



Newsletter of the Pomona Valley Amateur Astronomers

Be glad of life because it gives you the chance to ...
look up at the stars.
Henry Van Dyke

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nightwatch

September 2016

President's Message

Not much news from me this time - between being out of town for a paleontology conference and coming back to full-time teaching, I haven't had much time or energy for stargazing. There are still quite a few planets up, and now is a great time of year to catch the summer constellations in the early evening and the winter constellations if you stay up a little later.

A bit of off-topic news: a dinosaur book I've been working on for the past five years is finally done and out. It's *The Sauropod Dinosaurs: Life in the Age of Giants*, written by Mark Hallett and myself, and illustrated with Mark's amazing paintings and drawings. If you're interested, please see the publisher's page

<https://jhupbooks.press.jhu.edu/content/sauropod-dinosaurs>

or the Amazon link

<https://www.amazon.com/Sauropod-Dinosaurs-Life-Age-Giants/dp/1421420287>.

Our speaker this month is Dr. Elijah Langdon Quetin, visiting instructor of physics and astronomy at Pomona College. He will speak about his research on black holes. The meeting will be 7:30 this Friday, Sept. 15, downstairs in Beckman Hall (not Shanahan B460 where we have been meeting). I hope to see you there .

Matt Wedel

Club Events Calendar

Sept 16, 2016 General Meeting – Dr. Elijah Quetin – Stars Consumed by Black Holes

Oct 1, 2016 Star Party-- Palomar Campground - Palomar 200" Tour

Oct 5, 2016 Board Meeting

Oct 14, 2016 General Meeting

Oct 29, 2016 Star Party – Afton Canyon

Nov 10, 2016 Board Meeting

Nov 18, 2016 General Meeting

Nov 30, 2016 Board Meeting

Dec 10, 2016 Xmas Party

Jan 4, 2017 Board Meeting

Jan 13, 2017 General Meeting

Jan 28, 2017 Star Party – Salton Sea, Mecca Beach

Feb 1, 2017 Board Meeting

Feb 10, 2017 General Meeting

Feb 25, 2017 Star Party

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PVAA General Meeting 8/19/16

After club announcements Annie Kary gave a presentation on her school essay of Black Holes in science fiction. (Such as the science fiction movie “Interstellar”, or the Kip Thorne book: “Black Holes & Time Warp”.) She classified the science fiction into 3 eras: Early, Golden & Modern. Early was generally 1948 – 1968. Golden was from 1968 -1990, while Modern is from 1990 and continuing. Early included books like “Sword of Rhiannon” by Leigh Brachett. The Golden Age had authors like Larry Niven and Joe Haldeman. (Although Joe is also in the Modern Age.) The Modern Age has movies like the before mentioned “Interstellar”. While all the writings work with black holes, our knowledge of them has changed the way the science fiction writer deals with the black holes in general. (The early literature did not deal with Quantum versus Stellar black holes.)

Her talk was entertaining and informative. She suggests that you check out “The Nothing Spot” by Dian Girad

<http://vintage.failed-dam.org/nothing.htm>,

“Eater” by Gregory Benford & “Exultant” by Stephen Baxter.

The next presenter was Dr. Matt Povich - Assistant Professor Department of Physics and Astronomy California State Polytechnic University, Pomona (Cal Poly Pomona) - on the *Milky Way Project*. He is the lead scientist on the project.

<https://www.zooniverse.org/projects/povich/milky-way-project>

The Milky Way Project is now hosted by Zooniverse which allows the everyday citizen contribute to the research of the universe (local and interstellar). – Become a “Citizen Scientist”.

He presents the problem of the data we are collecting about our galaxy the Milky Way coming in much faster than we can analyze it. Even back to the Sloan Digital Sky Survey (SDSS) starting in the year 2000, - 35% of the sky was surveyed with 500 million objects and spectra for more than 3 million objects. The data release 8 (DR8) of the SDSS was released in 2011. The data coming in is just too much for the professional scientists. They just don’t have enough eyes and time to truly look in detail at every square inch of sky. The 1st year of SDSS cataloged more than 50 million galaxies.

The Professor’s main focus is: the ‘bubbles’ blown by massive stars’ solar wind. YOU CAN HELP by going to the website listed above. With more than 76,000 images, there are more than enough to go around. – Be the first to spot something! – Maybe you’ll get published!

Also, starting in October, the 2nd Thursday of the month they have a star party on the roof of Building 8 at Cal Poly. (Take the freight elevator.) Parking is \$6. Carpool and save gas and money.

Gary Thompson

What's Up? - Many Moons

Our solar system has 182 known planetary moons. There are over 200 minor planet moons.

