead at sunset, and the summer Milky Way rises before midnight. These fertile deep-sky hunting grounds are patrolled by the giant planets - Jupiter among the galaxies, and Saturn in the Milky Way.

Speaking of the gas giants, we are fortunate to have space probes orbiting both right now - Juno at Jupiter, and Cassini at Saturn. That won't last for much longer - Cassini will dive into Saturn's clouds and burn up on September 17. There's a constant stream of new science and mind-blowing images on NASA's Saturn page. Check it out: <https://saturn.jpl.nasa.gov/>.

Our 2017 election for club officers will take place at the general meeting this Friday. That means it's also time to renew memberships. Dues are still \$30 per person and \$40 for families.

Our speaker this month is Professor Alma Zook of Pomona College. Normally she works on blazars, but she'll speak to us Friday about Pluto. Ron assured her that we are not Pluto-ed out! The meeting will be Friday evening at 7:30 in Shanahan B460 on the Harvey Mudd campus. I hope to see you there. .

*Matt Wedel*

### Club Events Calendar

**May 12, 2017 General Meeting**

**May 25 - 29, Joint RTMC**

**May 31, 2017 Board Meeting**

**June 9, 2017 General Meeting**

**June 24, 2017 Star Party – Grandview**

**June 28 Board Meeting**

**July 7 General Meeting**

**July 22 Star Party -Culp Valley Campground, Anza Borrego**

**July 26 Board Meeting**

**August 4 General Meeting**

**August 5, 2017, Girl Scout Star Party at Cabrillo Beach**

**August 12 Star Party - Cow Canyon Saddle, Mount Baldy**

**August 30 Board Meeting**

**September 8 General Meeting**

**September 16 Star Party - Palomar Mountain and Observatory tour**

**September 27 Board Meeting**

**October 6 General Meeting**

### PVAA Officers and Board

#### Officers

President .....	Mathew Wedel .....	909-767-9851
Vice President ..	Joe Hillberg .....	909-949-3650
Secretary .....	Howard Maculsay .....	909-624-1667
Treasurer .....	Gary Thompson .....	909-935-5509
VP Facilities .....	Jeff Felton .....	909-622-6726

#### Board

Jim Bridgewater (2016).....	909-599-7123
Karl Rijkse (2016) .....	909-428-1884
Ron Hoekwater (2017).....	909-391-1943
Cori Charles (2017) .....	909-646-0275

#### Directors

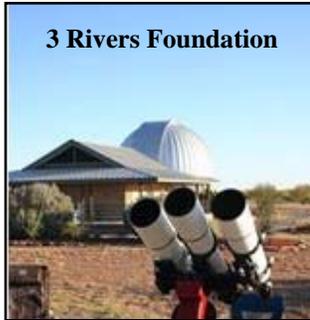
Membership / Publicity....	Gary Thompson ..	909-935-5509
Outreach .....	Jeff Schroeder .....	909-758-1840
Programs .....	Ron Hoekwater .....	909-391-1943
Nightwatch .....	John Stover .....	909-988-9747

## PVAA General Meeting 04/07/17

PVAA president Mathew Wedel opened the meeting with calendar announcements and reminded the attendees of the upcoming club elections. Ron Hoekwater talked about the upcoming RTMC (Riverside Telescope Makers Conference) this Memorial Day weekend. For more information, their website is:

<http://rtmcastronomyexpo.org/>

After the calendar Matt talked about his visit to the Comanche Springs Astronomy Campus in Crowell Texas. They have very dark skies, a 30" and two 20" Obsession telescopes. They also have a 15" refractor. Matt participated in their Messier Marathon and earned an award.

