
Glossary

This glossary provides brief explanations of the technical terms used in the introductions to the chapters and in the 'conclusions' sections of the site reports. These explanations are not rigorous scientific definitions, but are intended to help the general reader. Detailed stratigraphical terms are omitted as they are given context within the tables and figures. Words in **bold** type indicate an internal reference to another glossary entry.

Abrasion: the process of wearing away parts of fossils or rocks by sediment-laden water or air. The process produces an increasingly smoothed and rounded outline shape.

Acadian Orogeny: the Early to **Mid-Devonian** phase of mountain building (late Caledonian) along a collision zone between **Avalonia** and **Laurentia**, after the **subduction** of the **Iapetus Ocean** and the production of a range of mountains stretching south-westwards from Scandinavia, through northern Britain and Ireland, Greenland and North America.

Acanthodian: any member of the extinct (**Silurian–Permian**) **class** Acanthodii (**phylum** Chordata). These primitive jawed fish, the so-called 'spiny sharks' with spine-supported fins and a covering of small scales, occupied both marine and fresh waters.

Accretion: the build up of **sediment** by physical processes such as water and wind.

Acme: the point of maximum sea or lake level (**highstand**) during a marine or **lacustrine transgression**.

Adhesion wart: a small, irregular, wart-like **sand** accumulation formed by wind that changes direction rapidly whilst blowing over a moist sand surface.

Aeolian: descriptive of **sediments** carried and deposited by the wind.

Age: a geological time unit (cf. **chronostratigraphy**), usually taken to be the smallest standard division of geological time.

Agglomerate: a **pyroclastic** rock with predominantly rounded **clasts** greater than 64 mm in diameter.

Aggradation: the building upwards of a river valley or floodplain by accumulation of **fluvial** deposits; can also be applied to material deposited by other agencies, such as wind or sea.

Aggregate: a mass or body of rock fragments and/or mineral grains.

Agnathan: any member of the **class** Agnatha (**phylum** Chordata). Primitive jawless vertebrates which have existed since the Cambrian Period, they include a large number of extinct marine and freshwater groups, but are now reduced to two: hagfishes and lampreys.

Algae (sing. **alga**): a large and diverse division of the plant kingdom, consisting of mainly aquatic organisms. Simple plants that have no true stems, roots or leaves, they contain chlorophyll and therefore can **photosynthesize**. They range from microscopic single cells to very large multi-cellular structures.

Allochthonous: descriptive of **fossils** or rocks that lived or formed elsewhere to their current position.

Alluvial: a term applied to the environments, action and products of rivers or streams. Alluvial deposits are composed of clastic material deposited in river channels and floodplains.

Alluvial fan: a cone-shaped deposit of water-laid deposits at the confluence of a tributary stream with the main river.

Alluvium: **sediment** deposited by rivers.

Ammonoid: any member of the extinct subclass Ammonoidea (**class** Cephalopoda). Important **zone fossils** for the **Palaeozoic** and Mesozoic **eras**.

Anastomosing: descriptive of a system which branches or contains a network; for example the channel pattern of a **braided river**, or the veins on a leaf which form a netlike pattern.

Andesite (adj. **andesitic**): a fine-grained volcanic (**extrusive**) rock containing more than 53 wt% SiO₂. Intermediate in composition between a **basalt** and a **rhyolite**.

Anglo-Welsh Basin: a **Devonian sedimentary basin** that occupied a large part of what is now Wales and England, in which the **Old Red Sandstone** was deposited.

Anoxic: literally 'without oxygen'; often used to describe an anaerobic environment.

Antecedent: of a river or drainage system controlled by a pre-existing system.

Anticline: an arch-shaped upfold of rocks produced by **tectonic** activity with younger **strata** on the outermost part of the arch and older rock in the core (cf. **syncline**).

Arenite (adj. **arenaceous**): a general term for a detrital, **clastic sedimentary rock** made of sand-sized particles.

Argillite (adj. **argillaceous**): a general term for a fine-grained, clay-rich, **clastic sedimentary rock**.

Arkose (adj. **arkosic**): an **arenaceous** rock that contains at least 25% **feldspar**.

Arthropod: any member of the **phylum** Arthro-poda, the largest and most diverse phylum of the animal kingdom. These invertebrate animals are characterized by a segmented body and paired antennae, wings or legs. Examples include insects, **crustaceans** and arachnids.

Ash (volcanic): unconsolidated deposit consisting of **pyroclastic** material (glass shards, crystals etc.) less than 2 mm in size. In consolidated rocks the term is commonly used to denote the size of individual **volcaniclastic** fragments (e.g. coarse-ash grains and fine-ash grains).

Autochthonous: descriptive of **fossils** or rocks that lived or formed in their current positions.

Avalonia: a small early **Palaeozoic** crustal plate consisting of parts of the maritime states of North America, England, Wales, south-east Ireland and part of western Europe, which split from **Gondwana** early in **Ordovician** times and moved northwards, colliding with **Laurentia** during the **Silurian Period**.

Avulsion: the process when **aggradation** on a floodplain diverts a river channel to a new course, at a lower elevation on the floodplain.

Axial drainage: a river drainage system that flows along the axis of a valley or **basin**.

Ball-and-pillow structure: a sedimentary structure with a hemispherical shape resembling balls and pillows. Caused by **sand** sinking into fluidized muddy **sediment**.

Baltica: an early **Palaeozoic** crustal plate consisting of much of present-day northwestern Europe, including Scandinavia, European Russia and parts of Central Europe. The plate formed the south-eastern continental margin of the **Iapetus Ocean** and amalgamated with **Avalonia** before moving northwards from Late **Ordovician** times and colliding with **Laurentia** to form the Caledonian mountain belt.

Bar: a lenticular deposit, usually **sandy**, formed in and at the margins of a river channel, or offshore of a beach.

Barrier deposits: **sand** deposits that accumulate in shallow, offshore waters by wave action.

Back-barrier deposits: shallow-water deposits formed on the landward side of a barrier.

Basalt (adj. **basaltic**): a fine-grained, usually dark-coloured, basic, volcanic (**extrusive**) **igneous rock**. It usually occurs as a **lava** or **dyke**.

Basement: the oldest rocks recognized in a given area; a complex of **metamorphic** and/ or **igneous rocks** that underlies all the sedimentary **formations**.

Basin: an area of **subsidence**, or depression, usually of considerable size, in which **sediments** and/or volcanic **strata** accumulate.

Basin-fill: the sedimentary succession deposited in a **basin**.

Basin inversion: the **tectonic** process in which **basin-fill** is **uplifted**.

Batholith: a very large (over 100 km²) igneous **intrusion**, most commonly **granite**, that extends to great (unknown) depth in the Earth's crust.

Bed: in **lithostratigraphy**, a subdivision of either a **member** or a **formation**; the smallest unit within the scheme of formal lithostratigraphical classification. Also used informally to indicate a **stratum** within a **sedimentary rock** succession.

Bedding plane: a planar feature in **sedimentary rocks** representing an original surface of deposition. Conspicuous bedding planes may indicate a short interruption in, or change in character of, **sediment** deposition.

Beyrichiacea: named after Beyrich, a German palaeontologist, an extinct group (late Ordovician?–early Carboniferous) of marine **ostracods**, which have **biostratigraphical** use.

Bioclast (adj. bioclastic): a **sediment** grain consisting of comminuted **fossil** remains.

Biofacies: a **facies** defined by its characteristic **fossil** assemblage, and reflecting a specific set of environmental conditions.

Biogenic: produced by living organisms or biological processes.

Biostratigraphy: the **stratigraphical** subdivision, classification and **correlation** of **sedimentary rocks** based on their **fossil** content.

Biota: the **flora** and **fauna** of a particular place; or the faunal and floral assemblage of a **bed** or other **stratigraphical** unit.

Bioturbation: the physical disturbance of unconsolidated **sediment**, such as by burrowing and feeding, caused by the organisms living on or in it. These disturbances are often preserved as **trace fossils** in ancient **sediments**.

Biozone: in **biostratigraphy**, a restricted unit of **sedimentary rock** defined by its **fossil** content, most usefully by **species** of narrowly defined temporal, but wide spatial, range, and named after one or more abundant or characteristic species.

