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Hygiea, 1611394, 1403 its variations could also correspond to either hydrated minerals or potentially water ice frost.[76][1394,1401][1][9] Rivkin and colleagues speculated that the variations could be caused by exposed subsurface material on some parts of Hygiea's surface.[76][1405] although they do not appear to be correlated with one particular surface location.[76][1403] Hygiea's bulk density has been estimated as either 1.944 to 2.50g/cm3 or 2.06 to 2.0g/cm3, based on measurements of its rotation and mass from 2020 and 2021, respectively.[61][1361][37][5][6] Hygiea's bulk density is similar to that of Ceres (2.16g/cm3),[61][13][7] which together with Hygiea's low size suggests it could have a differentiated interior.[71][7][97][7][10] Hygiea likely has a water ice-rich subsurface, as hinted by Hygiea's bulk density, spectroscopic detections of water ice, and its lack of large, bowl-shaped craters.[61][1391][78][7] Assuming the higher density estimate of 2.060.20g/cm3, Hygiea would be among the dense members of the largest C-type asteroids (diameters larger than 300km or 190mi), whose densities range between 1.5 to 2.16g/cm3 and may have negligible interer macroporosities, according to Vernazza and colleagues.[5][12] They further speculated that the higher densities of Hygiea and other large C-type asteroids may be due to a more lithified or compacted interior, as a result of significant aqueous alteration.[5][12]Image of 10 Hygiea taken by the ZMASS surveyThis section needs expansion. You can help by adding to it. (March 2025)Despite its size, Hygiea appears very dim when observed from Earth. This is due to its dark surface and its position in the outer main belt. For this reason, six smaller asteroids were observed before Annibale de Gasparis discovered Hygiea on 12 April 1849. Although it is the largest body in its region, due to its dark surface and farther-than-average distance from the Sun, Hygiea appears very dim when observed from Earth. In fact, it is the third dimmest of the first twenty-three asteroids discovered, with only 13 Egeria and 17 Thets having lower mean opposition magnitudes.[79] At most oppositions, Hygiea has a magnitude of around +10.2,[79] which is as much as four orders farther than Vesta, and observation calls for at least a 4-inch (100mm) telescope to resolve.[80] However, at a perihelic opposition, Hygiea can reach +9.1 magnitude and may just be resolvable with 10 50 binoculars, unlike the next two largest asteroids in the asteroid belt, 704 Interamnia and 511 Davida, which are always beyond binocular visibility.[81]A total of 17 stellar occultations by Hygiea have been tracked by Earth-based astronomers.[82][83] including two (in 2002 and 2014) that were seen by a large number of observers. The observations have been used to constrain Hygiea's size, shape and rotation axis.[77] The Hubble Space Telescope has resolved the largest asteroid and ruled out the presence of any orbiting companion larger than about 16 kilometers (9.9mi) in diameter.[84] Hygiea has not been explored by any space probe. In 2006, Mark V. Sykes and others from the Planetary Science Institute proposed the Exploring the Very Earliest Epoch (EVE) mission to NASA, as part of the Discovery Program. The proposal, which did not get approved, suggested launching a copy of the Dawn probe to Hygiea in October 2011 and arriving to the asteroid via rendezvous in 2021.[67][12][1][2][1][3][85][43] Pierre Vernazza and Philippe Lamy proposed the medium-class mission INSIDER for the European Space Agency's Space Programme.[86] The proposal, which also did not get approved, suggested rendezvousing and orbiting around two or three large main-belt asteroids before releasing one or two landers. Hygiea and 24 Themis would be the potential targets of the INSIDER mission concept.[86] The exploration of primitive main-belt asteroids like Hygiea could provide clues to the processes that led to the formation of the solar system.[86][67][1704] Interamnia (the fifth-largest main-belt asteroid, whose shape is close to hydrostatic equilibrium)[78][65] Cybele one of the largest main-belt asteroids, whose shape is also close to hydrostatic equilibriumList of former planetsList of gravitationally rounded objects of the Solar System * Flattening derived from the maximum aspect ratio (c/a): f = 1 − c a (displaystyle f=1-(rac{c}{a})^{2}), where (c/a) = 0.940.05[5][6] The Reichenbach equatorial telescope was the smaller of the Capodimonte Observatory's two equatorial telescopes, with an objective lens diameter of 8.3cm (3.3in) and focal length of 120cm (47in).