

# Glossary - Botany *Angiosperm*

**Alternation of Generation:** A reproductive cycle in which a haploid (n) phase, the gametes, which after fusion in pairs to form a zygote, germinate, producing a diploid (2n) phase, the sporophyte. Spores produced by meiotic division from the sporophyte give rise to new gametophytes, completing the cycle.

**Benthos:** Collectively, the sedentary animal and plant life living on the sea bottom.

**Carotenoids:** A class of fat-soluble pigments that includes the carotenes (yellow and orange pigments) and the xanthophylls (yellow pigments); found in chloroplasts and chromoplasts of plants. Carotenoids act as accessory pigments in photosynthesis.

**Cauloid:**

**Cellulose:** A carbohydrate  $C_6H_{10}O_5$ ; the chief component of the cell wall in plants and some protista; an insoluble complex carbohydrate formed of microfibrilli of glucose molecules attached end to end.

**Chitin:** (Gk. chiton, tunic) A tough, resistant, N-containing polysaccharide  $C_8H_{13}NO_5$ , forming the cell walls of certain fungi, the exoskeleton of arthropods, and the epidermal cuticle of other surface structures of certain other protista and animals.

**Chlorophyll:** (Gk. chloros, green + phyllon, leaf) The green pigment of plants, which is the receptor of light energy in photosynthesis; also found in algae and photosynthetic bacteria.

**Chloroplast:** A plastid in which chlorophylls are contained; the site of photosynthesis. Chloroplasts occur in plants and algae.

**-chory:** (Gk. choros, )

**Anemochroy:** (Gk. anemo, breath) Dispersal of seeds by the wind.

**Autochory:** (Gk. auto, self) Dispersal of seeds by self-generated means e.g.: turgor pressure

**Hydrochory:** (Gk. hydros, water) Dispersal of seeds via water.

**Zoochory:** (Gk. zoo, animal) Dispersal of seeds via animals.

**Cytokinesis:** The process of cytoplasmic division accompanying nuclear division.

**Dehiscence:** (L.de, down; hiscere, split open) The opening of an anther, fruit, or other structure, which permits the escape of reproductive bodies contained within.

**Dormancy:** (L. dormire, to sleep) A special condition of arrested growth which the plant and such plant parts as buds and seeds do not begin to grow without special environmental cues.

**Egg:** A nonmotile female gamete, usually larger than a male gamete of the same species.

E. **Apparatus:** The egg cell and synergids located at the micropylar end of the female gametophyte, or embryo sac, of angiosperm.

E. **Cell:** The part of the egg apparatus which after fertilization develops into the zygote (in angiosperm).

**Embryo:** (Gk. en, in; bryein, to swell) A young sporophytic plant, before the start of a period of rapid growth (germination in seed plants - spermatophytes). The embryo is made up of the seed coat, and stored food.

E. **Sac:** The female gametophyte of angiosperms, generally an 8-nucleate, seven-celled structure; the 7 cells are the egg cell, two synergids and three antipodals (mono-nucleated) and the central cell (binucleated).

**Polyembryony:** Having more than one embryo within the developing seed.

**Endosperm:** (Gk, endon, within; sperma, seed) A tissue, containing stored food, that develops from the union of a male nucleus and the polar nuclei of the central cell; it is digested by the growing sporophyte either before or after the maturation of the seed.

**Primary ES.:** The haploid endosperm of prothallial gymnosperms nourishing the embryo.

**Secondary ES.:** In angiosperms, the nourishing tissue (3n) for the embryo.

**Fertilization:** The fusion of two gamete nuclei to form a diploid zygote.

**Double F.:** The fusion of the egg and sperm (resulting in a 2n-fertilized egg, the zygote) and the simultaneous fusion of the second male gamete with the polar nuclei (resulting in a 3n-secondary endosperm nucleus); a unique characteristic of all angiosperms.

**Gamete:**(Gk. Gamete, wife) A haploid reproductive cell; gametes fuse in pairs, forming zygotes, which are diploid.

**Gametangium** (Gk. gamein, to marry + tangere to touch) a cell or organ in which gametes are formed.

**-gamy:** (Gk. Gamos, marriage)

**Anisogamy:** (Gk. aniso, unequal) The condition of dissimilar motile gametes; see also isogamy, oogamy.

**Heterogamy:** (Gk. heteros, other + gamos, union or reproduction) Reproduction involving two types of gametes different in size and form.

**Gametangiogamy:** (Gk. gamein, to marry, + tangere to touch) Two gametangia, a male and female or of +/- mating type merge and form a diploid zygote (in zygomycetes); see also karyo-, plasmo-, somato-, and syngamy.

**Isogamy:** (Gk. iso, equal) A type of sexual reproduction in which the gametes (or gametangia) are alike in size - found in some algae and fungi; see also heterogamy and oogamy.

**Karyogamy:** (Gk. karyon, kernel) The union of two nuclei following plasmogamy; (D: Keimsporangium); see also gamatangiogamy-, somato-, plasmo-, and syngamy.

**Oogamy:** (Gk. oo, egg) Sexual reproduction in which one of the gametes (the egg) is large and nonmotile, and the other gamete (the sperm) is smaller and motile; see also iso- heterogamy.

**Plasmogamy:** (Gk. plasma, to form, to mold) Union of the protoplasts of gametes that is not accompanied by union of their nuclei (karyogamy); see also karyo-, gamatangiogamy-, somato-, and syngamy.

**Somatogamy:** (Gk. soma, body) Copulation of two cells from different thalli; in basidiomycetes when two different mating types (+/-) fuse, giving rise to a dikaryotic cell.

**Syngamy:** (Gk. syn. Together with) The fusion of two gametic nuclei to form a diploid zygote; see also gamatangiogamy-, karyo-, somato-, and plasmogamy.

**Syphogamy:** Fertilization of the egg (spermatophytes) by pollination tube.

**Homology:** (Gk. homologia, agreement) A condition indicative of the same phylogenetic, or evolutionary, origin, but not necessarily the same in present structure and or function.

**Analogy:**

**-karyon:** (Gk. karyon, kernel, nut)

**Dikaryota:** (Gk. di, two) In fungi, mycelium with paired nuclei, each usually derived from a different parent; the state between plasmogamy and karyogamy; compare monokaryota.

**Eukaryota:** (Gk. eu, good) A cell that has a membrane-bound nucleus, membrane-bound organelles, and chromosomes in which the DNA is associated with proteins, an organism composed of such cells. Plants, animals, fungi, and protista are the four domains of eukaryota.

**Monokaryota:** (Gk. monos, single) In fungi, having a single haploid nucleus within one cell compartment; preceding plasmogamy; compare dikaryota.

**Prokaryota:** (Gk, pro, before) A cell lacking a membrane-bound nucleus and membrane-bound organelles; a bacterium.

**-kontic:** Referring to flagella type and shape.

**Heterokont:** Having flagella of unequal length or different type.

**Isokont:** Having flagella of equal length or same type.

**Limnobiologic:** Living in freshwater.

**Littoral:** (1) the area between high and low tide marks; (2) the shallower water of lakes where light reaches the bottom and where rooted plants may grow.

**Neuston:** Minute organisms, such as mosquito larvae, or *Chromulina sp.* (Chrysophyceae), that float or swim on the surface of water.

**-oecium:** (Gk. oikos, house) The reproductive organs within the flower; see flower -parts.

**Androeceum:** (Gk. Andros, male) The stamens, which bear the filament and the anther (pollen).

**Gynoecium:** (Gk. gyne, woman) The aggregate of carpels in the flower of a seed plant.

**-ogonium:** (Gk. angeion, vessel)

**Carpogonium:** (Gk.karpos, fruit) The female sex organ in red algae (n); a carpospore containing cell.

**Oogonium:** In fungi and certain algae, a female sex organ in which large female nonmotile gametes are formed.

**Spermatogonium:** A sperm father-cell; a primordial male germ cell.

**Parasite:** An organism that lives on (ectoparasite) or in (endoparasite) of a different species and derives nutrients from it; the association is beneficial to the parasite and harmful (not deadly) to the host.

**Pelagic:** Living in the middle depths and surface water of the sea.

**-phyll:** (Gk. phyllon, leaf) Referring to the shape and size of leaves.

**Anisophylly:** (Gk. aniso, unequal) Leaves of different size found on the same shoot or node.

**Heterophylly:** (Gk. heteros, other) Leaves of different shape found on the same shoot.

**Sporophyll:** A modified leaf or leaflike organ that bears sporangia; applied to the stamens and carpels of angiosperms, fertile fronds of ferns, and other similar structures, see also strobilus.

**Trophophyll:** (Gk. trophos, feeder + phyllon, leaf) The vegetative, infertile part of the sporophytic generation (in Ferns, and higher plants).

**-phyte:** (Gk. phyton, plant)

**Gametophyte:** (Gk. gamein, to marry) In plants, which have an alternation of generation, the haploid (n), gamete-producing phase.

**Sporophyte:** The spore-producing, diploid (2n) phase in a life cycle characterized by alternation of generations.

- **Carposporophyte:** The diploid part, still residing on the haploid carposporangial of rhodophytes, formed after fusion of the carpogon with the nucleus of a spermatia, giving rise to the tetrasporophyte.
- **Tetrasporophyte:** (Gk. tetra, four + spora, seed) In certain red algae, a diploid individual that produces tetrasporangia, releasing the haploid tetraspores.

Other organisms:

**Epiphyte:** An organism that grows upon another organism for support but is not parasitic on it.

**Saprophyte:** An organism that grows upon dead organic matter; i.e.: carcasses of insects.

**Phylogeny:** (Gk. phylon, race, tribe) Evolutionary relationships among organisms; the developmental history of a group of organisms.

