

### Terrestrial planets /Dad



#### Earth

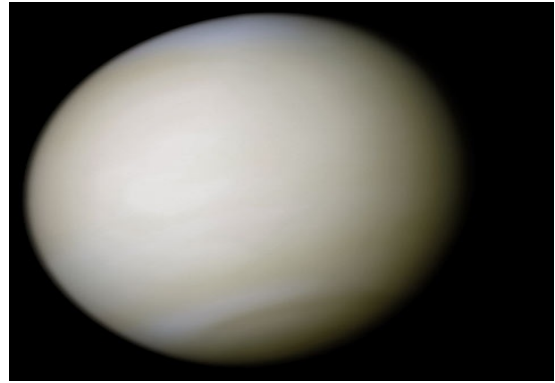
*Terrestrial planet*

*The earliest undisputed life on Earth arose at least 3.5 billion years ago.*

*71% of Earth's surface is covered with water.*

Albedo	0.367
Radius (km)	6371.0
Mass (kg)	$5,973.6 \times 10^{24}$
Density (g/cm <sup>3</sup> )	5.514
Gravity (m/s <sup>2</sup> )	9.807
Orbital period (days)	365.256
Orbital speed (km/s)	29.78
Temperature (K)	288
Discovery date	NA

### Terrestrial planets /Mom



#### Venus

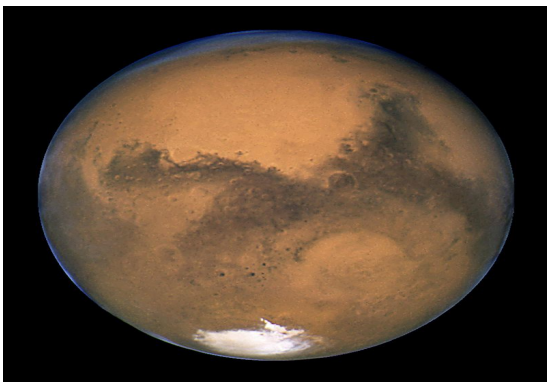
*Terrestrial planet*

*Bright enough to be seen in a midday clear sky.*

*In 1966 the Venera 3 probe crash-landed on Venus, the 1st spacecraft to reach the surface of another planet*

Albedo	0.67
Radius (km)	6051.8
Mass (kg)	$4,868.5 \times 10^{24}$
Density (g/cm <sup>3</sup> )	5.243
Gravity (m/s <sup>2</sup> )	8.872
Orbital period (days)	224.701
Orbital speed (km/s)	35.02
Temperature (K)	737
Discovery date	1600 BC (Babylon)

### Terrestrial planets /Son



#### Mars

*Terrestrial planet*

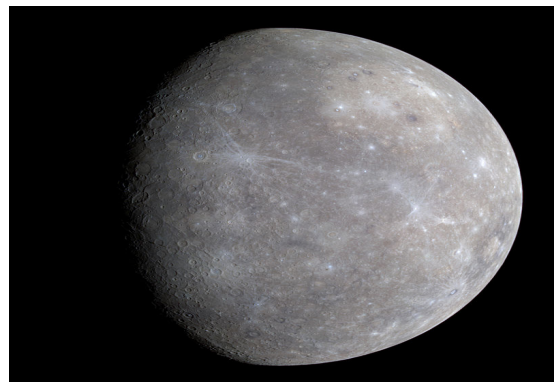
*The red-orange appearance is caused by rust*

*It consists of minerals containing silicon, oxygen...*

*Olympus Mons is roughly 3x the height of Mt Everest*

Albedo	0.15
Radius (km)	3389.5
Mass (kg)	$6.417 \times 10^{23}$
Density (g/cm <sup>3</sup> )	3.9335
Gravity (m/s <sup>2</sup> )	3.7
Orbital period (days)	686.971
Orbital speed (km/s)	24.077
Temperature (K)	210
Discovery date	1534 BC (Egypt)

### Terrestrial planets /Daughter



#### Mercury

*Terrestrial planet*

*The smallest planet in the Solar System*

*An observer on Mercury would see only one day every two years.*

Albedo	0.142
Radius (km)	2,439.7
Mass (kg)	$330.11 \times 10^{23}$
Density (g/cm <sup>3</sup> )	5.427
Gravity (m/s <sup>2</sup> )	3.7
Orbital period (days)	87.969
Orbital speed (km/s)	47.362
Temperature (K)	200->340
Discovery date	1300 BC (Assyria)

### Terrestrial planets /Dog



#### Moon

*Moon of Earth*

*The Moon is exceptionally large relative to Earth.*

*There are estimated to be roughly 300,000 craters wider than 1 km on the Moon's bright side only.*

Albedo	0.12
Radius (km)	1,737.1
Mass (kg)	$7.342 \times 10^{22}$
Density (g/cm <sup>3</sup> )	0.0123
Gravity (m/s <sup>2</sup> )	3.3464
Orbital period (days)	27.322
Orbital speed (km/s)	1.022
Temperature (K)	150->220
Discovery date	1.800.000BC

### Terrestrial planets /Bird



#### Phobos

*Moon of Mars*

*It sets and rises 2x each Martian day*

*It is predicted that in 30 to 50 million years it will collide with the planet or break up into a planetary ring.*

Albedo	0.071
Radius (km)	11
Mass (kg)	$1.660 \times 10^{16}$
Density (g/cm <sup>3</sup> )	1.87
Gravity (m/s <sup>2</sup> )	0.006
Orbital period (days)	0.319
Orbital speed (km/s)	2.138
Temperature (K)	233
Discovery date	1877 (A. Hall)

### Terrestrial planets /Cat



#### Deimos

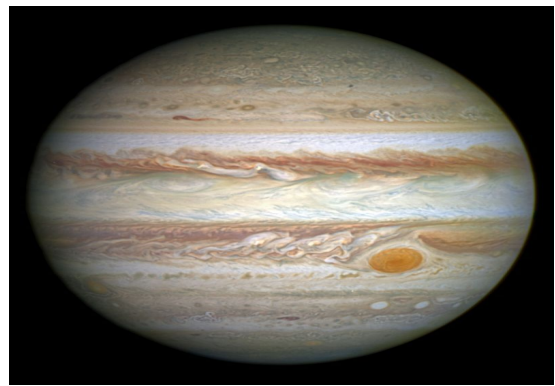
*Moon of Mars*

*In Greek mythology, Deimos was the twin brother of Phobos and personified terror.*

