

Glossary of Terms Used¹

airglow

/ˈɛ:gləʊ/

(US /ˈɛ:ɹgləʊ/)

Radiation of a planetary atmosphere, caused mainly by the interaction of atoms and molecules in the atmosphere with photons and high energy particles from the Sun. Dayglow is brought about by the direct interaction of solar photons with the atoms and molecules of a planetary atmosphere. Nightglow is the result of the downward energy transitions of the atoms and molecules. Dayglow is orders of magnitude more intense than nightglow.

albedo feature

/ælˈbi:dəʊ ˈfi:tʃə/

(US /ælˈbi:dəʊ ˈfi:tʃə/)

An extensive area on the surface of a planet or any solid celestial body, discernible by the amount of reflected light.

IAU designation: AL.

aphelion

/æpˈhi:lən, əˈfi:lən/

For a body in orbit around the Sun, the point at which the body is farthest from the centre of the Sun.

apoapsis

/æpəʊˈæpsɪs/

(US /æpəʊˈæpsɪs/)

The point in an artificial satellite's orbit that is farthest from the centre of the central body.

apsi-s

/ˈæpsɪ-s/ pl. -des /-di:z/

Either of the two points in an orbit that define the greatest and least distances from the central body.

ascending node

/əˈsɛndɪŋ nɒd/

(US /- nɒd/)

The point in the orbit of a celestial body at which it passes from south to north of a reference plane.

In the case of a planet the reference plane is usually the **ecliptic**. For an artificial satellite, the reference plane could be the equator of a Solar System body.

atmospheric extinction

/ætˈmæsˈfɛrɪk ɛkˈstɪŋkʃən/

The dimming of light emitted by celestial bodies due to scattering of the light by molecules and aerosols, and absorption by molecules in the atmosphere.

attitude

/ˈætɪtju:d/

The orientation of the axes of a spacecraft with respect to a fixed reference frame.

¹The entries in this glossary are meant to serve merely as explanations of the terminology used in this book; they are not intended as formal definitions.

base mosaic

/ˈbeɪs məʊˈzeɪɪk/
(US /- moʊˈzeɪɪk/)

A map of Mercury combining the part (43.01 %) of the surface surveyed by *Mariner 10* and the 90.90 % of the surface mapped during the three flybys of *MESSENGER*.

MESSENGER has now made a complete survey of the surface of Mercury.

BELA

/ˈbɛlə/

= **BepiColombo Laser Altimeter** (*q.v.*).

BepiColombo

/ˌbɛpɪkəˈlɒmbəʊ/
(US /- kəˈlambou/)

A planned orbital mission to Mercury comprising two separate satellites: the *Mercury Planet Orbiter* and the *Mercury Magnetospheric Orbiter*.

BepiColombo will reach Mercury in 2020 and will operate from September 2020 to September 2021, with a possible extension until 2022.

BepiColombo Laser Altimeter

/- ˈleɪzə ælˈtɪmɪtə/
(US /- ˈleɪzə ælˈtɪmɪtə/)

A laser altimeter to be carried on board the *Mercury Planet Orbiter* of the planned *BepiColombo* mission.

bow shock

/bəʊ ʃɒk/
(US /- ʃak/)

A sharp boundary between the **solar wind** and a planetary **magnetosphere** that results in the slowing down of the solar wind in

the vicinity the planet, the wind later regaining its initial speed.

Cassegrain telescope

/ˈkæsɪɡreɪn ˈtelɪskəʊp/
(US /- ˈtelɪskəʊp/)

A **reflecting telescope** consisting of a concave **primary mirror** and a convex **secondary mirror**, and in which the **focus** is located below a hole in the centre of the primary mirror.

Compared to a **Newtonian**, this design is more compact and more easily accommodates the mounting of detection equipment.

The primary mirror is paraboloidal in cross-section and the secondary mirror hyperboloidal.

celestial mechanics

/sɪˈlestɪəl mɪˈkæniks/

A branch of astronomy concerned with the analysis of the motions and positions of celestial bodies and artificial satellites.

chi-squared analysis

/kʌɪ skwɛɪd əˈnæɪlɪs/
(US /- skwɛɪd -/)

[also **chi-square test**]

A statistical significance test that examines the goodness of fit of a data set to an assumed probability distribution.

If the data are distributed into n bins, then $\chi^2 = \sum_{k=1}^n (O_k - E_k)^2 / E_k$, where O_k is the observed k th value and E_k is the expected k th value according to the assumed probability distribution.

conformal projection

/kənˈfɔ:məl prəˈdʒekʃən/
(US /kənˈfɔ:məl -/)

A map projection that retains a correct angular representation, and

hence does not distort shapes, over a limited area.

conjunction

/kən'dʒʌŋkʃən/

The alignment, as seen from Earth, of two bodies in the Solar System such that they have the same celestial longitude.

crater

/'krɛɪtə/

(US /'krɛɪtəɹ/)

A circular depression on the surface of a planet or any solid celestial body.

IAU designation: AA.

cusps

/kʌsp/

One of the two extreme points of the crescent of the Moon or an **inferior planet**.

Cytherean

/sɪθi'ri:ən/

Of, or pertaining to, the planet Venus.

descending node

/dɪ'sɛndɪŋ nəʊd/

(US /- noʊd/)

The point in the orbit of a celestial body at which it passes from north to south of a reference plane.

In the case of a planet the reference plane is usually the **ecliptic**. For an artificial satellite, the reference plane could be the equator of a Solar System body.

descriptor term

/dɪs'krɪptə tɜ:m/

(US /dɪs'krɪptəɹ tɜ:ɹm/)

A planetary surface feature type in the IAU planetary nomenclature system.

