Mesozoic and Tertiary Palaeobotany of Great Britain

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In this reference list the arrangement is alphabetical by author surname for works by sole authors and dual authors. Where there are references that *include the first-named author with others*, the sole-author works are listed chronologically first, followed by the dual author references (alphabetically) followed by the references with three or more authors listed *chronologically*. Chronological order is used within each group of identical authors.

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Glossary

This glossary provides brief explanations for the technical terms used in Chapter 1 and the 'Conclusions' sections of the site reports, along with some of the botanical terms to be found in this volume. These explanations are not rigorous scientific definitions but are intended to help the general reader. Words in **bold** type indicate an internal reference to another glossary entry. Detailed stratigraphical terms are omitted as they are given context within the tables and figures. The systematics of the Plant Kingdom are given on pp. 10–12 of the text (Chapter 1).

Abaxial: the side of a leaf facing away from the stem or main axis. In most leaves, this is the lower surface.

Abscission: the controlled shedding of a leaf, branch, fructification or other organ.

Adpression: Fossil preserved by compression of the plant tissue into almost two dimensions. If carbonized plant tissue still remains, the fossil is known as a *compression*. If the plant tissue is lost, the result is an *impression*.

Angiosperms: flowering plants.

Arborescent: tree-like.

Axil: the upper angle between a stem and a lateral branch or leaf. Structures growing out of that angle (tubercles, branches, **sporangia** etc.) are said to be axillary.

Biostratigraphy: the subdivision and **correlation** of sedimentary **strata** based on their fossil content.

Bioturbation: burrows and feeding traces in sediment, made by the organisms living on or in it.

Biozone: in **biostratigraphy**, a restricted unit of sedimentary rocks 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.

Brackish: waters with salinities intermediate between fresh and marine waters.

Bract: a leaf-like structure.

Bryophytes: non-**vascular** land plants known as mosses, liverworts and hornworts.

Cainozoic: the youngest **era** of geological time extending from about 65 million years ago to the present and consisting of the **Tertiary** and **Quaternary** sub-**eras**. Literally it means 'recent life'.

Charcoal: carbonized remains of plant tissue burnt at very high temperatures, in which some internal structure of the plant may be still preserved.

Chine: sharply incised valley intersecting a sea cliff.

Chronostratigraphical unit: a sequence of rocks deposited during a particular interval of geological time.

Chronostratigraphy: the **correlation** and subdivision of rock units on the basis of relative age – a hierarchy of sequential units to which the layers of sedimentary rocks are allocated. The hierarchy of principal chronostratigraphical units is **system**, **series** and **stage**, which are related, respectively, to the geological time units of **period**, **epoch** and **age**. Rocks of the **Jurassic System** (a chronostratigraphical unit) were laid down in the

Jurassic **Period** (a geological time unit).

Circinate: a type of leaf development in which the young leaf is inrolled with its apex central. When the leaf starts to unroll, it forms a crozier, as seen in many living ferns.

Compression: see **adpression**.

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

Correlation: tracing and identification of a **stratigraphical** unit away from its type area.

Cortex: zone of tissue outside the **stele**.

Cretaceous: the last **period** of the **Mesozoic Era**, ranging from about 140 to 65 million years ago.

Cupule: cup-shaped protective structure containing one or more seeds or **ovules**.

Cuticle: outer protective 'skin' covering the aerial parts of most land plants.

Diagenesis: small-scale changes of mineralogy and/or texture developed after deposition of sediment (e.g. cementation of sediment grains; excludes changes due to subsequent **metamorphism**).

Dichotomous: a type of branching where an axis divides into two equal branches.

Disconformity: a minor **unconformity** without angular discordance.

Dicotyledon: flowering plants whose seeds produce two seed leaves (cotyledons) on germination.

Disseminule: a part of the plant, such as a seed, that is released from the parent to achieve propagation.

Embryo sac: the megaspore in **gymnosperms** and **angiosperms**, containing the female **gametophyte**.

Eocene: middle **epoch** of the **Palaeogene Period**.

Eon: the largest unit of geological time, divided into **eras**.

Epidermis: outermost cells of a plant, usually (but not always) in a single layer.

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

Era: a large unit of geological time composed of several **periods**. The Phanerozoic **Eon** is divided into the **Palaeozoic**, **Mesozoic** and **Cainozoic** eras, and their constituent **periods** are defined on the basis of their characteristic contents of invertebrate, vertebrate and plant fossils.

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

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

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

Frond: a leaf, especially of ferns and some primitive **gymnosperms**.

Fusain: see **charcoal**.

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**.

Gametophyte: the sexual, gamete-forming phase (or generation) of the life-cycle of a plant.

Group: a **stratigraphical** unit combining several **formations**.

Gymnosperms: plants that reproduce by 'naked' seeds (i.e. seeds not enclosed in a carpel).

Holotype: the single specimen selected to epitomize a particular named species.

