

Glossary of Useful Words and Terms

Alga (plural = **algae**): the common name for simple plants which do not have specialised parts such as roots or leaves. They do not have **vascular** systems, so most are found living in water. They can range from single cells (e.g. *Euglena*) to plants of several metres in length (e.g. kelp).

Ammonoid: A group of **extinct cephalopod molluscs** with coiled shells. They lived in the seas during the **Mesozoic**. The shells are divided into chambers. The final chamber of the shell was relatively large and long and held the soft body of the animal, which was probably rather like a squid or octopus with **tentacles** and a **beak**. The chambers are separated by walls of shell known as **septa**, often with highly folded margins (**sutures**) where they connect with the outer shell layers. Each **septum** was perforated by a tube (the **siphuncle**) which joins together all of the chambers of the shell from its earliest growth stage (the tiny, egg-like **protoconch**) to the final **septum**. This tube has a special surface which allowed the animal to regulate the quantity of gas (mainly nitrogen) and water in each chamber and therefore move up or down in the sea, rather like a submarine. We interpret the characteristics of ammonoids by comparing them with **nautiloids** which are still alive today.

Amphibians: a **Class** of **vertebrate** animals that spend part of their time on land and part in the water; so they are considered an intermediate form between fishes and **reptiles**. Amphibians must return to the water to breed and they have distinct larval and adult forms. Members of this **Class** include frogs, toads, and salamanders.

The name is derived from the Greek word *amphibios* which means "living a double life".

Arthropod: An arthropod is a member of a **phylum** of **invertebrate** animals that includes insects, arachnids (spiders and mites), and crustaceans (crabs and lobsters). An extinct group of fossil arthropods is the **trilobites**. The arthropods first appear in the **fossil record** in the early **Cambrian**, and account for 75% of all animal **species** ever described.

Arthropods are characterized by having **exoskeletons**, and paired jointed limbs.

This word comes from the Greek words *arthron* (joint) and *podos* (foot)

Bacteria: Tiny, single-celled, **prokaryotic** organisms that reproduce by cell division and usually have rigid cell walls. Bacteria are very diverse. They can be shaped like spheres, rods or spirals and can be found in virtually any environment. The earliest fossils found on Earth are bacteria, almost 3.3 billion years old.

Basalt: a dark coloured **extrusive igneous rock**. Flows of basalt cover 70% of the Earth's surface, and large areas of the surfaces of the other **Terrestrial Planets**, so it is a very important **crustal** rock. It is produced by the **partial melting** of rocks deep inside the Earth's **mantle**.

Belemnoid: A group of **extinct cephalopod molluscs** with an elongate, tapering body and an internal shell. They probably looked rather like squid or cuttle fish. The rear part of the bullet-shaped, cylindrical shell is known as the **rostrum** and has a conical cavity in the wide end into which fits a small conical structure called the **phragmacone**. This is divided by **septa** and cut by a **siphuncle**, like the other cephalopods that have an external shell.

Bivalve: a group of molluscs with flattened bodies enclosed by a pair shells (**valves**) made of hard **calcite**.

Burgess Shale: a layer of rocks in the Stephen Formation, British Columbia, Canada, which contains a **fauna** of soft-bodied fossil animals which lived during the middle Cambrian. Some of these animals are very strange looking, and do not appear to have living descendants.

Calcite: the **mineral** form of calcium carbonate. **Limestones** are made mostly of calcite.

Calyx : the cup-shaped head of a **crinoid**, made of several rows of concentrically arranged **calcite** plates. It has five-fold symmetry.

Cambrian: the period of geological time running from 544 - 505 million years ago. The name comes

from the Cambrian Mountains in Wales, where the **strata** of the Cambrian were first defined.

Cambrian Explosion: the term used to describe the very sudden appearance of a huge diversity of fossil organisms in the **sedimentary** rocks of the middle **Cambrian**.

Carboniferous: the period of geological time running from 360 – 286 million years ago. The name describes the most important feature of **strata** laid down during this period, thick deposits of **coal**.

Carnivore, carnivorous: an animal or plant that feeds on meat.

Cartilage: flexible skeletal tissue found in **vertebrates** and **chordates**, made of fibres of a rubbery protein. In most animals the embryo has a skeleton made entirely of cartilage, which is then mostly turned to bone as it develops. Some fish, such as sharks and rays, retain a cartilage skeleton throughout life.