Most named features (except for craters) include the descriptor term in the name (in the case of craters, 'crater' is implicit but unstated).

dipolar magnetic field

/dɪlɪ'pəʊlə mæɡ'nɛtɪk fɪ:ld/

(US /dɪlɪ'pəʊləɹ - -/)

The field generated by a magnetic dipole.

The Earth's magnetic field is approximately dipolar, roughly equivalent to a that of a bar magnet.

dipole moment

/'dɪlɪpəʊl 'məʊmənt/

(US /'dɪlɪpəʊl 'moʊmənt/)

See **magnetic dipole moment**.

Doppler-spread

/'dɒplə sprɛd/

(US /'dɒpləɹ -/)

In the context of radar measurements of Mercury, the spectral broadening, caused by the planet's rotation, of radar signals received from different parts of the Mercurian surface.

dors-um

/'dɔ:ɪsəm/

(US /'dɔ:ɪsəm/)

pl. -a /-ə/

A ridge on the surface of a planet or any solid celestial body.

IAU designation: DO.

dwarf planet

/dwɔ:ɪf 'plænit/

(US /dwɔ:ɪf -/)

In the IAU planetary nomenclature system, a celestial body (not a satellite), intermediate in mass between a **principal planet** and a **small solar system body**, orbiting the Sun and with sufficient mass to overcome internal rigid

body forces and assume an approximately spherical shape.

dynamo effect

/ˈdʌɪnəməʊ əˈfɛkt/
(US /ˈdʌɪnəmou -/)

A mechanism invoked to explain the origin of the Earth's magnetic field.

Radioactive decay in the Earth's outer core is thought to provoke convective motion in the core's liquid iron in a surrounding weak magnetic field; this combined convective motion and intrinsic magnetic field induce an electric current in the liquid iron.

This induced electric current then produces a secondary magnetic field that coalesces with the initial magnetic field to produce a stronger magnetic field roughly aligned with the rotational axis of the Earth.

eccentricity

/ɪksənˈtrɪsɪti/

Of an orbit, the degree to which it diverges from a perfect circle.

More generally, a parameter that determines the shape of a conic section.

Represented by the symbol e . For a circle, $e = 0$ for an ellipse $0 < e < 1$, for a parabola $e = 1$ and for a hyperbola $e > 1$.

ecliptic

/ɪˈkliptɪk/

The apparent eastward circular path traced during the year by the Sun against the background stars.

More formally, the intersection of the ecliptic plane and the celestial sphere.

elongation

/ɪˈlɒŋˈɡeɪʃən/
(US /ɪˈlɑŋˈɡeɪʃən/)

The angular separation on the sky of a planet from the Sun.

Energetic Particle and Plasma Spectrometer

/ɛnəˈdʒ/ɛtɪk ˈpɑːtɪkəl ənd ˈplæzmə spekˈtrɒmɪtə/
(US /ɛnəˈdʒ/ɛtɪk ˈpɑːtɪkəl - - spekˈtrɑmɪtə/)

An instrument comprising an energetic particle spectrometer and a fast imaging plasma spectrometer on board the **MESSENGER** probe to measure charged particles in the **magnetosphere** of Mercury and charged particles from the surface of the planet.

EPPS

= **Energetic Particle and Plasma Spectrometer** (*q.v.*).

equal-area projection

/ˈiːkwəl ˈɛːrə prəˈdʒɛkʃən/

A map projection (of a sphere on to a plane) in which areas, but not angles, are accurately represented.

exosphere

/ˈɛksəsfɪə/
(US /ˈɛksəsfiə/)

That part of a planet's atmosphere which blends into the interplanetary medium.

The atmosphere of Mercury is an exosphere.

extreme ultraviolet

/ɪkˈstriːm ʌltrəˈvʌɪələt/

The part of the electromagnetic spectrum (10–100 nm) lying between the ultraviolet and X-ray regions.

flyby

/ˈflaɪbaɪ/
pl. -s /-z/

In astronautics, a passing encounter of a space probe with a celestial body.

foss-a

/'fɒsə/

(US /'fasə/)

pl. -ae /-i:/

A long, narrow depression on the surface of a planet or any solid celestial body.

IAU designation: FO.

Gamma-Ray and Neutron Spectrometer

/'gæmə ɾeɪ ənd 'nju:trɒn

spek'trɒmɪtə/

(US /- - - 'nju:trən spek'tramɪtə/)

A spectrometer on board the *MESSENGER* probe that measures the numbers and energies of gamma rays and neutrons emanating from the surface of Mercury.

A germanium semiconductor crystal measures electrical pulses deriving from interactions with gamma rays, and scintillators are used to detect neutrons.

Gazetteer of Planetary Nomenclature

/gæzi'tiə əv 'plænɪtri nəv'menklətʃə/

(US /gæzi'tiə əv 'plænɪtəri

nəv'menklətʃə/)

A database, maintained by the Planetary Geomatics Group of the US Geological Survey Astrogeology Science Center in cooperation with the International Astronomical Union, listing all IAU-approved names for surface features of planetary bodies and ring systems.

general-relativistic precession

/'dʒenərəl ɾelə'tɪvɪstɪk prɪ'seɪʃən/

A residual amount of advance of the **line of apsides** of a planet caused by the Sun's gravitational distortion of the space in the vicinity of the planet.

The effect is small and additional to the larger classical effect caused by gravitational perturbations exerted by the other planets.