**Phylloid:** blattartig verbreiteter Blattstiel (frond).

**Plasmodesma:** (Gk. plasma, form + desma bond) The minute cytoplasmic threads that extend through openings in cell walls and connect the protoplasts of adjacent living cells.

**Plastid:** Organelle in the cells of certain groups of eukaryota that is the site of such activities as food manufacture and storage; plastids are bounded by two membranes.

**Saprobe:** (Gk. sapos, rotten + bios, life) An organism that secures its food directly from nonliving organic matter.

**Sporangium** (pl. Sporangia, Gk. spora, seed, + angeion, vessel) a hollow unicellular or multicellular structure in which spores are produced.

**Eusporangium:** A sporangium that arises from several initial cells and before maturation, forms a wall of more than one layer of cells; see also leptosporangium (in Pterophyta, ferns).

**Leptosporangium:** A sporangium that arises from a single initial cell and whose wall is composed of a single layer of cells forming the anulus; see also eusporangium (in Pterophyta).

**Megasporangium:** A sporangium in which megaspores are produced.

**Microsporangium:** A sporangium in which microspores are produced.

**Tetrasporangium:** (Gk. tetra, four + spora, seed) In certain red algae, a sporangium in which meiosis occurs, resulting in the production of tetraspores.

**Zoosporangium:** A sporangium bearing zoospores.

- Spore:** (Gk. spora, seed) The product of meiosis i.e. the reproductive, asexual cell, usually unicellular, and equipped with starchy reserve products, capable of developing into an adult without fusion with another cell.
- Aeciospore:** (Gk. aita, injury) A dikaryotic spore of rust fungi; produced and released from a aecium (conidia).
- Androspore:** (Gk. andros, man) A prefix meaning " male", ....
- Aplanospore:** (in Zygomycetes)
- Carpospore:** In red algae, the single diploid spore found within a carposporangium.
- Heterosporous:** Two kinds of spores, designated as micro- and macro-/ megaspores in ferns; compare isosporous.
- Isosporous:** (Gk. iso, equal, + spora, seed) The spore giving rise to either female or male gametophytes look alike - found in many lower and higher plants till to ferns (Elater); see also heterosporous.
- Megaspore:** In heterosporous plants, a haploid (n) spore that develops into a female gametophyte which gives rise to archegonia in which eggs are formed; in most groups, megaspores are larger than microspores.
- Microspore:** In heterosporous plants, a spore that develops into a male gametophyte which gives rise to antheridia in which sperms are formed.
- Oospore:** The thick-walled zygote characteristic of oomycetes.
- Pycnospore:** In certain fungi; a kind of spore produced by a fruiting body called a pycnidium.
- Tetraspore:** (Gk. tetra, four) In certain red algae, the four spores formed by meiotic division in the tetrasporangium of a mother cell.
- Teuletospore:** (also teliospore) A thick-walled spore formed in the fungal order Uredinales , and commonly termed a resting spore or winter spore, which forms a spore-bearing structure called a phragma-basidium; releasing monokaryotic basidiospores (also known as pycnospores).
- Uredinospore:** In rust fungi, a reddish, binuclear, dikaryotic spore produced in summer.
- Zoospore:** A motile spore, found among algae, oomycetes, and chytrids.
- Zygospor:** A thick-walled, resistant spore that develops from a zygote, resulting from fusion of isogametes.
- trophy:** (Gk. trophos, feeder) Referring to the main principle of obtaining food.
- Autotroph:** (Gk. autos, self, same) An organism that is able to synthesize the nutritive substances it requires from inorganic substances in its environment; see also heterotroph.
- Heterotroph:** (Gk. heteros, other) An organism that cannot manufacture organic compounds and so must feed on organic materials that have originated in other plants and animals; see also autotroph.
- Trichogyne:** (Gk, trichos, hair + gyne, female) In the red algae and certain ascomycetes and basidiomycetes, a receptive protuberance of the female gametangium for the conveyance of the spermatia.
- Zygote:** (Gk. zygos, paired together) The diploid (2n) cell resulting from the fusion of male and female gametes.
- Auxozygote:** (Gk. auxo, to grow + zygos, paired together) The result of fusion of two diatoms creating two larger offspring.

# Glossary - Botany *Algae*

## Algal Organization - D:

**Amoebide** Stufe: Vertreter amoebid beweglich, bilden Scheinfüßchen (pseudopods), mit denen sie feste Nahrungspartikel aufnehmen können.

**Monadale** Stufe: Vertreter einzellig und begeißelt. Wenn die Monaden bei der Zellteilung keine Geißeln mehr bilden und sich in Gallerten einhüllen, so nennt man diesen Zustand **Palmella** Stadium.

**Capsale** Stufe: Geißeln meist reduziert, höchstens die Keimzellen sind noch beweglich. Die Zellen bleiben wie beim Palmella-Stadium in Gallerten.

**Coccale** Stufe: Die vegetativen Zellen sind von einer festen Zellwand umgeben und unbegeißelt.

**Trichale** Stufe: Fäden aus einkernigen (monokaryotischen) Zellen, können sich verzweigen.

**Sifonogladale** Stufe: Fäden aus vielkernigen (polykaryotischen) Zellen.

**Sifonale** Stufe: Deren Vertreter bestehen aus einer einzigen, riesigen Zelle mit vielen Kernen.

**Filz- und Flechtthallus:** Ähnelt echten Gewebe, besteht aber nur aus verfilztem und verflochtenen Fäden.

**Gewebethallus:** Diese Vertreter teilen sich die Zellen so, dass ein Gewebeverband entsteht.

**Algae:** Traditional term for a series of unrelated groups of photosynthetic eukaryotic organisms lacking multicellular sex organs (except for caryophyta; -phyta: Gk, phyton, plant); the haploid phase generally dominates the life cycle, and reproduction involves swimming eggs and sperm.

**Chlorophyta:** (Gk, chloros, green) *Ulva*, *Chlamydomonas*; green algae; produce carotene, contain chlorophyll a and b, like the land plants which efficiently absorb sunlight in shallow water and in air; many have conspicuous haploid and diploid generations; may have been ancestors of land plants; in fresh water.

**Phaeophyta:** (Gk. phaeos, brown) Brown algae; giant kelps (>100m) and *Sargassum*; and have brown pigments which allow them to photosynthesize in deep water; the largest algae; have tubelike conducting cells, but no true vascular tissue, but many species have plant parts called fronds, stipes, and holdfasts; diploid generation dominant in many species; kelp harvested for chemicals and cattle feeding.

**Rhodophyta:** (Gk. rhodos, red) Red algae; fanlike or filamentous type; single celled, colonial, or multicellular; reproduction is asexual or sexual; haploid generation dominates; light absorbing red or purple pigments can function at great depths under water; used commercially for extracting thickening agents; life cycle similar to and probable predecessor from ascomycetes.

## Protist-like Algae:

**Chrysophyta:** Important fresh water and marine phytoplankton; since they contain chlorophyll *a* and *c* along with fucoxanthin they are very important contributors to photosynthetic productivity in the sea. Chrysophyceae and Bacillariophyceae (Diatoms) with unique double silica cell walls which do have flagellated stages (male gametes); Xanthophyceae, a third class, lacks fucoxanthin, and is therefore known as yellow-green algae.

**Euglenophyta:** Euglenoids as there are also known, are a small group of unicellular, mostly fresh water organisms. They contain chlorophyll a and b and store carbohydrates as paramylon. Euglenoids lack cell wall but have a flexible series of proteinaceous strips, which, together with the plasma membrane, make up the pellicle. The cells contain a contractile vacuole and bear flagella; reproduce asexually.

**Pyrrhophyta:** Dinoflagellates are the most prominent agents of this division; they are unicellular biflagellated (beating in two different planes resulting in a spin) cellulose armored cells give them a bizarre appearance. In their symbiotic form, then called zooxanthellae, dinos are major contributors to the productivity of coral reefs.

**Chromatic Adaptation:** Differences in amount or proportion of photosynthetic pigments in response to the amount and color of light. It can be (1) phenotypic as in many cyanophyceae or (2) constitutive as in the distribution of littoral algae (red lowest, green at the top, brown in-between) in rhodo-, phaeo-, and chlorophyta.

**Coenocytic:** (Gk. koinos, shared in common + kytos, a hollow vessel) A term used to describe an organism or part of an organism that is multinucleate, the nuclei not separated by walls or membranes; also siphonaceous, siphonous, or syncytial.

**Conceptacle:** That part of phaeophyta (*Fucus* sp.) in which the reproductive organs are located.

**Cormus:** D: in Wurzel, Sproßachse od. Stengel u. Blätter gegliederter Pflanzenkörper.

**Fertilization:** The fusion of two gamete nuclei to form a diploid zygote.

**Frond:** The leaf of a fern or alga; any large, divided leaf (phylloid).

**Gamete:** (Gk. Gamete, wife) A haploid reproductive cell; gametes fuse in pairs, forming zygotes, which are diploid.

**Gametangium** (Gk. gamein, to marry + tangere to touch) a cell or organ in which gametes are formed.

**-gamy:** (Gk. Gamos, marriage)

**Anisogamy:** (Gk. uniso, unequal) The condition of dissimilar motile gametes; see also isogamy, oogamy.

**Isogamy:** (Gk. iso, equal) A type of sexual reproduction in which the gametes (or gametangia) are alike in size - found in some algae and fungi; see also heterogamy and oogamy.

