

Offered Title: What Asteroids can Tell Us

Asteroids are numerous, and they are old. Kind of like baby boomers. I know, I'm one. A baby boomer that is.

Most astronomers think asteroids represent some of the oldest remnants of our solar systems formation. Let's see what we've learned so far...

We know there are millions of asteroids, most located between the orbits of Mars and Jupiter. Even though there are millions, their total mass is less than that of our Moon. Nearly all are irregular in shape, while the largest one's mass/gravity/spin resulted in a more or less spherical shape. Ceres, at 940 miles diameter, and once labeled the largest asteroid, is now classified as a dwarf planet. Asteroids are in an elliptical orbit just like the planets and many appear to have become satellites of the big outer planets. Even Phobos and Deimos, satellites of Mars, appear to be captured asteroids. Asteroids can be solid, or of loose aggregate like comets and we have found a few objects behaving like comets residing in the asteroid belt. They are classified "Main Belt Comets".

Asteroids come in three common flavors: C-type (carbonaceous) – are stony, with silicate rock and clays. S-type (silicaceous) – are silicate and nickel-iron. M-type (metallic) – are nickel-iron. Some of the largest asteroids even have a basaltic, volcanic crust (V-type).

Why such a fetish with asteroids? It's about how our solar system, our home group that orbits the Sun, formed. Humans are weird that way, many just need to know about stuff, how it works, how it got to be what it is now. Our home group is a good place to start because, well, it's closest, and we might just represent a common process of solar system building. Maybe not, but we want to know anyway.

While we know this much about asteroids, further investigation and analysis is important to better understand how they formed. Maybe how the solar system formed too. So far about 15 spacecraft have made a rendezvous with asteroids, but they just took photos as they zoomed by, or performed remote analysis. Enter the latest generation of asteroid studying spacecraft – landers. That's right, spacecraft have and will land on asteroids to study them up close. NASA's NEAR spacecraft was the first to land in 2001, even though it was not designed to do that! At least has that record. Japan's Hayabusa spacecraft not only landed, it collected some asteroid stuff and took off, returning to Earth in 2010. Analysis of the asteroid stuff is continuing. On September 8, 2016 NASA launched the *Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer* (OSIRIS-Rex) and it rendezvoused with C-type asteroid Bennu on December 3, 2018. It is scheduled to touch down and collect samples, returning in September 2023. Keep your fingers crossed!

What's in the Sky?

December 13; late night into morning of the 14th; high in the south: The Geminid meteor shower.

December 14; after sunset; south: The Moon and Mars get close.