Bivalve: any member of the **order** Bivalvia (**phylum** Mollusca (see **mollusc**)). These marine invertebrates are characterized by bodies enclosed in two, hinged, often mirror-image, shells (valves). Modern examples include cockles and mussels.

Boudinage: a structure in strongly deformed **sedimentary** or **metamorphic rocks**, in which an original competent layer between less competent layers has been stretched, thinned and broken at regular intervals into bodies resembling boudins or sausages.

Brachiopod: any member of the **phylum** Brachiopoda. These marine invertebrates are superficially similar to **bivalves** but with a different anatomy and two hinged shells that are typically dissimilar.

Braided river: a network of converging and diverging (**anastomosing**) streams.

Braidplain: the floodplain of a **braided river** system.

Breccia: a rock composed of angular broken fragments greater than 2 mm in diameter; can be **pyroclastic**, sedimentary or **fault-related**.

Breconian Stage: a local **chronostratigraphical** division of the **Old Red Sandstone** of the **Devonian Period** for the **Anglo-Welsh Basin**. Roughly equivalent to the more widely known **Emsian** and **Pragian stages**, it follows the **Dittonian Stage**.

Bryozoan: any member of the **phylum** Bryozoa. These very small, moss-like aquatic organisms often form permanent colonies, linked by their box-like skeletons of **calcium carbonate**.

Calc-alkaline: of a suite of **igneous rocks** characterized chemically by the steady increase in iron content relative to silica during evolution of the magma.

Calcareous: containing large quantities, or composed, of **calcium carbonate**.

Calci-: prefix indicating containing/composed of **calcium carbonate**.

Calcite: the most common, rock-forming crystalline form of **calcium carbonate**; the main constituent of **limestone** and the shells of many **brachiopods**, echinoderms and other invertebrates.

Calcium carbonate (CaCO₃): a colourless or white crystal compound, which occurs naturally as **limestone**, marble and chalk.

Calcrete: a soil rich in **calcium carbonate**, indicative of arid or semi-arid environments. In the geological record, the term is used for a fossilized soil (**palaeosol**) rich in **carbonate** that is now a **limestone** or **dolomite**.

Calcretized: of a **sediment** that has been altered wholly or partly to **calcrete**.

Caldera: a circular, **basin-shaped** depression, usually many times greater than the size of any individual volcanic vent, caused by collapse of the roof of an underlying magma chamber following an eruption; also refers to the underlying volcanic structure.

Caledonian Orogeny: a major period of mountain building that took place about 430 million years ago, associated with the closure of the ancient **Iapetus Ocean** that was situated between Scotland and the rest of present-day Britain.

Caledonides: the Palaeozoic mountain chain that extended in a NE–SW-direction from Spitsbergen, eastern Greenland, Scandinavia, Scotland, northern Ireland, the Lake District of England, Wales into eastern Canada and the USA, which resulted from the closure of the **Iapetus Ocean**.

Caliche: see **hardpan**.

Carbonaceous: containing carbon.

Carbonate: a mineral salt of carbonic acid, usually referring to the common sedimentary form of **calcium carbonate** in **limestones** and invertebrate shells, but also encompassing other minerals, notably **dolomite**.

Carboniferous Period: a geological time division (cf. **chronostratigraphy**). Ranging from 362 to 290 million years ago, it precedes the Permian Period.

Carious weathering: differential **weathering** that produces honeycomb outcrop.

Cataclasis: the deformation of rock by fracture and rotation of **aggregates** and mineral grains.

Cataclasite: a rock containing angular fragments formed by **cataclasis**.

Cement: the mineral 'glue' that holds particles together in **sedimentary rocks**.

Cementstone: **argillaceous limestone** and **dolostone**.

Cephalaspid: any member of the extinct **order** Cephalaspida (**class** Agnatha (see **agnathan**)) with both an exoskeleton and endoskeleton of bone. Also referred to as **Osteostracans**. Characterized by a solid bony head-shield and broad **cornual** processes.

Chalcedony: a variety of **quartz** that is composed of microscopic crystals or fibres.

Channelized: of **fluvial** deposits formed in a river channel.

Chert: microcrystalline silica (**quartz** and **chalcedony**), which may be of organic or inorganic origin. It occurs as layers or **nodules** in **sedimentary rocks** (mainly chalk and limestone).

Chlorite: a green mineral, an anhydrous silicate of magnesium and alumina.

Chloritize: the conversion of a mineral to **chlorite**.

Chronostratigraphy: the subdivision and **correlation** of rock units on the basis of relative age. The hierarchy of principal chronostratigraphical units to which layers of **sedimentary rock** are allocated through the study and interpretation of their **stratigraphy** is erathem, **system**, **series** and **stage**, which are related, respectively to the geological time units of **era**, **period**, **epoch** and **age**. Rocks of the Devonian System (a chronostratigraphical unit) were laid down in the **Devonian Period** (a geological time unit).

Class: a category used in the taxonomic classification of organisms, which consists of one or several related **orders**. Similar classes are grouped into a phylum.

Clast: (adj. **clastic**): a fragment of a pre-existing rock. See *also* **bioclast**.

Clay: an extremely fine-grained **sediment** (grain-size less than 0.004 mm) composed of so-called 'clay minerals'.

Claystone: indurated **clay**, consisting predominantly of fine material and clay minerals.

Cleavage: a plane of incipient parting in a rock, produced by the alignment of platy crystals such as mica in response to confining pressure during deformation.

Coeval: belonging to or formed at the same time.

Concretion: a rounded or irregular mass of mineral matter concentrated around a nucleus and formed during **diagenesis** in a **sedimentary rock**.

Condensed deposit: a thin deposit formed where there was reduced sedimentation and/or **subsidence**.

Conglomerate: a **sedimentary rock** consisting of pebbles (cf. **breccia**).

Conodont (Conodonta): an extinct group of small eel-like marine animals, characterized by assemblages of paired tooth-like structures made of bone-like material. These 'teeth' have considerable use in **biostratigraphy**.

Contemporaneous: formed or occurring at the same time.

Contiguous: touching, in contact.

Continental: of **sediments** formed in a **terrestrial**, non-marine environment.

Cornstone: a **concretionary limestone** characteristic of arid **terrestrial** environments (synonymous with **calcrete**).

Cornua (-ates): a horn or horn-like projection.

Correlation: the tracing and identification of a **stratigraphical** unit away from its **type area** by comparing **lithologies** and/or **fauna**.

Crevasse splay: a small fan-shaped accumulation of **sediment** formed when a river breaks through its banks or **levee**.

Cross-stratification: subsidiary bedding surfaces oblique to the upper and lower bounding surfaces of a particular **stratum** and representing ripples or dunes formed in the **sediment** by water currents (or wind). Large-scale features are named 'cross-bedding', small-scale features are known as '**cross-lamination**'.

Crossopterygian: in some systems of classification any member of a mainly extinct **order** (Crossopterygii) of lobe-finned fish of the subclass Sarcopterygii (see **sarcopterygian**), **class Osteichthyes**.

Crustacean: any member of the **class** Crustacea (**phylum** Arthropoda (see **arthropod**)). These animals typically have two pairs of antennae, a pair of mandibles and often many other appendages, and are mainly aquatic. Examples include lobsters, barnacles and wood lice.

Cryptic: unidentified, hidden or unseen.

Crustal extension: expansion of the Earth's crust by **tectonic** forces.

Cyclothem: a succession of sedimentary layers, representing a sequence of depositional events that tend to be repeated; the result of cyclical sedimentation.

Dalradian: a large tract of (mainly) late **Precambrian** metamorphosed **sedimentary rocks** in the Grampian Highlands of Scotland and the north of Ireland.

Debris flow: a deposit formed by the down-slope movement of water- and air-borne material.

Delta (adj. **deltaic**): a tract of **sediment**, typically fan-shaped, deposited where a river enters a lake or the sea.

Denudation: the combined processes of **weathering** and **erosion** that wear down landscapes.

Depocentre: the centre of (greatest) deposition.

Desiccation crack: a crack formed when wet **sediment** dries out.

