Lichens of Great Britain and Ireland (LGBI3): Glossary

Version 3: 25 February 2025

Ensuring consistency in a multi-author work is a challenge, but a surmountable one. Many terms used in lichenology have no single 'correct' definition, having been used to mean slightly different things by various authors. It is important to ensure that a reader can consult the glossary to find out what our authors mean. This is mainly the responsibility of the editorial board, but to make the 3rd edition as consistent as possible, we provide some guidelines about usage of terminology. Our aim is not to be restrictive, or overly prescriptive, while encouraging consistency. Individual authors are welcome to discuss with the editorial board if they have issues with sticking to our guidelines.

Here are some of the guiding principles we had in mind when compiling our guidelines:

- The 2nd edition (2009) contained various inconsistencies in usage of nomenclature: some terms didn't appear in the glossary, and others were used by authors in a different way to the definition in the glossary.
- The aspiration is to achieve greater consistency without creating complications for authors.
- Strict definitions may be illusory in lichenology.
- Many terms should be flexible, the meaning depending on context.
- Traditional usage should be maintained in a group (lichens, or certain important genera).
- An explanation of what is meant, rather than just using a string of technical terms, is desirable.
- A picture is worth a thousand words.

We would like to draw special attention to the usage of the following terms:

areole/areolate, the 2nd edition used a narrow definition of the term areole while individual authors used the term in various ways. This led to confusion for users of that edition. We propose a wider definition and urge authors to read the new definition in the Glossary below.

epihymenium/epithecium are terms that have often been used synonymously despite some authors insisting that an epihymenium has a specific meaning. Epithecium is the preferred term unless an author has special requirement to use the term epihymenium.

epispore/gelatinous sheath/halo/perispore are terms which have been used inconsistently and have caused some confusion. Please refer to the definitions in the glossary below for guidance.

Nimis & Martellos (2004) provided some introductory notes to their glossary, including the following useful observations:

"As for all languages, botanical language has deep roots in the past. Modern authors tend to adopt the same terms they learnt as students from their professors, just as the latter did when they were students. Old-inherited terminology, however, can degenerate into jargon. A term like leprose dates back to times when lepra [leprosy] was a common skin disease in Europe. Today, it evokes something only to people which have other things to do than appreciating a leprose thallus.

Botanical jargon largely derives from Greek and Latin (e.g. acicular, anisotomic, apothecium, paraplectenchymatous). Coined at a time where most scholars were fluent in these languages, those terms are often mute to modern users.

Technical jargon is indispensable in any scientific discipline. We wonder, however, whether at least some of the old-inherited terms could be made more understandable in broader circles."

The editorsof this 3rd edition of The Lichens ofGreat Britain and Ireland have also considered which terms are indispensable for succinct and accurate description, and which are jargon that can be substituted with familiar descriptive words. The aim is to be clear, unambiguous and consistent; the latter is not easily accomplished when compiling a multi-authored work. The priority is to explain what is meant rather than using strings of technical terms. Traditional established usage is preferred, though some terms have been used with different meanings bydifferent authors. The important thing is that a reader can consult this glossary to find out what is meant in this publication.

The glossary contains most of the terms which have been used in recent British literature, even in cases where we have decided not to use them in this edition. This facilitates interpretation of other sources which provide no glossary. It also provides the opportunity to explain why some terms are not used in this edition.