**Karyogamy:** (Gk. karyon, kernel) The union of two nuclei following plasmogamy; (D: Keimsporangium); see also gamatango-, somato-, plasmogamy, and syngamy.

**Oogamy:** (Gk. oo, egg) Sexual reproduction in which one of the gametes (the egg) is large and nonmotile, and the other gamete (the sperm) is smaller and motile; see also iso- heterogamy.

**Plasmogamy:** (Gk. plasma, to form, to mold) Union of the protoplasts of gametes that is not accompanied by union of their nuclei (karyogamy); see also karyo-, gamatango-, somato-, and syngamy.

**Syngamy:** (Gk. syn. Together with) The fusion of two gametic nuclei to form a diploid zygote; see also gamatango-, karyo-, somato-, and plasmogamy.

**Heterocyst:** (Gk. heteros, other + cystis, a bag) A transparent, thick-walled, nitrogen-fixing cell that forms in the filaments of certain cyanobacteria.

**Holdfast:** The basal part of a multicellular alga that attaches it to a solid object; may be unicellular or composed of a mass of tissue - see rhizoid.

**-kontic:** Referring to flagella type and shape.

**Heterokont:** Having flagella of unequal length or different type.

**Isokont:** Having flagella of equal length or same type.

**Littoral:** (1) the area between high and low tide marks; (2) the shallower water of lakes where light reaches the bottom and where rooted plants may grow.

**-morphic:** (Gk. morphe, form) A specific form or shape of an organism, singled out for attention.

**Anisomorphic:**

**Heteromorphic:** (Gk. heteros, other) A term used to describe a life history in which the haploid and diploid generations are dissimilar in form (first appearance in ferns).

**Isomorphic:** (Gk. isos, equal) A term used to describe a life history in which the haploid and diploid generations are similar in form; see also heteromorphic.

**Neuston:** Minute organisms, such as mosquito larvae, or *Chromulina sp.* (Chrysophyceae), that float or swim on the surface of water.

**-ogonium:** (Gk. angeion, vessel)

**Carpogonium:** (Gk. karpos, fruit) The female sex organ in red algae (n); a carpospore containing cell.

**Oogonium:** In fungi and certain algae, a female sex organ in which large female nonmotile gametes are formed.

**Spermatogonium:** A sperm father-cell; a primordial male germ cell.

**Paraphysis:** (Gk. para, beside + physis, growth) As in certain fungi and brown algae, a sterile (monokaryotic) filament growing among the reproductive cells in the fruiting body.

**Pelagic:** Living in the middle depths and surface water of the sea.

**-phyte:** (Gk. phytos, plant)

**Gametophyte:** (Gk. gamein, to marry) In plants, which have an alternation of generation, the haploid (n), gamete-producing phase.

**Sporophyte:** The spore-producing, diploid (2n) phase in a life cycle characterized by alternation of generations.

- **Carposporophyte:** The diploid part, still residing on the haploid carposporangial of rhodophytes, formed after fusion of the carpogon with the nucleus of a spermatia, giving rise to the tetrasporophyte.

- **Tetrasporophyte:** (Gk. tetra, four + spora, seed) In certain red algae, a diploid individual that produces tetrasporangia, releasing the haploid tetraspores.

**Phylloid:** blattartig verbreiteter Blattstiel (frond).

**Raphe:** (Gk. raphe, seam) A groove on the shell, or frustule, of diatoms.

**Rhizoid:** (Gk. rhiza, root) Branched rootlike extensions of fungi (that absorb water, food and nutrients) and algae (to fasten the structure onto a substrate - not used for food-gathering purposes) - see also holdfast.

**Septum:** (L. septum, fence) Divided by cross walls into cells or compartments.

**Spermatangium:** (Gk. sperma, sperm + tangere, to touch) In red algae, the structure that produces spermatia.

**Spermatium:** (Gk. sperma, sperm) In red algae, a minute, nonmotile male gamete.

**Sporangium** (pl. Sporangia, Gk. spora, seed, + angeion, vessel) a hollow unicellular or multicellular structure in which spores are produced.

**Tetrasporangium:** (Gk. tetra, four + spora, seed) In certain red algae, a sporangium in which meiosis occurs, resulting in the production of tetraspores.

**Zoosporangium:** A sporangium bearing zoospores.

**Spore:** (Gk. spora, seed) The product of meiosis i.e. the reproductive, asexual cell, usually unicellular, and equipped with starchy reserve products, capable of developing into an adult without fusion with another cell.

**Carpospore:** In red algae, the single diploid spore found within a carposporangium.

**Tetraspore:** (Gk. tetra, four) In certain red algae, the four spores formed by meiotic division in the tetrasporangium of a mother cell.

**Zoospore:** A motile spore, found among algae, oomycetes and chytrids.

**Stigma:** A light sensitive eye-spot, found in some kinds of algae.

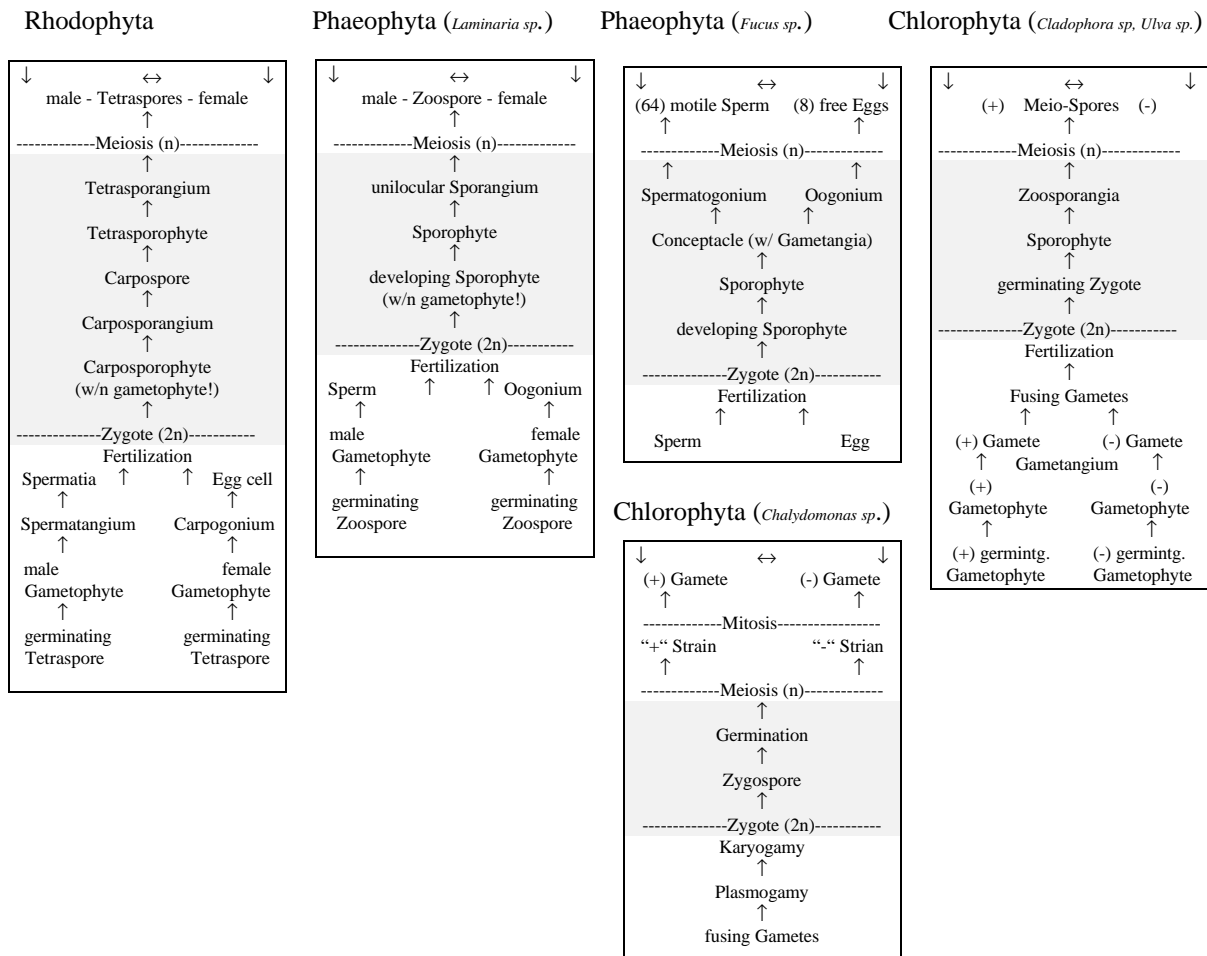
**Thallus :** (Gk, thallos, sprout) A type of body that is undifferentiated into root-like, stem-like, or leaf-like; the word thallus is used to distinguish their simple construction, and that of certain gametophytes, from differentiated bodies of plant sporophytes and the elaborate gametophytes of the bryophytes - see stipe.

**Trichogyne:** (Gk, trichos, hair + gyne, female) In the red algae and certain ascomycetes and basidiomycetes, a receptive protuberance of the female gametangium for the conveyance of the spermatia.

**Zygote:** (Gk. zygotos, paired together) The diploid (2n) cell resulting from the fusion of male and female gametes.

**Auxozygote:** (Gk. auxo, to grow + zygotos, paired together) The result of fusion of two diatoms creating two larger offspring.

### Life Cycles:



# Glossary - Botany *Fungi*

**Aecium:** (Gk. aita, injury) In rust fungi, a cuplike structure in which aeciospores are produced.

**Annulus:** (L. anus, ring) In ferns, a row of specialized cells in a sporangium; in gill fungi, the remnant of the inner veil forming a ring on the stalk, aiding spore dispersal.

