

Glossary

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- 3-ranked plants** - leaves arranged in 3 rows running down the stem.
- Acrocarpous** - moss growth form that is erect and rarely branched, with the sporophyte produced at the end of the stem.
- Acumen** - tip of the leaf.
- Acuminate** - leaves taper to a narrow point.
- Acute** - edges of leaf tip meet an angle of less than 90°.
- Air pore** - a minute opening in upper surface of most complex thalloid liverworts; bordered by one or more rings of modified epidermal cells; functions in gas exchange and water regulation.
- Alar cells** - cells at the basal corners of the leaves; these often differ in size and shape from the other leaf cells.
- Amphigastria** - underleaves of a prostrate bryophyte; usually different in form and size from other leaves.
- Annulus** - a ring of differentiated cells between the operculum (capsule cap) and capsule base.
- Apical** - at the apex area of a leaf, branch or stem.
- Apiculate** - with a small short point at the end of a leaf that is not part of the costa; the point is longer than in mucronate and shorter than in cuspidate.
- Appendiculate** - with short, thin, transverse projections.
- Appressed** - pressed closely, as leaves to a stem.
- Areolation** - the cellular network of a leaf or thallus.
- Auricles** - lobes of cells at the basal corners of a leaf; the lobes project out to the side and bottom corner of the leaf.
- Auriculate** - with auricles.
- Awn** - a bristle or hair-point at the tip of a leaf where the costa extends beyond the main part of the leaf.
- Axil** - the angle between a stem and the top surface of a leaf.
- Basidiomycetous** - belonging to a large group of fungi bearing sexually produced spores on a basidium (microscopic, spore-producing structure); includes puffballs, shelf fungi, rusts, smuts, and mushrooms). See *Cryptothallus*
- Beak** - the elongated end of an operculum, calyptra or perianth.
- Bifid** - divided into two lobes or segments.
- Bilabiate** - with two lips.
- Biplicate** - with two longitudinal folds as in some leaves.
- Bistratose** - with a double layers of cells in a part or all of a leaf.
- Botryoidal** - with the appearance of a bunch of grapes, as in some liverwort oil bodies.
- Bracts** - modified leaves around sex organs or gemmae.
- Braided** - said of shoots that are regularly pinnate with flat-topped, bilaterally symmetrical stems and distinctly falcate-secund leaves.
- Brood bodies** - bits of specialized plant tissue grown by a bryophyte that can grow into a new plant.
- Brood leaves** - brood bodies that appear to be miniature leaves.
- Bulbiform** - in the shape of a bulb.
- Caducous** - falling off easily as with a leaf, leaf-tip or perianth.
- Calyptra** - a thin cap that covers and protects the developing capsule and operculum until maturity.
- Campanulate** - shaped like a bell.
- Canaliculate** - channeled lengthwise as in leaves or thalli.