In the case of the Solar System, the effect is most noticeable for Mercury (43.03" per year in the direction of motion of the planet).

gibbous

/'gɪbəʊs/

Of the Moon or a planet, having more than half of but less than the whole observer-facing disc illuminated by the Sun.

global mosaic

/'gləʊbəʌl məʊ'zeɪɪk/

(US /'gləʊbəʌl moʊ'zeɪɪk/)

A map of Mercury combining images taken by *Mariner 10* and the Mercury Dual Imaging System on board the *MESSENGER* probe.

gravitational field

/grævɪ'teɪʃənəl fi:ld/

A region of space surrounding a massive body in which the gravitational force of the body is detectable.

gravitational potential well

/- pə'tenʃəl wəl/

A region in a **gravitational field** inside a higher potential region in which the potential steepens abruptly.

gravitational slingshot

/- 'slɪŋʃɒt/

(US /- 'slɪŋʃat/)

See **gravity assist**.

gravity assist

/'grævɪtɪ ə'sɪst/

The use of the **gravitational field** of a planet to alter the **momentum** of a spacecraft during a **flyby**.

great circle

/grɛɪt 'cə:kəl/
(US /- cə:ʊkəl/)

A circle inscribed on the surface of a sphere and centred on the centre of the sphere.

greatest eastern elongation

/'grɛɪtɪst 'i:stən i:lŋ'geɪʃən/
(US /- 'i:stən i:lŋ'geɪʃən/)

The greatest angular distance between an **inferior planet** and the Sun during a synodic period of the planet when the planet is to the east of the Sun.

This angle varies according to the respective positions of the Earth and planet in their orbits at the time of greatest elongation.

greatest western elongation

/- 'wɛstən -/
(US /- wɛstən -/)

The greatest angular distance between an **inferior planet** and the Sun during a synodic period of the planet when the planet is to the west of the Sun.

This angle varies according to the respective positions of the Earth and planet in their orbits at the time of greatest elongation.

GRNS

= **Gamma Ray and Neutron Spectrometer** (*q.v.*).

heliocentric transfer orbit

/hi:lɪəʊ'sentrɪk 'trɑ:nsfə: 'ɔ:bit/
(US /hi:lɪəʊ'sentrɪk 'træ:nsfə: 'ɔ:bit/)

Half of an elliptical orbit, centred on the Sun, enabling a spacecraft in orbit around one planet to reach another planet.

inferior conjunction

/ɪn'fɪərɪə kənʤʌŋkʃən/
(US /ɪn'fɪərɪə -/)

The **conjunction** of an **inferior planet** when it is located between the Earth and the Sun.

inferior planet

/ɪn'fɪərɪə 'plænɪt/
(US /ɪn'fɪərɪə -/)

A planet whose distance from the Sun is inferior to that of the Earth. There are two inferior planets: Mercury and Venus.

infrared radiometer

/ɪnfrə'red reɪdɪ'ɔmɪtə/
(US /- reɪdɪ'ɑmɪtə/)

A device that measures the amount of infrared radiation received from an object.

The infrared part of the electromagnetic spectrum ranges from about 1 to 300 μm .

ionosphere

/ɪ'ɔnəsfiə/
(US /ɪ'anəsfiə/)

A layer of the atmosphere of a planet or other body in which solar X-rays and ultraviolet radiation ionize atmospheric molecules, producing roughly equal amounts of free electrons and ions.

Apart from the Earth, ionospheres have been found on a number of other Solar System bodies, including Venus, Mars, the gas giants, the Jovian satellite Io, the Saturnian satellite Titan, the Neptunian satellite Triton and several comets.

ISA

= **Italian Spring Accelerometer**
(*q.v.*).

Italian Spring Accelerometer

/i'tæliən sprɪŋ æksələ'rɒmɪtə/
(US /- æksələ'rɑmɪtə/)

An instrument on board the *Mercury Planet Orbiter* of the planned *BepiColombo* mission to measure non-gravitational accelerations that need to be taken into account in the mission's gravimetry, rotation and general relativity experiments.

Lambert conformal projection

/'læmbət kən'fɔ:məl prə'dʒɛkʃən/
(US /'læmbət kən'fɔ:ɹmə -/)

[also **Lambert conformal conic projection**]

A **conformal projection** in which meridians are straight lines converging at a pole and parallels of latitude appear as concentric circles.

Named after the Swiss mathematician and physicist J. H. Lambert (1728–1777).

A cone is placed such that its axis coincides with that of the globe being mapped, with two reference parallels secant to and intersecting the body. There is no distortion at the reference parallels and increasing distortion with increasing distance from the reference parallels. The conformal nature of the projection ensures that angles are preserved.

libration

/lɪb'reɪʃən/

An apparent nodding and wobbling of the Moon that causes 59 % of its surface to be visible over time.

The Moon's **sidereal period** is equal to its rotational period, but the

elliptical shape of the orbit, its inclination to the ecliptic and the rotation of the Earth produce libration in longitude, libration in latitude and diurnal libration.

The slightly irregular shape of the Moon results in small variations of the rotation of the Moon on its axis, an effect known as physical libration.

line of apsides

/laɪn əv 'æpsɪdɪz/

The straight line joining the **periapsis** and **apoapsis** of an elliptical orbit.

lobate scarp

/'ləʊbeɪt ska:p/
(US /ləʊbeɪt ska:ɹp/)

A long line of cliffs with scalloped edges.

On Mercury, they are termed **rupēs** and are attributed to thrust faults arising from shrinkage of the planet's crust.

MAG

/mæg/

= ²**Magnetometer** (*q.v.*).

magnetic dipole moment

/mæg'netɪk 'dɪpəʊl 'məʊmənt/
(US /- 'dɪpəʊl 'moumənt/)

The product of the strength of the poles of a dipolar magnet and the distance separating them.

magnetic field

/- fi:ld/

A region of space permeated by magnetic forces.

magnetic flux

/- flʌks/

The product of a given area and the average **magnetic induction** over the area and at a right angle to it.

The total magnetic flux, $\Phi = \int \mathbf{B} \cdot d\mathbf{A}$, where **B** is the **magnetic induction** and **A** is the area.

magnetic flux tube

/- - tju:b/

A cylindrical region of space containing a **magnetic field** with its field lines parallel to the surface of the cylinder.

magnetic tornado

/- tɔ:nɛɪdəʊ/

(US /- tɔ:nɛɪdʊz/)

[also **flux transfer event**]

A twisted bundle of **magnetic fields** and **plasma**.