**Appressoria:** Hyphae lying along the surface of the photosynthetic cells, penetrating them by means of specialized pegs - in lichens; see also haustoria.

**Ascomycota:** (Gk. askos, bladder) Monokaryotic hyphae merge (plasmogamy) which gives rise to the fruiting body (cup-shaped ascocarp) only once; there karyogamy occurs, producing usually 8 spores per ascus; thought to be a derivative of red algae - see also fungi.

**Ascus:** A specialized cell, characteristic of the ascomycetes lined with specialized cells called asci, in which two haploid nuclei fuse to produce a zygote that immediately divides by one mitotic and a meiotic cycle; at maturity, an ascus contains ascospores. Ascomata may be open or closed.

**Ascogonium:** The oogonium or female gametangium of the ascomycetes.

**Ascogenous Hyphae:** (Gk. askos, bladder + genous, producing) Hyphae containing paired haploid male and female nuclei; they develop from an ascogonium and eventually give rise to asci.

**Ascospore:** Spore produced within and borne from an ascus following nuclear fusion and meiosis.

**Basidiomycota:** (Gk. , ) Common field mushroom; produce spores in club-shaped basidia; the dikaryotic mycelium repeatedly gives rise to the fruiting body (basidioma) which is the familiar mushroom or toadstool which can be extremely poisonous. Basidium houses usually 4 basidiospores; see also fungi.

**Basidioma:** A multicellular structure, characteristic of the basidiomycetes, within basidia are formed.

**Basidiospore:** A spore of the basidiomycetes, produced within and borne on a basidium following nuclear fusion and meiosis.

**Basidium:** A specialized reproductive cell on the basidiomycetes, often club-shaped, in which nuclear fusion and meiosis occur, giving rise to 4 basidiospores.

**Capillitium:** A 3-dimensional network of filaments or hyphae threading through spores of the fruiting body of certain slime-molds belonging to the fungal class of Myxomycota (made of the remaining plasma).

**Coenocytic:** (Gk. koinos, shared in common + kytos, a hollow vessel) A term used to describe an organism or part of an organism that is multinucleate, the nuclei not separated by walls or membranes; also siphonaceous, siphonous, or syncytial.

**Conidium:** (Gk. konis, dust) An asexual fungal spore not contained within sporangium; it may be produced singly or in chains; most conidia are multinucleate; can be anamorphic (during asexual phase) or telomorphic (during sexual cycle) both of deuteromycota; (D: Nebenfruchtform - exospore).

**Dolipore:** Characteristic in hyphae of basidiomycetes; a parenthosome popped over the perforated septum of the cell neighboring another, facilitating the transport of nuclei derived from opposite mating types after plasmogamy; especially developed in parasitic basidiomycetes.

**Fertilization:** The fusion of two gamete nuclei to form a diploid zygote.

**Fungus: (-mycota:** Gk, mycos, fungus) The kingdom comprising multicellular heterotrophs such as mushrooms or molds; chitin is predominant in the cell walls; secrete digestive enzymes that decompose other biological tissues which they absorb.

**Ascomycota:** (Gk. askos, bladder) Terrestrial and aquatic fungus with perforated septa; bread mold, brewer's yeast (economically important) etc.; once the monokaryotic hyphae merge, the fruiting body will develop only once (cup-shaped ascocarp) which produces spores (usually 8) in ascus (complete septa cut off the reproductive body), or sac; powdery mildews harm fruit trees and grain crops - see ascomycota.

**Basidiomycota:** (Gk. , ) Terrestrial fungus; common field mushroom, giant puffballs, bracket fungi, toadstools, smuts; produce spores in club-shaped basidia; the dikaryotic mycelium (septate hyphae with dolipores) gives repeatedly rise to the fruiting body (basidioma) which is the familiar mushroom or toadstool which can be extremely poisonous. One basidium houses usually 4 basidiospores - see basidiomycota.

**Deuteromycota:** (Gk. deuterios, real) Like species that produce penicillin; Lack sexual reproduction and, instead produce asexual spores; various species are used in making drugs, cheeses, and soy sauce.

**Zygomycota:** (Gk. zygo, pair) Terrestrial fungus; common black bread mold; hyphae septate only during formation or reproductive bodies, chitin predominant in the cell walls. Produce diploid spores and a cottony mat of hyphae on breads, grains, or other foods and organic materials.



**-gamy:** (Gk. Gamos, marriage)

**Anisogamy:** (Gk. uniso, unequal) The condition of dissimilar motile gametes; see also isogamy, oogamy.

**Heterogamy:** (Gk. heteros, other + gamos, union or reproduction) Reproduction involving two types of gametes different in size and form.

**Gametangiogamy:** (Gk. gamein, to marry, + tangere to touch) Two gametangia, a male and female or of +/- mating type merge and form a diploid zygote (in zygomycetes); see also karyo-, plasmo-, somato-, and syngamy.

**Isogamy:** (Gk. iso, equal) A type of sexual reproduction in which the gametes (or gametangia) are alike in size - found in some algae and fungi; see also heterogamy and oogamy.

**Karyogamy:** (Gk. karyon, kernel) The union of two nuclei following plasmogamy; see also gametangiogamy-, somato-, plasmo-, and syngamy.

**Plasmogamy:** (Gk. plasma, to form, to mold) Union of the protoplasts of gametes that is not accompanied by union of their nuclei (karyogamy); see also karyo-, gametangiogamy-, somato-, and syngamy.

**Somatogamy:** (Gk. soma, body) Copulation of two cells from different thalli; in basidiomycetes when two different mating types (+/-) fuse, giving rise to a dikaryotic cell.

**Syngamy:** (Gk. syn. Together with) The fusion of two gametic nuclei to form a diploid zygote; see also gametangiogamy-, karyo-, somato-, and plasmogamy.

**Haustorium:** ((L. haustus, from haurire, to drink, draw) Very common in lichens, fungal hyphae penetrates the photosynthetic cells by means of specialized pegs; in oomycetes during sexual reproduction and parasitic protist-like fungi in higher plants; see also appressoria.

**Hymenium:** (Gk. hymen, a membrane) The layer of asci on an ascoma, or of basidia on basidioma, together with any associated sterile hyphae within the fungal body; see also isogamy and oogamy.

**Hyphae:** (Gk. hyphae, web) A single nonreproductive, tubular filament in fungi.

**Isidia:** - see lichen.

**-karyon:** (Gk. karyon, kernel, nut)

**Dikaryota:** (Gk. di, two) In fungi, mycelium with paired nuclei, each usually derived from a different parent; the state between plasmogamy and karyogamy; compare monokaryota.

**Monokaryota:** (Gk. monos, single) In fungi, having a single haploid nucleus within one cell compartment; preceding plasmogamy; compare dikaryota.

**Lichen:** An association between a fungus (commonly ascomycetes) and an alga (usually cyanophyta), which live symbiotically together - see also merous.

**Isidium:** Fragmental outgrowth of lichens, which break off; used as one type of asexual reproduction.

**Soredium:** (Gk. soros, heap) Specialized reproductive powder, consisting of a few cyanobacterial or green algal cells surrounded by fungal hyphae used for asexual reproduction of a lichen.

**-merous:** (Gk. meros, structure) Referring to the dispersal of alga within lichens.

**Heteromerous:** (Gk. heteros, different) Lichens in which there is a clear separation between the algal and fungal layer.

**Homoiomerous:** (Gk. homos, same) Lichens that have evenly distributed algal and fungal cells.

**Mycelium:** (Gk. mycos, fungus) The mass of hyphae forming the body of a fungus, oomycete, or chytrid.

**Mycorrhizae:** A symbiotic association between certain fungi and plant roots; characteristic of most vascular plants.

**Mycota:** (Gk. mycos, fungus) - protist-like fungi.

**Oomycota:** Unicellular to highly branched coenocytic filaments. Zoospores have two flagella (insel and whiplash). Cell-walls largely made of cellulose or similar polymers. Sexual reproduction involves a large, immobile egg and small, motile male nuclei.

**Chytridiomycota:** (Chytrids) Unicellular or coenocytic organisms that are aquatic containing chitin as a cell wall material. The motile spores and gametes have a single posterior whiplash flagellum (ancestor of fungi).

**Acrasiomycota:** Cellular slime molds; amoeba-like organisms that aggregate together at one stage of their life cycle to form pseudoplasmodia, (slugs) which undergo complex patterns of differentiation. Flagellated cells are not known.

**Myxomycota:** Plasmodial slime molds; exist as streaming, multinucleate masses of protoplasm called plasmodia, which are usually diploid. Plasmodia ultimately form sporangia in which diploid spores are formed. Meiosis within each of the spores, while three of the resulting nuclei disintegrate, leaving one haploid nucleus in each spore. Under favorable conditions, the spores split open, producing amoebas, which may become flagellated (gamete-like status); plasmodium formation often follows after fusion of gametes.

**-ogonium:** (Gk. angeion, vessel)

**Oogonium:** In fungi and certain algae, a female sex organ in which large female nonmotile gametes are formed.

**Spermatogonium:** A sperm father-cell; a primordial male germ cell.

**Paraphysis:** (Gk. para, beside + physis, growth) As in certain fungi and brown algae, a sterile (monokaryotic) filament growing among the reproductive cells in the fruiting body.

**Peridium:** The double-layered outer wall surrounding the spore bearing organs of certain fungi.

**Picnidium:** In certain fungi; the fruiting body in which pycnospores are produced.

**-phyte:** (Gk. phytos, plant)

**Gametophyte:** (Gk. gamein, to marry) In plants, which have an alternation of generation, the haploid (n), gamete-producing phase.

