

= 253 Mathilde =

253 Mathilde / m<sup>1</sup> / is a main belt asteroid about 50 km in diameter that was discovered by Johann Palisa in 1885 . It has a relatively elliptical orbit that requires more than four years to circle the Sun . This asteroid has an unusually slow rate of rotation , requiring 17 h 4 days to complete a 360 ° revolution about its axis . It is a primitive C type asteroid , which means the surface has a high proportion of carbon ; giving it a dark surface that reflects only 4 % of the light that falls on it .

This asteroid was visited by the NEAR Shoemaker spacecraft during June 1997 , on its way to asteroid 433 Eros . During the flyby , the spacecraft imaged a hemisphere of the asteroid , revealing many large craters that have gouged out depressions in the surface . It was the first C type asteroid to be explored and , until 21 Lutetia was visited in 2010 , it was the largest asteroid to be visited by a spacecraft .

= = Observation history = =

In 1880 , Johann Palisa , the director of the Austrian Naval Observatory , was offered a position as an assistant at the newly completed Vienna Observatory . Although the job represented a demotion for Johann , it gave him access to the new 27 inch ( 690 mm ) refractor , the largest telescope in the world at that time . By this point Johann had already discovered 27 asteroids , and he would employ the Vienna 27 inch ( 690 mm ) and 12 inch ( 300 mm ) instruments to find an additional 94 asteroids before he retired .

Among his discoveries was the asteroid 253 Mathilde , found on November 12 , 1885 . The initial orbital elements of the asteroid were then computed by V. A. Lebeuf , another Austrian astronomer working at the observatory . The name of the asteroid was suggested by Lebeuf , after Mathilde , the wife of Moritz Leoway who was the vice director of the Paris Observatory .

In 1995 , ground based observations determined that 253 Mathilde is a C type asteroid . It was also found to have an unusually long period of rotation .

On June 27 , 1997 , the NEAR Shoemaker spacecraft passed within 1 212 km of 253 Mathilde while moving at a velocity of 9 93 km / s . This close approach allowed the spacecraft to capture over 500 images of the surface , and provided data for more accurate determinations of the asteroid 's dimensions and mass ( based on gravitational perturbation of the spacecraft ) . However , only one hemisphere of 253 Mathilde was imaged during the flyby . This was only the third asteroid to be imaged from a nearby distance , following 951 Gaspra and 243 Ida .

= = Description = =

253 Mathilde is very dark , with an albedo comparable to fresh asphalt , and is thought to share the same composition as CI1 or CM2 carbonaceous chondrite meteorites , with a surface dominated by phyllosilicate minerals . The asteroid has a number of extremely large craters , with the individual craters being named for coal fields and basins around the world . The two largest craters , Ishikari ( 29 3 km ) and Karoo ( 33 4 km ) , are as wide as the asteroid 's average radius . The impacts appear to have spalled large volumes off the asteroid , as suggested by the angular edges of the craters . No differences in brightness or colour were visible in the craters and there was no appearance of layering , so the asteroid 's interior must be very homogeneous . There are indications of material movement along the downslope direction .

The density measured by NEAR Shoemaker , 1 300 kg / m<sup>3</sup> , is less than half that of a typical carbonaceous chondrite ; this may indicate that the asteroid is very loosely packed rubble pile . The same is true of several C type asteroids studied by ground based telescopes equipped with adaptive optics systems ( 45 Eugenia , 90 Antiope , 87 Sylvia and 121 Hermione ) . Up to 50 % of the interior volume of 253 Mathilde consists of open space . However , the existence of a 20 km long scarp may indicate that the asteroid does have some structural strength , so it could contain some large internal components . The low interior density is an inefficient transmitter of

impact shock through the asteroid , which also helps to preserve the surface features to a high degree .

Mathilde 's orbit is eccentric , taking it to the outer reaches of the main belt . Nonetheless , the orbit lies entirely between the orbits of Mars and Jupiter ; it does not cross the planetary orbits . It also has one of the slowest rotation periods of the known asteroids ? most asteroids have a rotation period in the range of 2 ? 24 hours . Because of the slow rotation rate , NEAR Shoemaker was only able to photograph 60 % of the asteroid 's surface . The slow rate of rotation may be accounted for by a satellite orbiting the asteroid , but a search of the NEAR images revealed none larger than 10 km in diameter out to 20 times the radius of 253 Mathilde .