Cephalopod: a **class** of **marine molluscs** which have a soft body with beaked feeding parts surrounded by grasping tentacles. Fossil examples include **ammonoids** and **belemnoids**. Living examples include octopus, **nautilus** and squid.

Chalk: a white **limestone** made from tiny mud-sized particles. Deposition during the **Cretaceous** period was dominated by chalk.

Chordate: an animal which has an internal rod of flexible tissue to support its body to which muscles are attached. **Vertebrates** are chordates which have a bony spine instead of this rod.

Class: in **taxonomy**, a group of **orders** with shared characteristics. E.g. **Mammals** are a class of **vertebrates** which are warm-blooded, give birth to live young which they breast-feed. This includes humans, cows, whales and cats.

Coal: a carbon-rich mineral deposit made of the remains of fossil plant life. It is first deposited as **peat**, but over time is buried, compressed and heated which changes it physically and chemically. There are different grades of coal depending on the amount of water and gases left inside the deposit, and the percentage of carbon present.

Colony, Colonial: many organisms living closely together for mutual benefit, for example sharing nutrients. **Graptolites** and **corals** can be colonial.

Columnal: one of the plates which together form the articulated stalk of a **crinoid**.

Compound: a substance formed by the chemical combination of two or more **elements**. Minerals such as **calcite** (made of calcium, carbon and oxygen) and **quartz** (made of silicon and oxygen) are compounds

Conifer: a plant belonging to a group of seed-bearing trees and shrubs, which have needle or scale-like leaves and resinous sap. Fertile parts of the plant are cones. The group first appeared in the

Carboniferous.

Coral: A member of the Cnidarians. A **corallite** is the skeleton formed by an individual coral **polyp**. This may be **solitary** or part of a **colony**. Corals are important reef-building organisms from the late **Palaeozoic** onwards.

Core: 1. The iron-rich central part of the Earth. The core is divided into two zones (the inner core and outer core) because of the different way in which they transmit seismic waves. The core is responsible for the Earth's magnetic field, and accounts for 32% of the mass of the planet. 2. a long sample of **sediment** or rock extracted by drilling down into the Earth. This is used to help to analyse **strata** which are not exposed at the surface.

Correlate: correlation is the method by which rocks units or **strata** are compared and time-relationships between them are established. This can be done by examining the rock type and succession, the fossil content, or by chemical analysis.

Cretaceous: the period of geological time running from 145 – 65 million years ago. The name comes from the **chalk** which was the main rock type deposited during this period.

Crust: the thin, outermost, solid layer of the Earth. It varies in thickness from 5km beneath the oceans (**oceanic crust**) to 60km beneath mountain chains (**Continental crust**). It is broken into a number of **plates**.

Cycad: a seed-bearing plant similar in appearance to modern palm trees. They first appeared in the **Permian**, and were common in the **Mesozoic**, but are rare today, having been displaced by flowering, fruit-bearing plants which appeared in the **Cretaceous**.

Dendroid: a branching type of graptolite. Most types lived attached to the sea-bed, and were upright and bushy in appearance.

Denudation: the removal of rock material from the surface of the Earth through the processes of **weathering** and **erosion**.

Deposition: the process by which **sediment** is laid down and builds up on the Earth's surface- the direct opposite to **erosion**.

Devonian: the period of geological time running from 410 – 360 million years ago. The name comes from the **strata** in Devon, S.W. England, which define this part of geological history. The Devonian is also known as the Old Red Sandstone (O.R.S.) because the characteristic colour of the rocks is red. The red colour is because of a high iron content in the rock, and tells us that the climate was hot and dry when they were deposited.

Division: in plant **taxonomy**, the second highest level of classification beneath **kingdom**. The equivalent to **phylum** in animal classification.

Ecosystem: a term used to describe a natural unit that consists of living and non-living parts which interact to form a stable system. The ecosystem idea can be applied at different scales in the same way e.g. a pond or an ocean.

Element: any of more than 100 fundamental substances that consist of atoms of only one kind and that singly or in combination constitute all matter.

Erosion: the part of the process of **denudation** which includes the physical breakdown, **chemical solution** and transportation of material from the surface of the Earth. This includes the removal of the surface layer of rock or soil by agents of erosion such as ice, wind and water.

Eukaryote: an organism with cells with a true nucleus. This includes fungi, plants and animals. Compare with **prokaryote**.

Exoskeleton: a hard body covering found on the outside of many **invertebrates**. The term is most often applied to the body covering on **arthropods**. This is made of a protein compound which is secreted by a layer of cells underneath it. Because it is not stretchy, the creature has to **moult** regularly to accommodate growth.