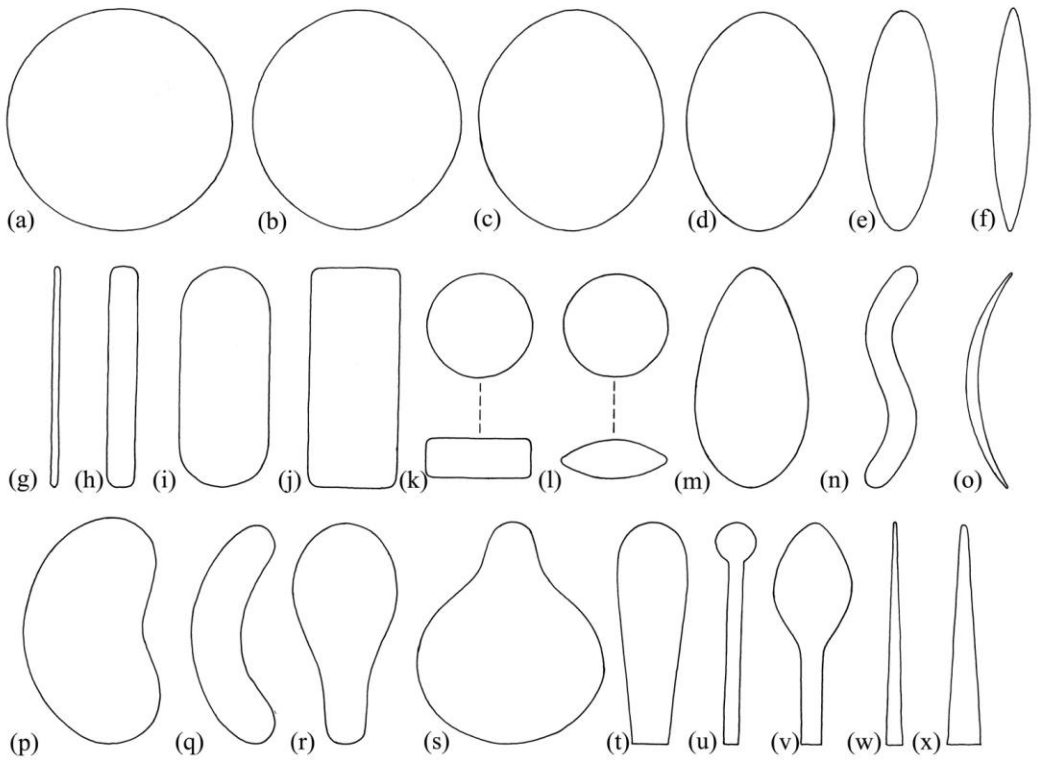

Fig. 1. Shape terminology (after Hawksworth *et al.* 1983). (a) Globose; (b) subglobose; (c) broadly ellipsoid; (d) ellipsoid; (e) narrowly ellipsoid: (f) fusiform; (g) filiform;(h) bacilliform; (i) oblong, rounded ends; (j) oblong, truncate ends; (k) discoid; (l) lenticular; (m) ovoid; (n) sigmoid; (o) falcate; (p) reniform; (q) allantoid; (r) pyriform; (s) ampulliform; (t) clavate; (u) capitate; (v) spathulate; (w) acicular; (x) subulate.

acrogenous (of conidia), formed at the apex of conidiophores.

acicular, needle-shaped (Fig. 1w).

acuminate, gradually narrowing to a point.

alpine, this term has been used in the British literature to imply 'montane'. The latter is preferred since 'alpine' may imply some connection with the Alps.

amphithecium, the portion of a lecanorine apothecium external to the exciple, usually containing algae, constituting the thalline margin.

ampulliform, flask-like with a narrow neck (Fig. 1s).

adnate, fused or adherent (e.g. thallus to the substratum); of an apothecium, not constricted at the base.

amyloid, stained blue by iodine.

anamorph, an asexual stage or morph characterized by the production of conidia.

anastomosing, branched, the branches joining together to form a net-like, interconnected growth (Fig. 11f).

anisotomic, with unequal branching (Fig. 24a).

annellidic, a form of conidial development where succeeding conidia are formed from the same conidial locus (c.f.) but where the wall extends, forming a series of transverse bands (annellations).

apical cushion, colourless zone within an amyloid apical dome (Fig. 4c).

apical dome, the thickened inner part of the apex of an ascus (Fig. 4b); synonym: tholus.

apiculate, with a short projection at one end.

