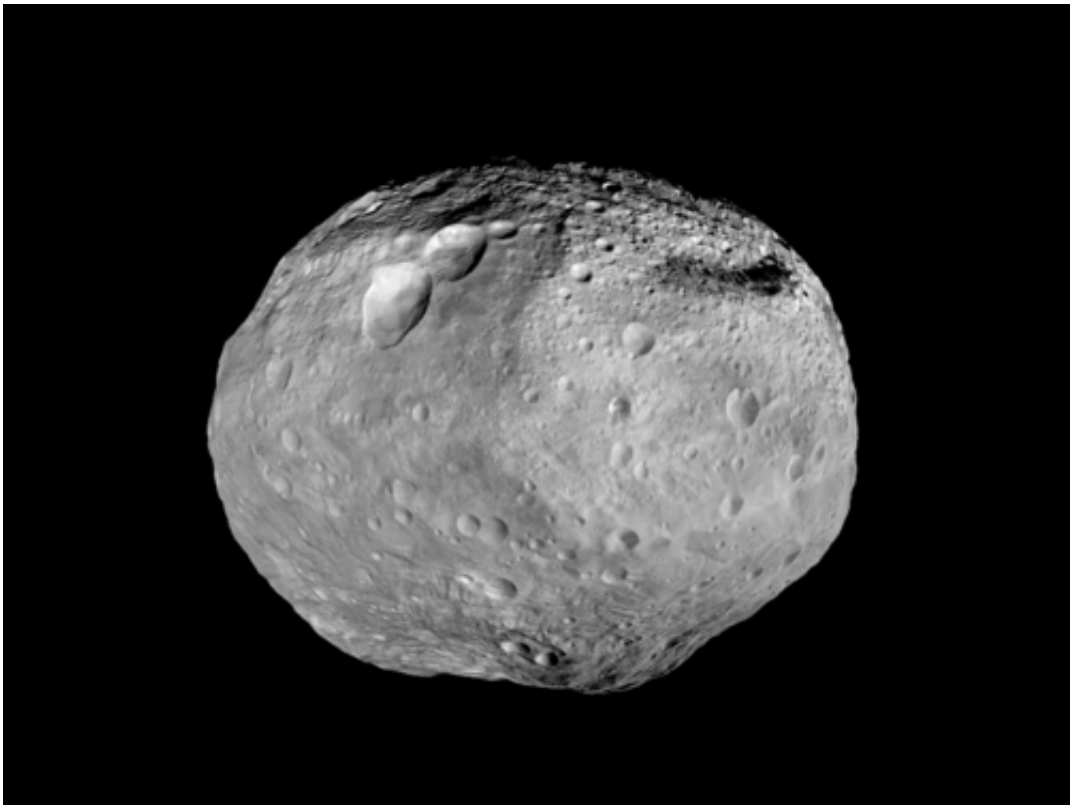
Nullarbor meteorite likely fragment of unknown asteroid

July 1 2014, by Geoff Vivian



Full View of Asteroid Vesta

The first meteorite ever located solely using data from specially-placed cameras has been found to be geologically unique, presenting questions of its origins.

Geochronologist Fred Jourdan says the Bunburra Rockhole

meteorite—found seven years ago on the WA side of the Nullarbor Plain—appears to be part of an asteroid that may no longer exist.

It consists of basalt with a character never before found in a meteorite.

"This one has a particular composition—which makes us think that it comes from a different body that has not been sampled before," Associate Professor Jourdan says.

Based on present scientific knowledge, he says most basalt meteorites are thought to have originated from volcanic eruptions on the asteroid Vesta, that NASA's Dawn spacecraft spent a year orbiting.

Vesta is the solar system's second-largest asteroid, more than 500km wide, that had a magmatic eruption at the beginning of its history 4.5 billion years ago, exhausting its heat.

This meteorite was unknown asteroid

However A/Prof Jourdan says a giant impact may have destroyed another, previously unknown asteroid about 3.6 billion years ago.

The Bunbura Rockhole meteorite is thought to be a fragment of this former asteroid.

The impact generated tremendous heat that "reset" the rock's isotopic signature.

"There's no way, with our knowledge of the current laws of physics, that we would have vulcanism at this time because all the heat is long gone from the asteroids," he says.

"It [the unknown asteroid] was born 4.5 – 6 billion years ago and then it

probably got shattered 3.6 billion years ago."

He says this occurred at a time when asteroid bombardments were common—most appear to have happened between 3.8 and 3.3 billion years ago.

Argon dating back in time

A/Prof Jourdan is director of Curtin University's Argon Laboratory, a facility the team used to date the Bunburra Rockhole meteorite using the "argon-argon" method.

"Potassium decays in Argon and with that we can measure the age of a given geological event," he says.

"By measuring Argon 39 and Argon 40 we can back calculate major events.

"We take a chunk of rock, we separate the different crystals if we can, if it's too small we take bulk rock, and we put them under a LASER.

"The LASER heats the grain and releases the argon, and the argon is measured on a mass spectrometer."

He says finding part of a "new" asteroid helps confirm existing knowledge of the solar system's bombardment history by increasing the sample size, which has been biased by most available specimens coming from the asteroid Vesta.

More information: 40Ar/39Ar impact ages and time–temperature argon diffusion history of the Bunburra Rockhole anomalous basaltic achondrite,*Geochimica et Cosmochimica Acta*, Volume 140, 1 September 2014, Pages 391–409 www.sciencedirect.com/science/ …

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