¹**magnetometer**

/mægni'tɒmɪtə/

(US /mægni'tamɪtəz/)

An instrument that measures **magnetic field** strength and direction.

²**Magnetometer**

A ¹**magnetometer** mounted on a 3.6-metre-long boom on board **MESSENGER** to measure the magnetic field of Mercury.

magnetopause

/mæg'ni:təʊpɔ:z/

(US /mæg'ni:təʊpɔ:z/)

The boundary separating a **magnetosphere** from the **solar wind**.

magnetosphere

/mæg'ni:təʊsfɪə/

(US /mæg'ni:təʊsfɪəz/)

A region of space in which a planet's magnetic field predominates over external magnetic fields

magnetotail

/mæg'ni:təʊteɪl/

(US /mæg'ni:təʊteɪl/)

The elongated part of a planet's magnetosphere that trails away from the planet in the direction of the solar wind.

¹**major axis**

/'meɪdʒə 'æksɪs/

(US /'meɪdʒə -/)

The longest diameter of an ellipse.

²**major axis**

The **line of apsides** of an elliptical orbit.

Mariner 10

/'mæɪnən tɛn/

(US /'mæɪnənə -/)

[also **Mariner Venus Mercury 1973**]

The first spacecraft to visit Mercury and the first to return close-up pictures of Mercury and Venus.

Primarily designed to investigate the environment, surface and atmosphere of Mercury, the probe mapped 43.01 % of Mercury's surface, thus providing the first definite information on the planet's surface features.

Launched on 1973 Nov 3, *Mariner 10* made three flybys of Mercury on 1974 Mar 29, 1974 Sep 21 and 1975 Mar 16.

MASCS

= **Mercury Atmospheric and Surface Composition Spectrometer** (*q.v.*).

mass

/mæs/

The amount of material in a body that determines its resistance to change in motion and its mutual

gravitational attraction to other bodies.

maximum eastern elongation

/ˈmæksɪmə ˈiːstən ɪˈlɒŋˈɡeɪʃən/
(US /- ˈiːstən -/)

The greatest possible **elongation** of an **inferior planet** when it is visible after sunset.

In the case of mercury maximum eastern elongation is 27° 45' in April and **maximum western elongation** (in September) is 17° 50'. The values are so divergent owing to the high ellipticity and inclination of the orbit of Mercury.

maximum western elongation

/- ˈwɛstən -/
(US /- ˈwɛstən -/)

The greatest possible **elongation** of an **inferior planet** when it is visible before sunset.

MDIS

/ɛm diː ɹɪ ˈɛs/

= Mercury Dual Imaging System (*q.v.*).

MDM

/ɛm diː ɛm/

= Mercury Dust Monitor (*q.v.*).

Mercator projection

/məˈkeɪtə prəˈdʒɛkʃən/
(US /məˈɪːkɪtə -/)

A cylindrical projection of a globe in which the cylinder touches the circumference of the globe (at the equator for practical mapping purposes), and in which straight segments represent ‘rhumb lines’, or ‘loxodromes’ (lines of constant course).

For small objects this projection is conformal (i.e. shape and angle are

preserved), but areal distortion increases with increasing latitude. First presented in 1569 by Gerardus Mercator, a Flemish geographer and cartographer.

Mercury Atmospheric and Surface Composition Spectrometer

/ˈmɜːkjʊəri ætməsˈfɛrɪk ənd səˈfɪs kɒmpəˈzɪʃən spɛkˈtrɒmɪtə/
(US /ˈmɜːrkjʊəri - - səˈfɪs kəmpəˈzɪʃən spɛkˈtrəmitə/)

A spectrometer on board the **MESSENGER** probe designed to determine the abundance of gases in the atmosphere of Mercury and identify minerals on its surface.

MASCS comprises two instruments: an ultraviolet and visible spectrometer (UVVS) and a visible and infrared spectrometer (VIRS).

The UVVS studies Mercury’s exosphere and measures its ionized components. The VIRS analyses surface titanium- and iron-bearing materials.

Mercury Dual Imaging System

/- ˈdʒuːəl ˈɪmɪdʒɪŋ ˈsɪstəm/

An imaging system on board the **MESSENGER** probe consisting of a wide-angle camera (WAC; field of view: 10.5° × 10.5°) and a narrow-angle camera (NAC; field of view: 1.5° × 1.5°), both producing 1024 × 1024 pixel images.

Since the Mercurian orbit of **MESSENGER** is highly elliptical, with periapsis in the northern hemisphere and apoapsis in the southern hemisphere, for the global map of Mercury the WAC will map the northern hemisphere and the NAC, the southern hemisphere.

The NAC is monochromatic (650–850 nm) and the WAC operates in the visible and near-infrared (430–1020 nm with 12 filters).

Mercury Dust Monitor

/- dʌst 'mɒnɪtə/

(US /- - 'manɪtə/)

An instrument on board the *Mercury Magnetospheric Orbiter* of the planned *BepiColombo* mission for measuring the distribution and dynamics of dust in the vicinity of Mercury.

Mercury Gamma-Ray and Neutron Spectrometer

/- 'gæmə ɾeɪ ənd njuːtrɒn

spek'trɒmɪtə/

(US /- - - njuːtrən spek'trəmɪtə/)

A spectrometer to be flown on board the *Mercury Planet Orbiter* of the planned *BepiColombo* mission in order to study the composition of the upper part of Mercury's crust and to search for water ice deposits in polar craters by measuring gamma-rays and neutrons produced by cosmic rays impacting the surface of the planet.

Mercury Laser Altimeter

/- 'leɪzə æl'tɪmɪtə/

(US /- 'leɪzə æl'tɪmɪtə/)

An instrument on board the *MESSENGER* probe that uses a laser transmitter and receiver to map the surface relief of the northern hemisphere of Mercury. The travel time of the emitted and reflected laser light (divided by two) is converted into distances, from which heights above datum level are deduced.