- Cancellinae** - hyaline (clear) basal cells in a leaf.
- Capsule** - the part of the sporophyte that contains spores.
- Capsule neck** - the lower part of the capsule, usually smaller in diameter than the rest of the capsule, which connects the capsule to the seta (supporting stem).
- Carpocephala** - (carpocephalum – singular) sporogonial receptacles in most complex thalloid liverworts.
- Central strand** - cells in the central part of the stem; they differ in appearance from the rest of the stem cells and are usually smaller.
- Channeled** - growth pattern that looks like half of a tube.
- Chloroplast** - a small, usually round cellular structure that contains chlorophyll; many are found in cells of most mosses and liverworts, while hornworts contain only one to 8.
- Cilia** - a fine hair like growth.
- Ciliate** - fringed with hair like structures.
- Cladocarpous** - growth form of a small group of pleurocarpous mosses where sporophytes grow on the ends of short branches.
- Cleft** - deeply split; used in leaf descriptions for *Fissidens* to describe the that part of leaf next to the stem split into two parts (vaginant lamina); these split leaf parts enclose the stem and the base of the next leaf growing on the same side of stem,
- Cleistocarpous** - said of a capsule that does not break open along a regular seam, but by rupture and breakdown of the cell wall.
- Collenchymatous** - with cell walls that are thickest at the cell corners.
- Columella** - the central sterile structure surrounded by spores along the central axis of most moss or hornwort capsules.
- Complanate** - a flattened plant growth pattern where the leaves twist around the stem and appear to be growing out of opposite sides of the stem.
- Complicate-bilobed** - said of a bifid leaf with two parts folded together longitudinally.
- Compound pore** - an air pore bordered by concentric rings of superficial cells; an internal, barrel shaped structure derived from epidermal cells; found in some complex liverworts such as *Marchantia*.
- Conduplicate** - with leaves folded along the costa or midrib; the two parts are almost equal.
- Confluent** - appearance when two structures merge without a seam.
- Cordate** - heart-shaped at the base of leaf, as in *Calliergon*.
- Costa** - the midrib of a leaf.
- Crenate** - with rounded teeth.
- Crenulate** - with a series of minute, rounded protuberances along a leaf margin.
- Crispate/crisped** - wavy (curled, twisted or contorted).
- Cruciate** - cross-shaped.
- Crypt** - a small sunken hole or depression.
- C-shaped papillae** - papillae that appear like “c’s” when focusing up and down through the leaf with a microscope.
- Cucullate** - said of leaves that are hood-shaped where the tips curve in to meet the sides of the leaf. or calyptrae that have a conical cap with a single split up one side.
- Cuspidate** - with leaves ending abruptly in a stout short point.
- Cuticle** - an external coating on the epidermis of most complex thalloid hepatics; on the leaves, stems, setae or capsules of mosses; or capsules of hornworts.
- Cuticular** - said of the surface layer of a leaf.
- Cutin** - mixture of fatty acid polymers that forms most of the cuticle.
- Cyanobacteria** - photosynthetic blue-green bacteria; formally termed blue-green algae.
- Cygneous** - shaped like a swan’s neck.
- Decurrent** - with the basal corners of a leaf extending longitudinally down the stem or branch.
- Dendroid** - shaped like a tree.
- Dentate** - with short teeth than extend outwards.