Extinct, extinction: the disappearance of a type of organism from the Earth. **Mass extinctions** happen at certain times during the geological record, and these are believed to be the result of catastrophic events which cause a break-down in the **ecosystem**.

Family: in **taxonomy** a group of **genera** which show very similar characteristics. E.g. the cat Family (Felidae) is made up of different genera which all have whiskers and sharp claws.

Fauna: the animal life of a region or **period** of geological time.

Fern: a type of plant with large, much-divided leaves. First found in the **Devonian**. During the **Palaeozoic** tree-ferns up to several metres in height dominated the forest vegetation. Today ferns grow mostly as smaller plants and tree ferns are rare.

Foodchain: the transfer of energy through an **ecosystem** starting with primary producers (plants) which use the energy of the sun to produce sugars, through a series of organisms that eat and are in turn eaten. An example might be: lettuce, slug, blackbird, hawk.

A **food web** is a more realistic model of energy flow, which demonstrates how food chains combine.

Fossil: Fossils are the remains of plants and animals which lived on the Earth during the geological past preserved in the rocks.

Gastropod: a class of mollusc which typically have a single, often coiled shell, and a head and unsegmented soft body. They are found as fossils in rocks from the early **Cambrian**, and now live successfully on the land, in the sea and in fresh water. The name means “stomach foot”. Examples are snails, whelks and slugs.

Genus: a genus is a group of **species** with similar characteristics. An example is lions, tigers, panthers and cats.

Granite: a light-coloured **intrusive igneous** rock made up of **quartz** and feldspar with biotite and / or muscovite mica. The crystals are big enough to be seen with the naked eye. It is formed from the melting of **continental crust rocks**.

Graptolite: a stick-like group of **colonial, marine** animals which lived from the middle **Cambrian** to the Lower **Carboniferous**. They are very important for defining **stratigraphy** of Ordovician and Silurian rocks in the UK.

Grasses: a group of flowering plants which now dominate the world’s vegetation. They first appeared during the Tertiary.

Helix, helical: something spiral in form, such as a **gastropod** shell.

Hemichordate: a group of animals first found in the **Burgess Shale** which have bodies very similar in arrangement to **chordates**, but without the central stiffening rod (notochord).

Herbivore, herbivorous: an animal which feeds only on plants.

Horsetail: a plant which first appears in the **Devonian**. Jointed stems with a ring of long, pointed leaves and branches at each joint. *Equisetum* is the only type alive today. Fossil varieties grew up to 30m in height. *Calamites* had a very thin stem but grew extremely long and probably crept like bind weed.

Ichthyosaur: a **Jurassic marine reptile** which bears a superficial resemblance to a modern dolphin.

Igneous: igneous rocks are new rocks, formed when hot **magma** rises up from inside the Earth and solidifies.

Intrusive igneous rocks do not reach the surface, but form bodies of rock within the **crust**.

Granite is an intrusive igneous rock.

Extrusive igneous rocks are formed when the **magma** breaks through the **crust** and erupts on to the surface of the Earth. Once magma has reached the surface of the Earth it becomes known as **lava**. These rocks, such as **basalt**, can form **volcanoes**.

Invertebrate: an animal without a backbone.

Jurassic: the period of geological time running from 213 – 145 million years ago. The name comes from the Jura mountains where the most complete section of these rocks is found.

Kingdom: the top unit in **taxonomy**. Originally there were just two kingdoms; Animals and Plants. Now there are thought to be five- animals, plants, fungi (mushrooms and lichen), protists (true algae) and monera (bacteria).

Lava: the term for **magma** which has reached the surface and lost its gas content.

Limestone: a **sedimentary** rock which is made up mostly from calcium carbonate (**calcite**)

Lithify: to turn to rock

Magma: hot molten rock full of dissolved volatile gasses. It is often produced by the melting of rocks

deep inside the Earth's **crust**, but can sometimes come directly from the **mantle**.

Mantle: the thick layer of the Earth, between the **crust** and the **core**. It is usually solid, but can also be molten or partially molten.

Marine: **1.** of the sea. **2.** In terms of organisms, living in the sea.

Marine reptiles: a group of mostly large, **carnivorous** animals which lived in the oceans during the Mesozoic. Now restricted to marine crocodiles and turtles, this group was very successful during the **Jurassic** and includes **ichthyosaurs** and pliosaurs.

