The Manx comet and naturalistic assumptions

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An object described variously as a 'rocky comet' or a 'Manx' comet was recently reported by an international team of researchers working under the PANSTARRS program.[1,2] The 'Manx' term describes it as being like a cat without a tail. The object has been given a comet designation of C/2014 S3 ('S3' for short). Object S3 was observed at a distance of 2.1 AU (astronomical units) from the Sun on 22 September 2014. It is a rather unusual object in that it has an orbit like a long period comet but the spectra of the dust emitted by it is very much like an S-type asteroid, making it of a silicate composition. Thus it raises the question of what the significance of a rocky object in an orbit like a long period comet is.

Scientists are suggesting that if more objects similar to S3 are observed, it could help confirm the new solar system origins theories that are being debated today by planetary scientists. Object C/2014 S3 orbits the Sun in a retrograde direction, with an orbital inclination of 169.3°.[1] Its eccentricity is 0.977,[1] making the orbit much more elliptical than that of an asteroid. Its perihelion (minimum distance from the Sun) is 2.049 AU and its aphelion (maximum distance from the Sun) is estimated at 178.9 AU.[1] This makes its orbit very much like a number of long-period comets. The S3 object has an orbital period of 860.3 years.[1] The discoverers of S3 are arguing that it must be an object that was 'stored' in the Oort cloud for most of the age of the solar system and was deflected inward relatively recently. So this is essentially an evolutionary way of saying that S3 is a young object, because of the nature of the dust it gives off. Yet to solar system scientists it is assumed to be a very old and 'unprocessed' object.

Today it is normally possible from the spectra to distinguish between an S-type asteroid, an icy comet generating a comet tail, and an extinct comet that can no longer create a tail. Scientists may take this discovery as tending to confirm some of the newer models on the formation of our solar system. The traditional nebula model for the formation of our solar system has no planet migration. But newer models, such as the Nice model[3–5] and the Grand Tack model,[6,7] suggest that Jupiter, Saturn, Uranus, and Neptune migrated in the early solar system. In these new models, the movement of Jupiter and Saturn would cause many planetesimals and small objects to be deflected outward. These new models for the formation of our solar system would say there could be some rocky objects in the Oort cloud, but the traditional nebula model would say that is unlikely.

Comets and asteroids are believed to have formed in the early solar system when many planetesimals were present. Accepted theories on our solar system posit that comets formed mainly in the outer planets region (from Jupiter to Neptune).[8,9] Asteroids formed mainly in the region between Mars and Jupiter, where temperatures were higher. Some of the small objects deflected outward would have enough velocity imparted by Jupiter and Saturn to allow them to escape the Sun's gravity. A small percentage of them could have enough energy to take them to distances of a few tens of thousands of AU and yet remain in elliptical orbits. These would become Oort cloud objects. At the aphelion of their orbit these objects move slowly and thus they could be 'captured' by the Oort cloud and are thought by many to remain stable there for possibly millions or billions of years.

In the modern understanding of the Oort theory, there are multiple regions that transition into the Oort cloud. From about the orbit of Neptune to a distance of approximately 55 AU is the region known as the Edgeworth-Kuiper Belt. Then from about 55 AU to perhaps 200 AU is a region called the Scattered Disk. The region from about 3,000 AU to roughly 20,000 AU is usually called the Inner Oort cloud. The Scattered Disk and Inner Oort cloud are thought to have objects with orbits that have a range of inclinations. Objects have been actually observed in the Kuiper Belt region and a few have been observed that would have orbits taking them into the Scattered Disk region. The inner part of the Scattered Disk represents the edge of what can possibly be observed with present technology. However, fewer objects have been observed in the Kuiper Belt and Scattered Disk than accepted models suggest.[8,10]

A comet is generally defined as being an object that can generate a comet tail. But the distinction between comets and asteroids is not always so clear. Asteroids can emit a dust tail and can give off water. Comets may have two types of tails, an ion tail and a dust tail. But comets tend to give off much more material in their dust tails than asteroids. The observations of C/2014 S3 indicate it has a very limited dust tail that is like an S-type asteroid; it is much less active in its 'tail' than a typical comet.[1] The near-infrared spectrum is used for these observations. There have been other 'tailless comets' but the unique thing about C/2014 S3 is that its spectrum is like an S-type asteroid. The paper by Meech *et al.* (2016), which reported the discovery of C/2014 S3, states that the first 'nearly inactive' object observed in a long-period comet orbit was 1996 PW. Meech *et al.* goes on to compare these two objects:

> "An exploration of the dynamical history of 1996 PW … showed that it was equally probable that

Figure 1. This comet is designated 2011 L4, also known as comet PANSTARRS. The PANSTARRS comet is named after the research project which discovered it. PANSTARRS is an acronym for 'Panoramic Survey Telescope and Rapid Response System'. The PANSTARRS telescope sits on top of the Haleakala volcano in Hawaii. The PANSTARRS system does optical astrometry and photometry using a 1.4 Gigapixel array of CCD cameras. It is used to detect many faint objects, including Near Earth Objects, asteroids, comets, and Kuiper Belt Objects. PANSTARRS was used to detect the C/2014 S3 comet.

> 1996 PW was an extinct comet or an asteroid ejected into the Oort cloud during the early evolution of the solar system. More recently, other Manx candidates have been discovered. We have observed five of them, which also show comet-like red colors similar to 1996 PW. C/2014 S3 is the first and only Manx candidate to date with an S-type reflectivity spectrum."[1]

Young-age creationists have argued for a young solar system from the lifetimes of short-period comets.[8,11–13] Today there are generally considered to be two classes of short-period comets, the Jupiter Family Comets (JFCs), and the Halley Type Comets (HTCs). The JFC comets have orbits of low inclination and they are believed to come from Kuiper Belt objects, the orbits of which have been altered by Jupiter. The Halley Type Comets on the other hand have a broad range of orbit inclinations and they have somewhat larger orbits than the JFC objects. Halley Type Comets are sometimes in retrograde orbits as well. Today comet researchers believe the HTC objects come from the Scattered Disk, but demonstrating the orbital dynamics of this has not been entirely successful.[14] There are fewer HTC objects than models have predicted. One paper estimated what it called the 'death-rate' of HTC comets as being 69,000 years.[14] This is the time for them to become essentially unobservable. The Jupiter Family Comets would have shorter lifetimes (or 'death-rates') than this. So the young-age argument for short-period comets is still valid. The young-age argument creationists have made from short-period comets I believe applies mainly to the Jupiter Family Comets. But object C/2014 S3 is not a short-period comet.

How then should young-age creationists understand long-period comets? Comets in orbits with orbital periods greater than 200 years are considered to be 'long-period' comets. There is a wide range of orbital periods for the long-period comets, from 200 years up into the millions of years. But the orbital period of a long-period comet orbit has nothing to do with the age of a comet or the age of the solar system. As mentioned above, Jupiter Family Comets could be Kuiper Belt objects, the orbits of which have been altered by Jupiter. But Halley Type Comets and long-period comets could have been created mostly in their present orbits. Thus, in a young-age perspective, there is no need to invent a place like the Oort cloud to 'store' comets for billions of years. For many long-period comets with orbital periods in the hundreds of thousands to millions of years, they would only traverse a small part of their orbit in 6,000 years. Many of the long-period comets are still on their very first trip toward the Sun. This is actually something astronomers would agree on, even if they believe in an old solar system. There is debate among comet researchers on the question of how many of the long-period comets are 'new' and have not yet ever reached their perihelion.

An object like C/2014 S3 could only have made about 7 orbits in 6,000 years. It is very plausible that a rocky object could still be giving off some dust after such a timeframe. Other long-period comets observed may have a more significant tail than S3, but they could be young for the same reasons. Some comets disrupt completely when they pass near the Sun. But scientists have estimated that more typically comets can make anywhere from a few dozen to hundreds of perihelion passes before they are 'extinct'. Thus, in a young-age point of view, there is no need for an object like S3 to be 'stored' for billions of years in a hypothetical cloud (the Oort cloud) that cannot be observed.

Conclusion

Solar system scientists often try to classify objects and define them according to their origin. Yet no human being was able to observe the origin of our solar system or the objects in it. There is a great tendency for scientists to only view new discoveries through a lens that is built up from many naturalistic assumptions. But naturalistic assumptions are often inadequate in matters of origins. The S3 object seems to be a comet of an unusual composition. The assumption that all comets are 'dirty snowballs' is probably worth questioning. It may be that we need a classification system for the composition of comets. Such a system has not been devised to my knowledge. As Bible believers we can build our thinking on different assumptions than secular science and sometimes come to better answers.

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