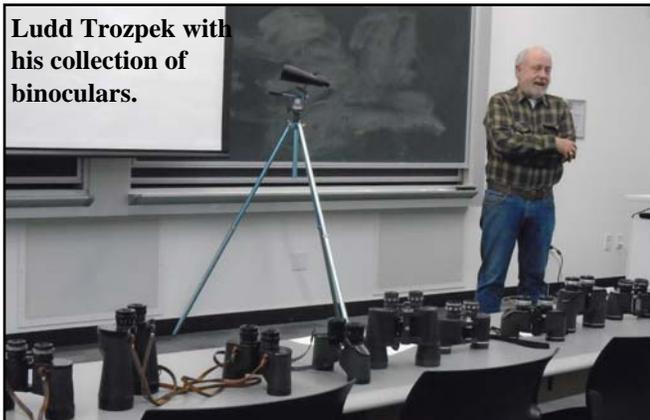


**3 Rivers Foundation**

Their Facebook page is

<https://www.facebook.com/pages/Comanche-Springs-Astronomy-Campus/124908334242423>

Ludd Trozpek gave a talk on binoculars, and brought in 11 pairs for us to look at during the break. He suggested the book: "Binocular Astronomy" by Stephan Tunkin as a 'must have'. (\$35.99 at Amazon) His talk was about the differences in field-of-view, eye relief, when & where they were made, and his likes and dislikes of the way they were made.



**Ludd Trozpek with his collection of binoculars.**

The main speaker for the night was Tim Thompson of the [Los Angeles Astronomical Society](#) and retired JPL employee. The topic of the night was Saturn, as the Cassini spacecraft is about to end its mission around the planet.

When Galileo Galilei first saw the rings in 1610, his optics were so bad that he thought they were two moons on either side the planet. In 1859 James Clerk Maxwell published 'On the Stability of the Motion of Saturn's Rings' in 1859 for which he received the Adams prize for his work. In it he proved that the rings were not solid. (The mathematical calculations are 60 pages long!) In 1883, the first photograph of Saturn was taken by Andrew Common. As a side note, Andrew Common built his own 60" reflector that he ground himself, only to have it perform poorly. He then ground ANOTHER 60" mirror that still wasn't up to his standards. This was well before the 60" Mount Wilson telescope.

**Picture of Saturn by Cassini spacecraft**



Pioneer 11 flew by Saturn in September 1979, followed by Voyager 1 in November 1980, and Voyager 2 in August 1981. These were our first close-up pictures of Saturn. We only had a brief period to observe Saturn, as they were all fly-bys.

Then the Cassini spacecraft was launched on October 15, 1997, and entered orbit around Saturn on July 1, 2004. The spacecraft is named after Giovanni Cassini. Giovanni Cassini discovered the 'Cassini division' of Saturn's rings. The Huygens probe – named after the Dutch astronomer Christiaan Huygens, who discovered Saturn's moon Titan. On January 14, 2005, the Huygens probe was released from the Cassini spacecraft and landed on the moon Titan. This was the first landing ever in the outer solar system. On the way to Saturn JPL figured out that the original plan to release Huygens wouldn't work because of the doppler effect. The radio frequency of the lander would be beyond Cassini's range. Fortunately, that discovery allowed them to change their approach and avoid that dilemma.

JPL's Cassini discovered the hexagonal top at Saturn's north pole, Enceladus's "tiger stripes" that are hotter than the rest of the moon's surface & the geysers spaying water into space – making a ring around Saturn.

Tim then showed us a short movie of the moons Pandora – embedded in the rings & causing ripples, and Prometheus – which shepherds the F ring. .

*Gary Thompson*



**Tim Thompson**

## What's Up? - Lord of Rings

Saturn is called a planet but it's totally unlike our rocky Earth. It's a diffuse gas giant with no solid surface. Of course it's best known for its impressive system of brightly reflective rings. Other gas giant planets (Jupiter, Uranus, Neptune) have faint rings but Saturn's are large enough to be seen with small telescopes. They're brighter even though they're amazingly thin for their size. Their width could reach from Earth to our Moon. But most sections are only as wide as a football field's length. Made up of 90% of water ice, plus dust and rock. They're named alphabetically in order of discovery. A and B rings border Cassini's Division and are the largest. The inner C or Crepe Ring is almost transparent. D, E, F, and G Rings are smaller.