Mercury Magnetospheric Orbiter

/- mæɡniːtəʊ'sfɛrɪk 'ɔːbɪtə/

(US /- mæɡniːtəʊ'sfɛrɪk 'ɔːbɪtə - - ou/)

A probe designed to orbit Mercury as part of the planned

BepiColombo mission in order to measure the planet's intrinsic magnetic field with high accuracy, explore the characteristics of the magnetosphere, monitor variations in the thin atmosphere of the planet and explore interplanetary space near the Sun.

The *MMO* will host five experiments: a magnetometer, a plasma particle experiment, a plasma wave experiment, a spectral imager for studying the sodium atmosphere of the planet and a dust monitor.

Mercury Orbiter Radio-science Experiment

/- - 'reɪdiəʊ 'sɪəns ɛk'spɛrɪmənt/

An instrument to be carried on board the *Mercury Planet Orbiter* of the *BepiColombo* mission and designed to study the gravity field and core of Mercury.

Mercury Planet Orbiter

/- 'plænɪt -/

A probe designed to orbit Mercury as part of the planned *BepiColombo* mission in order to study the detailed characteristics of the planet.

The *MPO* will host 11 experiments: a laser altimeter, an accelerometer, a magnetometer, radiometer and thermal imaging spectrometer, a gamma-ray and neutron spectrometer, an imaging X-ray spectrometer, a Ka-band transponder for radio science, an ultraviolet spectrometer, an ionized and neutral particle analyser, an infrared and visible high-resolution stereoscopic camera, and a solar monitor.

Mercury Plasma Particle Experiment

/- 'plæzmə 'pɑːtɪkəl ɛk'spɛrɪmənt/

(US /- - 'paːtɪkəl -/)

A suite of instruments to be carried on board the **Mercury Magnetospheric Orbiter** of the **BepiColombo** mission and comprising two electron analysers, an ion analyser, a mass spectrum analyser, and high-energy particle instruments for electrons, ions and neutral particles.

Mercury's Imaging X-ray Spectrometer

/ˈmɜːkjəɪz ˈɪmɪdʒɪŋ ˈɛksrɛɪ
spekˈtrɒmɪtə/
(US /ˈmɜːɹkjəɪz - - spekˈtramɪtəɹ/)

An instrument to be carried on board the **Mercury Planet Orbiter** of the **BepiColombo** mission and designed to measure X-ray emission from the surface and magnetosphere of Mercury.

Mercury's Sodium Atmosphere Interferometer

/- ˈsəʊdiəm ˈætɹəsfiə ɪntəfəˈrɒmɪtə/
(US /- ˈsoudiəm ˈætɹəsfiə
ɪntəfəˈramɪtəɹ/)

An instrument to be carried on board the **Mercury Planet Orbiter** of the **BepiColombo** mission and designed to study the planet's exosphere, how it couples to the magnetosphere, and how the exosphere is bounded by the planetary surface, interplanetary space and the solar wind.

Mercury Thermal Infrared Imaging Spectrometer

/- ˈθɜːməl ɪnfɹəˈrɛd ˈɪmɪdʒɪŋ
spekˈtrɒmɪtə/
(US /- ˈθɜːɹməl - - spekˈtramɪtəɹ/)

An infrared (7–14 μm) **spectrometer** to be carried on board the **Mercury Planet Orbiter** of the planned

BepiColombo mission for studying the surface composition, identifying rock-forming minerals, and studying the surface temperature and **thermal inertia** of Mercury.

¹meridian

/məˈrɪdiən/

A **great circle** passing through the north and south poles of a planet and defining **planetographic longitude** on its surface.

²meridian

A **great circle** passing through the observer's **zenith**, and the north and south celestial poles.

MERMAG-M/MGF

/ˈmɜːmæg ɛm/
(US /ˈmɜːɹmæg/)

= MMO

Magnetometer/Magnetometer Fluxgate (*q.v.*).

MERMAG-P

= MPO Magnetometer (*q.v.*).

MERTIS

= Mercury Thermal Imaging Spectrometer (*q.v.*).

MESSENGER

/ˈmɛsɪndʒə/
(US /ˈmɛsɪndʒəɹ/)

The NASA **MERcury Surface, Space ENvironment GEOchemistry, and Ranging** spacecraft, designed to map the surface and study the environment of Mercury.

Launched on 2004 August 3, the probe has made one flyby of Earth, two of Venus and three of Mercury. On 2011

March 18, *MESSENGER* was inserted into orbit around Mercury, where it is now producing a complete detailed survey of the surface.

MGNS

/εm ɔ̃i: εn εs/

= **Mercury Gamma-Ray and Neutron Spectrometer** (*q.v.*).

MIXS

= **Mercury Imaging X-ray Spectrometer** (*q.v.*).

MLA

/εm εl εl/

= **Mercury Laser Altimeter** (*q.v.*).

MMO

/εm εm əv/

(*US* /- - ou/)

= **Mercury Magnetospheric Orbiter** (*q.v.*).

MMO Magnetometer

/- mæɢnɪ'ɔ̃mɪtə/

(*US* /- mæɢnɪ'ɔ̃mɪtəɪ/)

An instrument to be placed on board the *Mercury Magnetospheric Orbiter* of the *BepiColombo* mission and designed to investigate the formation and dynamics of the **magnetosphere** of Mercury, characterize the **magnetic field** of the planet, and examine the **solar wind** and dynamics of the inner **heliosphere**.

mon-s

/mɔ̃nz/

(*US* /manz/)

pl. **-tes** /'mɔ̃ntɛz/ (*US* /'mantɛz/)

A mountain on the surface of a planet or any solid celestial body.
IAU designation: MO.