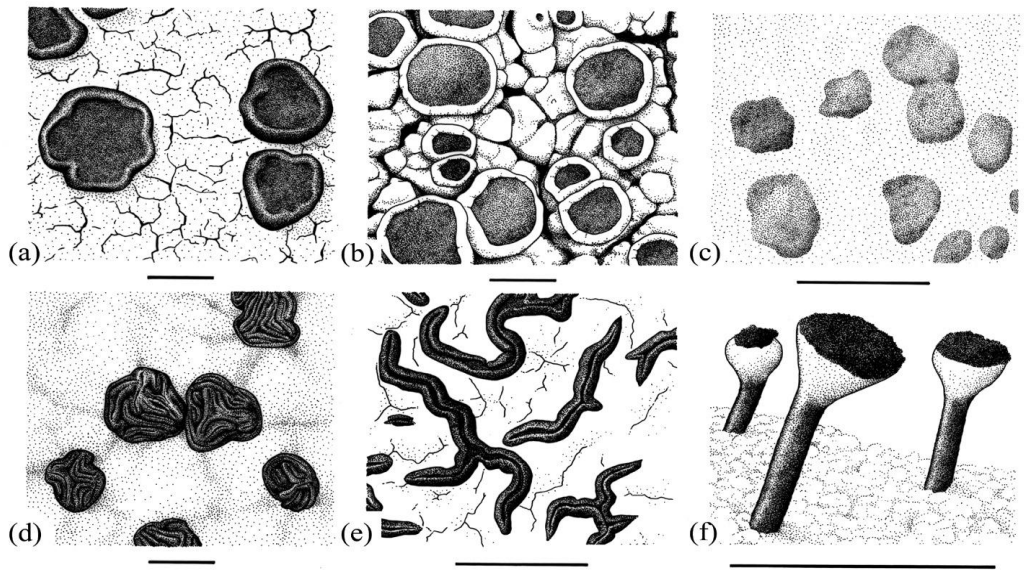

Fig. 2. Types of apothecia. (a) lecideine, lacking a thalline margin (*Porpidia macrocarpa*); (b) lecanorine, with a thalline margin (*Lecanora gangaleoides*); (c) arthonioid (*Arthonia spadicea*); (d) gyrose (*Umbilicaria hyperborea*); (e) lirellate (*Opegrapha vulgata*); (f) stalked (*Calicium viride*). Scale = 1 mm.

apothecium (pl. apothecia), an ascoma where the hymnium is exposed at maturity; the outline may vary from circular, with a broadly exposed and conspicuous hymenium, to narrow and elongated, with a narrowly exposed hymenium. The term lirellum (see below) describes the latter case. Most lichen ascomata are regarded as either apothecia or perithecia (see below).