Impression: see **adpression**.

Integuments: protective structures enclosing the **nucellus** in **ovules**.

Jurassic: the middle **period** of the **Mesozoic Era**, ranging from about 195 to 140 million years ago.

Kimmeridgian: a **stage** of the Upper **Jurassic Series**. It is followed by the **Portlandian** and preceded by the **Oxfordian stages**.

Leaf scar: an **abscission** mark left on the stem or leaf cushion after a leaf has become detached.

Liana: climbing plant with woody rope-like stem.

Lias: the oldest **Group** of the **Jurassic System**,

approximately equivalent to the Lower **Jurassic Series**.

Lignin: a complex polymer deposited in the walls of vessels, **tracheids** and fibres to increase their strength.

Lithology: the composition and form of rocks.

Lithostratigraphy: the organization and division of **strata** into mainly mappable rock units and their **correlation** based entirely upon their **lithological** characteristics.

Lumen: central cavity of a cell.

Maastrichtian: the youngest **stage** of the **Cretaceous Period**.

Medullary ray: radial extension of **pith** penetrating between the **vascular** bundles of a stem.

Megaspore: a **spore** that produces a female **gametophyte**.

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

Mesozoic: the middle **era** of the Phanerozoic **Eon**, spanning the **Triassic** Period to the base of the **Tertiary** sub-**Era**, (i.e. after the **Palaeozoic**, but before the **Cainozoic** era), from about 230 to 65 million years ago. Literal meaning is 'middle life'.

Metamorphism: the processes whereby rocks undergo changes in the solid state by heat and/or pressure but without melting.

Microphyll: a small leaf with just a single, or in some cases a pair of veins running along its length.

Micropyle: a small pore remaining from the incomplete closure of the **integuments** in an **ovule**, through which a pollen grain or pollen tube has to pass to effect fertilization.

Microspore: a **spore** that produces a male **gametophyte**.

Miocene: older of the two **epochs** of the **Neogene Period**.

Monocotyledon: flowering plants whose seeds produce a single seed-leaf (cotyledon) on germination.

Neogene: the younger period of the **Tertiary** sub-**Era**, preceded by the **Palaeogene Period**.

Nucellus: the tissue surrounding the **embryo sac** in an **ovule**.

Oligocene: youngest **epoch** of the **Palaeogene Period**.

Ovule: a female reproductive structure in **gymnosperms** and **angiosperms**, which contains an **embryo sac** surrounded by the **nucellus** and **integuments**. It is known as a seed after fertilization.

Oxfordian: the oldest **stage** of the Upper **Jurassic Series**. It is followed by the **Kimmeridgian**, and preceded by the Callovian.

Palaeobiogeography: a branch of **palaeontology** dealing with spatial distribution of plants and animals in the geological past, in particular referring to environmental conditions and climate.

Palaeocene: oldest **epoch** of the **Palaeogene Period**.

Palaeoecology: a branch of palaeontology dealing with the relationships between plants and animals, and their **palaeoenvironment**.

Palaeoenvironment: an environment in the geological past.

Palaeogene: the older **period** of the **Tertiary** sub-**era**.

Palaeontology: the study of fossil flora and fauna, including their evolution and reconstruction of past animal/plant communities and ancient environments.

Palaeozoic: 'ancient life', the first major division (**era**) of geological time, characterized by abundant life; succeeded by the **Mesozoic Era**

Palynology: the study of pollen, spores and certain other microfossils such as **dinoflagellates**.

Papilla: small 'bump' on the plant's surface.

Pappus: tuft of fine hairs or teeth on a seed, to aid dispersal. A well-known example is the parachute-like structures on dandelion seeds.

Parenchyma: tissue of thin-walled, unspecialized cells that often make up a large part of non-woody plants and plant-organs.

Period: a major division of geological time, of shorter duration than an **era** and itself divisible into **epochs.**

Permineralization: the deposition of mineral matter within organic tissues (and sometimes also called petrifaction).

Petiole: the stalk of a leaf.

Phloem: conducting tissue responsible for the movement of sugars and other nutrients throughout a plant.

Pinna: a subdivision of a compound leaf or frond.

Pinnule: the ultimate division of a compound

leaf or frond.

Pith: a zone of central **parenchyma** within the **stele** of a stem or root.

Pleistocene: the older **epoch** of the **Quaternary** sub-**Era**.

Pliocene: the younger **epoch** of the **Neogene Period**.

Pollen: the microspores of **angiosperms** and certain groups of **gymnosperm**.

Portlandian: the final **stage** of the Upper **Jurassic Series**, preceded by the **Kimmeridgian** stage and followed by the **Cretaceous System**.

Propagule: any part of a plant capable of growing into a new individual, e.g. seeds and spores.

Pteridophytes: a generalized term used for vascular plants, including ferns, horsetails and club mosses, that reproduce by **spores**.