MORE

/mɔ̃:/

(*US* /mɔ̃:ɪ/)

= **Mercury Orbiter**

Radio-science Experiment

(*q.v.*).

MPO

/εm pi: əv/

(*US* /- - ou/)

= **Mercury Planet Orbiter**

(*q.v.*).

MPO Magnetometer

/εm pi: əv mæɢnɪ'tɔ̃mɪtə/

(*US* /- - ou mæɢnɪ'tɔ̃mɪtəɪ/)

An instrument to be placed on board the *Mercury Planet Orbiter* of the *BepiColombo* mission, and designed to make detailed measurements of the **magnetic field** of Mercury with the aim of characterizing the evolution and present state of the planet's interior.

MPPE

= **Mercury Plasma Particle Experiment** (*q.v.*).

MSASI

= **Mercury's Sodium**

Atmosphere Interferometer

(*q.v.*).

node

/nəʊd/

(*US* /nouɪd/)

Either of two points marking the intersection of an **orbit** with a reference plane (for example, the **ecliptic** in the case of a planet, or the equator of the parent planet in the case of a satellite).

The node through which a body passes from south to north of the reference plane is called the **ascending node** and the node through which the body passes north to south is the **descending node**.

obliquity

/ə'blɪkwɪti/

The inclination of the equatorial plane of a celestial body with respect to the ecliptic plane.

occultation

/ɔkəl'teɪʃən/

(US /əkəl'teɪʃən/)

The partial or complete covering of a celestial body by a nearer one of larger apparent size.

opposition

/ɔpə'zɪʃən/

(US /apə'zɪʃən/)

An arrangement of the Earth and a **superior planet** such that the planet crosses the observer's meridian at local midnight.

The planet's celestial longitude, as measured from the Earth, is 180° at the moment of opposition.

orbit

/ɔ:bit/

(US /ɔ:ɪbit/)

The path of a secondary celestial body around a more massive central body.

In the limiting case of a two-body system with a central body of great mass and a pointlike secondary body, the latter may describe a circular ($e = 0$), elliptical ($0 < e < 1$), parabolic ($e = 1$) or hyperbolic ($e > 1$) orbit, where e is the eccentricity of the orbit. In such ideal cases, circular and elliptical orbits are closed, whereas parabolic and hyperbolic orbits are open. In reality, tidal effects

and perturbations from other bodies prevent orbits from being closed.

orbital period

/'ɔ:bitəl 'pɪəriəd/

(US /'ɔ:ɪbitəl -/)

The time taken for a celestial body to complete a revolution about another celestial body.

The **sidereal period** is the time taken for a body to return to the same position with respect to the background stars. The **synodic period** is the time interval between successive displays of the same **phase** as seen from a third body orbiting the central body.

periapsis

/pɛrɪ'æpsɪs/

The point of closest approach of a celestial body in orbit around another.

perihelion

/pɛrɪ'hi:lɪən/

The point of closest approach of a planet, asteroid, comet or space probe to the Sun.

phase

/feɪz/

The illuminated fraction of the disc of a planet or satellite as seen from a given point in space.

PHEBUS

/'fi:bəs/

= **Probing Hermean Exosphere by Ultraviolet Spectroscopy** (*q.v.*).

¹planet

According to Resolution B.5 of the International Astronomical Union,

a celestial body (a) in orbit around the Sun, (b) with sufficient mass for hydrostatic equilibrium to prevail over its internal rigid body forces (i.e. for the body to be round) and (c) that has dynamically cleared the neighbourhood of its orbit. Since the 2006 General Assembly of the IAU, this has been the working definition within the planetary nomenclature system of the IAU. According to Resolution B.6 of 2006, Pluto was reclassified as a **dwarf planet**.

²planet

A non-luminous celestial body, intermediate in mass between an asteroid and a brown dwarf, in orbit around a star.

Traditionally divided into major planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto) and minor planets (asteroids). In 2006, the International Astronomical Union made sense one the official basis for its planetary nomenclature system.

³planet

/ˈplænɪt/

Traditionally, any one of Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune or Pluto.

planetographic longitude

/plæni:təʊ'græfɪk 'lɒŋdʒɪtju:d, 'lɒŋg-/
(US /- 'lɑŋdʒɪtju:d, 'lɑŋg-/)

The angular distance between a meridian passing through a point on a planetary body and a reference meridian on the same body.

planiti-a

/plə'niʃə/

pl. -ae.

A low plain on the surface of a planet or any solid celestial body. IAU designation: PL.

plasma

/ˈplæzmə/

The fourth state of matter, comprising a gas of **electrons** and **ions**.

Plasma Wave Investigation

/- weɪv ɪnvəsti'geɪʃən/

An instrument to be carried on board the *Mercury*

Magnetospheric Orbiter of the *BepiColombo* mission and designed to study plasma waves in the magnetosphere of Mercury.

polar stereographic projection

/ˈpəʊlə ,stɛrɪə'græfɪk prə'ʊʒekʃən/
(US /ˈpəʊlə -/)

In cartography, a projection of a globe onto a plane tangential and normal to one of the poles of the globe.

Meridians are represented as straight segments converging on the pole of projection and parallels of latitude are represented as circles concentric on the pole of projection. Rhumb lines and **great circles** are concave towards the pole of projection.

The projection is conformal (i.e. angles are preserved), but neither distance nor area is preserved.

primary planet

/ˈpraɪməri 'plænɪt/

A planet that orbits a star (as opposed to a secondary planet, or satellite, which orbits a primary planet.