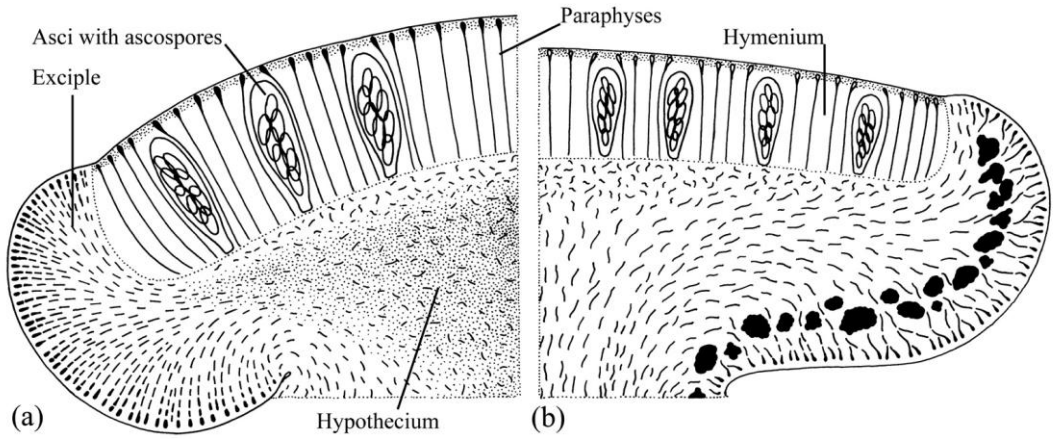

Fig. 3. Structure of apothecia. (a) lecideine; (b) lecanorine. Showing exciple types, hypothecium, hymenium, paraphyses, asci, ascospores.

arachnoid, covered with, or formed of, delicate interwoven hairs or fibres, cottony in appearance, like the web of some spiders (cf. byssoid).

areole, a more or less discrete unit of crustose thallus, separated from adjacent units by a gap, groove, or crack. Areoles can arise as discrete areas of lichenization on the prothallus (when they may be termed primary areoles), later merging, or becoming subdivided by cracks (into secondary areoles). In other cases, the young thallus margin may be entire, but the older thallus is divided by cracks (sometimes termed rimose-areolate). These distinctions are difficult to apply consistently across all lichens, and the term 'areole' is used in this work as a neutral term for all cases, with additional explanation where needed. The variation in size, outline, and three-dimensional shape of areoles often determines the characteristic appearance of a species. Discrete corticate patches on the podetia of some *Cladonia* species are also sometimes referred to as areoles.

areolate (of areoles), subdivided into patches called areoles. The term areolate may refer either to the entire structure of a crustose thallus or to the thallus surface. Primarily areolate thalli develop from separate individual areoles, each one distinctly delimited and having developed as an individual unit. Rimose-areolate thalli are secondarily formed when fissures of a rimose thallus merge and thus secondarily delimit areoles. An areolate thallus surface of a foliose or fruticose lichen thallus is one that is covered with individual patches of cortex.

arthonioid, apothecium-like structures without a clear determinate edge (e.g. in *Arthonia*).

ascogenous (of hyphae), hyphae from which asci are produced. ascoma (pl. ascomata), any ascus-containing structure.

ascoma (pl. **ascomata**), the fruiting body of an ascomycete; the structure that bears the asci, which in turn contain the ascospores. Apothecia and perithecia are types of ascomata.

ascomycete, a fungus that produces its sexual spores within an ascus.

ascoplast, the internal cavity within an ascus containing the cytoplasm and ascospores. Rarely used.

ascospore, a spore that is the product of meiosis, formed within an ascus. The term is used to distinguish spores produced in asci from spores produced asexually such as conidia.

ascus (pl. asci), a sac-like cell within which the products of meiosis, the ascospores, are produced (Figs. 8-9) (cf. basidium).

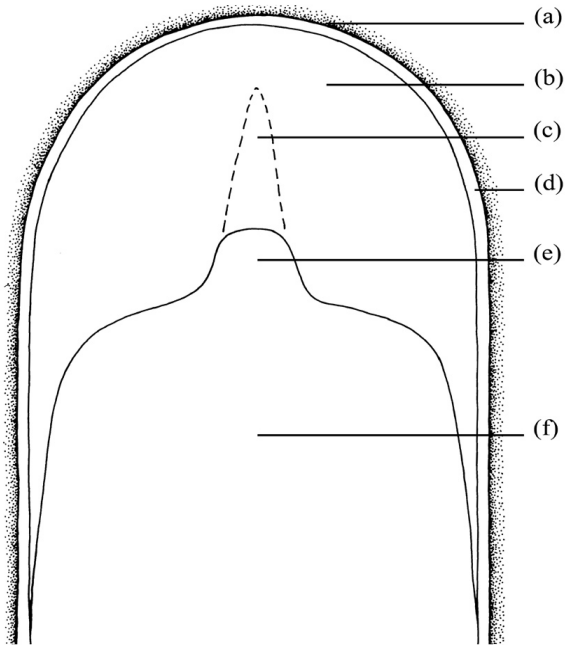

Fig. 4.
Ascus structure (Lecanoralean, '*Bacidia*-type').
(a) "fuzzy" or gelatinous coat (outer layer);
(b) apical dome (tholus);
(c) apical cushion (mass axiale);
(d) ascus wall;
(e) ocular chamber;
(f) ascoplast.