These rings are extremely complex. Small moonlets orbit and clear out the visible ring gaps. There are other "shepherd" moonlets that confine the rings and hold them in place. There are bits as large as automobiles, but most pieces are only dust size. All held in orbit by gravitational physics.

It was pioneer astronomer Galileo who first looked at Saturn with his basic 1610 telescope. He thought there were two large moons on either side of Saturn. They looked like "ears" and he was bewildered. Christian Huygens with a stronger telescope so was able to see them as rings.

Huygens also discovered Saturn's largest moon: Titan. The second largest moon in the solar system. It's the only moon to have a thick nitrogen rich atmosphere. It's larger than the planet Mercury, but still it seems too cold for any life. Although it could have oceans of methane with rainfall-like cycles.

Giovanni Cassini next spotted four more large moons: Iapetus, Rhea, Tethys, and Dione. In 1675 Cassini also discovered the largest ring gap which became Cassini's Division. James Maxwell in 1859 proved the rings couldn't be solid but must be icy rocks. Spooky ring "spokes" are the result of electrostatic dust suspension. Every 15 Earth years the rings tilt so they seem invisible (next is 2025). Are they the remains of a destroyed moonlets or original material from Saturn's formation?

Saturn, as the solar system's second largest planet (after Jupiter), is able to hold on to over 150 moons although only 53 are big enough to be named. Its diameter is 74,500 miles, nine times that of Earth. Its volume is 764 times larger than Earth. It's atmosphere is mostly 96% hydrogen but there is also methane (0.4%) ammonia (.01%) and helium (3%). The surface clouds are a very cold -274 degrees F.

Its north polar atmospheric vortex exhibits an ongoing mysterious wave patterns (hexagons larger than Earth), another Saturn mystery.

As a gas giant with no solid surface Saturn has less surface gravity than Earth. It should be light enough to float on water (if a large enough bathtub could be found) because it's less dense than water. Although there must be dense rocky core to be the center of it all. It's gassy form is flattened by its fast rotation. It's an odd oblate spheroid shaped planet. Its polar diameter is 90% of its equatorial diameter.

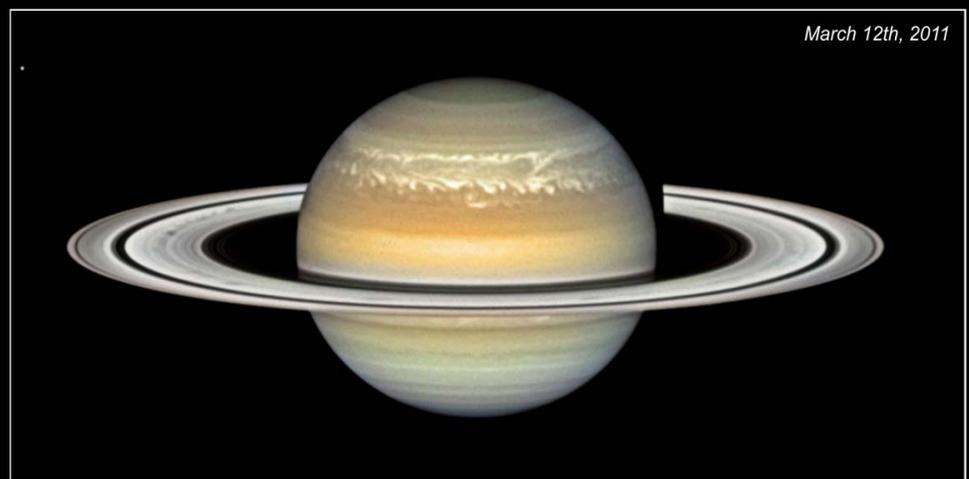
Saturn's apparently bland yellowish methane surface atmosphere exhibits long-lived ovals storms and larger planet banding storm structures that come from deeper in Saturn to rise to its frigid surface (pictured). Saturn's thin icy upper winds are about the fastest moving in our solar system. Speeds of 1800 km/h have been observed. They form faint cold yellowish bands unlike Jupiter's intense ones. In Saturn's center is a relatively small (Earth sized?) rocky core that might be 20,000 degrees F. hot. Although others think its frozen icy cold.