- Denticulate** - finely dentate.
- Dichotomous** - divided into two very similar parts.
- Dimorphic** - of two forms; stem and branch leaves of mosses often differ in form.
- Diplolepidous** - said of a peristome with outer peristome teeth formed from the remnants of two adjacent columns of cells. The dividing cell wall between the two columns can be seen as a fine line on the outer surface of the tooth; this fine line is often somewhat zigzag. The peristome may have one ring, or two separate concentric rings of teeth.
- Distichous** - leaves are attached in two rows on opposite sides of the stem.
- Divaricate** - separating, divergent at almost 90°.
- Dorsal** - the lower, outer or abaxial surface of moss leaves; the outer surface of peristome teeth; the upper surface of stems and thalli, away from the substrate; the opposite of ventral.
- Ecostate** - said of a leaf without a costa (either a midrib or short basal ribs).
- Emerginate** - broad, shallowly lobed as in a leaf apex (deeper than retuse).
- Embedded** - sunken deeply in a surrounding solid mass, as with sporophytes of *Riccia* and *Ricciocarpos*.
- Emergent** - said of capsules that are partly, but not completely exerted beyond the ends of the leaves.
- Endophyte** - an endosymbiont that can live within a plant without causing disease (*Nostoc* colonies in *Blasia*, or a fungus associated with *Cryptothallus* thalli).
- Endostome** - the inner ring of teeth in a double peristome.
- Enlarged alar cells** - larger than adjacent cells, but not necessarily inflated or “bubble” cells.
- Entire** - smooth; without teeth or serrulations as in leaf margins.
- Ephemeral** - short lived.
- Ephemerals** - mosses lasting only a few weeks; just enough time when conditions are right for a spore to grow into a tiny plant with capsule and produce new spores for the next generation.
- Epiphragm** - a circular membrane attached to the ends of short peristome teeth; found in Polytrichaceae.
- Epiphytes** - plants that grow on other plants.
- Erose** - irregularly notched or ragged (margins of leaves and perianths).
- Excavate** - abruptly concave, as in leaves with the basal area or basal corners (alar cells) hollowed out in comparison to the plane leaf margins and distal portions of the leaf; sometimes used to describe *Brachythecium* leaves with two and only two “plications”.
- Excurrent** - said of a costa that extends beyond the end of the leaf.
- Explanate** - flattened or spread out.
- Exserted** - projecting well beyond the end of leaves as in capsules or perianths.
- Falcate** - curved like a sickle blade.
- Falcate-secund** - both curved and bent to one side, or towards the substrate. *Dicranum scoparium* is an erect acrocarp whose curved leaves are all bent to one side like a flag on a pole; *Hypnum imponens* is a prostrate pleurocarp whose leaf tips are bent toward the substrate.
- Fen** - an open boggy area obtaining nutrients from seepage from ground water; mineral rich and alkaline.
- Filamentous** - threadlike.
- Filiform** - long and slender.
- Fimbriate** - fringed, with partially eroded marginal cells.
- Flagella** - in liverworts, a slender branch with or without minute leaves.
- Flexuose** - slightly bent or wavy; used to describe some leaf cells.
- Fragile** - easily broken, such as the leaf tips of *Dicranum viride*.
- Furcate** - forked.
- Furrow** - groove, or indentation.
- Fusiform** - spindle shaped, narrow with tapered ends.
- Gemmae** - unicellular or multicellular filamentous, globose, ellipsoidal, cylindrical, stellate, or discoid brood bodies; for asexual reproduction (singular = gemma).
- Glaucous** - with a whitish or grayish overcast.
- Guide cells** - large empty cells found in some costae that are seen in a cross section of a leaf.

- Gymnostomous** - lacking a peristome.
- Haploleptideous** - said of a peristome with the outside face of an outer ring tooth formed from remnants of a single column of cells. The peristome may consist of one ring or two separate concentric rings of teeth. .
- Helical** - coiled, or spiraled.
- Helicoidal** - see helical.
- Hexagonal** - six-sided in shape; some bryophyte leaf cells grow in this form.
- Homomallous** - with leaves or leaf tips pointing more or less in the same way; compare to “secund” in which the leaves are strongly pointing in the same direction.
- Hyaline** - clear and transparent; no chlorophyll.
- Hyalodermis** - an outer layer of stem cells that are hyaline and thin walled.
- Hypophysis** - a strongly differentiated neck between the seta and spore bearing part of a capsule (urn).
See *Polytrichum*, especially *P. commune*.
- Imbricate** - overlapping in a regular pattern like the shingles on a roof; often found as an arrangement of leaves on a stem.
- Immersed** - said of a capsule that does not project beyond the perichaetial leaves surrounding it.
- Incubous** - growth form of leafy liverworts, in which lower leaves overlap upper leaves along their dorsal surface; if held upright by tip, rain would flow in between leaves.
- Incurved** - the edges of a leaf are rolled inward toward the center of the leaf.
- Inflated** - strongly enlarged and bubble-shaped with bulging surfaces as in alar cells.
- Inflexed** - leaf margins that are bent upward and inward.
- Inrolled** - leaves whose edges are rolled in over the top surface of the leaf.
- Intercalary** - describes a branch developing below the apical region of a stem or thallus.
- Intramarginal border** - a row or two of differentiated cells a short distance from the leaf margin.
- Involucre** - a protective tube of thallus tissue surrounding a single antheridium or archegonium in thalloid liverworts and hornworts.
- Involute** - inrolled, with respect to leaf margins.
- Isodiametric** - about as broad as long, such as in round, square, or hexagonal cells.
- Isophyllous** - stem and branch leaves that are similar.
- Julaceous** - said of stems & branches that are round with tightly appressed & imbricate leaves giving a worm- or catkin-like appearance; traditionally applied to stems & branches with a smooth surface, but also used for similar stems & branches that with excellent eyesight or a hand lens show protruding leaf tips (tiny bristles).
- Keeled** - said of a leaf that is sharply folded along its central costa.
- Kidney shaped** - bean-shaped.
- Lamellae** - parallel green ridges or plates along a leaf blade, costa or thallus.
- Lanceolate** - lance-shaped; narrow and tapering from base to a point.
- Lax** - large and thin walled (cells).
- Ligulate** - strap shaped (leaves).
- Linear** - very narrow and elongate; leaf edges that are nearly parallel.
- Lingulate** - tongue shaped; usually wider than ligulate.
- Lobe** - a segment of a divided leaf.
- Mammillose** - said of cell walls of uniform thickness that bulge outwards.
- Marsupium** - a swollen sac or bulb that grows down into the substrate; protects the developing sporophyte of some leafy liverworts.
- Medial cells** - cells midway between the tip and the base of a leaf.
- Mesic** - intermediate in wetness with respect to environment or substrate.
- Mitrate** - said of conical calyptrae with bottom edges either entire or with regular lobes.
- Mucronate** - having a tiny point at the tip of a leaf.
- Multifid** - divided many times.