When I was a teen, Mt. Wilson astronomers lived in my neighborhood in Altadena. One was Seth Nicholson who discovered four moons of Jupiter with the Mt. Wilson 100 inch telescope. He was fifty years older than I, but he did speak to me of his desire that his moons should only have numbers and not mythic names. He thought it was more scientific. This would be in the order of their discovery starting with Galileo's 1610 sighting of the four large moons Io, Europa, Ganymede, and Callisto. So his moons were Jupiter IX, X, XI, XII. However, twelve years after his death (1975) the moons were named: Sinope (discovered in 1914), Lysithea (1938), Carme (1938), and Ananke (1957).

Jupiter now has 67 moons, all with similar exotic Jupiter related mythological names. Most new discoveries are out beyond the four large and famous Galilean Moons. In 2003 a total of 21 tiny moons (each about a mile in diameter) were discovered.

While Earth's Moon is a dry desert, most of the frigid moons out beyond the asteroid belt are made of rock hard ices of water, nitrogen, ammonia and carbon dioxide mixed with rock.

While our solar system has a variety of moons, Mercury has none, and Venus has none. Inner planet moons were probably gobbled up by the Sun. Earth has the largest moon in relation to its primary planet. Unless you count Pluto's very close moon Charon. Pluto and Charon are considered by some to be a dual planet system since they revolve around a common center.

The Apollo Astronauts discovered that our Moon's rocks were very similar to Earth's geology. So it was decided that it had been created by an early impact between a new Earth and a Mars sized object (pictured).

Mars has two little moons Phobos and Deimos (meaning Fear

and Panic, the companions of the blood-red War God). They look like captured asteroids. They were discovered by in 1877 by Asaph Hall. They're closer to the planet than any other moons so orbit rapidly. You could watch them in motion from the Martian surface. Phobos is the closest, it orbits in less than a day. It could be used as a space station base to explore Mars.

Moon sized dwarf planet Ceres in the Asteroid Belt has no moons. But some of the asteroids have tiny moonlets.

Saturn has 62 icy moons and many moonlets. The exception is Titan, our system's second largest moon. Discovered by Christian Huygens in 1655, its larger than Earth's Moon. It's also the only moon to have its own atmosphere. It forms a thick haze made of nitrogen and methane. Titan also has many lakes of cold liquid methane-ethane which are kept full by occasional hydrocarbon rainfalls.

Saturn's white icy moons, such as Enceladus, are known to have water geysers spouting from their warmer interiors. Mimas has an enormous impact crater making it look like Star Trek's Death Star. An outer moon Iapetus is unusual in that one side is icy white while the other side is "spray painted" by an exterior black discharge from another moon. Tethys, Dione, and Rhea are each unique in their frozen ways. All moons are named after the mythologic Titans.

Uranus has 27 known moons all named for characters in Shakespeare plays. A system started by William Herschel, the planet's discoverer. He was trying to gain favor with the British Royal Academy. He did choose non-human characters such as fairy gods, and goddesses in keeping with mythological tradition. The largest discovered by Herschel in 1787 are fairy queen Titania (often confused with Titan) and her fairy king Oberon from A Midsummer Nights Dream. The next biggest is a mythological Oberon from a poem by the dwarf poet Alexander Pope. From the Bard's The Tempest there is fairy

Ariel and princess Miranda. The small inner moon Miranda has an extremely fractured geology which looks as if the moon had been torn apart and put back together again.

Blue Neptune (a blue of cold methane) has moons named after sea gods and goddesses. All are modestly small except for Triton (often confused with Titan and Titania). Triton resembles Pluto in size and ice mountain surface structure. It's our seventh largest moon. It has an rough cantaloupe like surface, and may be a captured dwarf planet.

The dwarf planets of the Kuiper Belt on our solar system outer edge are still being discovered to have mini-moonlets of their own. A moonlet was just found orbiting outer (Hawaiian god) planet Makemake. There're many more truly odd moons out there.

Lee Collins



One Incredible Galaxy Cluster Yields Two Types of Gravitational Lenses

There is this great idea that if you look hard enough and long enough at any region of space, your line of sight will eventually run into a luminous object: a star, a galaxy or a cluster of galaxies. In reality, the universe is finite in age, so this isn't quite the case. There are objects that emit light from the past 13.7 billion years—99 percent of the age of the universe—but none before that. Even in theory, there are no stars or galaxies to see beyond that time, as light is limited by the amount of time it has to travel. But with the advent of large, powerful space telescopes that can collect data for the equivalent of millions of seconds of observing time, in both visible light and infrared wavelengths, we can see nearly to the edge of all that's accessible to us.