**Sporophyte:** The spore-producing, diploid (2n) phase in a life cycle characterized by alternation of generations.

**Plasmodium:** (Gk. plasma, to form, to mold) Stage in life cycle of myxomycetes ( plasmodial slime molds), a multinucleate mass of protoplasm surrounded by a membrane.

**Pseudoplasmodium:** A multicellular mass of individual amoeboid cells, representing the aggregate phase in the cellular slime molds.

**Pycnidium:** In certain fungi; a hollow fruiting body that produces pycnidiospores.

**Rhizoid:** (Gk. rhiza, root) Branched rootlike extensions of fungi (that absorb water, food and nutrients) and algae (to fasten the structure onto a substrate - not used for food-gathering purposes) - see also holdfast.

**Saprobe:** (Gk. sapos, rotten + bios, life) An organism that secures its food directly from nonliving organic matter.

**Sclerotium:** In fungi, a hardened structure that develops as a defense against unfavorable environmental conditions, such as lack of moisture or nourishment; the plasmodium becomes a hard mass that may stay dormant until favorable conditions return (in myxomycetes and parasitic ascomycetes).

**Septum:** (L. septum, fence) Divided by cross walls into cells or compartments.

**Soredia:** see lichen.

**Spore:** (Gk. spora, seed) The product of meiosis i.e. the reproductive, asexual cell, usually unicellular, and equipped with starchy reserve products, capable of developing into an adult without fusion with another cell.

**Aeciospore:** (Gk. aita, injury) A bi-nucleate (dikaryotic) spore of rust fungi; produced and released from a aecium (conidia).

**Aplanospore:** (in Zygomycetes)

**Ascospore:** Spore produced within and borne from an ascus following nuclear fusion and meiosis.

**Basidiospore:** A spore of the basidiomycetes, produced within and borne on a basidium following nuclear fusion and meiosis.

**Oospore:** The thick-walled zygote characteristic of oomycetes.

**Pycnospore:** In certain fungi; a kind of spore produced by a fruiting body called a pycnidium.

**Teletospore:** (also teliospore) A thick-walled spore formed in the fungal order Uredinales, and commonly termed a resting spore or winter spore, which forms a spore-bearing structure called a phragma-basidium; releasing monokaryotic basidiospores (also known as pycnospores).

**Uredinospore:** In rust fungi, a reddish, binuclear, dikaryotic spore produced in summer.

**Zoospore:** A motile spore, found among algae, oomycetes, and chytrids.

**Zygosporangium:** A thick-walled, resistant spore that develops from a zygote, resulting from fusion of isogametes.

**Sterigma:** (Gk. sterigma, a prop) A small, slender protuberance of a basidium, bearing the basidiospore.

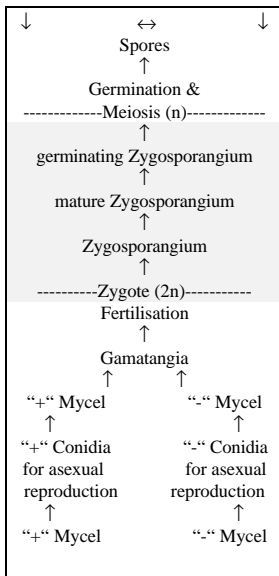
**Stolon:** (L. stolo, shoot) A stem that grows horizontally along the ground surface and may form adventitious roots.

**-trophy:** (Gk. trophos, feeder) Referring to the main principle of obtaining food.

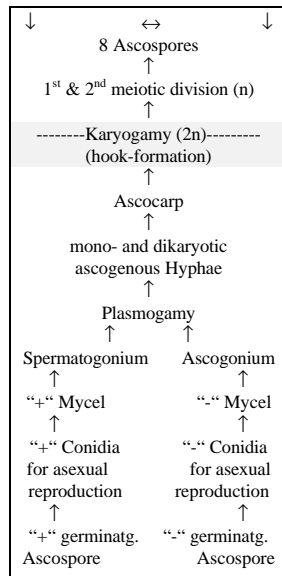
**Trichogyne:** (Gk, trichos, hair + gyne, female) In the red algae and certain ascomycetes and basidiomycetes, a receptive protuberance of the female gametangium for the conveyance of the spermatia.

## Life Cycle:

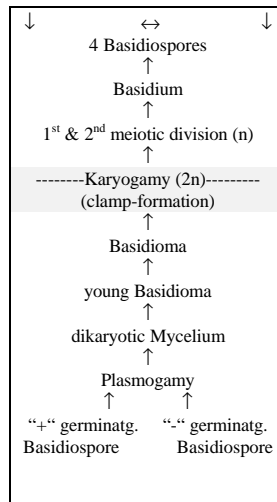
## Zygomycetes



## Ascomycetes



## Basidiomycetes



# Glossary - Botany Mosses

**Antheridium:** The organ of male sex cell development, embedded in sterile tissue; in flowerless and seedless plants - compare archegonium.

**Apophyse:** The swollen region between the seta and the capsule in a moss sporophyte (bryophyta) functioning as an active photosynthetic region that helps to nourish the developing sporophyte.

**Archeogonium:** A multicellular organ in which a single egg is produced; in bryophytes and some vascular plants - compare antheridium.

**Calyptra:** (Gk. kalyptra, covering for the head) The hood or cap that partially or entirely covers the capsule of some species of mosses: it is formed from the expanded archegonial wall.

**Colonella:** Mass of spores in the capsule of hornworts (Bryophyta).

**Cormus:** D: in Wurzel, Sproßachse od. Stengel u. Blätter gegliederter Pflanzenkörper.

**Egg:** A nonmotile female gamete, usually larger than a male gamete of the same species.

**Elater:** (Gk. elater, driver) (1) an elongated, spindle-shaped, sterile cell in the sporangium of liverwort sporophyte (Hepatophyta) which aids in spore dispersal.

**Embryo:** (Gk. en, in; bryein, to swell) A young sporophytic plant, before the start of a period of rapid growth (germination in seed plants - spermatophytes). The embryo is made up of the seed coat, and stored food.

**Eustele:** (Gk. eu, good + stele, pillar) A stele in which the primary vascular tissues are arranged in discrete strands around a pith; already in some ferns, typical of gymnosperms and angiosperms.

**Fertilization:** The fusion of two gamete nuclei to form a diploid zygote.

**Haustorium:** ((L. haustus, from haurire, to drink, draw) Very common in lichens, fungal hyphae penetrates the photosynthetic cells by means of specialized pegs; in oomycetes during sexual reproduction and parasitic protista-like fungi in higher plants; see also appressoria.

**Holdfast:** The basal part of a multicellular alga that attaches it to a solid object; may be unicellular or composed of a mass of tissue - see rhizoid.

**-kotic:** Referring to flagella type and shape.

**Heterokont:** Having flagella of unequal length or different type.

**Isokont:** Having flagella of equal length or same type.

**Moss:** Simple land plants, which lack a vascular system or true leaves, stems, or roots. Alternation of heteromorphic generations, with the gametophytic generation (n) being dominant over the sporophytic generation (2n). Antheridia release swimming sperm (reach the archegonia chemotactically), hence rely on open water for reproduction. The zygote will develop into the sporophyte, which is fed by the gametophyte; the haploid spores released from the sporophyte develop into the branched protonema from which buds will form the leafy gametophyte and rhizoids.

**Anthoceroophyta:** Hornworts have thallose gametophytes; the sporophyte grows from a basal intercalary meristem for as long as conditions are favorable. stomata are present on the sporophyte.

**Bryophyta:** Real mosses which have leafy gametophytes; the sporophytes have complex patterns of dehiscence. Specialized conducting tissue is often present in both gameto- and sporophytes; rhizoids are multicellular; stomata are present on the sporophyte.

**Hepatophyta:** Liverworts have multicellular gametangia with a sterile jacket layer; the sperm are biflagellated; photosynthesis is carried out in the gametophyte upon which the sporophyte is dependent. Liverworts lack specialized conducting tissue, a cuticle, and stomata; they are the simplest of all living plants; gametophytes are thallose or leafy, and the rhizoids are single-celled.

**Peristome:** (Gk. peri, around + stoma, mouth) In mosses, a fringe of teeth around the opening of the sporangium, facilitating spore dispersal.

**-phyte:** (Gk. phyton, plant)

**Gametophyte:** (Gk. gamein, to marry) In plants, which have an alternation of generation, the haploid (n), gamete-producing phase.

**Sporophyte:** The spore-producing, diploid (2n) phase in a life cycle characterized by alternation of generations.

**Phylloid:** blattartig verbreiteter Blattstiel (frond).

**Protonema:** (Gk. proto, first + nema, thread) The first stage in development of the gametophyte of mosses and certain liverworts; protonema may be filamentous or platelike; the dominant stage preceding the sporophyte.



# Glossary - Botany *Ferns*

**Annulus:** (L. anus, ring) In ferns, a row of specialized cells in a sporangium; in gill fungi, the remnant of the inner veil forming a ring on the stalk, aiding spore dispersal.

**Antheridium:** The organ of male sex cell development, embedded in sterile tissue; in flowerless and seedless plants - compare archegonium.

**Archeogonium:** A multicellular organ in which a single egg is produced; in bryophytes and some vascular plants - compare antheridium.

**Egg:** A nonmotile female gamete, usually larger than a male gamete of the same species.

**Embryo:** (Gk. en, in; bryein, to swell) A young sporophytic plant, before the start of a period of rapid growth (germination in seed plants - spermatophytes). The embryo is made up of the seed coat, and stored food.