[15][9] The Reichenbach equatorial telescope was located in the northern dome of the observatory.[15][10][7] The Berlin Academy star chart, which was published in years between 1830 and 1859, was compiled by a collaboration of astronomers who were each allotted a section of the sky spanning one hour of right ascension.[17][367] The stars in the 12th (XXII) hour of right ascension were charted by Carl August von Steinheil.[17][368] whose map aided de Gasparis's discovery of Hygiea.[18][19][126][14][XVI] Hygiea was located at the 12th hour of right ascension in the sky at the time of its discovery.[20] Asteroids were referred to as "planets" at the time of Hygiea's discovery. These would eventually be reclassified as "minor planets"[21] ". In the new-style provisional designation scheme for pre-1925 minor planet discoveries, the designation begins with the letter A followed by three digits corresponding to the year of discovery ("A849" for 1849, and "A900" for 1900) and ends with two letters, with the first indicating the discovery date's half-month ("G" for the first half of April) and the second indicating the order of discovery in that half-month ("A" meaning first minor planet discovered in that half-month).[38] These diameter and mass values come from Vernazza et al. (2021).[5][6] in an earlier paper from 2020, the same authors measured a diameter of 43414km and a mass of (8.32080±0109kg).[61][136][1][6][1][7] "JPL Small-Body Database Lookup: 10 Hygiea (A849 GA)" (2025-01-13 last obs.). Jet Propulsion Laboratory. Retrieved 28 March 2025.[^][5][6][1][7][8][9][10][11][12][13][14][15][16][17][18][19][20][21][22][23][24][25][26][27][28][29][30][31][32][33][34][35][36][37][38][39][40][41][42][43][44][45][46][47][48][49][50][51][52][53][54][55][56][57][58][59][60][61][62][63][64][65][66][67][68][69][70][71][72][73][74][75][76][77][78][79][80][81][82][83][84][85][86][87][88][89][90][91][92][93][94][95][96][97][98][99][100][101][102][103][104][105][106][107][108][109][110][111][112][113][114][115][116][117][118][119][120][121][122][123][124][125][126][127][128][129][130][131][132][133][134][135][136][137][138][139][140][141][142][143][144][145][146][147][148][149][150][151][152][153][154][155][156][157][158][159][160][161][162][163][164][165][166][167][168][169][170][171][172][173][174][175][176][177][178][179][180][181][182][183][184][185][186][187][188][189][190][191][192][193][194][195][196][197][198][199][200][201][202][203][204][205][206][207][208][209][210][211][212][213][214][215][216][217][218][219][220][221][222][223][224][225][226][227][228][229][230][231][232][233][234][235][236][237][238][239][240][241][242][243][244][245][246][247][248][249][250][251][252][253][254][255][256][257][258][259][260][261][262][263][264][265][266][267][268][269][270][271][272][273][274][275][276][277][278][279][280][281][282][283][284][285][286][287][288][289][290][291][292][293][294][295][296][297][298][299][300][301][302][303][304][305][306][307][308][309][310][311][312][313][314][315][316][317][318][319][320][321][322][323][324][325][326][327][328][329][330][331][332][333][334][335][336][337][338][339][340][341][342][343][344][345][346][347][348][349][350][351][352][353][354][355][356][357][358][359][360][361][362][363][364][365][366][367][368][369][370][371][372][373][374][375][376][377][378][379][380][381][382][383][384][385][386][387][388][389][390][391][392][393][394][395][396][397][398][399][400][401][402][403][404][405][406][407][408][409][410][411][412][413][414][415][416][417][418][419][420][421][422][423][424][425][426][427][428][429][430][431][432][433][434][435][436][437][438][439][440][441][442][443][444][445][446][447][448][449][450][451][452][453][454][455][456][457][458][459][460][461][462][463][464][465][466][467][468][469][470][471][472][473][474][475][476][477][478][479][480][481][482][483][484][485][486][487][488][489][490][491][492][493][494][495][496][497][498][499][500][501][502][503][504][505][506][507][508][509][510][511][512][513][514][515][516][517][518][519][520][521][522][523][524][525][526][527][528][529][530][531][532][533][534][535][