*No landings on Deimos have been made yet.*

Albedo	0.068
Radius (km)	6.2
Mass (kg)	$1.476 \times 10^{15}$
Density (g/cm <sup>3</sup> )	1.471
Gravity (m/s <sup>2</sup> )	0.003
Orbital period (days)	1.263
Orbital speed (km/s)	1.351
Temperature (K)	233
Discovery date	1877 (A. Hall)

### Gas giants/Mom



#### Jupiter

*Gas giant*

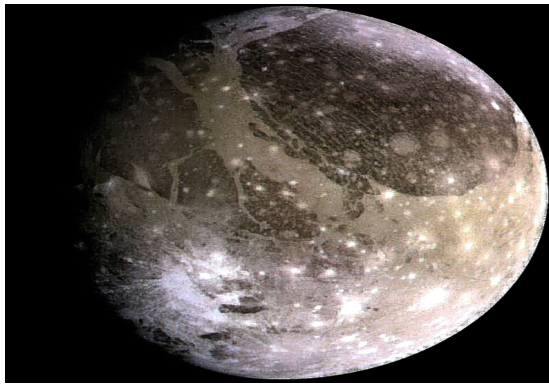
*Primarily composed of hydrogen and some helium.*

*It lacks a well-defined solid surface*

*Jupiter has at least 67 moons.*

Albedo	0.52
Radius (km)	69,911
Mass (kg)	$1.899 \times 10^{27}$
Density (g/cm <sup>3</sup> )	1.326
Gravity (m/s <sup>2</sup> )	24.79
Orbital period (days)	4,332.59
Orbital speed (km/s)	13.07
Temperature (K)	165
Discovery date	800 BC (Babylon)

## Gas giants/Cat



### Ganymede

*Moon of Jupiter*

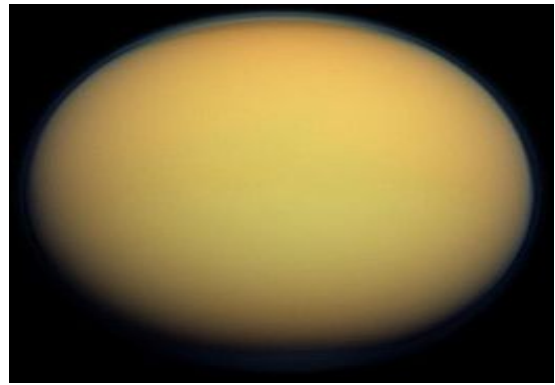
*The most massive planetary satellite.*

*It is the only moon known to have a magnetosphere.*

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Albedo	0.43
Radius (km)	2634.1
Mass (kg)	$1.481 \times 10^{23}$
Density (g/cm <sup>3</sup> )	1.936
Gravity (m/s <sup>2</sup> )	1.428
Orbital period (days)	7.155
Orbital speed (km/s)	10.880
Temperature (K)	110
Discovery date	1610 (G. Galileo)

## Gas giants/Dad



### Titan

*Moon of Saturn*

*The only satellite known to have a dense atmosphere.*

*Primarily composed of water ice and rocky material.*

*Its surface can rise by up to 10 metres during each orbit*

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Albedo	0.22
Radius (km)	2,576
Mass (kg)	$1.345 \times 10^{23}$
Density (g/cm <sup>3</sup> )	1.8780
Gravity (m/s <sup>2</sup> )	1.354
Orbital period (days)	15.945
Orbital speed (km/s)	5.57
Temperature (K)	93.7
Discovery date	1655 (Ch. Huygens)

## Gas giants/Daughter



### Callisto

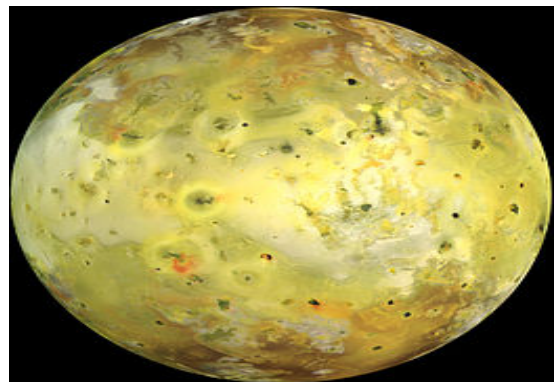
*Moon of Jupiter*

*Its surface is the oldest and most heavily cratered in the Solar System. The likely presence of an ocean leaves open the possibility that Callisto could harbor life.*

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Albedo	0.22
Radius (km)	2,410.3
Mass (kg)	$1.075 \times 10^{23}$
Density (g/cm <sup>3</sup> )	1.8344
Gravity (m/s <sup>2</sup> )	1.236
Orbital period (days)	16.689
Orbital speed (km/s)	8.204
Temperature (K)	134
Discovery date	1610 (G. Galileo)

## Gas giants/Son



### Io

*Moon of Jupiter*

*The driest known object in the Solar System*

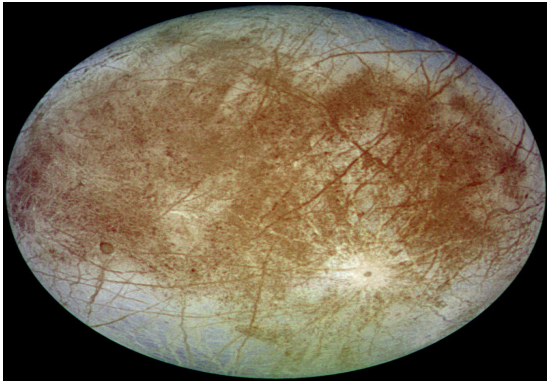
*With over 400 active volcanoes, Io is the most geologically active object in the Solar System*

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Albedo	0.63
Radius (km)	1,821.6
Mass (kg)	$89.3 \times 10^{22}$
Density (g/cm <sup>3</sup> )	3.528
Gravity (m/s <sup>2</sup> )	1.797
Orbital period (days)	1.769
Orbital speed (km/s)	17.334
Temperature (K)	110
Discovery date	1610 (G. Galileo)