Probing Hermean Exosphere by Ultraviolet Spectroscopy

/ˈprəʊbɪŋ ˈhæɪmiən ˈeksəsfiə blɪ
 ʌltrəˈvʌiələt spɛkˈtrɒskəpi/
 (US /ˈprəʊbɪŋ ˈhæɪmiən ˈeksəsfiə - -
 spɛkˈtraskəpi/)

An instrument to be carried on board the **Mercury Planet Orbiter** of the **BepiColombo** mission and designed to explore the composition and dynamics of Mercury's exosphere.

promontori-um

/prɒmənˈtɔːriəm/
 (US /prəmənˈtɔːriəm/)
 pl. -a /-ə/

A headland-type feature on the surface of the Moon.

PWI

/piː ˈdʌlbəljuː ɹɪ/
 = **Plasma Waves Investigation**
 (q.v.).

quad

/kwɒd/
 (US /kwad/)
 Abbrev. **quadrangle** (q.v.).

quadrangle

/ˈkwɒdræŋɡəl/
 (US /ˈkwadræŋɡəl/)
 In cartography, a four-sided map. Depending on the type of projection used, a quadrangle may be bounded by four straight segments (as in a **Mercator projection**) or by two non-parallel longitude lines and two curved latitude lines (as in a **Lambert conformal conic projection**).

quadrature

/ˈkwɒdrətʃə/
 (US /ˈkwadrətʃuː/)

The aspect, as viewed from Earth, of the Moon or a planet when its angular distance from the Sun is 90°.

radiation pressure

/reɪdɪˈeɪʃən ˈpreʃə/
 (US /- ˈpreʃə/)
 The pressure exerted by **electromagnetic radiation** on the surface of a body.

radiometer

/reɪdɪˈɒmɪtə/
 (US /reɪdɪˈamɪtə/)
 An instrument for measuring radiant energy, usually in the **infrared** region of the **electromagnetic spectrum**.

reconnection

/riːkəˈnekʃən/
 A process in which the **magnetic field** lines in a **plasma** are broken and spliced with oppositely directed magnetic field lines, resulting in the conversion of magnetic energy into kinetic and thermal energy, and the acceleration of particles in the plasma.

refractor

/rɪˈfræktə/
 (US /rɪˈfræktə/)
 [**also refracting telescope**]
 An optical telescope that uses an lens objective to form an image, which is then magnified by a smaller eyepiece lens.

remanent magnetism

/ˈremənənt ˈmæɡnɪtɪzəm/
 [**also remanence**]
 The magnetism remaining in a body in the absence of external magnetism.

rotation period

/rəʊ'teɪʃən 'piəriəd/
(US /rou'teɪʃən -/)

The time taken for a celestial body to rotate completely on its axis with respect to the background stars.

rup-es

/'ru:pɪs/
pl. -ēs /'ru:pɛɪz/.

A scarp on the surface of a planet or any solid celestial body.

IAU designation: RU.

Search for Exospheric Refilling and Emitted Natural Abundances

/sə:tʃ fə ɛksə'sfɛrɪk rɪ:'fɪlɪŋ ənd ɪ'mɪtɪd
'nætʃərəl ə'bʌndənsɪz/
(US /sə:tʃ fə - - - - -/)

An instrument to be carried on board the *Mercury Planet Orbiter* of the *BepiColombo* mission and designed to study the gaseous interaction of the planet's surface with its exosphere and magnetosphere, and with the solar wind.

SERENA

/sə'ri:nə/
= Search for Exospheric Refilling and Emitted Neutral Abundances (*q.v.*).

sidereal day

/saɪ'diəriəl deɪ/

The time taken for a celestial body to rotate fully on its axis with respect to the background stars.

sidereal orbital period

/- ɔ:bɪtəl piəriəd/
(US /- ɔ:ɪbɪtəl -/)

The time taken for a planet to complete an orbit with respect to the background stars.

sidereal period

= sidereal orbital period (*q.v.*)
or sidereal rotation period (*q.v.*).

sidereal rotation period

/- rəʊ'teɪʃən -/
(US /- rou'teɪʃən -/)

The time taken for a celestial body to rotate fully on its axis with respect to the background stars.

SIMBIO-SYS

/sɪmbɪ'əʊsɪs, sɪmbɪ'əʊsɪs/
(US /sɪmbɪ'əʊsɪs, sɪmbɪ'əʊsɪs/)
= Spectrometers and Imagers for MPO BepiColombo Integrated Observatory System (*q.v.*).

sinus

/'saɪnəs/
pl. -ūs /'saɪnju:s/

A small plane on the surface of a planet or any solid celestial body.
IAU designation: RU.

SIXS

= Solar Intensity X-ray and particle Spectrometer (*q.v.*).

small solar system body

/smɔ:l 'səʊlə 'sɪstəm 'bɒdi/
(US /- 'soʊlə - 'badi/)

In the planetary nomenclature system of the International Astronomical Union, an object orbiting the Sun that is neither a ¹planet nor a dwarf planet.

solar day

/'səʊlə deɪ/
(US /'soʊlə -/)

The time interval between successive passages of the Sun

through a given planetographic
1meridian.

Solar Intensity X-ray and particle Spectrometer

/ˈsəʊlə ɪnˈtensɪti ˈeksreɪ ænd ˈpɑːtɪkəl
spekˈtrɒmɪtə/
(US /ˈsəʊlə - - - pɑːtɪkəl
spekˈtrɒmɪtə/)

An instrument to be carried on board the *Mercury Planet Orbiter* of the *BepiColombo* mission and designed to provide continuous monitoring of solar X-rays and particles.

solar wind

/- wind/

A stream of ionized particles emanating from the solar corona and carried radially outward into the interplanetary medium.

The main constituents of the solar wind are protons and electrons.

solitudo

/sɒlɪˈtʃuːdəʊ/
(US /sɒlɪˈtʃuːdəʊ/)

A type of albedo feature on Mercury.

The term is not part of the IAU nomenclature system and is not applied to any other planet.

spectrometer

/spekˈtrɒmɪtə/
(US /spekˈtrɒmɪtə/)

An instrument that analyses electromagnetic radiation by dispersing it into its constituent wavelengths over a given range of the spectrum and produces electronically measured output of wavelength and intensity.