Devonian Period: a geological time division (cf. **chronostratigraphy**). Ranging from 418 to 362 million years ago, it precedes the **Carboniferous Period** and is part of the **Palaeozoic Era**.

Dextral: of lateral, right-handed movement along a geological **fault**.

Diachronous: descriptive of a **lithological** unit, or **contiguous** rock body, that was deposited at different times in different locations and therefore differs in age from place to place.

Diagenesis: (adj. **diagenetic**): the post-depositional changes in mineralogy and texture of **sediments** and organisms that combine to produce rocks and **fossils**. The term excludes **metamorphic** alteration.

Diamict: a poorly or **non-sorted non-calcareous terrigenous sedimentary rock** or unconsolidated **sediment** that contains a wide range of particle sizes.

Disconformity (adj. **disconformable**): a break in continuity of deposition, (**unconformity**), where the **beds** above and below are parallel and therefore show no angular discordance.

Dissolution: the natural process of dissolving a solid; also known as solution.

Distal (adj. **distally**): far from the source.

Distributary channel: a river channel along which **sediment** has been transported.

Dittonian Stage: a local **chronostratigraphical** division of the **Old Red Sandstone** of the **Devonian Period** for the **Anglo-Welsh Basin**. Roughly equivalent to the more widely known **Lochkovian Stage**, it follows the **Downtonian Stage** and precedes the **Breconian Stage**.

Dolerite: a **mafic, igneous rock** that generally occurs in **dykes** and **sills**.

Dolomicrite: a **sedimentary rock** consisting of clay-sized **dolomite** crystals.

Dolomite (CaMg(CO₃)₂): a white or colourless mineral with a structure similar to **calcite** but with some calcium replaced by magnesium.

Dolostone: a **limestone** whose **carbonate** fraction contains more than 50% **dolomite**.

Downtonian Stage: a local **chronostratigraphical** division of the **Old Red Sandstone** for the **Anglo-Welsh Basin**. Of **Silurian** age it is roughly equivalent to the **Píídolí Series**, and precedes the **Dittonian Stage**.

Dyke: a sheet of **igneous rock** that has 'intruded' or 'cut through' pre-existing rocks.

Early Devonian Epoch: a geological time division (cf. **chronostratigraphy**) of the **Devonian Period**. Ranging from 418 to 394 million years ago it includes the Lochkovian, Pragian and Emsian ages.

Ecosystem: habitat or environment inhabited by a group of animals and/or plants.

Eifelian Stage: a **chronostratigraphical** division of the **Middle Devonian Series**, comprising the rocks deposited during the Eifelian Age. The fourth **stage** of the **Devonian Period** it is dated to approximately 394–387.5 Ma and is preceded by the **Emsian Stage** and followed by the **Givetian Stage**.

Emsian Stage: a **chronostratigraphical** division of the **Lower Devonian Series**, comprising the rocks deposited during the Emsian Age. The third **stage** of the **Devonian Period** it is dated to approximately 409.5–394 Ma and is preceded by the **Pragian Stage** and followed by the **Eifelian Stage**.

Ephemeral: short-lived, intermittent.

Epichnial cast: a **trace fossil** cast that stands proud of the **sediment** or **bedding plane** surface.

Epoch: a geological time unit (cf. **chronostratigraphy**), of shorter duration than a **period** and itself divisible into **ages** (e.g. the Late Triassic Epoch).

Epsilon cross-bedding: **cross-bedding** formed by **lateral accretion** on a migrating **point bar** in a meandering stream.

Equigranular: a texture in which all the crystals are approximately the same size.

Era: a major geological time unit (cf. **chronostratigraphy**), which is divided into **periods** (e.g. the **Palaeozoic Era**).

Erosion: the wearing away of the land's surface by mechanical processes such as the flow of water, ice or wind.

Euramerica: the continental mass of northwestern Europe and North America, formed when the **Iapetus Ocean** was subducted during the **Caledonian Orogeny**.

Eurypterid: any member of the extinct (**Ordovician–Permian**) order Eurypterida (**class** Merostomata, **phylum** Arthropoda (see **arthropod**)). These large aquatic organisms (up to 2 m in length) superficially resemble scorpions.

Eutrophic: a body of water with high levels of plant nutrients, with correspondingly high productivity.

Evaporite (adj. **evaporitic**): a **sediment** or mineral grown from a saline solution by evaporation of water, which may be marine or **continental** in origin.

Exotic (extraformational): a rock or block unrelated to the rocks with which it is now associated, which has been moved from its place of origin; or of a pebble or **clast** from outwith a depositional **basin**, or of a **conglomerate** composed of such pebbles or clasts.

Extramontane: outwith a mountain belt.

Extrusive: descriptive of **igneous rocks** that have been extruded onto the Earth's surface, rather than being intruded beneath the surface.

Facies: the sum total of a rock's **lithological** and gross **faunal/floral** characteristics that together reflect the particular environment in which it formed.

Famennian Stage: a **chronostratigraphical** division of the **Upper Devonian Series**, comprising the rocks deposited during the Famennian Age. The sixth and final **stage** of the **Devonian Period**, it is dated to approximately 376.5–362 Ma and is preceded by the **Frasnian Stage**.

Family: a category used in the taxonomic classification of organisms, which consists of one or several related **genera**. Similar families are grouped into an **order**.

Fanglomerate: a **sedimentary rock** containing angular rock fragments cemented in a finer-grained groundmass; formed of coarse material in an **alluvial fan**.

Farlovian Stage: a local **chronostratigraphical** division of the **Old Red Sandstone** of the **Devonian Period** for the **Anglo-Welsh Basin**. Roughly equivalent to the more widely known **Famennian Stage**, it extends into the beginning of the Carboniferous System.

Fault: an approximately planar fracture surface in rock along which there has been some movement of one side relative to the other.

Fauna: animals; often referring to the characteristic animal assemblage of a region/time period.

Feldspar: a widespread, ubiquitous group of rock-forming silicate minerals that are the essential constituents of many **igneous rocks**. Variations in composition divide the group into two series — the 'alkali feldspars' with end-members albite (Na-rich) and orthoclase (K-rich), and the 'plagioclase feldspars', with end members albite and anorthite (Ca-rich).

Feldspathic: a rock rich in **feldspar**.

Felsic: a pale-coloured rock poor in iron and magnesium minerals and rich in **quartz** and **feldspar**; the opposite of **mafic**.

Felsite: a field term for glassy and fine-grained **felsic igneous rocks**. Also called **felstone**. **Felstone:** see **felsite**.

Fenestrae: cavity structures, which are generally infilled with crystals, also called 'birdseye structures'.

Fissile: descriptive of a **sedimentary rock** that contains very thin bedding or **cleavage laminae** along which the rock splits into thin sheets.

Flagstone: a hard, thin-bedded **sandstone**, firm **shale**, or other rock that splits easily along **bedding planes** or **joints** into flat slabs.

Flashy: of streams that flow as a result of sudden, heavy rainfall in tropical and sub-tropical areas.

Flexural subsidence: **subsidence** of the Earth's crust caused by loading in association with mountain building.

Flora: plants; often referring to the characteristic plant assemblage of a region/time period.

Flute mark/cast: a structure formed by small eddies that carve depressions in the surface of a **sediment** deposit. The cavities are asymmetrical in outline, with the deeper or thicker part at the upstream end, and are generally preserved on the base of the overlying **bed** as a 'cast' of the depression.

Fluvial: relating to a river or river system.

Flysch: deposits of dark, fine-grained, thin-bedded **sandstone**, **shales**, and **clay**, typically syn-**orogenic** and thought to be deposited by **turbidity currents**.

Fold: a bend in rock **strata** produced by earth movements.

Foliation: the planar arrangement of minerals, or other textural or structural features in rocks.

Footwall: the upthrow side of a geological **fault**.

Foreset: the steeply dipping surface of **cross-bedded strata**.

Formation: a succession of **contiguous** rock **strata** that is distinctive enough in its **lithology** from the surrounding rocks to be mapped as a unit; the fundamental unit of **lithostratigraphy**.