Being so light weight, Saturn "daily" rotates every 10 hours and 30 minutes. But because it's so far from our Sun it takes 29 and a half Earth years to orbit our Sun. It can remain in the same constellation for two or more years. It's currently been in Ophiuchus almost that long. This has given it the mythic identity of an old man planet. Holst's orchestral piece "Planets" calls Saturn "the bringer of old age." Saturn is the god of time, wealth and agriculture. He is often pictured with a long beard and a harvester's sickle. Named after the Roman god Saturnus, he is the ancient father of Jupiter. The planet has also been called "the Jewel of the Solar System" because of its visually jewel-like ring system. The day Saturday (which comes at the end of the week) is named after slow moving Saturnus.

Pioneer 11 did the first flyby in 1979. Next Voyager was sent closer to take quality photos of the famous ringed planet and its many exotic moons. In 2004 Cassini-Huygens space probe entered into orbit for many years taking vivid photographs of the planet, its moons and its rings. Much still remains to be understood about this complex Lord of Rings. .

*Lee Collins*

### Saturn Storm



ACS / Hubble Space Telescope (NASA/ESA)



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## NOAA's Joint Polar Satellite System (JPSS) to monitor Earth as never before

Later this year, an ambitious new Earth-monitoring satellite will launch into a polar orbit around our planet. The new satellite—called JPSS-1—is a collaboration between NASA and NOAA. It is part of a mission called the Joint Polar Satellite System, or JPSS.

At a destination altitude of only 824 km, it will complete an orbit around Earth in just 101 minutes, collecting extraordinarily high-resolution imagery of our surface, oceans and atmosphere. It will obtain full-planet coverage every 12 hours using five separate, independent instruments. This approach enables near-continuous monitoring of a huge variety of weather and climate phenomena.

JPSS-1 will improve the prediction of severe weather events and will help advance early warning systems. It will also be indispensable for long-term climate monitoring, as it will track global rainfall, drought conditions and ocean properties.

The five independent instruments on board are the main assets of this mission:

- The Advanced Technology Microwave Sounder (ATMS) adds 22 microwave channels to CrIS's measurements, improving temperature and moisture readings.

- The Cross-track Infrared Sounder (CrIS) will detail the atmosphere's 3D structure, measuring water vapor and temperature in over 1,000 infrared spectral channels. It will enable accurate weather forecasting up to seven days in advance of any major weather events.
- Taking visible and infrared images of Earth's surface at 750 meter resolution, the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument will enable monitoring of weather patterns, fires, sea temperatures, light pollution, and ocean color observations at unprecedented resolutions.
- The Ozone Mapping and Profiler Suite (OMPS) will measure how ozone concentration varies with altitude and in time over every location on Earth's surface. This can help us understand how UV light penetrates the various layers of Earth's atmosphere.
- The Clouds and the Earth's Radiant System (CERES) instrument will quantify the effect of clouds on Earth's energy balance, measuring solar reflectance and Earth's radiance. It will greatly reduce one of the largest sources of uncertainty in climate modeling.

The information from this satellite will be important for emergency responders, airline pilots, cargo ships, farmers and coastal residents, and many others. Long and short term weather monitoring will be greatly enhanced by JPSS-1 and the rest of the upcoming satellites in the JPSS system.

*Ethan Siegel*



*Caption: Ball and Raytheon technicians integrate the VIIRS Optical and Electrical Modules onto the JPSS-1 spacecraft in 2015. The spacecraft will be ready for launch later this year.*

*Image Credit: Ball Aerospace & Technologies Corp.*

Want to teach kids about polar and geostationary orbits?  
Go to the NASA Space Place:  
<https://spaceplace.nasa.gov/geo-orbits/>