## Gas giants/Bird



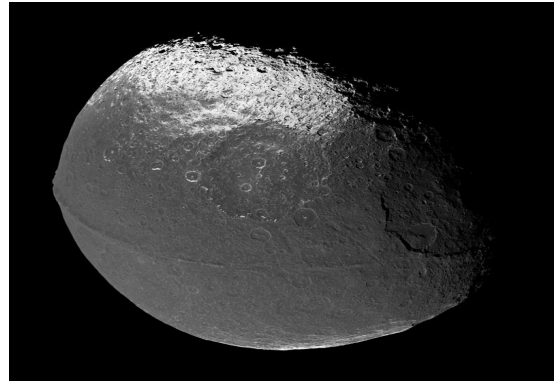
### Europa

*Moon of Jupiter*

*Exploration of Europa began in 1973 (Pioneer).  
It has the smoothest surface of any known  
solid object in the Solar System.*

Albedo	0.67
Radius (km)	1560.8
Mass (kg)	$4.799 \times 10^{22}$
Density (g/cm <sup>3</sup> )	3.013
Gravity (m/s <sup>2</sup> )	1.316
Orbital period (days)	3.551
Orbital speed (km/s)	13.740
Temperature (K)	102
Discovery date	1610 (G. Galileo)

## Gas giants/Dog



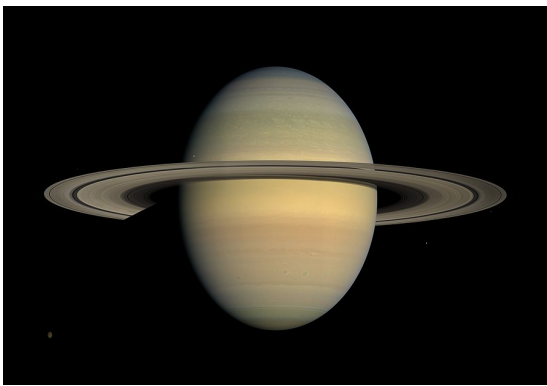
### Iapetus

*Moon of Saturn*

*Best known for its dramatic two-tone coloration.  
Its equatorial ridge (20km high) give Iapetus  
a walnut-like appearance.*

Albedo	0.05-0.5
Radius (km)	734.5
Mass (kg)	$1.805 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.088
Gravity (m/s <sup>2</sup> )	0.223
Orbital period (days)	79.321
Orbital speed (km/s)	3.26
Temperature (K)	90+>130
Discovery date	1671 (G. Cassini)

## Gas giants 2/Mom



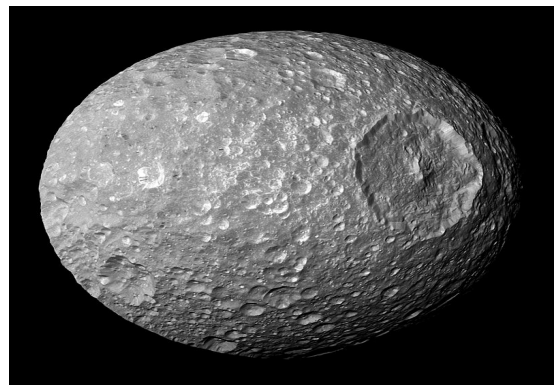
### Saturn

*Gas giant*

*The ring system consists of 9 continuous main  
rings and 3 discontinuous arcs. The only planet of the  
Solar System that is less dense than water.*

Albedo	0.47
Radius (km)	58,232
Mass (kg)	$5.683 \times 10^{26}$
Density (g/cm <sup>3</sup> )	0.687
Gravity (m/s <sup>2</sup> )	10.445
Orbital period (days)	10,759.22
Orbital speed (km/s)	9.69
Temperature (K)	134
Discovery date	1200 BC (Babylon)

## Gas giants 2/Son



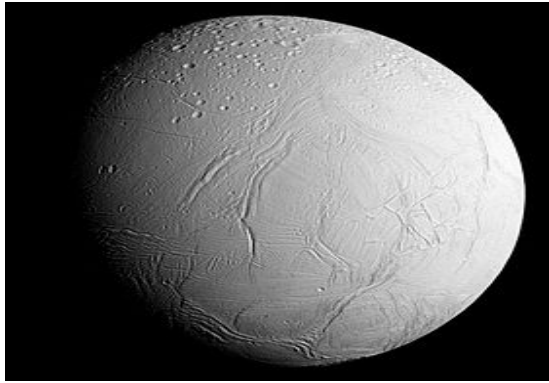
### Mimas

*Moon of Saturn*

*The smallest astronomical body that is known  
to be rounded in shape because of self-gravitation.  
From certain angles, Mimas resembles the Death Star.*

Albedo	0.962
Radius (km)	198.2
Mass (kg)	$3.749 \times 10^{19}$
Density (g/cm <sup>3</sup> )	1.148
Gravity (m/s <sup>2</sup> )	0.064
Orbital period (days)	0.942
Orbital speed (km/s)	14.28
Temperature (K)	64
Discovery date	1789 (W. Herschel)

## Gas giants 2/Bird



### Enceladus

*Moon of Saturn*

*Enceladus is geologically active today.*

*Enceladus is the primary source for Saturn's E Ring*

*It is losing mass at a rate of 200 kg/second.*

Albedo	1.375
Radius (km)	252.1
Mass (kg)	$1.080 \times 10^{20}$
Density (g/cm <sup>3</sup> )	1.609
Gravity (m/s <sup>2</sup> )	0.113
Orbital period (days)	1.370
Orbital speed (km/s)	12.6
Temperature (K)	75
Discovery date	1789 (W. Herschel)

## Gas giants 2/Cat



### Tethys

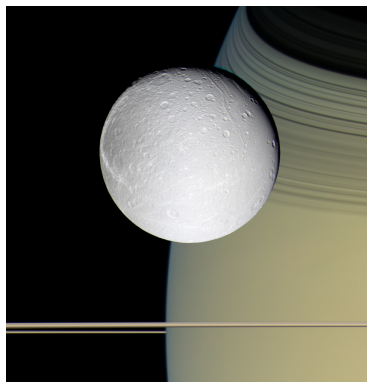
*Moon of Saturn*

*Its surface is one of the most reflective in the Solar System.*

*Its extremely water-ice-rich composition remains unexplained.*

Albedo	1.229
Radius (km)	531.1
Mass (kg)	$6.174 \times 10^{20}$
Density (g/cm <sup>3</sup> )	0.984
Gravity (m/s <sup>2</sup> )	0.146
Orbital period (days)	1.887
Orbital speed (km/s)	11.35
Temperature (K)	86
Discovery date	1684 (G. Cassini)