Fossil: the preserved remains of an animal or plant. *See also trace fossil.*

Frasnian Stage: a **chronostratigraphical** division of the **Upper Devonian Series**, comprising the rocks deposited during the Frasnian Age. The fifth **stage** of the **Devonian Period**, it is dated to approximately 382.5376.5 Ma and is preceded by the **Givetian Stage** and followed by the **Famennian Stage**.

Friable: descriptive of a rock that is crumbly or easily broken.

GCR: Geological Conservation Review, in which nationally important geological and geomorphological sites were assessed and selected with a view to their long-term conservation as **SSSIs**.

Gedinnian Stage: a **chronostratigraphical** division of the **Lower Devonian Series** in Belgium, France and Germany. Roughly equivalent to the **Lochkovian Stage**.

Genus (pl: **genera**): a category used in the taxonomic classification of organisms, which consists of one or several related **species**. Similar genera are grouped together into a **family**.

Geochemistry: the chemistry of rocks.

Geopetal: a sedimentary fabric that records the way up at the time of deposition. Commonly found in cavity fills within **limestones**.

Geotectonic: large-scale **tectonic** deformation of the Earth's crust.

Gilgai: the microrelief of small depressions or valleys and ridges on a soil surface. Found in soils that contain large amounts of **clay**, which expand and contract during wetting and drying.

Givetian Stage: a **chronostratigraphical** division of the **Middle Devonian Series**, comprising the rocks deposited during the Givetian Age. The fourth **stage** of the **Devonian Period**, it is dated to approximately 387.5382.5 Ma and is preceded by the **Eifelian Stage** and followed by the **Frasnian Stage**.

Glaebule: a **concretion** found in **palaeosol** profiles.

Gneiss: a coarse-grained, inhomogeneous rock, common in relatively high-grade **metamorphic terranes**, characterized by a coarse **foliation** or layering more widely spaced, irregular or discontinuous than that in a **schist**.

Gondwana: a grouping of the major southern continental plates of Africa, Australasia, Antarctica, South America, India, several smaller plates and fragments of what are now parts of Mediterranean Europe, which together formed a massive southern supercontinent straddling the South Pole in early **Palaeozoic** times and began to split up when **Avalonia** broke away in early **Ordovician** times.

Gorstian Stage: the older **chronostratigraphical** division of the **Ludlow Series** of the **Silurian Period**.

Graben: a linear block of crust downthrown between two parallel **faults** to form a **rift** or trough-shaped valley.

Graded beds: **beds** that show a change in grain size through the bed. Normal graded bedding is a fining upwards sequence. In reverse graded bedding, the grain size coarsens upwards.

Grampian Orogeny: the first mountain-building event of the **Caledonian Orogeny**, in the **Ordovician Period** from about 477 to 442 million years ago.

Granite: a pale-coloured, coarse-grained, typically **plutonic (intrusive) igneous rock**, with a high SiO_2 content. Commonly found in **batholiths** and veins.

Granitoid: a general term used to encompass unspecified coarse-grained, **quartz-rich igneous rocks** that may include compositional types such as **granite**, tonalite and **granodiorite**.

Granodiorite: a coarse-grained **igneous rock** similar to **granite** in texture but containing slightly less silica.

Graptolite: an extinct marine colonial organism belonging to the **class** Graptolithina (**phylum** Hemichordata) and characterized by a cup- or tube-shaped, highly resistant exoskeleton made of collagen.

Graptoloid: any **graptolite** belonging to the **order** Graptoloidea. The graptoloid exoskeleton is characterized by relatively few branches (stipes), lacks strengthening rods (dissepiments) and is without thecal (cup) differentiation. Typically **planktonic**.

Great Glen Fault: a major geological **fault** that trends north-east and crops out from Fort William to Inverness in Scotland and extends to the Shetland Islands and beyond. It separates two **terranes** and was active in the **Devonian Period**.

Greenstone: general term for **massive** basic **igneous rocks** that have been (partly) metamorphosed.

Greywacke: a poorly **sorted, clastic sedimentary rock** composed of fragments of rocks and crystals and **sand** set in a clay-rich **matrix**.

Groove mark/cast: a structure thought to be formed by the movement of objects along a stream bed by a continuous current. These straight narrow depressions are a few milli metres deep and several centimetres long and wide, and may be preserved on the base of the overlying **bed** as a 'cast' of the depression.

Group: in **lithostratigraphy**, a grouping of two or more **formations** with significant unifying **lithological** and/or genetic features.

Half-graben: an elongate trough bounded by a normal **fault** on one side only. *See also graben.*

Halite: the chemical name for sodium chloride, common salt (NaCl).

Hanging-wall: the downthrow side of a geological **fault**.

Hardpan: the indurated surface horizon of a soil, such as **calcrete** (caliche), formed in arid and semi-arid climates.

Heterolithic: of varied **lithologies**.

Heterostracan: any member of the extinct **order** Heterostraci (**class** Agnatha (see **agnathan**)). Characterized by extensive head armour of large plates and a pair of common branchial openings on either side.

Hexapoda: a superclass of the **phylum** Arthropoda (see **arthropod**) characterized by having six legs, and consisting of the **classes** Insecta (insects) and Parainsecta.

Hiatus: a break or gap in sedimentation.

High: a region or area that underwent little or no **subsidence** and sedimentation.

Highland Boundary Fault: a major **tectonic** and **terrane** boundary extending northeastwards across Scotland separating the Scottish Highlands from the Midland Valley. It was active during the **Devonian** and **Carboniferous periods** and experiences minor **seismic** activity today.

Highstand: a period of highest lake or sea level. **Holotype:** the single specimen (the so-called '**type specimen**') selected to epitomize a particular named **species**.

Honeycomb weathering: a form of chemical **weathering** in which numerous pits occur on a rock exposure, causing the surface to look similar to a large honeycomb. It typically occurs in arid regions, affecting granular rocks such as **sandstones** and **tuffs**.

Horst: an upfaulted block of crustal rocks, often on either side of a **graben**.

Hydrocarbon: an organic compound comprising hydrocarbon, oxygen and carbon, the term is also commonly applied to the energy compounds oil, gas and coal.

Hydrothermal: of heat generated from hot subsurface rock or groundwater.

Hypabyssal: descriptive of an igneous **intrusion**, or its rock, emplaced at a depth intermediate between **plutonic** and volcanic.

Hypolimnion: the layer of water below the thermocline in a lake that is non-circulating or perpetually cold.

Iapetus Ocean: a former ocean that separated the early **Palaeozoic** crustal plates of **Laurentia** and **Baltica** plus **Avalonia** until the ocean floor was subducted in **Ordovician-Silurian** times during the **Caledonian Orogeny**. It divided the present British Isles and its trace is situated between what is now Scotland and the northern part of Ireland, and the rest of Britain.

Ichnofauna (ichnofossil): an assemblage of **trace fossils**.

Ichthyofauna: the fish of a particular region.

Igneous rock: a rock that has formed from the cooling of molten magma, either following volcanic (**extrusive**) activity or **intrusive** processes. It consists of interlocking crystals, the size of which depends on the rate of cooling of the magma.

Ignimbrite: a **volcaniclastic** rock, typically silica-rich and pumiceous, formed by deposition from a **pyroclastic** flow; may partly or wholly comprise welded **tuff**.

Imbrication (adj. **imbricated**): a sedimentary fabric typically displaying elongate fragments that are aligned in a preferred angle to the line of bedding.

Index fossil (index species): a particular **fossil** (or **species**) that gives its name to a **biozone**.

Inlier: an outcrop of older rocks surrounded by younger rocks commonly exposed by **erosion** (cf. **outlier**).

Intercalation (adj. **intercalated**): layering within a sedimentary sequence of different rock types.

Intraclast: a fragment of rock derived from **coeval** parent material rather than an 'older' (**extraformational**) source.

Intraformational: of **conglomerate** containing **clasts** derived from the local depositional area.

Intramontane (intermontane): within a mountain belt.

Intrusion:(adj. intrusive): an **igneous rock** that has formed as a body intruded into other rocks below the Earth's surface.

Joint: a fracture in a rock that exhibits no displacement across it (unlike a **fault**).

Karst (adj. karstic): descriptive of a distinctive **terrane** developed upon a soluble rock, typically **limestone**; characterized by caves, sinkholes and dry valleys.