- Multistratose** - with more than one layer of cells.
- Mussel-like** - clam-shaped.
- Muticous** - without an awn or hair-point on a leaf.
- Nodulose** - with minute knobs; nodulose cells walls are not straight.
- Nostoc colonies** - fresh water cyanobacteria that form spherical colonies composed of cellular filaments in a gelatinous sheath. These appear as dark spots in some thalloid liverworts and hornworts.
- Oblate** - wider than long.
- Oblong** - much longer than broad, with nearly parallel sides.
- Obovate** - said of leaves that are broadest in the upper third, toward the tip of the leaf.
- Obtuse** - broadly pointed, as in leaf tips with an angle of more than 90; leaf tips blunt or round.
- Ocelli** - a leaf cell having one or more large oil bodies and no chloroplasts; found in leaves of leafy liverworts.
- Odiferous** - having a natural aroma.
- Oil body** - a terpene-containing organelle found in the cells of many liverworts.
- Operculate** - possessing an operculum; some moss sporophytes lack an operculum and release their spores when the capsule wall splits open (dehisces).
- Operculum** - a cap that seals the top of the capsule during growth until time to release spores.
- Orbicular** - nearly circular.
- Ovate** - egg shaped with the base broader than the top.
- Papillae** - solid protuberances on a cell wall (papilla = singular). Papillae are sometimes most easily seen on a folded leaf, or on by viewing a branch with all its leaves present and focusing up and down to get a "profile view" of the back of a leaf. Cross sections of papillose leaves will also show the papillae.
- Papillose** - with papillae on a cell wall; may have various shapes, i.e., forked, c-shaped, low conic or other.
- Papillose-crenulate** - describes the edge of leaf that has a series of minute, rounded papillae along the leaf margin (*Anomodon*) that give the leaf edge a crenulate appearance.
- Paraphyllia** - tiny green filaments, leaves or scale structures on stem and branches.
- Pellucid** - clear or transparent.
- Pendant** - hanging downward.
- Pendulous** - drooping or hanging from lack of support.
- Percurrent** - with the costa extending to the apex of a leaf.
- Perianth** - a tube like structure formed from fusion of 2 or 3 leaves that protects the developing sporophyte of most leafy liverworts.
- Perichaetial** - said of leaves surrounding an archegonium (female reproductive organ); these often differ in shape and form from vegetative leaves..
- Perigynium** - a fleshy tubular structure around the developing sporophyte of liverworts.
- Peristomate** - with a peristome present.
- Peristome** - structures resembling tiny teeth inside the top edge of a capsule; covered by an operculum before the sporophyte matures. (see exostome, endostome).
- Piliferous/piliform** - with a hair point.
- Pinnate** - with regular branches on either side of main stem of a pleurocarp (1-pinnate); if there are sub-branches on the branches, then the arrangement is 2-pinnate; a 3-pinnate structure has sub-sub-branches on the sub-branches.
- Plane** - flat, not recurved or incurved, as in edges of leaves.
- Pleuripapillose** - each cell having more than one papilla.
- Pleurocarpous** - moss growth form that is usually prostrate on the substrate, highly branched and with sex organs produced laterally.
- Plicate** - with longitudinal folds; often best seen on dried moss leaves.