## Gas giants 2/Daughter



### Dione

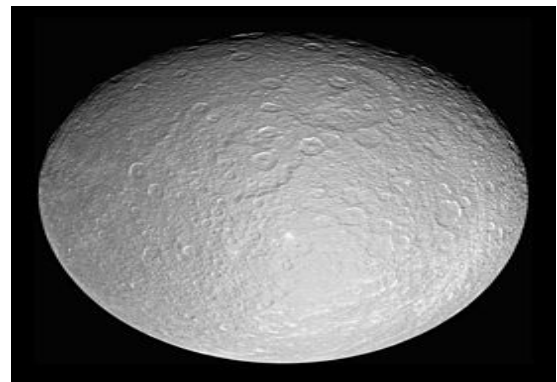
*Moon of Saturn*

*Originally named Sidera Lodoicea by its discoverer Giovanni Cassini to honor king Louis XIV.*

*Dione has two co-orbital, or trojan, moons.*

Albedo	0.998
Radius (km)	561.4
Mass (kg)	$1.095 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.478
Gravity (m/s <sup>2</sup> )	0.232
Orbital period (days)	2.737
Orbital speed (km/s)	10.027
Temperature (K)	87
Discovery date	1684 (G. Cassini)

## Gas giants 2/Dad



### Rhea

*Moon of Saturn*

*Rhea has a rather typical heavily cratered surface. In 2010, NASA announced the discovery of an atmosphere, an exosphere composed of oxygen and carbon dioxide.*

Albedo	0.949
Radius (km)	763.8
Mass (kg)	$2.307 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.236
Gravity (m/s <sup>2</sup> )	0.264
Orbital period (days)	4.518
Orbital speed (km/s)	8.48
Temperature (K)	53->99
Discovery date	1672 (G. Cassini)

## Gas giants 2/Dog



### Phoebe

*Moon of Saturn*

*It was the first satellite to be discovered photographically.*

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Albedo	0.06
Radius (km)	106.5
Mass (kg)	$8.292 \times 10^{18}$
Density (g/cm <sup>3</sup> )	1.638
Gravity (m/s <sup>2</sup> )	0.038
Orbital period (days)	550.567
Orbital speed (km/s)	-1.71
Temperature (K)	73
Discovery date	1899 (W. Pickering)

## Ice giants/Mom



### Uranus

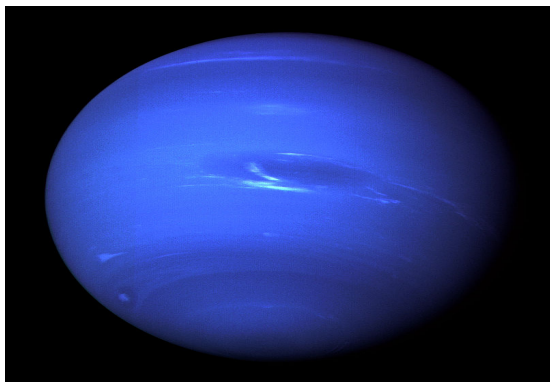
*Ice giant*

*The interior of Uranus is composed of ices and rock.  
Wind speeds can reach 250 m/s (900 km/h, 560 mph)  
It is the first planet discovered with a telescope.*

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Albedo	0.51
Radius (km)	25,362
Mass (kg)	$8.681 \times 10^{25}$
Density (g/cm <sup>3</sup> )	1.27
Gravity (m/s <sup>2</sup> )	8.87
Orbital period (days)	30,688.5
Orbital speed (km/s)	6.80
Temperature (K)	76
Discovery date	1781 (W. Herschel)

## Ice giants/Son



### Neptune

*Ice giant*

*Only planet in the Solar System found by mathematical prediction rather than by empirical observation.  
Recorded wind speeds can be as high as 2100 km/s.*

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Albedo	0.41
Radius (km)	24,622
Mass (kg)	$1.024 \times 10^{26}$
Density (g/cm <sup>3</sup> )	1.638
Gravity (m/s <sup>2</sup> )	11.15
Orbital period (days)	60,182
Orbital speed (km/s)	5.43
Temperature (K)	72
Discovery date	1845 (U. Le Verrier)

## Ice giants/Bird



### Triton

*Moon of Neptune*

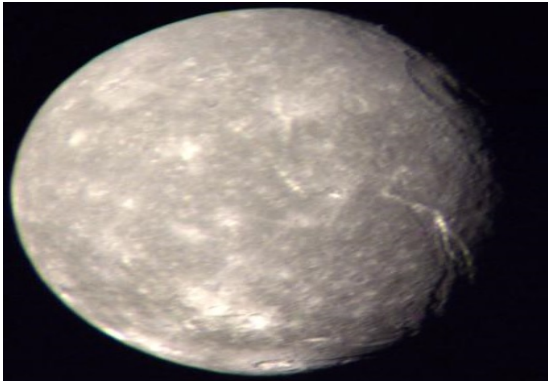
*Only 40% of Triton's surface has been observed.  
Triton's atmosphere has clouds of condensed nitrogen that lie between 1 and 3 km from its surface.*

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Albedo	0.76
Radius (km)	1,353.4
Mass (kg)	$2.14 \times 10^{22}$
Density (g/cm <sup>3</sup> )	2.061
Gravity (m/s <sup>2</sup> )	0.782
Orbital period (days)	-5.876
Orbital speed (km/s)	4.39
Temperature (K)	38
Discovery date	1846 (W. Lassell)



### Ice giants/Cat



#### Titania

*Moon of Uranus*

*It is subject to an extreme seasonal cycle. Both northern and southern poles spend 42 years in a complete darkness, and another 42 years in continuous sunlight.*

Albedo	0.35
Radius (km)	788.4
Mass (kg)	$3.526 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.711
Gravity (m/s <sup>2</sup> )	0.378
Orbital period (days)	8.706
Orbital speed (km/s)	3.64
Temperature (K)	70
Discovery date	1787 (W. Herschel)

