



Newsletter of the Pomona Valley Amateur Astronomers

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*nightwatch*

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## What's Up? Hairy Stars

Comet, it means long haired. Comets have a nucleus that glows with a coma (hair) and a tail that can be over 50 million miles long. They can have two tails caused by solar radiation, one of ionized gas and a dusty one from ice and rock. Many originate beyond the edge of the solar system from the supposed Oort Cloud.

A comet's sudden mysterious appearance has been seen as a magical portent, an evil omen. Chinese astronomers kept detailed records of these magical signs going back thousands of years.

Western scientists at first saw comets as a part of Earth's atmosphere, like aurora or rainbows. Galileo felt they were in Earth's air. It was up the eccentric Tycho Brahe to do a parallax on the Comet Of 1577. A parallax for the Moon proved it close, but the comet had none. So, Tycho declared comets to be beyond the moon but closer than the planets.

In a hundred years Edmond Halley would discovery an orbital comet. Halley was not known for comets in his lifetime, he had connections with the British Navy. He commanded a ship and sailed south to chart southern stars and geomagnetism. His discoveries aided navigation and were profitable. He also patented a working diving bell. He became Astronomer Royal. But it was Halley's friendship with Isaac Newton that was to make him comet famous.

Isaac Newton was a remarkable scientific genius who revolutionized physics. He invented the first working reflector telescope and tracking mount. But he was a recluse who avoided people especially women. When Halley visited him to ask about his mathematical studies on planetary orbits, Newton said he had all the math on orbits and much more but had never bothered to publish it. So Halley had Newton's work printed at his own expense. Halley had a lot to do with Newton's eventual fame.

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## Club Events Calendar

**January 17, 2014, General meeting, Brian Sinana, "The Frontier Fields: Hubble's Next Big Campaign to Find Distant Galaxies"**

**January 25, 2014, Star Party, Afton Canyon**

**February 6, 2014, Board meeting, 6:15**

**February 14, 2014, General meeting**

**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**

**April 3, 2014, Board meeting, 6:15**

**April 11, 2014, General meeting**

**April 26, 2014, Star Party**

**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**

**July 3, 2014, Board meeting, 6:15**

**July 11, 2014, General meeting**

**July 26, 2014, Star Party**

**August 7, 2014, Board meeting, 6:15**

**August 15, 2014, General meeting**

**August 23, 2014, Star Party**

What's Up? continued

Newton had studied the Comet Of 1682 and declared it to have an elliptical orbit. Encouraged by this, Halley looked at previously seen comets and discovered one that appeared about every 76 years. This apparent orbital cycle included recent Comet Of 1682, so he predicted it would reappear in 1758. Sadly Halley died in 1742, but when the comet reappeared he became famous as the discover of the first orbital comet. Halley's Comet has been traced by Chinese records back to 240 B.C.

It appeared in 1066, an important moment in English history when William the Conqueror deposed King Harold. Halley's Comet of 1066, good for William of Normandy but bad for Harold, was immortalized in the long comic-strip like Bayeux Tapestry. Halley's Comet next made an impression in 1301 when the Italian painter Giotto made it the blessed Star of Christ's Nativity. So comets, often a curse, could also be seen as a blessing.

When Halley's comet returned in 1910 it's long tail came so close there were many suicides even an attempted virgin sacrifice in Oklahoma. The media picked up on it to sell Comet songs, and protective pills. Mark Twain, who had been born in 1835 at Halley's last appearance, quipped that he came in with and would go out with the comet. He died on the day of the comet's closest perihelion.

Having survived 1910's close comet encounter everyone awaited it's reappearance in 1986. However it orbited far from Earth, barely visible. But, since it was predicted, the European Space Agency (also Russia and Japan) could send up comet probes. The ESA's probe was called Giotto (the Italian artist) and took the first picture of a comet's nucleus. It was a "dirty snowball" as described by astronomer Fred Whipple.

The comets I've seen did unpredictable things. Many dull comets grazed the sun coming out much brighter. This was true of the first naked eye comet I saw in 1965 called Ikeya-Seki. After ten years Comet West (1975) broke up rounding the Sun producing an impressive fan tail. Then came Comet Kohoutek (1973) which never thawed out to its fabulous predictions. Halley's in 1986 was dim but distant Comet Shoemaker-Levi (1993) was analyzed as it crashed into Jupiter leaving huge holes. In 1996 Comet Hyakutake was naked eye visible with its long tail. Right after it, Hale-Bopp became a remarkable two tailed visitor seen by all. The well known orbital comet Holmes mysteriously became a fuzzy glowing ball in 2007. Just after that Comet McNaught (pictured) put on a post sungrazing display, but only in the Southern Hemisphere. The same was true of Comet Lovejoy in 2011. Now there's Comet ISON. Another unpredictable comet, like a prowling cosmic cat.

*Lee Collins*





## Surprising Young Stars in the Oldest Places in the Universe

Littered among the stars in our night sky are the famed deep-sky objects. These range from extended spiral and elliptical galaxies millions or even *billions* of light years away to the star clusters, nebulae, and stellar remnants strewn throughout our own galaxy. But there's an intermediate class of objects, too: the *globular star clusters*, self-contained clusters of stars found in spherically-distributed halos around each galaxy.

Back before there were any stars or galaxies in the universe, it was an expanding, cooling sea of matter and radiation containing regions where the matter was slightly more dense in some places than others. While gravity worked to pull more and more matter into these places, the pressure from radiation pushed back, preventing the gravitational collapse of gas clouds below a certain mass. In the young universe, this meant no clouds smaller than around a few hundred thousand times the mass of our Sun could collapse. This coincides with a globular cluster's typical mass, and their stars are some of the oldest in the universe!

These compact, spherical collections of stars are all less than 100 light-years in radius, but typically have around 100,000 stars inside them, making them nearly 100 times denser than our neighborhood of the Milky Way! The vast majority of globular clusters have extremely few heavy elements (heavier than helium), as little as 1% of what we find in our Sun. There's a good reason for this: our Sun is only 4.5 billion years old and has seen many generations of stars live-and-die, while globular

clusters (and the stars inside of them) are often *over 13 billion years old*, or more than 90% the age of the universe! When you look inside one of these cosmic collections, you're looking at some of the oldest stellar swarms in the known universe.

Yet when you look at a high-resolution image of these relics from the early universe, you'll find a sprinkling of hot, massive, apparently *young* blue stars! Is there a stellar fountain of youth inside? Kind of! These massive stellar swarms are so dense -- especially towards the center -- that mergers, mass siphoning and collisions between stars are quite common. When two long-lived, low-mass stars interact in these ways, they produce a hotter, bluer star that will be *much* shorter lived, known as a *blue straggler star*. First discovered by Allan Sandage in 1953, these young-looking stars arise thanks to stellar cannibalism. So enjoy the brightest and bluest stars in these globular clusters, found right alongside the oldest known stars in the universe!

*Learn about a recent globular cluster discovery here:*

<http://www.nasa.gov/press/2013/september/hubble-uncover-largest-known-group-of-star-clusters-clues-to-dark-matter>.

*Kids can learn more about how stars work by listening to The Space Place's own Dr. Marc:*

<http://spaceplace.nasa.gov/podcasts/en/#stars>

**Dr. Ethan Siegel**



Globular Cluster NGC 6397.

Credit: ESA & Francesco Ferraro (Bologna Astronomical Observatory) / NASA, Hubble Space Telescope, WFPC2.