**Elater :** (Gk. elater, driver) Clubbed, hygroscopic bands attached to the spores of the horsetail (*Equisetum* / Sphenophyta).

**Eustele:** (Gk. eu, good + stele, pillar) A stele in which the primary vascular tissues are arranged in discrete strands around a pith; already in some ferns, typical of gymnosperms and angiosperms.

**Ferns** (simple vascular plants) Alternation of heretomorphic generations, in which the sporophyte is dominant; sperm is motile in all classes.

- **Heterosporous:** Two kinds of sporangia (micro- and megasporangia) are borne together in the same strobilus on the sporophyte. Microspores produced in the microsporangia develop into microgametophytes, - megaspores from megasporangia into megagametophytes. Each sporangium is subtended by scalelike appendages called ligule. Micro- and megaspores are shed near one another. Development of the gametophyte begins within the sporewalls. After fertilization, the embryo (enclosed by the tissues of the megagametophyte and nourished by the material stored in the megaspore) grows into the young sporophyte. There is no dormant period in the development of the embryo and no integuments to give rise to a seed coat.
- **Homosporous:** After meiosis the gametophytic generation is initiated; the spores give rise to bisexual gametophytes bearing both archegonia and antheridia; multiflagellated sperms require water to swim to the egg. With fertilization, a zygote is formed initiating the sporophytic generation. Development of the embryo occurs within the venter of the archegonium, with the young sporophyte (embryo), obtaining nourishment from the gametophyte via the sporophyte foot, which anchors the sporophyte to the gametophyte. Eventually, the sporophyte becomes detached from its foot and assumes an independent existence.

**Lycophyte** (Lycophyta): Homo- and heterosporous vascular plants characterized by the presence of microphylls housing the spores; young gametophyte bears both antheridia and archegonia (in Lycopodiaceae = homosporous) or separate (in Selaginellaceae = heterosporous).

**Psilopsids** (Psilophyta): Homosporous vascular plants, with extremely simple sporophytes (no differentiation into root and shoot) which develops right away from the rhizome; young gametophyte contains both antheridia and archegonia.

**Horsetails** (Sphenophyta): Vascular plants of a single genus *Equisetum* only; with jointed stems marked by conspicuous nodes and elevated siliceous ribs; leaves are saclike; plant is differentiated into a fertile (non-photosynthetic) and a vegetative (photosynthetic) shoot. Sporangia are borne in a strobilus at the apex of the stem; spore dispersal is facilitated by elaters.

**Fern** (Pterophyta): Mostly homosporous; all possess a megaphyll; spores are released from sori with the help of anuli. The gametophyte is more or less free-living and usually photosynthetic (prothallus); have multicellular gametangia and free-swimming sperm.

**Fertilization:** The fusion of two gamete nuclei to form a diploid zygote.

**Frond:** The leaf of a fern or alga; any large, divided leaf (phylloid).

**-gamy:** (Gk. Gamos, marriage)

**Anisogamy:** (Gk. aniso, unequal) The condition of dissimilar motile gametes.

**Isogamy:** (Gk. iso, equal) A type of sexual reproduction in which the gametes (or gametangia) are alike in size - found in some algae and fungi.

**Oogamy:** (Gk. oo, egg) Sexual reproduction in which one of the gametes (the egg) is large and nonmotile, and the other gamete (the sperm) is smaller and motile.

**Haptere:** Wounded elater around spores of Equisetum (Sphenophyta).

**Indusium:** covering of a body part or organ (technical name of skin).

**-kontic:** Referring to flagella type and shape.

**Heterokont:** Having flagella of unequal length or different type.

**Isokont:** Having flagella of equal length or same type.

**Ligule:** (L. ligula, small tongue) A minute outgrowth or appendage at the base of the leaf of grasses and lycophytes.

**-morphic:** (Gk. morphe, form) A specific form or shape of an organism, singled out for attention.

**Anisomorphic:**

**Heteromorphic:** (Gk. heteros, other) A term used to describe a life history in which the haploid and diploid generations are dissimilar in form (first appearance in ferns).

**Isomorphic:** (Gk. isos, equal) A term used to describe a life history in which the haploid and diploid generations are similar in form; see also heteromorphic.

**-phyte:** (Gk. phyton, plant)

**Gametophyte:** (Gk. gamein, to marry) In plants, which have an alternation of generation, the haploid (n), gamete-producing phase.

**Sporophyte:** The spore-producing, diploid (2n) phase in a life cycle characterized by alternation of generations.

**Prothallus:** In homosporous vascular plants, such as ferns, the more or less independent, photosynthetic gametophyte bearing both antheridia and archegonia; also called prothallium or recessive stage.

**Megaprothallium:** The prothallia (haploid gametophyte) nourishes the germinating cell (microspore) and the archegonia (megaspore), as well as the developing embryo after fertilization.

**Microprothallium:** Antheridial cell.

**Rhizome:** A more or less horizontal underground stem found in ferns.

**Sorus:** (Gk. soros, heap) A group or cluster of sporangia or spores (in ferns).

**Sporangium** (pl. Sporangia, Gk. spora, seed, + angeion, vessel) a hollow unicellular or multicellular structure in which spores are produced.

**Eusporangium:** A sporangium that arises from several initial cells and before maturation, forms a wall of more than one layer of cells; see also leptosporangium (in Pterophyta, ferns).

**Leptosporangium:** A sporangium that arises from a single initial cell and whose wall is composed of a single layer of cells forming the anulus; see also eusporangium (in Pterophyta).

**Megasporangium:** A sporangium in which megaspores are produced.

**Microsporangium:** A sporangium in which microspores are produced.

**Spore:** (Gk. spora, seed) The product of meiosis i.e. the reproductive, asexual cell, usually unicellular, and equipped with starchy reserve products, capable of developing into an adult without fusion with another cell.

**Heterosporous:** Two kinds of spores, designated as micro- and macro-/ megaspores in ferns; compare isosporous.

**Isosporous:** (Gk. iso, equal, + spora, seed) The spore giving rise to either female or male gametophytes look alike - found in many lower and higher plants till to ferns (Elater); see also heterosporous.

**Megaspore:** In heterosporous plants, a haploid (n) spore that develops into a female gametophyte which gives rise to archegonia in which eggs are formed; in most groups, megaspores are larger than microspores.

**Microspore:** In heterosporous plants, a spore that develops into a male gametophyte which gives rise to antheridia in which sperms are formed.

**Sporocyte:** A spore mother cell; A diploid (2n) cell that undergoes meiosis and produces (usually) 4 haploid cells (spores) or 4 haploid nuclei; in spermatophytes.

**Megasporocyte:** The megaspore mother cell; a diploid cell in which meiosis will occur, resulting in the production of 4 megaspores.

**Microsporocyte:** The microspore mother cell; a cell in which meiosis will occur, resulting in 4 microspores.

**Sporophyll:** A modified leaf or leaflike organ that bears sporangia; applied to fertile fronds of ferns, and other similar structures, see also strobilus.

**Stipe:** A supporting stalk, such as the stalk of a gill fungus or the leaf stalk of a fern (thallus).

**Strobilus:** (Gk. strobilus, a cone) A reproductive structure consisting of a number of modified layers (sporophylls) or ovule-bearing scales grouped terminally on a stem; a cone. Strobili occur in many kinds of gymnosperms, lycophytes, and sphenophytes.

**Suspensor:** A structure at the base of the embryo in many vascular plants. In some plants, it pushes the embryo into nutrient-rich tissue of the female gametophyte.

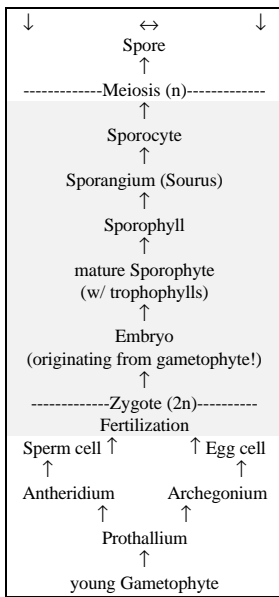
**S. Cells:** Greatly elongating cells forcing the developing embryo into the gametophyte.

**Tapetum:** (Gk. tapes, a carpet) Nutritive tissue in the sporangium.

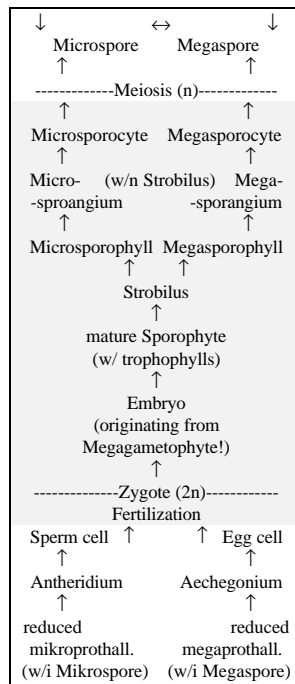
**Trophophyllic:** (Gk. trophos, feeder + phyllon, leaf) The vegetative, infertile part of the sporophytic generation (in Ferns, and higher plants).