### Ice giants/Daughter



#### Oberon

*Moon of Uranus*

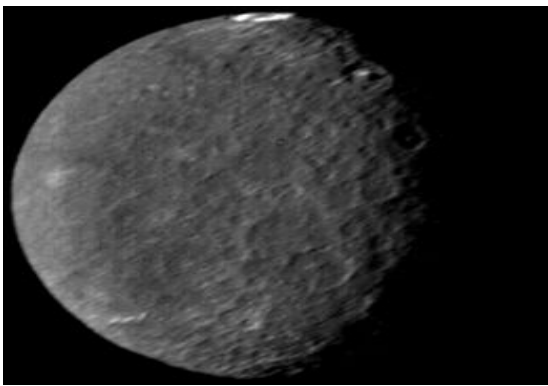
*Oberon was discovered by William Herschel*

*Named after a character created by W. Shakespeare.*

*No mission to Oberon planned in the foreseeable future.*

Albedo	0.31
Radius (km)	761.4
Mass (kg)	$3.014 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.63
Gravity (m/s <sup>2</sup> )	0.346
Orbital period (days)	13.463
Orbital speed (km/s)	3.15
Temperature (K)	70-80
Discovery date	1787 (W. Herschel)

### Ice giants/Dad



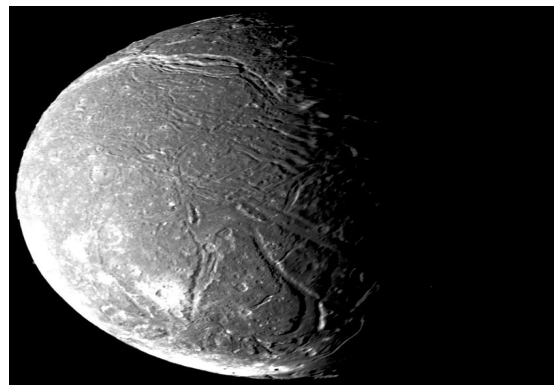
#### Umbriel

*Moon of Uranus*

*Covered by numerous impact craters reaching 210 km in diameter. Since the Voyager 2 flyby (1986) no other spacecraft has ever visited Uranus or Umbriel.*

Albedo	0.26
Radius (km)	584.7
Mass (kg)	$1.172 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.39
Gravity (m/s <sup>2</sup> )	0.2
Orbital period (days)	4.144
Orbital speed (km/s)	4.67
Temperature (K)	75
Discovery date	1851 (W. Lassell)

### Ice giants/Dog



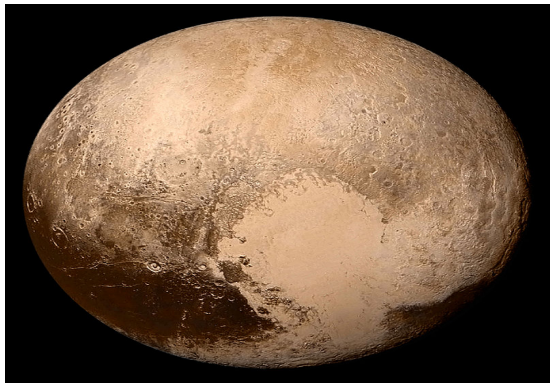
#### Ariel

*moon of Uranus*

*Except for water, the only other compound identified on the surface of Ariel is carbon-dioxide (CO<sub>2</sub>), concentrated mainly on its trailing hemisphere.*

Albedo	0.53
Radius (km)	578.9
Mass (kg)	$1.353 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.592
Gravity (m/s <sup>2</sup> )	0.269
Orbital period (days)	2.52
Orbital speed (km/s)	5.51
Temperature (K)	-213
Discovery date	1851 (W. Lassell)

## Dwarf planets/Mom



### Pluto

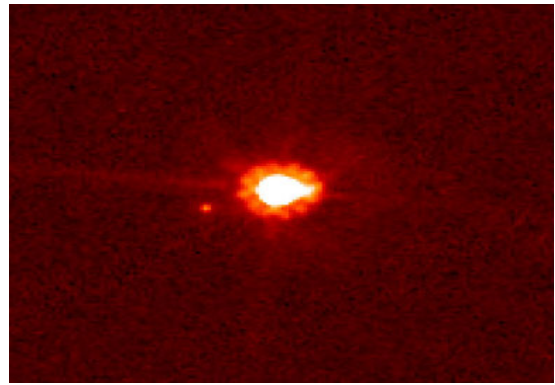
*Dwarf planet*

*Originally considered the ninth planet from the Sun. On July 14, 2015, the New Horizons spacecraft became the first spacecraft to fly by Pluto.*

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Albedo	0.44-0.61
Radius (km)	1,186
Mass (kg)	$13.105 \times 10^{22}$
Density (g/cm <sup>3</sup> )	1.87
Gravity (m/s <sup>2</sup> )	0.61
Orbital period (days)	90,581
Orbital speed (km/s)	4.67
Temperature (K)	44
Discovery date	1930 (C. Tombaugh)

## Dwarf planets/Bird



### Eris

*Dwarf planet*

*Because Eris appeared to be larger than Pluto, NASA initially described it as the Solar System's tenth planet. Since August 24, 2006, Eris is considered a dwarf planet.*

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Albedo	0.96
Radius (km)	1,163
Mass (kg)	$1.66 \times 10^{22}$
Density (g/cm <sup>3</sup> )	2.52
Gravity (m/s <sup>2</sup> )	0.659
Orbital period (days)	203,830
Orbital speed (km/s)	3.434
Temperature (K)	42.5
Discovery date	2005 (M. E. Brown)

## Dwarf planets/Son



### Charon

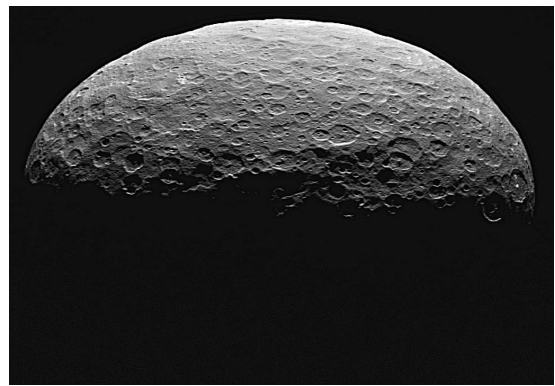
*Moon of Pluto*

*a very large moon in comparison to its parent body  
Charon is the ferryman of the dead in Greek mythology.*