Spectrometers and Imagers for MPO BepiColombo Integrated Observatory System

/-z ænd ɪmɪdʒəz fə ɛm piː əv
bepɪkəˈlɒmbəʊ ɪntɪgrɪtɪd əbˈzəːvətri
ˈsɪstəm/

An instrument to be carried on board the *Mercury Planet Orbiter* of the *BepiColombo* mission and designed to undertake a colour and stereo examination of the planet's surface geology, including its volcanism, tectonics, age, composition and geophysics.

spin-orbital resonance

/spɪn ˈɔːbɪtəl ˈrezənəns/
(US /- ˈɔːbɪtəl -/)

A tidally induced proportional relationship between the orbital and rotational periods of a planet or satellite.

subsolar point

/sʌbˈsəʊlə pɔɪnt/
(US /sʌbˈsəʊlə -/)

A point on the sunward-facing surface of a celestial body that is closest to the Sun, so that the Sun is in the zenith at that point.

superior conjunction

/sjuːˈpɪəriə kənˈdʒʌŋkʃən/
(US /suːˈpɪəriːə -/)

A **conjunction** in which an **inferior planet** and the Earth are on opposite sides of the Sun.

superior planet

/sjuːˈpɪəriə ˈplænɪt/
(US /suːˈpɪəriːə -/)

A planet in the Solar System whose distance from the Sun is greater than that of the Earth.

Traditionally, the superior planets are Mars, Jupiter, Saturn, Uranus,

Neptune and Pluto. In 2006, the IAU reclassified Pluto as a **dwarf planet**.

synodic period

/sɪ'nɒdɪk 'piəriəd/
(US /sɪ'nadɪk -/)

The time interval between successive occurrences of the same configuration of the Sun and a planet, or of a planet and a satellite, as seen from a third body.

thermal inertia

/'θɜ:məl i'nɜ:ʃə/
(US /'θɜ:ɪməl i'nɜ:ɪʃə/)

A property governing temperature variations on a planetary surface and determined by the physical properties of the surface material.

tidal friction

/'taɪdəl 'frɪkʃən/

A force exerted differentially on the bulk of a celestial body by another that causes it to slow its rate of rotation.

tidal locking

/'taɪdəl 'lɒkɪŋ/
(US /- 'lɑ:kɪŋ/)

A state of spin–orbital resonance brought about by tidal forces. In the case of the Earth–Moon system, tidal locking produced the Moon's synchronous rotation (a 1:1 resonance), resulting in the Moon's rotational period being equal to its orbital period so that the Moon always shows the same face to the Earth. In the case of Mercury, tidal locking has produced a 3:2 spin–orbit resonance.

tidally locked rotation

/-li lɒkt rəʊ'teɪʃən/
(US /- lɑkt -/)

= **tidal locking** (*q.v.*).

torque

/tɔ:k/
(US /tɔ:ɹk/)

A force that produces a turning effect.

For a rigid body, the torque is the product of the angular acceleration and moment of inertia about the axis of rotation.

¹transit

/'trɑ:nsɪt/
(US /'trænsɪt/)

The passage of an **inferior planet** across the disc of the Sun.

²transit

The passage of a planetary satellite or its shadow across the central **meridian** of the planet.

³transit

The passage of a celestial body across the local **meridian** of an observer.

transverse Mercator projection

/trans'vɜ:s mə'keɪtə prə'dʒɛkʃən/
(US /træns'vɜ:ɪs mə'keɪtə -/)

A cylindrical projection of a globe in which the cylinder touches the circumference of the globe along a meridian of longitude rather than along the equator as in the standard Mercator projection.

For small objects this projection is conformal (i.e. shape and angle are preserved), but areal distortion increases with increasing longitude. This projection is advantageous over the standard Mercator projection in such cases where the area to be

mapped has a greater north–south than east–west extension.

twilight

/ˈtʍaɪlaɪt/

The time interval between sunset and the moment when the Sun falls more than a specified angle below the horizon.

Civil twilight occurs when the zenith distance of the centre of the disc of the Sun lies between 90° 50' and 6°, *nautical twilight* when the zenith distance lies between 6° and 12°, and *astronomical twilight* between 12° and 18°.

unsharp masking

/ˈʌnfɑ:p 'mɑ:skɪŋ/

(US /ˈʌnfɑ:ɹp 'mæ:skɪŋ/)

An imaging process that increases the apparent sharpness of an image by combining a blurred positive with the negative of an image.

vall-is

/ˈvælis/

pl. -es /ˈvæles/.

A channel on the surface of a planet or any solid celestial body.
IAU designation: VA.

volatile

/ˈvɒlətaɪl/

n. and *adj.*

A chemical element or compounds with a low boiling point.

'weird' terrain

/ˈwiəd ti'reɪn/

(US /ˈwiərd -/)

Chaotic, hilly terrain located in the antipodes of the Caloris impact basin and thought to have been created as a consequence of the severe impact.

X-band

/ɛks bænd/

The 7.0–11.2 GHz microwave region of the electromagnetic spectrum.

X-Ray Spectrometer

/ˈɛksreɪ spɛk'trɒmɪtə/

(US /- - spɛk'tramɪtə/)

A **spectrometer** carried on board the **MESSENGER** probe to study the surface composition of Mercury by analysing the X-ray emission induced in surface materials by solar radiation.

XRS

/ɛks a: ɛs/

(US /- aɪ -/)

= Mercury X-Ray Spectrometer (*q.v.*).

<http://www.springer.com/978-1-4614-7207-0>

Mercury

Mahoney, T.

2014, XXXV, 328 p. 144 illus., 108 illus. in color.,

Hardcover

ISBN: 978-1-4614-7207-0