Medusoid: free-swimming, jelly-fish type young of members of the Cnidaria (**corals** and sea anemones). The older forms become attached and live as **polyps**, often in **colonies**. Jelly-fish do not leave the medusoid stage as they mature.

Mesozoic: the geological era which spans the **Triassic**, **Jurassic** and **Cretaceous** periods. The name means “middle life”.

Metamorphic, Metamorphic rocks: rocks which have been changed by being heated and / or squashed. As rocks are buried over millions of years, they are exposed to heat and pressure from the overlying rocks and from movements within the **crust**. This causes changes in their properties. The heat can make the **minerals** which make up the rock **recrystallise**, often in distinct layers or bands. One of the effects of recrystallisation is the loss of fossils from **sedimentary** rocks.

Mineral: minerals are the building blocks of rocks. They are naturally occurring substances, which often have a crystalline form. They can be single **elements** (such as gold or diamond) or **compounds** (such as quartz or pyrite).

Mollusc: a **phylum** of **invertebrates** which include modern creatures such as snails, slugs, cockles, and squids. They are characterised by their lower body being developed into a kind of muscular “foot” which has been adapted for digging, movement or swimming. Many have a hard protective shell. Some forms such as slugs and octopuses have lost their shells as they have developed other ways of protecting themselves.

Mosses: small, simple land plants which are first found as fossils in the **Devonian**. They rely on water for reproduction.

Moult: to shed a hard **exoskeleton** to allow body growth, or to lose thick body fur during warmer times of the year.

Nautilus: a “living fossil”. A type of **cephalopod mollusc** which is first found as fossils in rocks of **Devonian** age, and is still found alive in deep tropical oceans today. Nautilus has helped us to understand how **ammonites** lived.

Omnivorous: an animal eating a diet of meat and vegetables. Their dentition is adapted for this by having a combination of grinding and tearing teeth. Humans are **omnivores**.

Opposing muscles: Muscles which work against one another to allow side to side or up and down movement, e.g. biceps and triceps allow humans to bend or straighten their lower arms by relaxing and contracting in opposition to one another. Fish have opposing muscle blocks around their spines to allow their bodies to flex from side-to-side which propels them through the water.

Order: in taxonomy, a group of **genera** with shared characteristics.

Ordovician: the period of geological time running from 505 – 440 million years ago. The name comes from the Ordovices, a Celtic tribe which lived in Wales in the region where these rock units were first defined.

Palaeozoic: the geological era ... The word means “ancient life”.

Partial Melting: incomplete melting of a “parent rock” to produce a melt (like **magma**) with a different chemical composition. This happens because different minerals melt at different temperatures.

Permian: the period of geological time running from 286 – 248 million years ago. The name comes from Permian, an ancient kingdom in Central Europe

Petrified, petrification: the process by which organic matter is **fossilised** by the infiltration of water and the deposition of dissolved minerals. The Petrified Forest in Arizona, USA is a famous example. Here many trees have been completely converted to stone, but all the features of the wood have been perfectly preserved.

Phylum: **the second biggest grouping in taxonomy. Phyla are groups of classes with shared characteristics. The Chordate phylum is made up of classes of animals which have spines or notochords. This includes humans, fish, birds and mammals.**

The equivalent to phylum for plants is a division. Flowering plants are defined into the angiosperms division of the Plant Kingdom.

Planktonic: organisms (usually very tiny) which live in water and drift with the currents.

Plate:

Polyp: soft-bodied adult form of a member of the Cnidaria (**corals**, jelly fish and sea anemones) which has a cylindrical body which is anchored down at one end. At the other end is a mouth, usually surrounded by grasping tentacles used for feeding. The young are often free-swimming **medusoids**. Jellyfish are free-swimming and remain in the medusoid form throughout their lives.

Prokaryote: an organism with cells which do not contain a distinct nucleus.

Quartzite: a rock made entirely of the mineral **quartz**.

Recrystallise, recrystallisation: the growth of new types of mineral in a rock due to the effects of heat and / or pressure.

Reptiles: a **class** of air-breathing **vertebrates** that include the alligators and crocodiles, lizards, snakes, turtles, and extinct forms such as dinosaurs and pterosaurs. Reptiles are characterized by a bony skeleton and a body usually covered with scales or bony plates (scutes).

Rock: Rock is defined as “A consolidated or unconsolidated aggregate of minerals or organic materials.” (Oxford Dictionary of Earth Sciences)

Rocks can be made of a single type of mineral, or more than one mineral.