Kinematics: the mechanical processes involved in sedimentary **basin** formation.

Lacustrine: relating to, formed within, or produced by, lakes.

Lag deposit: a concentrated layer of coarse grained **sediments**, such as pebbles or bones, which accumulates at the bottom of a channel or the sea floor during deposition from strong currents.

Lagerstätten: a rock containing exceptionally abundant or exceptionally well-preserved **fossils** that are of considerable intrinsic interest.

Lamina (pl. laminae, laminations): the finest layer within a **sedimentary rock**, typically less than 10 mm thick.

Laminated: descriptive of a **bed** with a fabric composed of **laminae**.

Laminites: thin layers of generally fine-grained **sediment**, reflecting rapidly fluctuating, often seasonal, changes in sediment supply or environmental conditions; characteristic of lakes and other shallow **basins** of deposition where there is a restricted bottom **fauna**.

Lapillus (pl. lapilli): a **pyroclastic** fragment of any shape with a mean diameter of 2–64 mm.

Late Devonian Epoch: a geological time division (cf. **chronostratigraphy**) of the **Devonian Period**. Ranging from 382.5 to 362 million years ago it includes the Frasnian and Famennian ages

Lateral accretion: the build-up of **sediment** by river currents flowing obliquely to the main drainage direction.

Laurentia: the major North American crustal plate in early **Palaeozoic** times that straddled the equator, prior to the **subduction** of the **Iapetus Ocean**; comprised mainly of the ancient **Precambrian** core of the Canadian Shield,

Greenland, Scotland and north-west Ireland.

Laurussia: the amalgamated plates of North America and Russia, following the **subduction** of the **Iapetus Ocean**.

Lava: an **igneous rock** formed during volcanic eruptions (molten rock at the Earth's surface).

Levee: a broad ridge alongside a river or stream, deposited by floodwaters when they overtop the channel banks.

Limestone: **sedimentary rock** composed of **calcium carbonate**, often partly derived from the shells of organisms.

Lingulid: any member of the **order** Lingulida, extant shellfish of the **phylum** Brachiopoda (see **brachiopod**). Much more abundant in the **Palaeozoic Era** than at present.

Litharenite: an **arenaceous** rock composed of **lithic clasts**.

Lithic: relating to a rock **clast** found within a **sedimentary rock**.

Lithification: the conversion of **sediment** into rock.

Lithoclast: a mechanically deposited rock fragment, normally greater than 2 mm in diameter, derived from any older, (pre-existing) **lithified** rock.

Lithofacies: a **facies** defined by **sedimentary rock** type (using, for example, colour, texture and mineral composition).

Lithology: descriptive of the constitution of a **sediment** or other rock, including composition, texture, colour and hardness.

Lithostratigraphy: the organization and division of **strata** into mainly mappable rock units and their **correlation**, based entirely upon their **lithological** characteristics. Units are named according to their rank in a formal hierarchy, namely supergroup, **group**, **formation**, **member** and **bed**.

Littoral: descriptive of the zone between high-and low-water marks on a shoreline.

Load cast (structure): a protuberance of **sand** or coarse **clastic** material that extends downwards into a finer-grained, softer underlying material such as wet **mud** or **clay**. Produced by downsinking and unequal settling and compaction of the overlying material.

Lochkovian Stage: a **chronostratigraphical** division of the **Lower Devonian Series**, comprising the rocks deposited during the Lochkovian Age. The first **stage** of the **Devonian Period**, it is dated to approximately 418–413.5 Ma and is followed by the **Pragian Stage**.

Lower Devonian Series: a **chronostratigraphical** division of the Devonian System comprising the rocks deposited during the **Early Devonian Epoch**. It includes the **Lochkovian**, **Pragian** and **Emsian stages**.

Lowstand: a period of lowest sea level or lake level.

Ludfordian Stage: the younger **chronostratigraphical** division of the **Ludlow Series** of the **Silurian Period**.

Ludlow Bone Bed: a thin, lenticular **marker horizon** of **phosphatized** fish fragments in south Wales and the Welsh Borderland. It was formerly taken to mark the base of the **Old Red Sandstone** and marks the base of the **Pridoli Series** in the **Anglo-Welsh Basin**.

Ludlow Series: a **chronostratigraphical** division of the **Silurian Period**.

Macrofossil: a **fossil** that is easily seen by the naked eye.

Mafic: a rock rich in magnesium and/or iron minerals.

Magnafacies: a major continuous belt of deposits that is homogeneous in **lithological** and **palaeontological** characteristics and that extends obliquely across time planes or through several **chronostratigraphical** units.

Marker band/bed/horizon: a **bed** or layer within a rock succession with distinctive, easily recognizable characteristics that allow it to be traced for long distances or to serve as a reference or datum, and thereby enabling **correlation**.

Mass flow: the transport, downslope under the force of gravity, of large, coherent masses of **sediment**, tephra or rock; commonly assisted by the incorporation of water, ice or air.

Massif: a very large topographical or structural upland feature.

Massive: descriptive of a **bed** or layer of **sedimentary rock** with an apparently uniform structure and lacking bedding fabric or **lamination**.

Marl: a fine-grained **calcium carbonate-rich mud** or **clay**.

Matrix: the fine-grained **sediment** or crystalline **cement** that infills the spaces between larger grains.

Matrix-supported: a **conglomerate** in which the constituent **clasts** are not in contact with each other.

Medial: of the central parts of a depositional system.

Megafossil: **macrofossil**.

Megasequence: a very thick sequence of **sedimentary rocks**.

Member: in **lithostratigraphy** a subdivision of a **formation**.

Meta-: a prefix commonly used to indicate that a rock has been affected by low-grade metamorphism, while still retaining many recognizable features of its origin (e.g. metasedimentary).

Metamorphic rock: a rock that has been altered by the action of heat and/or pressure, without melting.

Metamorphism (adj. **metamorphic**): the process of radical alteration of the mineralogical and/or physical nature of rocks as a result of pressure and/or temperature.

Micrite: microcrystalline **calcite**; typically a lime **mud**.

Microfauna: microscopic animals.

Microflora: microscopic plants

Microfossil: a microscopic **fossil**.

Microgranite: a type of **granite** with characteristically small crystals.

Microspar: a recrystallized component of **limestone** rocks comprising mosaics of small (4–50 microns) crystals of **calcium carbonate**.

Microvertebrate: the **small fossil** remains of vertebrates, whether they be of juveniles of a large **species** or a small species. Remains tend to be disarticulated teeth and bones, and are usually size-sorted and deposited together by the processes of transport and deposition, especially by water currents.

Mid-Devonian Epoch: a geological time division (cf. **chronostratigraphy**) of the **Devonian Period**. Ranging from 394 to 382.5 million years ago it includes the Eifelian and Givetian ages.

Middle Devonian Series: a **chronostratigraphical** division of the Devonian System comprising the rocks deposited during the **Mid-Devonian Epoch**. It includes the Eifelian and Givetian stages.

Midland Microcraton: a triangular area underlying the English Midlands that was a stable, cratonic area on the south-east flanks of the **Lower Palaeozoic Welsh Basin**.

Milankovitch cycles: periodic shifts in the Earth's orbital parameters, thought to be one of the driving mechanisms behind glacial events.

Miospore: a general term for any **fossil** plant spore smaller than 0.2 mm.

Modiolopsid: a **species** of bivalve.

Molasse: of a **basin** and its deposits that form after a period of mountain building, the deposits being derived from the mountain range.

Mollusc: any member of the **phylum** Mollusca, which comprises about 5000 **species**. These invertebrates are characterized by a fleshy soft body and, usually, a hard shell. They may be marine, freshwater or **terrestrial**, and examples include gastropods (snails, limpets), **bivalves** (oysters, mussels), and cephalopods.

Monocline: a **fold** in which **strata** of otherwise uniform dip are locally steepened.

Mud: a mixture of **clay** and **silt**.

Mudflat: an area of predominantly fine-grained **mud** deposition.

Mudstone (mudrock): a fine-grained **sedimentary rock**; **lithified mud**.

Myriapod: any member of the extant (**Silurian-Recent**) **class** Myriapoda of **terrestrial** uniramious **arthropods**, which includes the centipedes and millipedes, some of which were amongst the first land-living animals.