Life Cycle:

Fern (isosporous *Dryopteris sp.*)



Fern (heterosporous *Selaginella sp.*)





# Glossary - Botany *Gymnosperm*

- Antheridium:** The organ of male sex cell development, embedded in sterile tissue; in flowerless and seedless plants - compare archegonium.
- Archeogonium:** A multicellular organ in which a single egg is produced; in bryophytes and some vascular plants - compare antheridium.
- Basidium:** A specialized reproductive cell on the basidiomycetes, often club-shaped, in which nuclear fusion and meiosis occur, giving rise to 4 basidiospores.
- Benthos:** Collectively, the sedentary animal and plant life living on the sea bottom.
- Calyptra:** (Gk. kalyptra, covering for the head) The hood or cap that partially or entirely covers the capsule of some species of mosses: it is formed from the expanded archegonial wall.
- Egg:** A nonmotile female gamete, usually larger than a male gamete of the same species.
- Embryo:** (Gk. en, in; bryein, to swell) A young sporophytic plant, before the start of a period of rapid growth (germination in seed plants - spermatophytes). The embryo is made up of the seed coat, and stored food.
- Endosperm:** (Gk, endon, within; sperma, seed) A tissue, containing stored food, that develops from the union of a male nucleus and the polar nuclei of the central cell; it is digested by the growing sporophyte either before or after the maturation of the seed.
- Primary ES.:** The haploid endosperm of prothallial gymnosperms nourishing the embryo.
- Eustele:** (Gk. eu, good + stele, pillar) A stele in which the primary vascular tissues are arranged in discrete strands around a pith; already in some ferns, typical of gymnosperms and angiosperms.
- Exine:** The outer wall layer of a spore or pollen grain.
- Fertilization:** The fusion of two gamete nuclei to form a diploid zygote.
- Gamete:** (Gk. Gamete, wife) A haploid reproductive cell; gametes fuse in pairs, forming zygotes, which are diploid.
- gamy:** (Gk. Gamos, marriage)
- Syphogamy:** Fertilization of the egg (spermatophyte) by pollination tube.
- Gymnosperms:** (Gk. gymnos, naked; sperma, seed) A seed plant with seeds not enclosed in an ovary. Gametophytes are much reduced and nutritionally dependent on the sporophyte; immature male gametophytes (consisting of 4 cells) are the pollen grains that are transferred bodily by the wind to the vicinity of the female megagametophyte within the ovule. The nonmotile sperm produced by the germinating pollen grains are conveyed to the egg of the archegonia via a pollen tube, hence no water required. The pollen adheres to a drop of sticky fluid about the micropyle; as the fluid evaporates, the pollen grain is drawn into the micropyle and comes in contact with the nucellus. The ovule, enclosing the megagametophyte matures after fertilization and becomes a seed. Suspensor cells disintegrate once the embryo is fully developed.
- Conifers** (Coniferophyta): Gymnosperms with active cambial growth and simple leaves; ovules and seeds exposed; sperm nonflagellated.
- Cycads** (Cycadophyta): Gymnosperm with sluggish cambial growth and pinnately compound, palmlike or fernlike leaves; ovules and seeds are exposed; sperm are flagellated and motile but are carried to the vicinity of the ovule in a pollen tube.
- Ginko** (Ginkophyta): Ovules and seeds exposed, seed coats are fleshy; sperm (lack pollination tube) swim to the vicinity of the ovule in a pollen tube offered by the female and are motile (flagellated).
- Integument:** The outermost layer or layers of tissue enveloping the nucellus of an ovule; develops into the seed coat (in spermatophyta).
- Intine:** The inner wall layer of a spore or pollen grain.
- kotic:** Referring to flagella type and shape.
- Heterokont:** Having flagella of unequal length or different type.
- Isokont:** Having flagella of equal length or same type.
- Microphyle:** A small opening in spermatophytes of the integument of an ovule through which the tube of a settling pollen grows.
- Nucellus:** (L. nucella, a small nut) Tissue composing the chief part of the young ovule, in which the embryo sac develops; equivalent to a megasporangium.
- Ovule:** (L. ovulum, a little egg) A structure in seed plants (spermatophytes) containing the female gametophyte with egg cell, all being surrounded by the nucellus and one or two integuments; when mature, an ovule becomes a seed.

**-phyte:** (Gk. phyton, plant)

**Gametophyte:** (Gk. gamein, to marry) In plants, which have an alternation of generation, the haploid (n), gamete-producing phase.

**Sporophyte:** The spore-producing, diploid (2n) phase in a life cycle characterized by alternation of generations.

**Pollen:** (L. fine dust) Collective term for pollen grains; microspores of seed producing plants; tiny multinucleated granules that contain mature or immature male gametophytes.

P. **Drop:** In gymnosperm the sticky fluid which makes sure that a pollen will not be removed again once attached.

P. **Grain:** A multinucleated (usually two) microspore containing a mature or immature (male) microgametophyte; in gymnosperms only one of the two sperm is functional; in angiosperm both are functional leading to double fertilization.

P. **Sac:** A cavity in the anther that contains the pollen grain.

P. **Tube:** A tube formed after germination of the pollen grain; carries the male gametophyte into the ovule.

**Pollination:** In gymnosperm, the transfer of pollen from a pollen-producing cone directly to an ovule via anemochory (pollination by wind) - compare fertilization.

**Prothallus:** In homosporous vascular plants, such as ferns, the more or less independent, photosynthetic gametophyte bearing both antheridia and archegonia; also called prothallium or recessive stage.

**Megaprothallium:** The prothallia (haploid gametophyte) nourishes the germinating cell (microspore) and the archegonia (megaspore), as well as the developing embryo after fertilization.

**Microprothallium:** Antheridial cell.

**Seed:** A structure formed by the maturation of the ovule of seed plants (spermatophytes) following fertilization.

S. **Coat:** The outer layer of the seed, developed from the integuments of the ovule.

**Sporangium** (pl. Sporangia, Gk. spora, seed, + angeion, vessel) a hollow unicellular or multicellular structure in which spores are produced.

**Megasporangium:** A sporangium in which megaspores are produced.

**Microsporangium:** A sporangium in which microspores are produced.

**Spore:** (Gk. spora, seed) The product of meiosis i.e. the reproductive, asexual cell, usually unicellular, and equipped with starchy reserve products, capable of developing into an adult without fusion with another cell.

**Megaspore:** In heterosporous plants, a haploid (n) spore that develops into a female gametophyte which gives rise to archegonia in which eggs are formed; in most groups, megaspores are larger than microspores.

**Microspore:** In heterosporous plants, a spore that develops into a male gametophyte which gives rise to antheridia in which sperms are formed.

**Sporocyte:** A spore mother cell; A diploid (2n) cell that undergoes meiosis and produces (usually) 4 haploid cells (spores) or 4 haploid nuclei; in spermatophytes.

**Megasporocyte:** The megaspore mother cell; a diploid cell in which meiosis will occur, resulting in the production of 4 megaspores.

**Microsporocyte:** The microspore mother cell; a cell in which meiosis will occur, resulting in 4 microspores.

**Sporophyll:** A modified leaf or leaflike organ that bears sporangia; applied to the stamens and carpels of angiosperms, fertile fronds of ferns, and other similar structures, see also strobilus.

**Strobilus:** (Gk. strobilus, a cone) A reproductive structure consisting of a number of modified layers (sporophylls) or ovule-bearing scales grouped terminally on a stem; a cone. Strobili occur in many kinds of gymnosperms, Lycophytes, and Spenophytes.

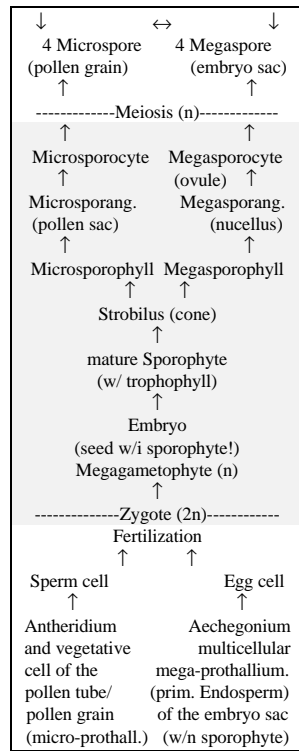
**Suspensor:** A structure at the base of the embryo in many vascular plants. In some plants, it pushes the embryo into nutrient-rich tissue of the female gametophyte.

S. **Cells:** Greatly elongating cells forcing the developing embryo into the gametophyte.

**Tapetum:** (Gk. tapes, a carpet) Nutritive tissue in the sporangium, particularly an anther; innermost layer of the pollen sac wall (in angiosperms).

**Trophophyllic:** (Gk. trophos, feeder + phyllon, leaf) The vegetative, infertile part of the sporophytic generation (in Ferns, and higher plants).