For example, **limestone** is made just of calcite and **quartzite** is made just of **quartz**. **Granite** is made up of three main minerals, **quartz**, feldspar and mica.

Rock Cycle: This is a term referring to a collection of processes which shape the surface of the Earth. Rocks are constantly recycled by **burial, melting, uplift** and **erosion**. These processes are driven by energy from inside the Earth and from the Sun (which drives processes in the atmosphere and leads to **weathering** of rock).

Rock Record: The sequences of rocks from all over the world which give us snapshots of different parts of the geological history of the planet.

Rostrum: in **belemnites**, the rear part of the bullet-shaped, cylindrical internal shell, also called the *guard*. Its purpose was possibly to act as a counter-balance to the weight of the animals' head parts.

Sediment: the material produced by the effects of **weathering** at the surface of the Earth.

Sedimentary rocks: recycled rocks made of fragments. The fragments can either be of organic matter or of other **rocks** and **minerals**. The organic material is often preserved as **fossils**.

Septum, septa: a cross wall or partition, especially referring to **cephalopod molluscs** whose shells are divided internally into chambers by **septa**.

Shale: a thinly laminated **sedimentary** rock made of tiny clay-sized **sedimentary** particles.

Silurian: the period of geological time running from 440 – 410 million years ago. The name comes from the Silures, another tribe of Celts.

Soft bodied creatures: animals such as worms and slugs which do not have a shell or bones. They are found fossilised as **body fossils** in exceptional circumstances, for example the **Burgess Shale**.

Solitary: an organism which lives alone.

Species: the basic unit of **taxonomy**. A species is defined as a group of individuals that look like one another and can interbreed to produce fertile young of the same kind. Similar species are grouped into **genera**. Similar genera are grouped into **families**. Similar families are grouped into **orders**. Similar orders are grouped into **classes**. Similar classes are grouped into **phyla**. Groups of phyla with similar characteristics are the top level of the classification system- the **kingdom**. Plants are classified in a similar way, although the **phylum** unit is called a **division**.

Strata: distinctive beds or layers of rocks.

Stratigraphy: the study of rock strata and the relationships between them.

Suture lines: the line marking the join between the **septa** and the inside wall of the shell of a **cephalopod mollusc**. Suture lines are visible when the shell has been preserved as a fossil mould. The lines can be very simple curves, or folded into complex crenulations. **Ammonite** evolution has been defined around the increasing complexity of the pattern of suture lines.

Taxonomy: the science of the classification of living things

Terrestrial: 1. of the Earth 2. living on the land

Terrestrial Planets: The group of rocky planets in our **Solar System** closest in character to the Earth. This group consists of Mercury, Venus, Earth and Mars.

Test: a hard shell or covering of internal soft parts of an **invertebrate** which may then have attached flesh e.g. **echinoids**

Tetrapods: 1. any four-legged animals, including **mammals**, birds, **reptiles** and **amphibians**. 2. descriptive name given to the first four-limbed creatures to emerge on to the land during the Devonian such as *Acanthostega*.

Triassic: the period of geological time running from 248 – 213 million years ago. The name reflects the division of this time period into 3 phases.

Tubercles: small knobs on the surface of **echinoid** and **trilobite** bodies. On echinoids they are attachment sites for spines which are adapted for protection and movement. On trilobites they are thought to have had a sensory purpose.

Valves: paired hard shells e.g. in **bivalves**

Vascular plant: a plant which has an internal water and food transport system through specially adapted cells.

Vertebra: individual bones which make up the spine or backbone in vertebrate animals.

Vertebrates: are animals that possess a backbone and an internal skeleton made of bone or cartilage. See also **notochord**.

Volcano: a mountain built up through the eruption of layers of **lava** on to the surface of the Earth. They are found in areas of the Earth which are geologically unstable, such as near **plate** boundaries, or hot-spots where magma wells-up from deep inside the Earth.

Weathering: the *in situ* breakdown of **rocks** and **minerals** at and just below the Earth's surface caused by a number of physical and chemical processes.

Physical or mechanical weathering is caused by atmospherically controlled processes such as temperature changes or humidity changes. Many of these processes are due to crystal growth- ice growth and expansion in freeze-thaw action, growth of salt crystals in salt weathering. Physical weathering does not involve and chemical changes to rock.

Chemical weathering is caused by chemical decomposition of rocks making them more sensitive to **erosion**. This includes the effects of acid rain on **limestones**, or the decomposition of **granite** to clay. **Mechanical** and **chemical weathering** processes rarely operate in isolation.
