

LEARN - What is so Special about Metallic Asteroids?



Learning Objective:

Learn the main characteristics of metallic asteroids, some notable examples and perspectives on extracting their resources.

Overview:

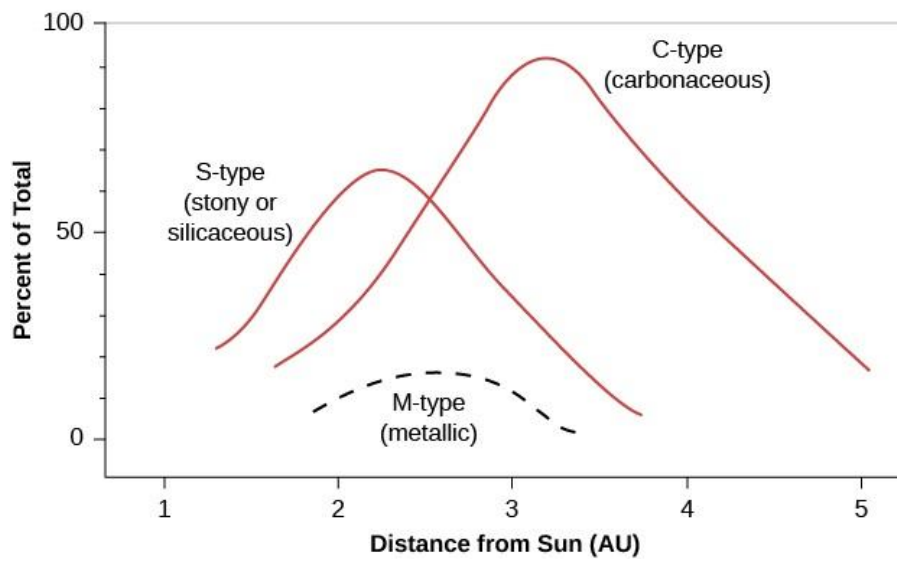
Among the Main Belt asteroids, metallic asteroids stand out for their scarcity. This uniqueness has fueled a dedicated mission aimed at their exploration, promising to shape our understanding of their potential resource utilisation in the future.

Specifics:

Asteroids can be categorised into three primary types based on their composition. Among these categories are the metallic asteroids, comprising approximately 10% of all known asteroids. This exceptional scarcity has made metallic asteroids the least explored within our solar system.

Many of these objects are composed predominantly of nickel and iron, usually mixed with some amount of rock. Scientists think these asteroids are the source of iron meteorites that fall on Earth. They were one of the first sources of iron in human history and this can be verified by analysing some artefacts produced by ancient civilisations.

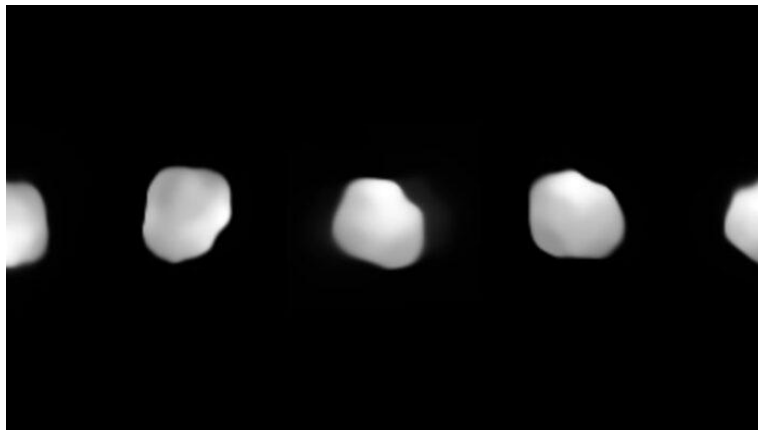
The majority of metallic asteroids are situated within the central region of the asteroid belt, positioned between the orbits of Mars and Jupiter. They have an [albedo](#) similar to moderately bright rocky asteroids.



Due to their limited research, explanations regarding the origins of metallic asteroids remain somewhat elusive. Nevertheless, a prevalent theory among scientists suggests that they might be remnants of planetesimals, the initial phases in the formation of a planet.