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Albedo	0.2-0.5
Radius (km)	606
Mass (kg)	$1.586 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.707
Gravity (m/s <sup>2</sup> )	0.288
Orbital period (days)	6.387
Orbital speed (km/s)	0.21
Temperature (K)	53
Discovery date	1978 (J. W. Christy)

## Dwarf planets/Cat



### Ceres

*Dwarf planet*

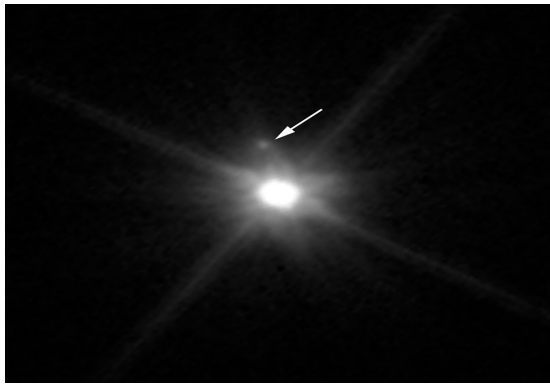
*Ceres is the only object in the asteroid belt known to be rounded by its own gravity. Ceres was the first asteroid discovered.*

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Albedo	0.09
Radius (km)	473
Mass (kg)	$9.393 \times 10^{20}$
Density (g/cm <sup>3</sup> )	2.161
Gravity (m/s <sup>2</sup> )	0.28
Orbital period (days)	1678.6
Orbital speed (km/s)	17.882
Temperature (K)	168
Discovery date	1801 (G. Piazzi)



### Dwarf planets/Daughter



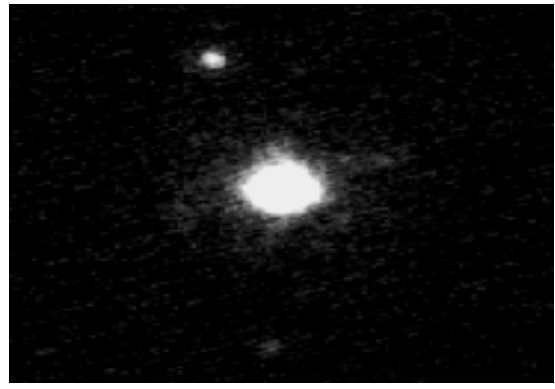
#### Makemake

*Dwarf planet*

*Perhaps the largest Kuiper belt object. Its surface is covered with methane, ethane and nitrogen ices  
A mission to Makemake could take just over 16 years.*

Albedo	0.81
Radius (km)	715
Mass (kg)	$4.4 \times 10^{21}$
Density (g/cm <sup>3</sup> )	1.4
Gravity (m/s <sup>2</sup> )	0.5
Orbital period (days)	112,897
Orbital speed (km/s)	4.419
Temperature (K)	40
Discovery date	2005 (Ch. Trujillo)

### Dwarf planets/Dad



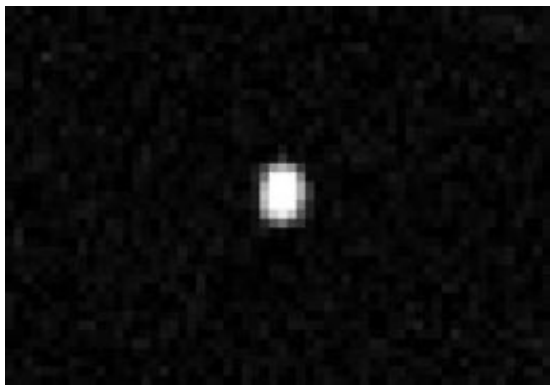
#### Haumea

*Dwarf planet*

*Haumea is spinning so fast that if it spun much faster its equatorial bulges would distort into a dumbbell shape and split the planet in two.*

Albedo	0.804
Radius (km)	620
Mass (kg)	$4.006 \times 10^{21}$
Density (g/cm <sup>3</sup> )	2.6
Gravity (m/s <sup>2</sup> )	0.63
Orbital period (days)	103,774
Orbital speed (km/s)	4.531
Temperature (K)	50
Discovery date	2004 (M. E. brown)

### Dwarf planets/Dog



#### Quaoar

*Kuiper belt dwarf-planet*

*Quaoar has one known satellite, Weywot  
It was named after the Tongva creator deity.  
Quaoar is about as massive as Charon.*

Albedo	0.19
Radius (km)	380
Mass (kg)	$1.4 \times 10^{21}$
Density (g/cm <sup>3</sup> )	2.2
Gravity (m/s <sup>2</sup> )	0.24
Orbital period (days)	104,334
Orbital speed (km/s)	4.52
Temperature (K)	43
Discovery date	2002 (Ch. Trujillo)

### Others/Mom

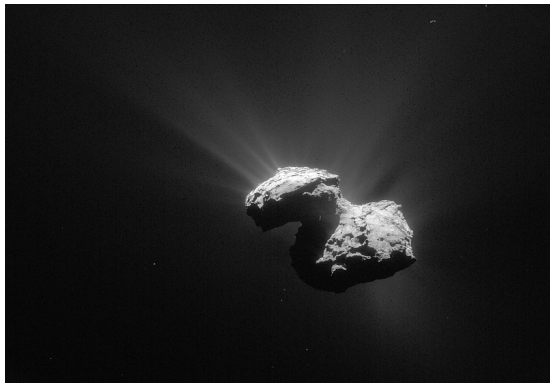


#### Sun

*Its mass accounts for about 99.86% of the total mass of the Solar System. The Sun is roughly middle aged and has not changed dramatically for over four billion years.*

Albedo	NA
Radius (km)	696,342
Mass (kg)	$1.988 \times 10^{30}$
Density (g/cm <sup>3</sup> )	1.408
Gravity (m/s <sup>2</sup> )	274.0
Orbital period (days)	NA
Orbital speed (km/s)	251
Temperature (K)	1,000,000
Discovery date	NA