aspicilioid (of apothecia), partially to wholly immersed in the thallus, the thalline margin usually not prominent.

autospore, nonmotile, asexual, algal reproductive cell or a nonmotile spore that is a miniature of the cell that produces it.

bacilliform (of spores and conidia), cylindrical with rounded ends, bacillus-like (Fig. 1h).

basidioma (pl. **basidiomata**), structure on which basidia are produced.

basidiomycete, a fungus that produces its sexual spores as external buds on a club-like basal cell (the basidium). Mushrooms and bracket fungi, among others, are basidiomycete fungi.

basidiospore, spore formed on a basidium.

basidium (pl. **basidia**), a reproductive cell on which the generally four products of meiosis (basidia) are borne externally, usually on extensions referred to as sterigmata (cf. ascus).

biatorine (of apothecia), having a relatively soft, clear, or lightly pigmented (not carbonized) margin containing no photobiont cells and usually resembling the disc in colour.

bitunicate, see fissitunicate.

blastidium (pl. **blastidia**), a more or less globose lichen propagule produced by budding of a thallus, new blastidia sometimes formed from the tip of the previous one; they are easily confused with soredia, more rarely with isidia. A soredium is generally derived from medullary tissue and lacks a cortex. An isidium is rarely regular in shape and does not produce another by budding at the tip (Fig. 3e) (cf. soredium).

botryose, in clusters, like grapes, cf. corymbose.

bryophilous, growing on mosses and liverworts.

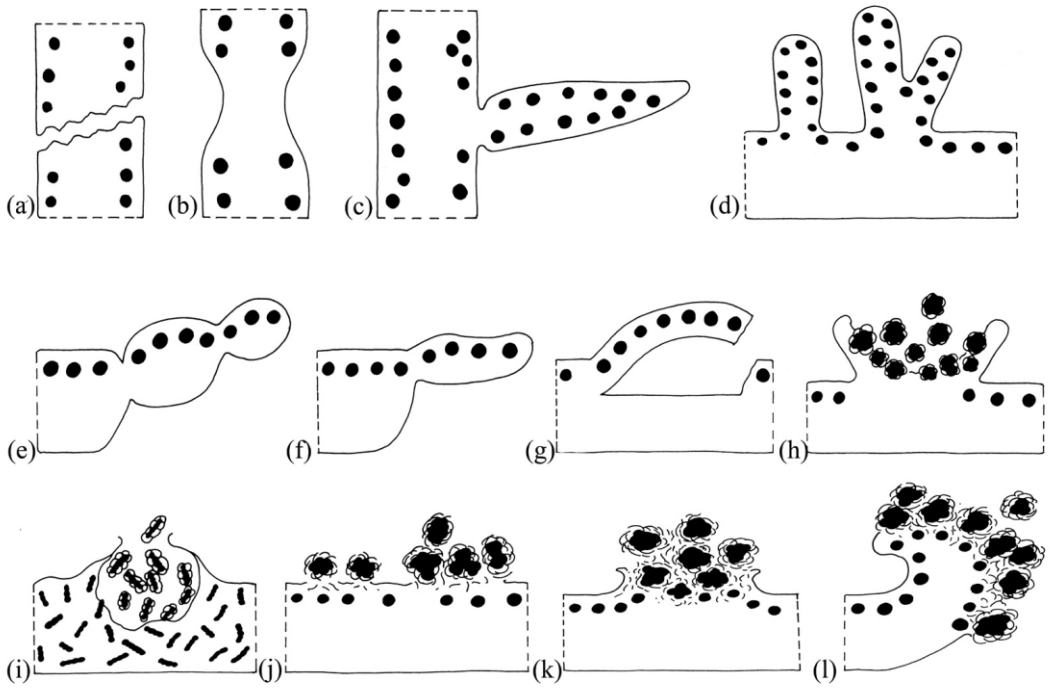

Fig. 5. Types of vegetative propagules (after Hawksworth & Hill 1984).