## Life Cycle:

Gymnosperm  
(*Pinus sp.*)

# Glossary - Botany *Angiosperm*

- Angiosperms:** The flowering plants (Antophyta); seed plants in which ovules are enclosed in a carpel and seeds are borne within fruits. Pollination in Angiosperms is done by wind (anemophyllic) or insects (zoochoric); gametophytic generation are much reduced (few cells only ); double fertilization is common giving rise to the zygote and to the secondary endosperm nucleus.
- Dicotyledones:** Flower parts are usually in four or fives; leaf venation is usually netlike; primary vascular bundles in the stem are in a ring; many with a vascular cambium and true secondary growth; there are two cotyledons in the embryonic phase present.
- Monocotyledones:** Flower parts are usually in threes, leaf venation is usually parallel; primary vascular bundles in the stem are scattered; true secondary growth does not exist; one cotyledon in the embryo.
- Antheridium:** The organ of male sex cell development, embedded in sterile tissue; in flowerless and seedless plants - compare archegonium.
- Antipodals:** 3 (or more) cells of the mature embryo sac, located at the end opposite of the micropyle (in angiosperm).
- Archeogonium:** A multicellular organ in which a single egg is produced; in bryophytes and some vascular plants - compare antheridium.
- Carpel:** (Gk. karpos, fruit) One of the members of the gynoecium, or inner floral whorl; each carpel encloses one or more ovules. One or more carpels form a gynoecium.
- Chalaza:** (Gk. chalaza, small tubercle) The region of an ovule or seed where the funiculus unites with the integuments and the nucellus (in angiosperms).
- Cupule:** A cuplike structure made of hardened, coherent bracts as found on corn.
- Dehiscence:** (L.de, down; hiscere, split open) The opening of an anther, fruit, or other structure, which permits the escape of reproductive bodies contained within.
- Dormancy:** (L. dormire, to sleep) A special condition of arrested growth which the plant and such plant parts as buds and seeds do not begin to grow without special environmental cues.
- Egg:** A nonmotile female gamete, usually larger than a male gamete of the same species.  
E. **Apparatus:** The egg cell and synergids located at the micropylar end of the female gametophyte, or embryo sac, of angiosperm.  
E. **Cell:** The part of the egg apparatus which after fertilization develops into the zygote (in angiosperm).
- Embryo:** (Gk. en, in; bryein, to swell) A young sporophytic plant, before the start of a period of rapid growth (germination in seed plants - spermatophytes). The embryo is made up of the seed coat, and stored food.  
E. **Sac:** The female gametophyte of angiosperms, generally an 8-nucleate, seven-celled structure; the 7 cells are the egg cell, two synergids and three antipodals (mono-nucleated) and the central cell (binucleated).
- Polyembryony:** Having more than one embryo within the developing seed.
- Endosperm:** (Gk, endon, within; sperma, seed) A tissue, containing stored food, that develops from the union of a male nucleus and the polar nuclei of the central cell; it is digested by the growing sporophyte either before or after the maturation of the seed.  
**Secondary ES.:** In angiosperms, the nourishing tissue (3n) for the embryo.
- Eustele:** (Gk. eu, good + stele, pillar) A stele in which the primary vascular tissues are arranged in discrete strands around a pith; already in some ferns, typical of gymnosperms and angiosperms.
- Exine:** The outer wall layer of a spore or pollen grain.
- Fertilization:** The fusion of two gamete nuclei to form a diploid zygote.  
**Double F.:** The fusion of the egg and sperm (resulting in a 2n-fertilized egg, the zygote) and the simultaneous fusion of the second male gamete with the polar nuclei (resulting in a 3n-secondary endosperm nucleus); a unique characteristic of all angiosperms.
- Funiculus:** (L. funiculus, small rope or cord) The stalk of the ovule.
- gamy:** (Gk. Gamos, marriage)  
**Syphogamy:** Fertilization of the egg (spermatophyte) by pollination tube.
- Integument:** The outermost layer or layers of tissue enveloping the nucellus of an ovule; develops into the seed coat (in spermatophyta).
- Intine:** The inner wall layer of a spore or pollen grain.
- Ligule:** (L. ligula, small tongue) A minute outgrowth or appendage at the base of the leaf of grasses and lycophytes.
- Microphyle:** A small opening in spermatophytes of the integument of an ovule through which the tube of a settling pollen grows.

- Nucellus:** (L. nucella, a small nut) Tissue composing the chief part of the young ovule, in which the embryo sac develops; equivalent to a megasporangium.
- oecium:** (Gk. oikos, house) The reproductive organs within the flower; see flower -parts.  
**Androeceum:** (Gk. Andros, male) The stamens, which bear the filament and the anther (pollen).  
**Gynoeceum:** (Gk. gyne, woman) The aggregate of carpels in the flower of a seed plant.
- Ovule:** (L. ovulum, a little egg) A structure in seed plants (spermatophytes) containing the female gametophyte with egg cell, all being surrounded by the nucellus and one or two integuments; when mature, an ovule becomes a seed.
- phyte:** (Gk. phyton, plant)  
**Gametophyte:** (Gk. gamein, to marry) In plants, which have an alternation of generation, the haploid (n), gamete-producing phase.  
**Sporophyte:** The spore-producing, diploid (2n) phase in a life cycle characterized by alternation of generations.
- Polar Nuclei:** Usually two nuclei, one derived from each end (pole) of the embryo sac, which become centrally located; they fuse with a male nucleus to form the primary (3n) endosperm nucleus (in angiosperm).
- Pollen:** (L. fine dust) Collective term for pollen grains; microspores of seed producing plants; tiny multinucleated granules that contain mature or immature male gametophytes.  
P. **Grain:** A multinucleated (usually two) microspore containing a mature or immature (male) microgametophyte; in gymnosperms only one of the two sperm is functional; in angiosperm both are functional leading to double fertilization.  
P. **Sac:** A cavity in the anther that contains the pollen grain.  
P. **Tube:** A tube formed after germination of the pollen grain; carries the male gametophyte into the ovule.
- Pollination:** In angiosperm, the transfer of pollen from the anther to a stigma by insects, birds, animals in general.
- Prothallus:** In homosporous vascular plants, such as ferns, the more or less independent, photosynthetic gametophyte bearing both antheridia and archegonia; also called prothallium or recessive stage.  
**Megaprothallium:** The prothallia (haploid gametophyte) nourishes the germinating cell (microspore) and the archegonia (megaspore), as well as the developing embryo after fertilization.  
**Microprothallium:** Antheridial cell.
- Raphe:** (Gk, raphe, seam) Ridge on seeds, formed by the stalk of the ovule, in those seeds in which the stalk is sharply bent at the base of the ovule.
- Rhizome:** A more or less horizontal underground stem.
- Seed:** A structure formed by the maturation of the ovule of seed plants (spermatophytes) following fertilization.  
S. **Coat:** The outer layer of the seed, developed from the integuments of the ovule.
- Sporangium** (pl. Sporangia, Gk. spora, seed, + angeion, vessel) a hollow unicellular or multicellular structure in which spores are produced.  
**Megasporangium:** A sporangium in which megaspores are produced.  
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- Spore:** (Gk. spora, seed) The product of meiosis i.e. the reproductive, asexual cell, usually unicellular, and equipped with starchy reserve products, capable of developing into an adult without fusion with another cell.  
**Megaspore:** In heterosporous plants, a haploid (n) spore that develops into a female gametophyte which gives rise to archegonia in which eggs are formed; in most groups, megaspores are larger than microspores.  
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**Microsporocyte:** The microspore mother cell; a cell in which meiosis will occur, resulting in 4 microspores.
- Sporophyll:** A modified leaf or leaflike organ that bears sporangia; applied to the stamens and carpels of angiosperms, fertile fronds of ferns, and other similar structures, see also strobilus.
- Stamen:** (L. stamen, thread) The part of the flower producing the pollen, composed (usually) of anther and filament; collectively, the stamens make up the androeceum.
- Suspensor:** A structure at the base of the embryo in many vascular plants. In some plants, it pushes the embryo into nutrient-rich tissue of the female gametophyte.  
S. **Cells:** Greatly elongating cells forcing the developing embryo into the gametophyte.

**Synergids:** Two short-lived cells lying close to the egg in the mature embryo sac of the ovule of flowering plants (angiosperm); along with the ovum they compose the egg apparatus.

**Tapetum:** (Gk. tapes, a carpet) Nutritive tissue in the sporangium, particularly an anther; innermost layer of the pollen sac wall (in angiosperms).

**Trophophyllic:** (Gk. trophos, feeder + phyllon, leaf) The vegetative, infertile part of the sporophytic generation (in Ferns, and higher plants).

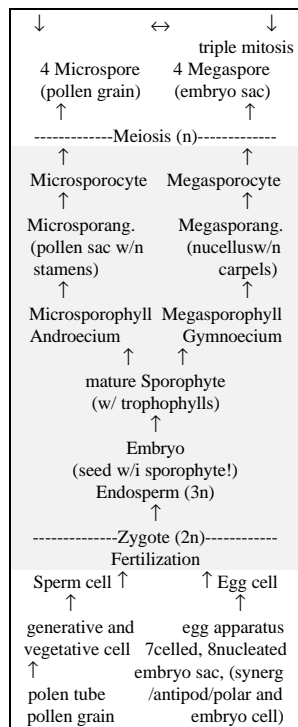
**-trophy:** (Gk. trophos, feeder) Referring to the main principle of obtaining food.

**Autotroph:** (Gk. autos, self, same) An organism that is able to synthesize the nutritive substances it requires from inorganic substances in its environment; see also heterotroph.

**Heterotroph:** (Gk. heteros, other) An organism that cannot manufacture organic compounds and so must feed on organic materials that have originated in other plants and animals; see also autotroph.

Life Cycle:

Angiosperm  
(*Glycine sp.*)



Differences between gymno- and angiosperms:

- |   |                                  |
|---|----------------------------------|
| i) always woody                         | mostly shrub (annuals)           |
| ii) seeds naked                         | seeds covered                    |
| iii) primary endosperm                  | secondary endosp. (3n)           |
| iv) anemochory                          | mostly zoochory                  |
| v) male gametophyte 4-5 cells           | male gametophyte 3-cells         |
| vi) female g.-phyte multicellular       | female g.-phyte 8-cells          |
| vii) simple fertilization               | double fertilization             |
| viii) sometimes flagellated sperm       | fertiliztn. by naked nuclei      |
| ix) no sieve elements & companion cells | sieve elements & companion cells |

Progression of angiosperms:

- i) reduction of woodformation - accelerated growth
- ii) appear shrubbier (annuals) are able to grow in arid conditions
- iii) reduction of inflorescence; corolla 4-5 (dicot); 3 (monocot)
- iv) co-evolutive adaptation to various animals and pollinators