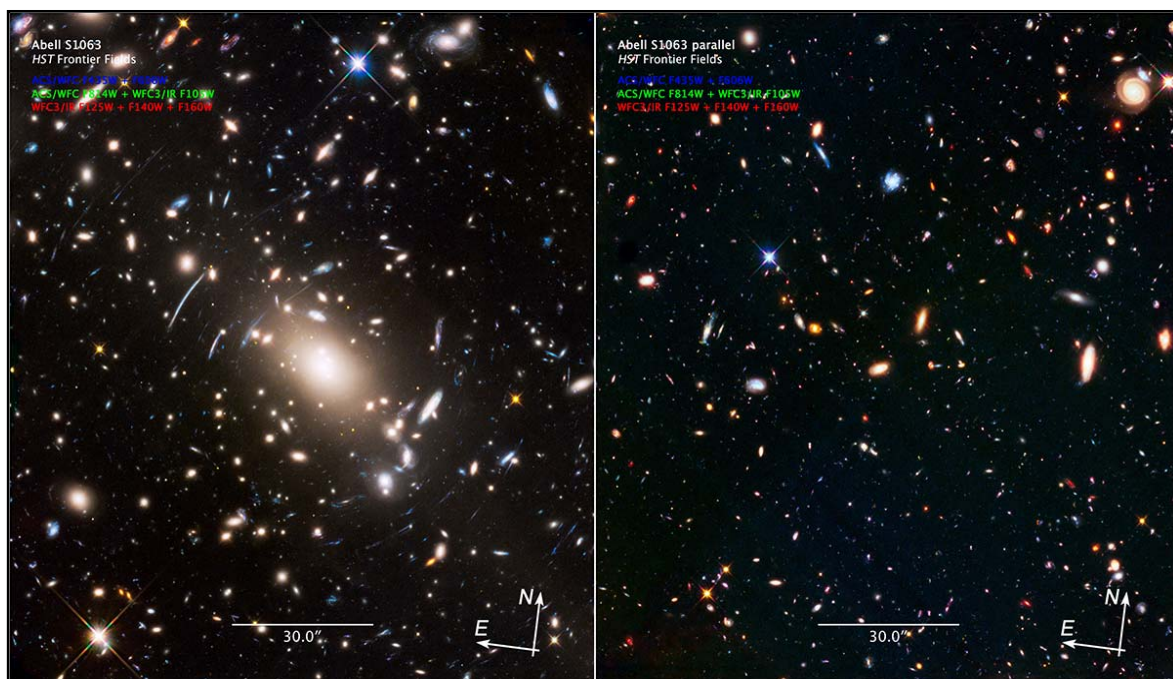
The most massive compact, bound structures in the universe are galaxy clusters that are hundreds or even thousands of times the mass of the Milky Way. One of them, Abell S1063, was the target of a recent set of Hubble Space Telescope observations as part of the Frontier Fields program. While the Advanced Camera for Surveys instrument imaged the cluster, another instrument, the Wide Field Camera 3, used an optical trick to image a parallel field, offset by just a few arc minutes. Then the technique was reversed, giving us an unprecedentedly deep view of two closely aligned fields simultaneously, with wavelengths ranging from 435 to 1600 nanometers.

With a huge, towering galaxy cluster in one field and no comparably massive objects in the other, the effects of both weak and strong gravitational lensing are readily apparent. The galaxy cluster—over 100 trillion times the mass of our sun—warps the fabric of space. This causes background light to bend around it, converging on our eyes another four billion light years away. From behind the cluster, the light from distant galaxies is stretched, magnified, distorted, and bent into arcs and multiple images: a classic example of strong gravitational lensing. But in a subtler fashion, the less optimally aligned galaxies are distorted as well; they are stretched into elliptical shapes along concentric circles surrounding the cluster.

A visual inspection yields more of these tangential alignments than radial ones in the cluster field, while the parallel field exhibits no such shape distortion. This effect, known as weak gravitational lensing, is a very powerful technique for obtaining galaxy cluster masses independent of any other conditions. In this serendipitous image, both types of lensing can be discerned by the naked eye. When the James Webb Space Telescope launches in 2018, gravitational lensing may well empower us to see all the way back to the very first stars and galaxies. .

Ethan Siegel

If you're interested in teaching kids about how these large telescopes "see," be sure to see our article on this topic at the NASA Space Place:
<http://spaceplace.nasa.gov/telescope-mirrors/en/>



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!

Galaxy cluster Abell S1063 (left) as imaged with the Hubble Space Telescope as part of the Frontier Fields program. The distorted images of the background galaxies are a consequence of the warped space due to Einstein's general relativity; the parallel field (right) shows no such effects. Image credit: NASA, ESA and Jennifer Lotz (STScI)