Nautiloid: a member of the subclass Nautiloidea (**class** Cephalopoda). These marine invertebrates possess a multi-chambered external shell of **calcium carbonate** which may be straight or coiled. Only one **genus**, the *Nautilus*, survives today.

Neoproterozoic: the youngest **period** of the Proterozoic Eon of the **Precambrian**, preceding the Cambrian Period.

New Red Sandstone: a sequence of red, largely desert and **fluvial sedimentary rocks**, which was formed in the **Permo-Triassic** period.

Nodule: a small **concretion**, generally roughly spherical or ellipsoidal.

Offlap: the successive build-up of **strata** in a prograding sequence in a shrinking sea or on the margin of a rising landmass.

Old Red Sandstone: a classic term applied to the terrestrial, largely clastic **facies** of late **Silurian** to earliest Carboniferous age in Britain; characterized by red **sandstones**, **mudstones**, **siltstones**, **conglomerates** and **conglomerates**.

Oncolite (adj. oncolitic): a spherical or sub-spherical particle, up to 5 cm in diameter, which is produced by the **accretion** of sedimentary material on to a mobile grain through the action of **algae**.

Ophiolite: an ordered sequence of petro-genetically related **ultramafic** rocks, gabbros, sheeted **dykes** and **basalt lavas** that originated through the generation of oceanic crust, but were subsequently thrust (obducted) onto continental crust.

Opilionid: an order of the class Arachnida (phylum Arthropoda (see arthropod)) commonly referred to as 'harvestmen' or 'daddy longlegs'.

Orcadian Basin: a Mid-Devonian depositional basin in north-east Scotland in which a thick succession of lacustrine and fluvial deposits accumulated.

Order: a category used in the taxonomic classification of organisms, which consists of one or several related **families**. Similar orders are grouped together in a **class**.

Ordovician Period: a geological time division (cf **chronostratigraphy**). Ranging from 495 to 290 million years ago it is the second **period of the Palaeozoic Era** and precedes the **Silurian Period**.

Orogen: a mountain belt produced by continental collision and **uplift**.

Orogeny: a process of mountain building during which the rocks and **sediments of** a particular area of a continent are deformed and **uplifted** to form mountain belts.

Orthoconglomerate: a **conglomerate** with an intact gravel framework, characterized by a mineral **cement**. Associated with coarse-grained **cross-bedded sandstones**.

Osteichthyes: a **class of the phylum** Chordata, also referred to as 'bony fish'.

Osteolepid: any member of the extinct family Osteolepidae (order Osteolepiformes, subclass Sarcopterygii (see **Sarcopterygian**)); lobe-finned fishes.

Osteostracan: see **cephalaspid**.

Ostracoderma: a popular name applied to the extinct division of jawless and armoured **agnathans**.

Ostracod: any member of the subclass Ostracoda (**class** Crustacea (see **crustacean**), **phylum Arthropoda** (see **arthropod**)). These small invertebrates are mostly less *than 1 mm* in size and consist of two calcareous valves ('shells'). They can be found in a wide range of aquatic environments, both in fresh- and salt-water.

Outlier: an outcrop of younger rocks surrounded by older rocks (**d inner**).

Overstep: a relationship in which a younger series of sedimentary **strata** rests upon a progressively older series of strata, the older and younger series of strata being separated by a plane of **unconformity**.

Overbank deposit: fine-grained **sediment (silt and clay)** deposited from suspension on a floodplain by floodwaters from a stream channel.

Pachytheca: a primitive, non-vascular Early Devonian plant fossil.

Palaeo-: 'ancient' (occurring or formed in geological time).

Palaeocurrent: a river current in a geological, fluvial deposit.

Palaeoclimate: the climate at a particular geological time.

Palaeoecology: the relationship between organisms and their environments in the geological past.

Palaeokarst: ancient **karst** landform.

Palaeomagnetism: the magnetic alignment of iron minerals imparted to a rock at the time of its formation: also the science of the reconstruction of the Earth's magnetic field and continents in geological time.

Palaeontology: the study of **fossil fauna** and **flora**, including their evolution and the reconstruction of pre-existing environments. **Palaeosol:** an ancient or 'fossilized' soil.

Palaeoslope: the depositional slope at a particular geological time.

Palaeozoic Era: a geological time division; the first major division of geological time characterized by abundant life. It precedes the Mesozoic Era and is subdivided into 'Lower' and 'Upper' divisions at the top of the **Devonian Period**.

Palyno-: prefix indicating 'pollen' or 'spores'.

Palynomorph: a microscopic, acid-resistant, organic-walled body studied in palynology.

Ped: a naturally formed unit of soil structure.

Pedogenic: of processes relating to the development of soil profiles.

Pelite: a general term for fine-grained, **clay-rich, clastic sedimentary** rocks; often applied to metamorphosed **mudstones**.

Penecontemporaneous: formed or existing at the same time.

Peneplain (adj. **penepained**): a virtually flat and featureless landscape of considerable size, caused by prolonged **weathering and erosion**, especially mass-wasting and sheetwash.

Period: a geological time unit (cf. **chronostratigraphy**); of shorter duration than an era and itself divisible into **epochs**.

Permian Period: a geological time division (cf. **chronostratigraphy**). Ranging from about 290 until 250 million years ago, it follows the **Carboniferous Period** and precedes the Triassic Period.

Permo–Triassic: a period of geological time spanning the **Permian** and **Triassic periods**.

Petrifaction: a process of fossilization whereby organic matter is converted into a stony substance by the infiltration of water containing dissolved inorganic matter, which replaces the original organic materials, thereby often retaining the structure of the materials.

Petrography: the study of the origin, mineral composition, texture and history of rocks; includes **petrology**.

Petrology: the study of the mineral composition, texture and systematic classification of rocks.

Petromictic: comprising a mixture of different rock types (normally with regard to **sediment** pebble composition).

Phosphate: a compound salt of phosphoric acid, a mineral commonly associated with the preservation of bones and shells.

Phosphatic: descriptive of a rock containing large quantities of **phosphate**.

Phosphatize: the process of becoming enriched with **phosphate**.

Photosynthesis: the process whereby green plants trap light in chlorophyll and use it to synthesize carbohydrates from carbon dioxide and water.

Phyllarenite: a **litharenite** composed mainly of fragmented **metamorphic rocks** such as slate, **phyllite** and **schist**.

Phyllite: a **metamorphic rock** rich in the ferromagnesian mineral mica and texturally intermediate between slate and **schist**.

Phylum (pl. **phyla**): a category used in the taxonomic classification of organisms, which consists of one or several related **classes**. The phyla are grouped together into two kingdoms, the Plantae (plants) and the Animalia (animals).

Phytoplankton: plant forms of **plankton**, for example diatoms. They are often microscopic and with limited powers of locomotion, so mainly dispersed by wind and tide.

Piedmont: a sloping area at the bottom of a mountain or mountain range.

Pisoid (pisolith): a large ooid with a diameter of more than 2 mm.

Pisolite: a **sedimentary rock** consisting mainly of **pisoids**.

Placoderm: any member of the extinct **class** Placodermi. A group of primitive Palaeozoic jawed fishes, with a dermal armour in two parts, one covering the head, the other the trunk, which are sometimes articulated.

Plankton (adj. **planktonic**): minute aquatic organisms that drift with water movement.

Playa: the flat dry bottom of a desert **basin**, often the bed of an **ephemeral** lake and underlain by **evaporites**.

Pluton (adj. **plutonic**): an **intrusion** of **igneous rock** emplaced at depth in the Earth's crust.

Point bar: a lenticular deposit formed on the inside bend of a meandering river channel.

Polychaete: a group of annelid worms, some bearing bristles, tentacles and hard organic tooth structures (**scolecodonts**).

Polygonal: refers to arrays of desiccation cracks in patterned ground, and subaqueous shrinkage cracks formed in **mudrocks**.

Polymictic: descriptive of a **conglomerate** that contains **clasts** of many different rock types.