(a) Thallus fragmentation; (b) fragmentation region; (c) lateral spinule; (d) isidia; (e) blastidia; (f) phyllidium; (g) schizidium; (h)goniocysts; (i) hormocysts; (j) soredia formed from eroded surface; (k) soredia formed in soralium; (l) soredia formed from lower cortex of recurved lobe (labriform). See also granule.

bullate, having bubble or blister-like swellings (e.g. the surface of *Peltigera membranacea*); shaped like a bubble and restricted at the base (e.g. the squamules of *Thalloidima physaroides*).

byssoid, made up of delicate threads, cotton-like (cf. arachnoid).

caespitose, in groups or tufts.

calcareous, containing lime or chalk (calcium carbonate), producing vigorous bubbling (CO_2) with strong acid. Calcareous rocks include limestone, dolomite, and marble; some sandstones and soils can also be calcareous.

canaliculate, grooved or channelled longitudinally.

capitate, having a well-formed, often swollen head (Fig. 1u). Of soralia, strongly convex (e.g. in *Hypogymnia tubulosa*); of paraphyses, having distinctly swollen apical cells.

carbonaceous, black, opaque, and often friable.

carbonized, tissue with opaque, black pigment.

catenate (of spores), arranged in chains.

centrum, within an ascoma (usually applied to perithecia), the asci, hamathecium and generative tissue from which these develop.