Polygonal - with many sides.

Porose - have adjacent cells that are connected through a pore or pit to each other; these can be seen in the microscope at 400X as bumps on the lumen (cell cavity inside cell walls); see *Dicranum scoparium* as an example.

Primordial utricle - the cell contents noticeable due to the cytoplasmic membrane shrinking from the cell wall on drying; usually an irregular outline (e.g., in *Anacamptodon splachnoides*)

Prorate - papillose from the end of a leaf cell overlapping the cell just above or below it and protruding above the plane of the leaf. (*Philonotis* species, *Hylocomium splendens*)

Prorulose - prorate.

Prostrate - growing flat along the ground or substrate (can be flat against bark of tree).

Protonema or protonemata - green, filamentous, branched structures produced by a spore when it germinates; the cell walls are at right angles in the filaments as opposed to oblique cell walls in rhizoids.

Pseudoparaphyllia - tiny leaf shaped or filamentous structures clustered around branches or branch buds in pleurocarpous mosses; helpful in identifying species in some genera (*Hypnum*).

Proximal - near the base or point of attachment; in spores, the inward face.

Pseudoperianth - a hyaline, beaked sheath around each sporophyte and its calyptra of complex thalloid liverworts; found in *Marchantia* & *Pallavicinia*.

Pyriiform - pear-shaped.

Quadrate - appearing square.

Recurved - curved downward and backward, as in leaf edges or tips, or peristome teeth.

Reflexed - bent backwards more abruptly & strongly than recurved.

Reniform - kidney-shaped.

Retuse - with a slight indentation or notch in a broad, rounded leaf apex.

Revolvute - with leaf margins rolled down over the back of a leaf.

Rhizoid initials - large clear cells, usually near a the tip of a moss leaf, that gives rise to rhizoids.

Rhizoids - simple or branched filaments that arise from a stem that serve to anchor the plant; the cell divisions in these are usually oblique; a stem completely covered with rhizoids can be called felted or tomentose.

Rhizome - a slender root like under-ground stem, that gives rise to secondary erect stems. (*Climacium*, *Rhodobryum*)

Rhombic - diamond shaped.

Rosulate - with leaves growing in a circular arrangement, a rosette, around a stem. (*Rhodobryum roseum*)

Rugose - wrinkled; irregular folds or transverse wrinkles in leaf of plant (at right angles to plicate pleats along longitudinal axis of leaf). (*Rhytidium rugosum*)

Rugulose - weakly rugose.

Saxicolous - growing on rocks.

Secund - with leaves or leaf tips strongly bent and pointing the same way; in erect secund acrocarpous mosses, the leaves are all bent to one side like a flag on a pole; in prostrate secund pleurocarpous mosses, the leaves are often bent toward the substrate in a bilaterally symmetric manner; compare to "homomallous" in which the leaves are pointing more or less in the same direction.

Serrate - sharply toothed as along leaf margins.

Serrulate - minutely toothed as along leaf margins.

Sessile - without a stalk or seta.

Seta - the stem that supports the capsule.

Setaceous - bristle-like.

Slime papillae - club-shaped cells in liverworts that secrete mucilage.

Spathulate - broad in the middle and even broader above as in leaves.

Spine - a long sharp projection; the tip of the costa of *Eurhynchium* species often projects above the back of the leaf as a spine.