### Others/Son



### Churyumovâ??Gerasimenko

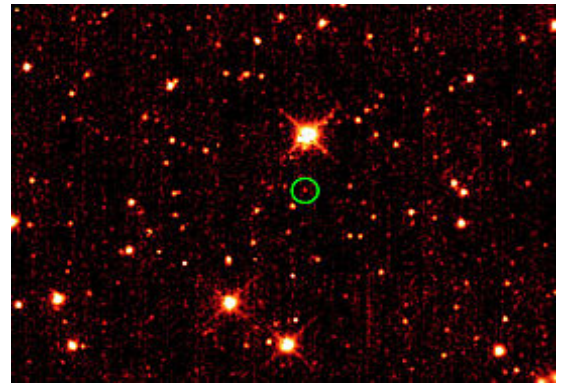
*Jupiter-family comet*

*It was the destination of the Rosetta mission, launched in 2004. On 12 November 2014 Philae probe landed on the comet.*

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Albedo	0.06
Radius (km)	4.3
Mass (kg)	$1.0 \times 10^{13}$
Density (g/cm <sup>3</sup> )	0.533
Gravity (m/s <sup>2</sup> )	0
Orbital period (days)	2351
Orbital speed (km/s)	38
Temperature (K)	180
Discovery date	1969 (S. Gerasimenko)

### Others/Bird



### 2010 TK7

*Asteroid*

*The first Earth trojan discovered  
50 more distant from Earth than the Moon.*

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Albedo	0.1
Radius (km)	0.3
Mass (kg)	Unknown
Density (g/cm <sup>3</sup> )	Unknown
Gravity (m/s <sup>2</sup> )	0.0005
Orbital period (days)	365.1
Orbital speed (km/s)	9.1
Temperature (K)	Unknown
Discovery date	2010 (WISE)

### Others/Cat



### (225088) 2007 OR10

*Trans-neptunian object*

*Largest known body in the Solar System without a name.  
2007 OR10 is among the reddest objects known.*

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Albedo	0.089
Radius (km)	750
Mass (kg)	$1.3 \times 10^{21}$
Density (g/cm <sup>3</sup> )	Unknown
Gravity (m/s <sup>2</sup> )	Unknown
Orbital period (days)	199,978
Orbital speed (km/s)	Unknown
Temperature (K)	31
Discovery date	2007 (D. Rabinowicz)

### Others/Daughter



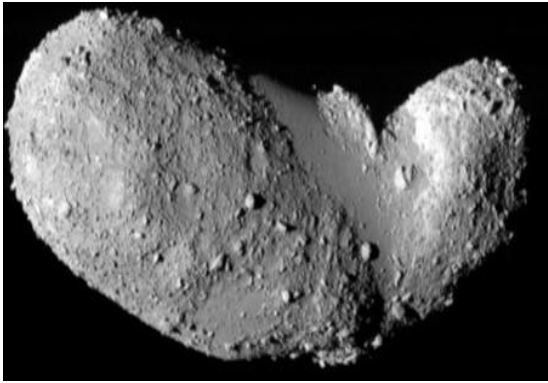
### Sedna

*Scattered object*

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Albedo	0.32
Radius (km)	480
Mass (kg)	Unknown
Density (g/cm <sup>3</sup> )	Unknown
Gravity (m/s <sup>2</sup> )	Unknown
Orbital period (days)	4,162,140
Orbital speed (km/s)	1.04
Temperature (K)	12
Discovery date	2003 (D. Rabinowicz)

## Others/Dad



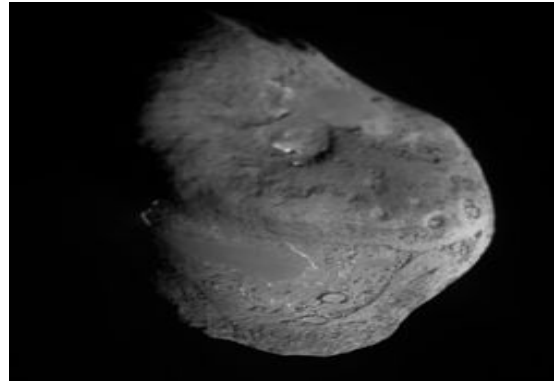
### 25143 Itokawa

*Apollo and Mars-crosser asteroid*

*The 1st asteroid to be the target of a sample return mission. On 25 November 2005, Hayabusa mission landed on the asteroid and returned a sample to Earth.*

Albedo	0.53
Radius (km)	0.5
Mass (kg)	$3.51 \times 10^{10}$
Density (g/cm <sup>3</sup> )	2.9
Gravity (m/s <sup>2</sup> )	0.00001
Orbital period (days)	556.355
Orbital speed (km/s)	Unknown
Temperature (K)	206
Discovery date	1998 (LINEAR)