Pteridosperm: a heterogeneous group of, mainly Palaeozoic, **gymnosperms** with large dissected leaves that superficially resemble fern fronds.

Pyrite: an iron sulphide mineral (FeS_2) common within sediments, resulting from the biochemical action of bacteria within anaerobic environments.

Pyritized: altered to the mineral pyrite (FeS_2).

Quaternary: the younger sub-**Era** of the **Cainozoic Era**, the beginning of the Quaternary is taken as about 2.4 million years ago in this volume and it extends to the present.

Rachis: the supporting axis of a compound leaf or frond, to which the leaflets or **pinnules** are attached.

Rays: radially arranged lines of **parenchyma** cells in **vascular** tissue.

Rhizome: a horizontal stem, usually underground, that facilitates vegetative propagation.

SSSI: Site of Special Scientific Interest. The designation of an area of land for statutory protection under the provisions of the *Wildlife and Countryside Act 1981*; the principal designation under which GCR sites are protected.

Sclerotic: thickened with **lignin**.

Secondary growth: the increase in girth of a plant by cell divisions in the **cambium**. Secondary wood in particular is an important means of increasing the girth of many plants, especially in **gymnosperms** and **angiosperms**.

Seed: a reproductive structure formed from a fertilized **ovule**.

Series: a major stratigraphical division of a geological **system** comprising all the rocks formed during a particular **epoch**.

Sorus: reproductive structures on ferns and certain algae, consisting of a cluster of sporangia, usually arranged in a regular pattern.

Sporangium: a spore case or capsule that produces spores.

Spore: a reproductive unit of one or more cells, produced by a **sporophyte**.

Sporophyll: a modified leaf, usually in a **strobilus**, on which a **sporangium** is borne.

Sporophyte: the **spore**-producing, non-sexual phase (or generation) in the life-cycle of a plant.

Stage: a **chronostratigraphical** subdivision of a **series.**

Stele: sometimes known as the vascular cylinder, consisting of **xylem** and **phloem**.

Stomata: small pores in the **epidermis**, which facilitate the movement of moisture and gases in and out of the plant (singular: stoma).

Strata (singular: stratum): layers within sedimentary rocks. The term is often used instead of **beds**.

Stratigraphy: the study of rock **strata** and their distribution in space and time. See also **lithostratigraphy**, **biostratigraphy**.

Stratotype: 'layer pattern', a sequence of **strata** at a particular location that has been internationally recognized as the definitive section for a particular **stratigraphical** subdivision.

Succession: in **stratigraphy**, a continuous sequence of sedimentary rock units.

System: a **chronostratigraphical** unit comprising all the rocks formed during a geological **period**, e.g. the Jurassic System comprises all the rocks of the Jurassic **Period**.

Taphonomy: the process of fossilization.

Taxonomic group: a unit of classification of organisms (e.g. phylum, class, order, family, genus, species).

Tertiary: the younger sub-**era** of the **Cainozoic Era**, ranging from about 65 to 2 million years ago.

Thanetian: the younger **stage** of the **Palaeocene Epoch**.

Trace fossil: a structure preserved in a sedimentary rock that indicates biological activity,

e.g. burrows, trails and footprints.

Tracheids: discrete, elongated, water-conducting **xylem** cells, joined by pits and open ends.

Triassic: the first **period** of the **Mesozoic Era** preceding the **Jurassic Period.**

Trichomes: epidermal hairs, which may have a protective function. In some cases, a gland occurs at the trichome tip from which an exudant may be produced.

Trilete mark: a 'Y'-shaped mark on a **spore**, formed through the development of the spores in tetrahedrally symmetrical groups.

Type locality: The location where the type section (or **stratotype**) for a **stratigraphical** unit is located, or where the original type section or fossil was first described.

Type section: see **Stratotype**.

Unconformity: a break in the relationship between successive **strata** resulting from a lack of deposition during an intervening phase of **tectonism** and erosion; the unrepresented time interval may be substantial, and there is often an associated angular discordance.

Vascular plants: plants with conducting tissue (**xylem** and **phloem**) in the roots, stems and usually the foliage.

Venation: the pattern of veins on a leaf or **pinnule**.

Vessel: a series of open-ended cells, arranged end-to-end, to form an elongate tube, found in the **xylem** of many **angiosperms**, and in some ferns and **gymnosperms**.

Xylem: woody conducting tissue responsible for the movement of water and solutes around a plant.

Zone: see **biozone**, but also used, more or less formally, as a 'building block' of a **Stage** in the **chronostratigraphical** hierarchy.

Fossil index

Note: Page numbers in **bold** and *italic* type refer to **tables** and *figures* respectively. For the Latin equivalents of common names, refer to pp. 10–12 of the main text.

Fossil index

Fossil index

General index

Note: Page numbers in **bold** and *italic* type refer to **tables** and *figures* respectively