GLOSSARY

Because of the wide-ranging nature of planetary science, it is to be expected that readers of this book may be unfamiliar with one or more of the fields covered. For such a reason this glossary has been added. It is intended as a dictionary-type aid, to preserve continuity and understanding through unfamiliar territory.

Glossaries possess both the advantages and disadvantages of dictionaries. They should preserve the virtue of simplicity and are not intended for the serious student or specialist, who is at best likely to become displeased by the definitions adopted. The latter reader is referred to the subject index, the references and notes and to the text itself for enlightenment.

Accessory Mineral—A term applied to a mineral occurring in small amounts in a rock.

Accretion—A term applied to the growth of planets from smaller fragments or dust.

Achondrite—Stony meteorite lacking chondrules.

Aeon—One billion years ($= 10^9$ years).

Agglutinate—A common particle type in lunar soils, agglutinates consist of comminuted rock, mineral and glass fragments bonded together with glass.

Albedo—The percentage of the incoming radiation that is reflected by a natural surface.

Alkali Element—A general term applied to the univalent metals Li, Na, K, Rb and Cs.

ALSEP—Apollo lunar surface experiments package.

An—Abbreviation for anorthite.

Angstrom (Å)—A unit of length, 10^{-8} cm; commonly used in crystallography and mineralogy.

Anorthite (An)—$CaAl_2Si_2O_8$, the most calcium-rich member of the plagioclase (feldspar) series of minerals.

Anorthosite—An igneous rock made up almost entirely of plagioclase feldspar.

ANT—An acronym for the suite of lunar highland rocks: anorthosite, troctolite, and norite.

BABI—Best estimate for initial $^{87}Sr/^{86}Sr$ ratio of basaltic achondrites, regarded as approximating that of the solar nebula.

Bar—The international unit of pressure (one bar = 10^6 dynes/cm^2).

Basalt—A fine-grained, dark colored igneous rock composed primarily of plagioclase (feldspar) and pyroxene; usually other minerals such as olivine, ilmenite, etc. are present.

Basaltic achondrite—Calcium-rich stony meteorites, lacking chondrules and nickel-iron, showing some similarities to terrestrial and lunar basalts; eucrites and howardites are types of basaltic achondrites.

Bouguer gravity—The free-air gravity corrected for the attraction of the topography, so it is only dependent on the internal density distribution.

Bow shock—A shock wave in front of a body.

Breccia—A rock consisting of angular, coarse fragments embedded in a fine-grained matrix.

Brownlee particles—Interplanetary dust particles, approximately 10μm in size, collected in the Earth's stratosphere.

Carbonaceous chondrites—The most primitive stony-meteorites, in which the abundances of the non-volatile elements are thought to approximate most closely to those of the primordial solar nebula.

Chalcophile element—An element which enters sulfide minerals preferentially.

Chondrite—The most abundant class of stony meteorite characterized by the presence of chondrules.

Chondrule—Small, rounded body in meteorites (generally less than 1 mm in diameter), commonly composed of olivine and/or orthopyroxene.

Clast—A discrete particle or fragment of rock or mineral; commonly included in a larger rock.

Clinopyroxene—Minerals of the pyroxene group, such as augite and pigeonite, which crystallize in the monoclinic system.

Cumulate—A plutonic igneous rock composed chiefly of crystals accumulated by sinking or floating from a magma.

Curie temperature—The temperature in a ferromagnetic material above which the material becomes substantially nonmagnetic.

Dunite—A peridotite that consists almost entirely of olivine and that contains accessory chromite and pyroxene.

Eclogite—A dense rock consisting of garnet and pyroxene, similar in chemical composition to basalt.

Ejecta—Materials ejected from the crater by a volcanic or meteorite impact explosion.

Epicenter—The point on a planetary surface directly above the focus of an earthquake.

*Eu**—See footnote [51], Chapter 5, page 259.

Eucrite—A meteorite composed essentially of feldspar and augite.

Exsolution-unmixing—The separation of some mineral-pair solutions during slow cooling.

Exposure age—Period of time during which a sample has been at or near the lunar surface, assessed on the basis of cosmogenic rare gas contents, particle track densities, short-lived radioisotopes, or agglutinate contents in the case of soil samples.

Ferromagnetic—Possessing magnetic properties similar to those of iron (paramagnetic substances with a magnetic permeability much greater than one).

Fines—Lunar material arbitrarily defined as less than 1 cm in diameter; synonymous with "soils."