Pragian Stage: a **chronostratigraphical** division of the **Lower Devonian Series**, comprising the rocks deposited during the Pragian Age. The second **stage of the Devonian Period** it is dated to approximately 413.5–409.5 Ma and is preceded by the **Lochkovian Stage** and followed by the **Emsian Stage**.

Precambrian: a widely used term to encompass the time preceding the Cambrian Period. It extends from the formation of the earth (4600 Ma) to the beginning of the Phanerozoic Eon (540 Ma).

Pridoli Series: a **chronostratigraphical** division of the Silurian System comprising the rocks deposited during the Pridoli Epoch. The final series of the **Silurian Period** it is dated to approximately 419–418 Ma and immediately precedes the **Devonian Period**.

Progradation. the advance of a sedimentary facies or belt of facies as a result of a change in sea or lake level, or uplift of the source area.

Proximal: near to the source.

Psammite: an **arenite**.

Pseudomorph: a replacement product, composed either of a single mineral or an assemblage of minerals, that retains the distinctive overall shape of the parent crystal.

Pseudonodule: a primary sedimentary structure consisting of a ball-like mass of **sandstone** enclosed in **shale** or **mudstone**. It is the result of the settling of **sand** into underlying **clay** or **mud** that welled up between isolated sand masses. Characterized by a rounded base with upturned or inrolled edges.

Pteraspid: any member of the extinct (**Palaeozoic**) order Pteraspidiformes, also known as **heterostracans**, abundant in early Devonian times.

Pull-apart basin: a sedimentary basin formed by the pulling apart of adjacent blocks by transcurrent faults.

Pyroclastic: descriptive of unconsolidated deposits (tephra) and rocks that form directly by explosive ejection from a volcano.

Quartz: a rock-forming mineral composed entirely of silica (SiO_2); one of the most common minerals of the Earth's crust.

Quartzite (adj. **quartzitic**, **quartzose**): both an **arenaceous** rock composed primarily of **quartz**, and a **metamorphic rock** formed of quartz.

Quaternary Period: a geological time division (cf. **chronostratigraphy**). The latest **period** of geological time and the last period of the Cainozoic Era, it ranges from 1.8 Ma to the present day.

Radiometric dating: methods of dating rocks or minerals using the relative abundances of radioactive and stable isotopes of certain elements, together with known rates of decay of radioactive elements. Radiocarbon dating can extend back to only 50 000 years, but other elements (potassium, lead, uranium) can be used to obtain dates of the order of tens to thousands of millions of years.

Red beds: a collective term applied to **continental** sedimentary successions that are predominantly red in colour due to the presence of iron oxides and hydroxides formed in a highly oxidizing environment.

Regolith: a layer of unconsolidated, **weathered**, broken rock debris that lies below the soil and above the bedrock below.

Regression: retreat or contraction of the sea as a result of a fall in sea level or **uplift** of the land. **Relict:** descriptive of a geological feature surviving in its primitive form.

Reworking: the natural excavation and transportation of **sediment** or **fossil** material that is then re-deposited elsewhere.

Rheic (Ocean): an approximately E-W-oriented ocean that opened up at the same time as the closure of the **Iapetus Ocean** and separated part of **Gondwana** (in part, what is now Brittany and central Germany) from southern Britain, northern France and northern Germany during the **Silurian Period**; its closure resulted in the Variscan Orogeny.

Rhizcretion: a hollow, concretion-like mass that formed around the root of a living plant.

Rhizolith: a concretion (normally calcitic) replacing a root.

Rhyolite: a fine-grained, pale coloured, acid ($\text{SiO}_2 > 63$ wt%) volcanic (**extrusive**) rock, with the same chemical and mineralogical composition as **granite**.

Rhythmite: a unit of a rhythmic succession or of **beds** that were developed by rhythmic sedimentation.

Rift: a depressed area of continental crust produced by tensile stretching of the crust and down-faulting along parallel **faults**.

Rip-up clast: a fragment of **sediment** that was eroded from river banks and re-deposited in the succeeding sedimentary layers.

Rotliegendes: 'red layers', a German **stratigraphical** term applied to the largely **continental** deposits of Lower to Mid-Permian times, which are commonly reddened with iron oxide minerals.

Rudite (adj: **rudaceous**): a coarse-grained **sedimentary rock**, either consolidated as in a **conglomerate**, or unconsolidated as in a till.

Sabkha: a salt-encrusted **supratidal** surface or coastal flat bordering a lagoon. Inland forms frequently support sand dunes.

Sand:sediment particles typically between 0.625 mm and 2 mm in diameter.

Sandbar: a **bar** or low ridge of **sand** that borders the shore and is built up, or near, to the surface of the water by currents or wave action.

Sandstone: a **sedimentary rock** composed of **lithified sand** grains between 0.625 mm and 2 mm in diameter.

Sand volcano: an accumulation of **sand** resembling a miniature volcano formed by the expulsion of liquefied sand to the **sediment** surface.

Sand wedge: a body of **sand** shaped like a vertical wedge, with the apex pointing downward, formed by the filling in of thermal contraction cracks.

Sarcopterygian: any member of the subclass Sarcopterygii, **class Osteichthyes**. This group of bony fishes, characterized by paired 'fleshy fins' and internal nostrils includes the crossopterygians and the dipnoans.

Scandian Orogeny: the phase of the **Caledonian Orogeny** that affected what is now the Scandinavian countries, when **Baltica** and **Laurentia** collided in the Ludlow Epoch.

Schist: a coarse-grained metamorphic rock that displays a strong foliation (schistosity) that is commonly defined by mica alignment.

Scolecodont: the fossilized jaw of an annelid. Scoriaceous: descriptive of lavas that are very highly vesiculated, giving them a 'clinkery' appearance.

Sediment: granular material such as **sand or mud** derived from the **weathering** and erosion of pre-existing rocks, biological activity (e.g. shells and organic matter), or chemical precipitation (e.g. **evaporites**).

Sedimentary rock: a rock composed of **sediments**, deposited by water, wind or ice.

Sedimentology: the study of **sediments** and sedimentary rocks, including their deposition, structure and composition.

Seismic: of movements in the Earth's crust causing earthquakes. **Seismic reflection** is the technique whereby artificially created seismic waves are differentially transmitted by rocks of differing density and recorded on their return to the surface.

Series: a **chronostratigraphical** division comprising all of the rocks formed during an **epoch**; it can be divided into **stages**.

Shale: a **mudrock** that splits easily into layers.

Shearing: deformation of a rock body by the sliding of one part relative to another part, in a direction parallel to their plane of contact.

Sheet flood: a **broad** expanse of rapidly moving water and debris, not confined to a channel and usually of short duration due to rapid runoff in an arid area.

Shoreface deposits: the deposits formed on the shoreward part of a barrier in shallow sea or between the seaward limit of the shore and the horizontal surface of the offshore.

Siegenian Stage: a **chronostratigraphical** division of the **Lower Devonian Series** in Belgium, France and Germany. Roughly equivalent to the **Pragian Stage**.

Silcrete: an indurated silica soil (or **palaeosol**); the term was originally used for a **conglomerate of sand** and gravel cemented into a hard mass by silica.

Silicification (adj. silicified): the process of conversion of a **sediment**, plant or animal to **chert** by **hydrothermal** and/or chemical processes.

Sill: a tabular body of **igneous rock** that is more-or-less concordant with the bedding or **foliation** of the host rocks.

Silt: a fine-grained **sediment** intermediate in grain size between **clay** and **sand**.

Siltstone: a rock made of **silt**.

Silurian Period: a geological time division (cf. **chronostratigraphy**). Ranging from 439 to 418 million years ago, it precedes the **Devonian Period**.

Silur-Devonian: a period of geological time spanning the **Silurian** and Devonian periods.

Sinistral: of left-hand lateral movement along a geological fault.

Sinter: a chemical **sedimentary rock** deposited by precipitation from mineral waters of springs, lakes or streams.

Sorting: the ordered distribution of grain sizes. in a **sediment** or **sedimentary rock**.

Sparite (sparry calcite): a **limestone** in which the sparite **cement** is more abundant than the micrite matrix.

Species: a category used in the taxonomic classification of organisms. Similar species are grouped together in a **genus**.

Spherulite: a spherical mass of acicular crystals, commonly **feldspar**, radiating from a central point; commonly found in glassy silicic volcanic rocks as a result of devitrification.