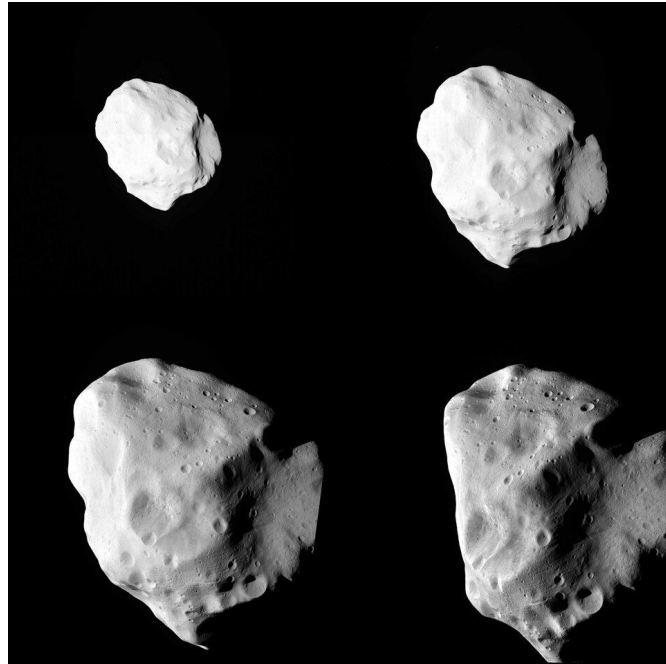
Another hypothesis posits that metallic asteroids could be ancient cores that have been stripped of their outer layers and inner materials through numerous, substantial collisions. Additionally, a third theory suggests that these celestial bodies might have undergone a unique form of iron volcanism, known as ferrovolcanism, during their cooling phase.

Notable metallic asteroids - **16 Psyche** is the prime example of a metallic asteroid. Discovered in 1852 by the Italian astronomer Annibale de Gasparis, Psyche is the most massive asteroid of its type and is among the 20 largest asteroids in the Main Belt, measuring over 200 kilometres in diameter.



Its characteristics made it the target of the [NASA Psyche mission](#). The objectives of this mission will be to characterise the topography of the asteroid, how it was formed, if it is a remnant core or unmolten material and if there are similar features with cores of rocky planets like Earth.

21 Lutetia was discovered by the Franco-German astronomer Hermann Goldschmidt from the balcony of his Parisian apartment. It was the first metallic asteroid to be photographed up close by a spacecraft. In 2010, ESA's Rosetta passed just over 3,000 km from the asteroid on its way to comet 67P/Churyumov-Gerasimenko.

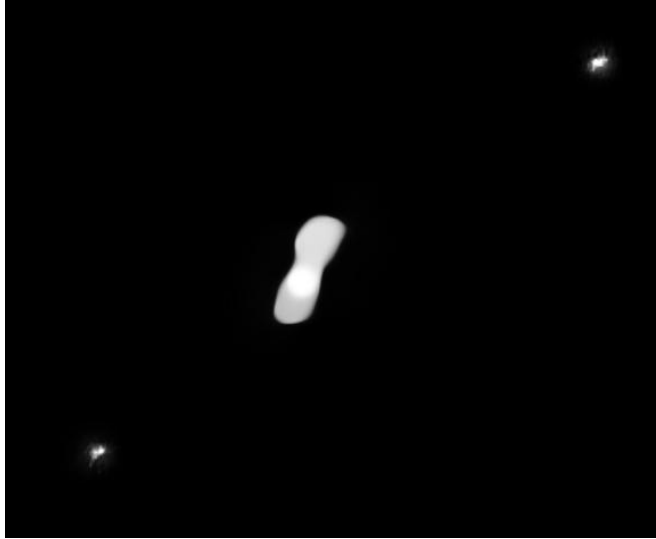


Discovered by the British John Russell Hind, **22 Kalliope** is a fairly large asteroid of about 160 km in diameter. It held the distinction of being the first metallic asteroid known to have a moon, Linus, which was discovered in 2001.

These three asteroids, Psyche, Lutetia, and Kalliope were discovered in the same year – 1852.



It is not uncommon for [asteroids to have moons](#) and in the case of metallic asteroids, **216 Kleopatra** is another noteworthy example. It is not only renowned for its dog-bone shape but also holds the distinction of being the first metallic asteroid discovered to have two moons. These moons, named Alexhelios and Cleoselene, are named after two of the famous Egyptian queen's children.



Metallic asteroids and space mining - Speculations regarding the potential metal content within these asteroids and their corresponding market value have spurred the development of specific programmes aimed at extracting these valuable resources in the future. Such ventures hold the promise of diverse applications across various industries.

While NASA's Psyche mission doesn't prioritise resource extraction from metallic asteroids as its primary goal, its findings and discoveries will undoubtedly provide valuable insights into the feasibility of turning such visionary concepts into practical endeavours in the future.

Learn more about this subject by visiting these websites:

[LEARN - What are the different types of Asteroids?](#)

[NASA Psyche Mission: Charting a Metallic World \(video\)](#)

[Maps of asteroid Psyche - Massachusetts Institute of Technology \(video\)](#)

[Rosetta triumphs at asteroid Lutetia \(ESA\)](#)