- Spinose** - with sharp pointed teeth.
- Spinulose** - with tiny sharp spines.
- Sporangia** - spore containing structure.
- Squarrose** - with leaves bent at 90° from the stem.
- Stellate** - star-shaped.
- Stepwise fronds** - a growth pattern of the main stem that forms annual stair steps (*Hylocomium splendens*); the age of the moss can be found by counting the “stair steps”.
- Stereids** - thick walled, long, support cells of small diameter found in some costae; costae may have two bands of stereid cells separated by larger, thin walled guide cells, or only a single band of such cells.
- Stipe** - the stem of a dendroid or frondose moss.
- Stoloniferous** - said of a plant that has a stolon, a long stem or branch that grows along, or below, the ground and connects different parts of the plant; a cluster of individual *Climacium* sp. plants is a single plant with the parts interconnected by stolons.
- Stomata** - minute opening in the capsule wall of hornworts, and neck of moss capsules; surrounded by two guard cells (*Funaria* has single cells with an opening in the center).
- Stomatose** - with stomata.
- Striations** - longitudinal ridges or lines.
- Striolate** - marked with fine lines or ridges, as on peristome teeth or a leaf cuticle.
- Strumose** - with a goiter-like swelling at the base of a capsule.
- Stylus** - a uniseriate or lanceolate flap found between a lobule and the stem in some liverworts (*Frullania*).
- Subpercurrent** - with a costa that almost reaches the leaf apex.
- Sub-pinnate** - a growth form that is almost regular enough to be pinnate.
- Subquadrate** - almost square.
- Subtubulose** - a growth form with leaves inrolled to almost form a tube.
- Subula** - a long, needle-like point at the tip of a moss leaf.
- Succubous** - a leafy liverwort growth form in which the upper leaves overlap the lower leaves on the dorsal side of the plants; if held by plant tip up, rain would run off.
- Sutures** - seams where two parts of a structure join, as the suture between a capsule and its operculum.
- Symbiotic** - said of a long-term association of two species; *Nostoc* lives inside some thalloid liverworts (*Blasia*) and hornworts.
- Systylious** – describes a moss capsule whose operculum stays attached to the columella (central structure in the center of the capsule) after the capsule opens.
- Terete** - having a round cross-section.
- Thalloid** - with a more or less flattened gametophyte without leaves and stem.
- Tomentum** - a thick felt like growth of rhizoids on a stem.
- Toothed** - with teeth on a leaf margin; or with a projection at the end of a costa on the back of a leaf.
- Transverse** - a liverwort growth form with the leaves inserted at right angles to the long axis of the stem.
- Trigones** - triangular or circular intracellular wall thickenings, found at point where three or more cells meet; common in liverwort leaf cells and used for identification.
- Trigonous** - three angled; applied to a three angled perianth in liverworts.
- Truncate** - cut off abruptly and squarely at the leaf apex.
- Tubers** - in mosses - gemmae that grow on rhizoids, and are found in many acrocarpous mosses; in liverworts and hornworts - an underground mass, protected by several layers of thick-walled cells; considered to be a method of vegetative reproduction.
- Undulate** - wavy; with transverse folds across a leaf, as in *Neckera pennata*.
- Unipapillose** - only one papilla per cell surface; a leaf may be unipapillose on one, or both upper and lower surfaces.
- Uniseriate** - cells arranged in one row; applied to hair-like structures.

Unistratose - with a single layer of cells.

Valvate - opening with valves (structures of a sporangium that separate to allow spores to leave); found in liverworts and *Andreaea* species.

Ventral - the upper, inner or adaxial surface of leaves; the inner face of peristome teeth; the lower surface of stems or thalli, next to the substrate.

Ventricose - bulging on one side below like a stomach, as in *Buxbaumia aphylla* capsules.

Vestigial - reduced to only a trace.

Vitta - a longitudinal stripe, one cell thick, in the middle of some liverwort leaves composed of one or more rows of often thicker-walled cells.

Weft - a growth form of pleurocarpous mosses; a mat of interwoven shoots and branches.

Xeric - said of a very dry environment or substrate.

End.