The Wilderness Above

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Comet Pan-STARRS

The closing of the Isthmus of Panama, cutting off the equatorial flow between the Atlantic and Pacific oceans, was just about complete five million years ago when, in the far reaches of the solar system, 50,000 times farther from the sun than Earth, two hill-sized hulks of rock, dust and volatile ices had a close encounter. The gravitational tug sent one of them plunging toward the distant sun appearing slightly dimmer than Venus does to us. It has taken all these years for that hulk, now Comet Pan-STARRS, to plunge to the inner solar system. It was just inside the orbit of Saturn and very faint on June 6, 2011 when it was discovered by the Panoramic Survey Telescope and Rapid Response (Pan-STARRS) facility in Hawaii. In March of 2012, J.J. Gonzalez of Leon, Spain was the first amateur astronomer to spot it. It became visible with binoculars in January of this year and had formed a tail by February that southern hemisphere observers have imaged.

Today, Comet Pan-STARRS will pass closest to the Earth at a distance a little greater than that to the sun. However, it is not yet visible from our latitude. On Thursday we may be able to spot it very low on the western horizon about ½ an hour after sunset. As the diagram shows, it will rise away from the horizon through the next couple weeks and gradually fade. On Sunday, the first day of Daylight Saving Time, it will make its closest approach to the sun at about 28 million miles. After this close encounter, some calculations indicate that its orbit will have a period of 110,000 years, but comets are notoriously hard to predict so it is possible that this will be the only time that this comet encounters the sun.

Most comets fall into two broad categories, short period and long period. Short period comets such as Halley's that came by in 1986, have orbital periods less than 200 years. Halley, with a 75-year orbit will return in 2061. Most of these comets are thought to originate in the Kuiper (KYP-er, rhymes with viper) Belt just beyond the orbit of Neptune. It was named for the Dutch-American astronomer Gerard Kuiper who suggested solar system material might exist beyond Pluto in 1951. An Irish astronomer, Kenneth Edgeworth made the same suggestion in 1943 and 1949, so, by the ways of science, it should be the Edgeworth Belt. Some now call it the Kuiper-Edgeworth belt, but, for whatever reason of astronomical culture, it has retained the name of Kuiper. The first Kuiper Belt Object (KBO) was discovered in 1992 and more than 1,000 are now known. It is thought that there are more than 100,000 KBOs larger than 100 km in

diameter (62 miles). These icy bodies were ejected from the forming solar system by the evolving planets. Some of the moons of Saturn and Neptune may be captured KBOs. The fact that Pluto, a mere 20% the size of Earth (smaller than our moon), is more a large KBO than a planet like the other eight is what led the International Astronomical Union (IAU) to re-classify it as a dwarf planet, or "Plutoid" in 2006 over the objections of generations of school children.

Long period comets such as Hyakutake and Hale-Bopp that gave us spectacular shows in 1996 and 1997, take more than 200 years to return to the sun. Hale-Bopp's orbit will bring it back in about 2,533 years but Hyakutake won't return for about 70,000 years. These objects have their origin in the Oort cloud, a spherical cloud of bodies similar to those in the Kuiper Belt, but a thousand times more distant at 50,000 times Earth's distance from the sun. It is named for Dutch astronomer Jan Oort who predicted its existence in 1950. The only evidence for this cloud is the orbits of long-period comets.

A last group of comets only come by the sun once and either crash into it or speed by on a path that sends them completely out of the solar system. This may be the fate of Comet Pan-STARRS, but we'll have to wait to see how it responds to the sun to find out.

Comets are actually dirty ice balls much like the plow berms surrounding all our parking lots at this time of year. But their ices include ammonia and methane as well as water. As a comet approaches the sun, the sunlight heats the ices, evaporating pockets of them off the surface in bursts that act as little jet engines, tumbling the comet nucleus and altering the orbit. The gas and dust that blows out with it form a cloud around the nucleus, known as the coma. Much of it then gets left behind along the orbit to form the tail as it reflects the sunlight. If Earth passes through the orbit, as it does the orbit of Comet Swift-Tuttle every August, the dust falls into our atmosphere to create a meteor shower such as the Perseids.

When first discovered, it was thought that Comet Pan-STARRS could be spectacular, particularly since this is its first trip in from the Oort cloud. Unfortunately, it has thus far been disappointing, but comets can always surprise us. David Levy is quoted as saying that "Comets are like cats; they have tails and they do precisely what they want." So let's watch the sunset sky and hope the Comet Pan-STARRS will give us an unexpected show! We can also start looking forward to Comet ISON that will grace our skies in November.

Beyond this column, local astronomers are anxious to share our love of the sky with you. Check out the Adirondack Public Observatory web site at apobservatory.org for events. Listen for me on North Country Public Radio about once a month during "The Eight O'clock Hour" or email me with any questions at aodonoghue@stlawu.edu.