## Others/Dog



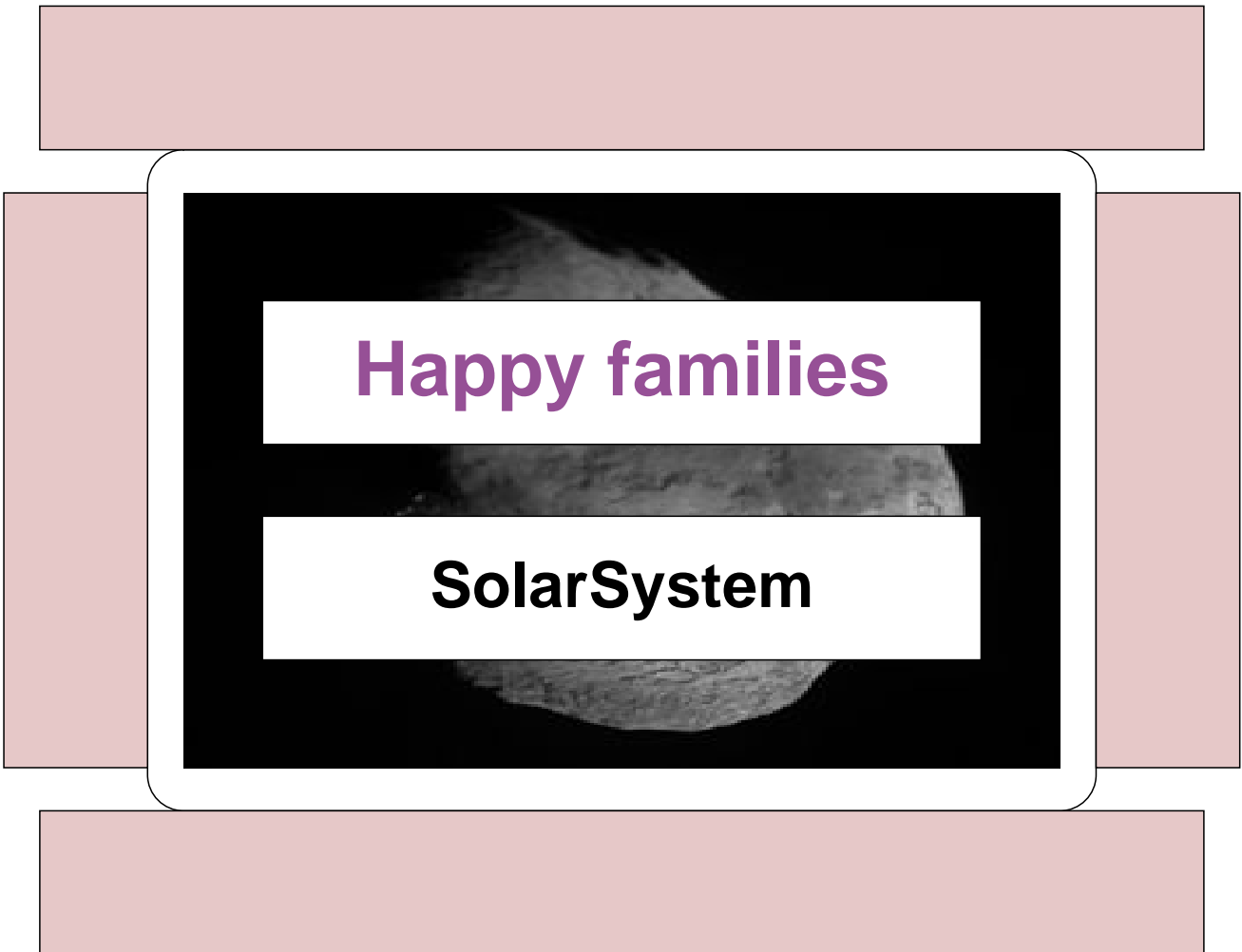
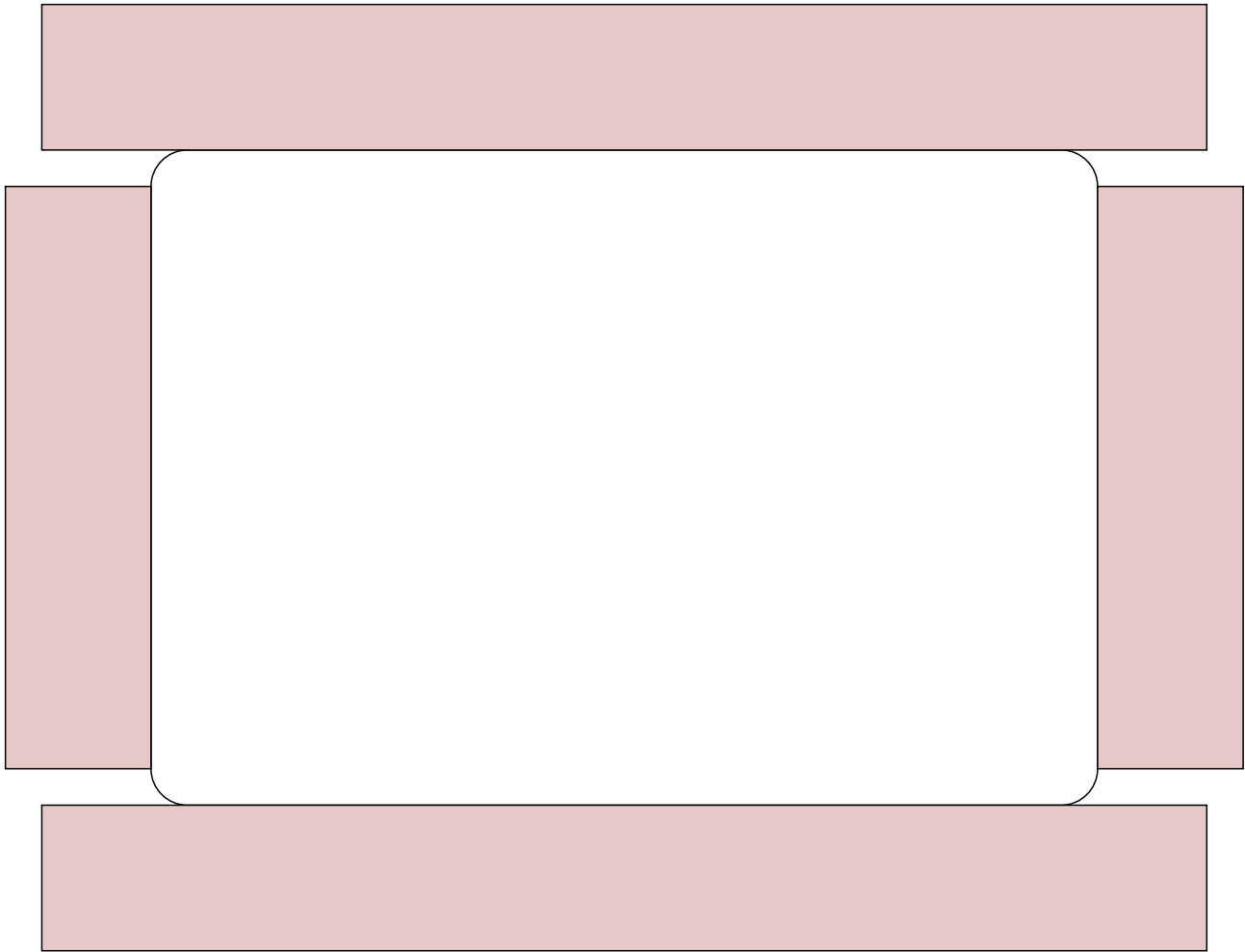
### Tempel 1

*Periodic Jupiter-family comet*

*In 2005, Tempel 1 was deliberately struck by one component of the NASA Deep Impact Probe. This was the first landing on a comet.*

Albedo	0.04
Radius (km)	3.8
Mass (kg)	$7.2 \times 10^{13}$
Density (g/cm <sup>3</sup> )	0.62
Gravity (m/s <sup>2</sup> )	Unknown
Orbital period (days)	2016.85
Orbital speed (km/s)	Unknown
Temperature (K)	Unknown
Discovery date	1867 (W. Tempel)





**Happy families**

**SolarSystem**