SSSI: Site of Special Scientific Interest; the designation of an area of land for statutory protection under the Wildlife and Countryside Act 1981.

Stage: a **chronostratigraphical** division comprising all of the rocks formed during an **age**, and usually taken to be the smallest standard unit.

Staurolite-grade: a medium grade of **metamorphic rock**, based on the amount of temperature/pressure it has been subjected to, this referring to the presence of the index mineral staurolite.

Stratigraphy: the study of the temporal and spatial relationships within a rock succession.

Stratotype: a sequence of **sedimentary rocks** at a particular locality chosen as the standard against which other sequences can be compared. Stratotypes are established for **lithostratigraphical** and **biostratigraphical** units, both regionally and internationally.

Stratum (pl. strata): a **bed** or single layer in a succession of rock.

Stratovolcano: a cone-shaped volcano with a layered internal structure.

Strike: the trend of a geological surface (e.g. a **bedding plane**) measured at right angles to the direction of maximum slope or dip.

Strike-slip: a **tectonic** break in which the predominant displacement is lateral rather than vertical.

Stromatolite: a **laminated** or mounded structure composed of **carbonate** trapped by cyanobacteria. Known in rocks throughout the geological record, they form in warm, shallow tropical seas in the present day.

Subaerial: of environments that exist and processes that operate in the open air.

Subarkose: a **sandstone** with insufficient **feldspar** to be termed an **arkose**, intermediate in composition between an arkose and a pure **quartz** sandstone.

Subduction: the process of one crustal plate descending into the mantle beneath another during plate convergence and collision, with the release of energy in the form of earthquakes and often accompanied by volcanicity.

Subsidence: the sinking of a local or regional portion of the Earth's surface with respect to its surroundings.

Subtidal: formed, or occurring, below the tides. **Sulphide:** a compound of sulphur with a metal or semi-metal, such as pyrite FeS_2 .

Supratidal: above the tides.

Synaeresis crack: a subaqueous shrinkage **crack**, formed by the loss of pore water from **clays** due to changes in salinity of the surrounding water.

Syn-: prefix indicating 'together' or '**contemporaneous** with'.

Syncline: a downfold of rock produced by **tectonic** deformation; the youngest rocks occur in its core.

System: a **chronostratigraphical** division comprising all of the rocks formed during a **period**; can be divided into **series**.

Talus: an accumulation of rock litter at the foot of a slope, generally with a wide size-range (up to several metres) and ungraded. Also called scree.

Taxon (pl. taxa): a named group of organisms of any rank.

Tectonism (adj. tectonic): deformation of the Earth's crust and the consequent structural effects (e.g. **faults** and **folds**).

Terrane: a small crustal plate or fault-bounded fragment of a larger plate, with distinctive characteristics, which may have been displaced considerable distances from its original site and welded to another plate during plate **tectonic** movement.

Terrestrial: of or relating to the Earth or the Earth's dry land.

Tetrapoda: four-footed vertebrates including amphibians, reptiles and mammals.

Thelodont: a member of the extinct **order** Thelodonti, **class** Agnatha (see **agnathan**). Characterized by their shark-like dermal denticles, which are commonly fossilized as separate elements within the **sediment**.

Thermal subsidence: **subsidence** of the Earth's crust as a result of heating.

Throw: the amount of vertical displacement between the rocks on either side of a **fault**.

Thrust fault: a **fault** characterized by movement of rocks under lateral compression along a low-angle fault plane.

Trace fossil (ichnofossil): a biogenic sedimentary structure produced by activity of an organism within a substrate; examples include burrows and footprints.

Transcurrent fault (strike-slip fault): a **fault** in which the major displacement is horizontal and parallel to the **strike** of a vertical or subvertical fault plane. Localized zones of deformation due to pressures and tensions across the fault occur at bends in the fault and can give rise to conditions of **transtension**. The latter process may cause the formation of rhombic-shaped **basins**, **graben**, or marginal basins that may be the focus of rift-related volcanic activity.

Transgression (adj. transgressive): the inundation of the land due to sea-level or lake-level rise, and the resulting sedimentary deposits.

Transpression: crustal shortening as a result of oblique compression across a **transcurrent (strike-slip) fault** or shear zone.

Transtension: crustal extension as a result of oblique tension across a **transcurrent fault** or shear zone leading to localized **rifts** or **basins**.

Triassic Period: a geological time division (cf. **chronostratigraphy**). Ranging from 245 to 208 million years ago, it is the first **period** of the Mesozoic Era, and is preceded by the **Permian Period**.

Trigonotarbida: an extinct (**Silurian**–**Carboniferous**) **order** of primitive chelicerate **arthropods**, which includes some of the earliest land-living animals.

Trough (cross-) bedding: cross-bedding formed in three-dimensional dunes in which the **foresets** (trough sets) are concave upwards.

Truncation: the cutting or breaking off of the top of a geological structure or landform.

Tuff (adj. tuffaceous): cemented and **lithified** volcanic **ash**, comprising rock and crystal fragments from an explosive eruption.

Turbidite: any **sediment** or rock transported and deposited by a **turbidity current**, generally characterized by **graded bedding**, large amounts of *matrix* and commonly exhibiting a Bouma sequence.

Turbidity current: a highly turbid, dense current carrying large quantities of **clay**, **silt** and **sand** in suspension which flows down a submarine slope through less dense sea water.

Type locality/area: the place where the **type section** (or **stratotype**) for a **stratigraphical** unit is located, or from where the **type specimen** of a **fossil** came.

Type section: see **stratotype**.

Type specimen: a single specimen designated as typifying a named **species** or subspecies. See also **holotype**.

Ultramafic: of an **igneous rock** in which dark-coloured (iron/magnesium) minerals comprise more than 90% of the rock.

Unconformity: the surface that separates two sedimentary sequences of different ages; it represents a gap in the geological record when there was **erosion**, and/or **tectonism** and/or no deposition. There is often an angular discordance between the two sequences.

Uplift: movements that raises or upthrusts the Earth's crust, as in a dome, arch or orogen.

Upper Devonian Series: a **chronostratigraphical** division of the Devonian System comprising the rocks deposited during the **Late Devonian Epoch**. It includes the **Frasnian** and **Famennian stages**.

Variscan Orogeny: the period of mountain building in Europe that occurred in the **Carboniferous** and **Permian** periods as a result of the closure of the **Rheic Ocean**.

Vascular: of plants with conducting tissue.

Varve: a sedimentary **bed**, layer, or sequence of layers deposited in a body of still water within a year, and usually during a season.

Vertisol: a mineral soil rich in calcium and magnesium and with 30% or more of **clay**. Deep wide cracks develop when the soil is dry.

Vesicle: a gas bubble cavity, usually in a consolidated **lava** or shallow **intrusion**.

Volcanic arc: a generally curved or arc-shaped, linear belt of volcanoes above a **subduction** zone along a continental margin.

Volcaniclastic: generally applied to a **clastic** rock containing mainly material derived from volcanic activity, but without regard for its origin or environment of deposition (includes **pyroclastic** rocks and **sedimentary rocks** containing volcanic debris).

Volcanism: volcanic activity.

Vug (adj. vuggy): a cavity in a rock, which may contain a lining of crystalline minerals.

Wacke: an impure **sandstone** that consists of a mixture of angular and unsorted or poorly **sorted** mineral and rock fragments, with an abundant **matrix** of **clay** and fine **silt**.

Wadi: a gorge-like valley formed in arid or semiarid environments.

Weathering: the chemical alteration and physical breaking down of rocks through the effects of exposure to the weather.

Welsh Basin: the Lower **Palaeozoic** sedimentary, deep-water basin that occupied much of what is now Wales.

Wenlock Series: a **chronostratigraphical** division of the **Silurian** System. It is preceded by the Llandovery Series and succeeded by the **Ludlow Series** and extended from about 430 to 424 million years ago.

Zone: a **stratigraphical** unit in many categories of stratigraphical classification. In **biostratigraphy** a zone is defined on the occurrence of a defining **fossil (index fossil)**, or by the entry of a particular fossil taxon (see **biozone**).

[References](#)