

Astronomical Serendipity

Since 1596, when **Johannes Kepler** (see “Between Jupiter and Mars”) predicted that there should be a planet between Mars and Jupiter, astronomers had been searching for that “missing planet.” When **Piazzi** (see “Dark and Starry Night”) discovered Ceres in 1801, the scientific world thought that he had ended the search. Then Ceres disappeared from sight, only to be recovered (see “Lost and Found”) one year later. Astronomers breathed a sigh of relief and celebrated! The “missing planet” was back!

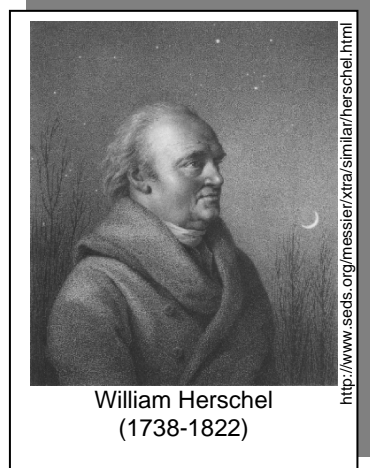
And Then There Were Two

Almost three months after Ceres was rediscovered, **Wilhelm Olbers**, an amateur astronomer who was a doctor by profession, was again looking for Ceres when he discovered another moving object nearby. This “planet,” which was named Pallas, caused quite a stir in the astronomical community because only one planet had been expected in the space between Mars and Jupiter. When Gauss (see “Lost and Found”) calculated this new object’s orbit, he found that Ceres and Pallas had almost identical periods of revolution—4.6 years. He also found that Pallas had a high **inclination**, which meant that it spent only a small portion of its time in the **ecliptic**. It was incredible luck and timing or, better yet, astronomical **serendipity** that Olbers was looking for Ceres during the short period of time that Pallas happened to be passing near Ceres. Otherwise, Pallas might not have been observed for many years.



<http://www.sil.si.edu/digitalcollections/hst/scientific-identity/fullsize/SIL14-0001-07a.jpg>

In 1802, **William Herschel** tried to measure the size of Ceres and Pallas by looking at the planet through a telescope with one eye and comparing it to a disk of a known size at a given distance. Although Herschel’s estimated values were considerably smaller than the modern measurement values, he was very surprised that these “planets” were so much smaller than the other known planets. Herschel was the first to call Ceres and Pallas **asteroids**, because of their small but “starlike” appearance.

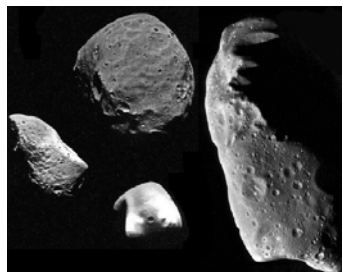


How Many More Are Out There?

As often happens, the results of this scientific discovery led to further questions. Could there be more than two asteroids? Where did these asteroids come from? Olbers formulated the first and oldest theory about the origin of asteroid formation in a letter to Herschel. He wrote, “Could it be that Ceres and Pallas are just a pair of fragments...of a once great planet which at one time occupied its proper place between Mars and Jupiter?” If this were the case, Olbers believed that many more asteroids would be discovered. In 1807, another theory proposed that asteroids were formed as small bodies, rather than fragmenting from a larger body and predicted that there were at least ten more asteroids.

Olbers’s belief that there were a great many asteroids to be discovered reactivated the **Celestial Police** (see “In Search of...”). The members of the police again made careful observations of promising regions of the sky at **Johann Schröter’s** private observatory at Lilienthal.

This was one of the largest in the world at that time and was very close to Bremen where Olbers lived and worked. A third asteroid, named Juno, was discovered by **Karl Harding** on September 1, 1804. It was much smaller than either Ceres or Pallas.



Between 1801 and 1807, four of the largest or brightest asteroids had been discovered: Ceres, Pallas, Juno, and Vesta. Since this first era of asteroidal discovery, over 7,000 asteroids have been identified.

<http://www.mclink.it/mclink/astro/nineplanets/asteroids.html>

Olbers had reasoned that if asteroids were fragments of an exploded planet, these fragments were propelled into different orbits by the blast. However, Olbers believed these various orbits would intersect at the point of explosion and at a location 180 degrees away from that point. As a result of his reasoning, Olbers became the first person to find two asteroids when he discovered Vesta on March 29, 1807.

So, by 1807, the two asteroids to be closely observed by the Dawn spacecraft had been discovered.

As it turned out, the discovery of Vesta brought the first era of asteroidal discovery to a close. In 1813, the French army burned the city of Lilienthal as they retreated from Russia. All of Schröter's books and observation records, kept in a government building, were destroyed and

his observatory was looted. The Celestial Police disbanded and Olbers continued his lonely search of the heavens until 1816, when Schröter died, but no asteroids were found in the period between 1807 and 1845.

Additional Resources

Web Sites

<http://nssdc.gsfc.nasa.gov/planetary/planets/asteroidpage.html>

NASA's "Asteroids and Comets" home page contains links to asteroid fact sheets, images, and information about NASA missions to the asteroid belt.

<http://www.bath-preservation-trust.org.uk/museums/herschel/>

Informative Web site sponsored by The William Herschel Museum.

<http://www.geocities.com/rasctb/asteroid.htm>

History of asteroid discovery and formation theories.

Print Resources

Cousins, F.W. (1972). *The solar system*. New York, NY: Pica Press.

Grunn, B. (1991). *The timetable of history – A horizontal linkage of people and events*. Simon & Schuster, Inc.

McSween, H.Y. (1999). *Meteorites and their parent planets*. Cambridge, NY: Cambridge University Press.

Peebles, C. (2000). *Asteroids: A history*. Washington, DC: Smithsonian Institution Press.

Roth, G.D. (1962). *The system of minor planet*. Princeton, NJ: Company Inc.

Schorn, R.A. (1988). *Planetary astronomy*. College Station, TX: Texas A&M University Press.