Fractional crystallization—Formation and separation of mineral phases of varying composition during crystallization of a silicate melt or magma, resulting in a continuous change of composition of the magma.

Fractionation—The separation of chemical elements from an initially homogeneous state into different phases or systems.

Free-air gravity—As applied to the Moon, it is usually synonymous with the observed gravity anomaly.

Fugacity—A thermodynamic function used instead of pressure in describing the behavior of non-ideal gases.

Gabbro—A coarse-grained, dark igneous rock made up chiefly of plagioclase (usually labradorite) and pyroxene. Other minerals often present include olivine, apatite, ilmenite, etc. A coarse grained equivalent of basalt.

Gardening—The process of turning over the lunar soil or regolith by meteorite bombardment.

Geomagnetic tail—A portion of the magnetic field of the Earth that is pulled back to form a tail by the solar wind plasma.

Granite—An igneous rock composed chiefly of quartz and alkali feldspar.

Granular—A rock texture in which the mineral grains are nearly equidimensional.

Groundmass—The fine-grained rock material between larger mineral grains; used interchangeably with matrix.

Half-life—The time interval during which a number of atoms of a radioactive nuclide decay to one half of that number.

Howardite—A type of basaltic achondrite.

Impact melting—The process by which country rock is melted by the impact of meteorite or comet.

Intersertal—A term used to describe the texture of igneous rocks in which a base or mesostasis of glass and small crystals fills the interstices between unoriented feldspar laths.

Ionic radius—The effective radius of ionized atoms in crystalline solids; ionic radii commonly lie between 0.4–1.5 Angstrom units.

Ionosphere—The ionized layers of a planet's atmosphere.

Isochron—A line on a diagram passing through plots of samples with the same age but differing isotope ratios.

Isostasy—Weight balancing of topography by underlying density anomalies. The distribution is such that at some uniform depth the pressure is everywhere constant and beneath this depth a state of hydrostatic equilibrium exists.

Isotopes—Atoms of a specific element which differ in number of neutrons in the nucleus; this results in different atomic weight, and very slightly differing chemical properties (for example, ^{235}U and ^{238}U).

Iron meteorite—A class of meteorite composed chiefly of iron or iron-nickel.

KREEP—An acronym for a lunar crustal component rich in potassium (K), the rare-earth elements (REE), phosphorous (P) and other incompatible elements.

Lattice site—The position occupied by an atom in a crystalline solid.

Layered igneous intrusion—A body of plutonic igneous rock which has formed layers of different minerals during solidification; it is divisible into a succession of extensive sheets lying one above the other.

LIL—Large Ion Lithophile elements. Those lithophile elements (e.g., K, Rb, Ba, REE, U, Th) which have ionic radii larger than common lunar rock-forming elements, and which usually behave as trace elements in lunar rocks and in meteorites.

Liquidus—The line or surface in a phase diagram above which the system is completely liquid.

Lithophile element—An element tending to concentrate in oxygen-containing compounds, particularly silicates.

LUNI—Best estimate for initial $^{87}Sr/^{86}Sr$ ratio of Moon, determined from lunar anorthosites.

Magmatic differentiation—The production of rocks of differing chemical composition during cooling and crystallization of a silicate melt or magma by processes such as removal of early formed mineral phases.

Mascon—Regions on the Moon of excess mass concentrations per unit area identified by positive gravity anomalies and associated with mare-filled multi-ring basins.

Maskelynite—Feldspar converted to glass by shock effects due to meteorite impact.

Matrix—The fine-grained material in which large mineral or rock fragments are embedded; often used interchangeably with groundmass.

Mesostasis—The interstitial, generally fine-grained material, between larger mineral grains in a rock; may be used synonymously with matrix and groundmass.

Microcrater (Zap Pit)—Crater produced by impact of interplanetary particles generally having masses less than 10^{-3} g.

Model age—The age of a rock sample determined from radioactive decay by *assuming* an initial isotopic composition of the daughter product.

Moment of inertia—A quantity which gives a measure of the density distribution within a planet, specifically, the tendency for an increase of density with depth. It is derived from gravity and dynamical considerations of the planet.

Noble gases—The rare gases, helium, neon, argon, krypton, xenon and radon.

Norite—A type of gabbro in which orthopyroxene is dominant over clinopyroxene.

NRM - Natural remanent magnetization—That portion of the magnetization of a rock which is permanent and usually acquired by the cooling of ferromagnetic minerals through the Curie temperature.

Nucleon—Sub-atomic nuclear particles (mainly protons and neutrons).

Nuclides—Atoms characterized by the number of protons (Z) and neutrons (N). The masss number (A) = N + Z; isotopes are nuclides with the same number of protons (Z) but differing numbers of neutrons (N); isobars have same mass number (A) but different numbers of protons (Z) and neutrons (N).

Oersted—The cgs unit of magnetic intensity.

Ophitic—A rock texture which is composed of elongated feldspar crystals embedded in pyroxene or olivine.

Orthopyroxene—An orthorhombic member of the pyroxene mineral group.

Peridotite—An igneous rock characterized by pyroxene and olivine (but no feldspar).

Phenocryst—A large, early formed crystal in igneous rocks, surrounded by a fine-grained groundmass.

Plagioclase—A sub-group (or series) of the feldspar group of minerals.

Plutonic—A term applied to igneous rocks which have crystallized at depth, usually with coarsely crystalline texture.

Poikilitic—A rock texture in which one mineral, commonly anhedral, encloses numerous other much smaller crystals, commonly euhedral.

Poikiloblastic—A metamorphic texture in which large crystals form in the solid state during recrystallization, to enclose preexisting smaller crystals.

Poise, cgs—Unit of viscosity (= 1 dyne sec/cm^2).

Porphyritic—Having larger crystals set in a finer groundmass.

PPB—Parts per billion — 1 ppb = 0.001 ppm.

PPM—Parts per million — 1 ppm = 0.0001%.

P-wave velocity—Seismic body wave velocity associated with particle motion (alternating compression and expansion) in the direction of wave propagation.

Pyroxene—A closely related group of minerals which includes augite, pigeonite, etc.

Radiogenic lead—Lead isotopes formed by radioactive decay of uranium and thorium (^{206}Pb from ^{238}U; ^{207}Pb from ^{235}U; ^{208}Pb from ^{232}Th).

Rare-earth (RE or REE)—A collective term for elements with atomic number 57-71, which includes La, Ce, etc.

Rare gases—The noble gases, helium, neon, argon, krypton, xenon, and radon.

Regolith—Loose surface material, composed of rock fragments and soil, which overlies consolidated bedrock.

Residual liquid—The material remaining after most of a magma has crystallized; it is sometimes characterized by an abundance of volatile constituents.

Siderophile element—An element which preferentially enters the metallic phase (see Appendix VII).

Silicate—A mineral (or compound) whose crystal structure contains SiO_4, tetrahedra.

SMOW - Standard Mean Ocean Water—Used as a reference for oxygen isotope work.

Soil breccia—Polymict breccia composed of cemented or sintered lunar soil.

Solar nebula—The primitive disk-shaped cloud of dust and gas from which all bodies in the solar system originated.

Solar wind—The stream of charged particles (mainly ionized hydrogen) moving outward from the sun with velocities in the range 300–500 km/sec.

Solidus—The line or surface in a phase diagram below which the system is completely solid.

Spinel-group—General term for several minerals (e.g., chromite) with chemical, physical and structural properties similar to spinel; general formula is AB_2O_4.

Stony meteorite—A class of meteorite composed chiefly of silicate minerals such as pyroxene, olivine, etc.

Suntan—Period of time during which a sample has resided on the lunar surface without shielding; determined from solar flare-induced particle tracks.

S-wave velocity—Seismic body wave velocity associated with shearing motion perpendicular to the direction of wave propagation.

Tektites—Small glassy objects of wide geographic distribution formed by splashing of melted terrestrial country rock during meteorite, asteroid, or cometary impacts.

Texture—The arrangement, shape and size of grains composing a rock.

Trace element—An element found in very low (trace) amounts; generally less than 0.1%.

T Tauri—An early pre-main-sequence state of stellar evolution, characterized by extensive mass loss.

Vesicle (Vesicular)—Bubble-shaped, smooth-walled cavity, usually produced by expansion of vapor (gas) in a magma.

Volatile element—An element volatile at temperatures below 1300° C.

Vug (Vuggy)—Small, irregular-shaped, rough-walled cavity in a rock.

XRF—X-ray fluorescence spectroscopy.

Zap Pit—See Microcrater.

$\delta^{18}O$—See footnote [95], Chapter 6, page 341.

μ—The ratio of ^{238}U to ^{204}Pb.