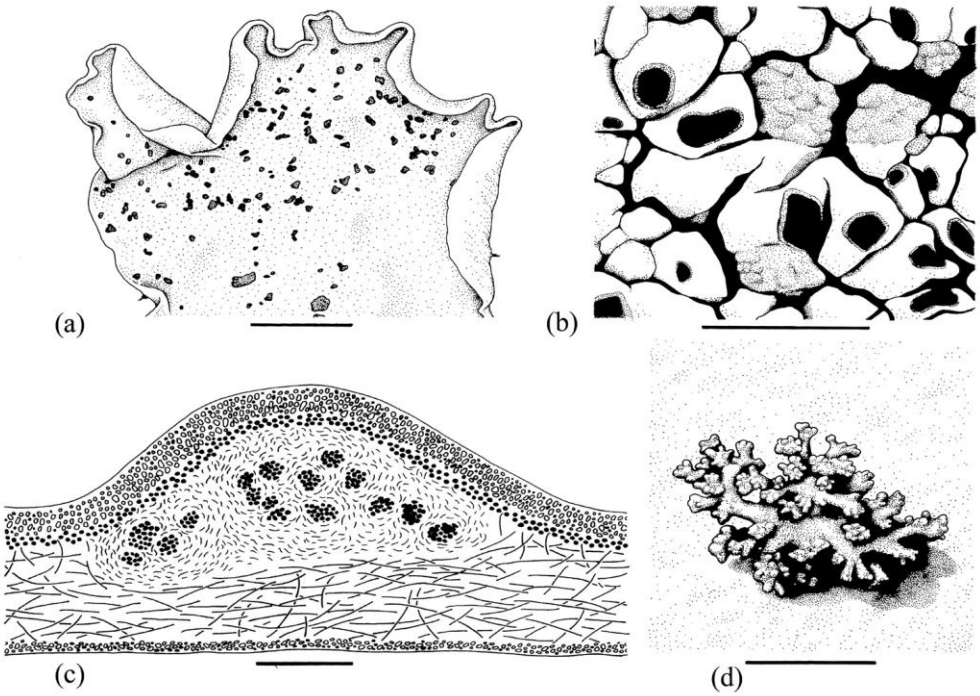

Fig. 6. Cephalodia. (a) *Peltigera britannica*; (b) *Amygdalaria pelobotryon*; (c) *Nephroma arcticum*, internal cephalodium; (d) *Ricasolia amplissima* young shrubby cephalodium. Scale a = 5 mm, b = 1 mm, c = 100 μm, d = 500 μm.

cephalodium (pl. **cephalodia**), Lichenized structure containing cyanobacteria, found in thalli with a green algal photobiont. They may appear as warts (e.g. *Peltigera leucophlebia*, *Placopsis* and *Stereocaulon* spp.), or coralloid outgrowths (e.g. *Ricasolia amplissima*); in some species they are scarcely visible, being immersed in the thallus (e.g. *Lobaria pulmonaria*, *Solorina saccata*) (Fig. 6).

chemotype, a pattern of secondary chemistry found in some or all members of a lichen species; species may comprise one or more chemotypes, which may or may not correlate with distribution or ecology.

chlorococcoid, (of the photobiont), rounded, green algal cells, not including *Trentepohlia*, giving the photobiont layer a bright green colour.

chondroid (of tissue), like cartilage, firm and tough but elastic, more or less translucent, often with a shiny surface. Species of *Ramalina* exhibit this characteristic.

cilium (pl. **cilia**), a marginal or submarginal hair-like outgrowth of the thallus.

clavate, club-shaped (Fig. 1t).

clypeus, a shield-like stromatic growth, comprising fungal hyphae and bark tissue, over one or more ascomata or conidiomata. An involucrellum is similar but does not contain plant tissues.

conblastidium (pl. **conblastidia**), aggregated mass of blastidia.

concolorous, of the same colour.

confluent, coming together; merging into one another (e.g. of soralia).

congeneric, belonging to the same genus.

conglutinate, glued together, not easily separated; especially of apothecial parts such as paraphyses.

conidiogenous, producing conidia.

conidiogenous cell, a terminal or intercalary cell of the conidiophore from which conidia are produced.

conidioma (pl. **conidiomata**), a complex multi-hyphal structure producing conidia (e.g. a pycnidium).

conidiophore, simple or branched hypha bearing cells from which conidia are produced.

conidium (pl. **conidia**), an asexually produced fungal spore. Conidia may function as vegetative propagules, but may also act as the male gametes for sexual reproduction in ascomycetes (then sometimes referred to as spermatia). These fuse with female gametes (trichogynes) within the generative tissue of ascomata, and do not germinate to form a vegetative mycelium. As the function of conidium-like structures is rarely known in detail, all are referred to as conidia in this work. In some genera (e.g. *Micarea*) there are different types of conidia, see macroconidium, mesoconidium and microconidium.

consoredium (pl. **consoredia**), an agglomeration of soredia that are fused together into a larger cluster (e.g. in *Hypotrachyna afrorevoluta*~~).~~

conspecific, belonging to the same species.

cortex, a discrete outer layer of a thallus differing in structure from internal layers, external to the algal layer and/or medulla. Sometimes absent, either entirely or restricted to the upper surface.

corticate, having a cortex.

corticolous, growing on bark.

corymbose, clustered in branches reaching similar height (cf. botryose).

crateriform, bowl- or crater-shaped.

crenate, having the edge toothed with small rounded, often irregular teeth.

crenulate, having the edge finely toothed with rounded teeth (delicately crenate).

crozier, the hook of an ascogenous hypha, the apical cell of which forms the ascus.

crustose (of lichen thalli), crust-like, without a lower cortex (Fig. 19 a-d).

cupulate, cup-like.

cyphella (pl. **cyphellae**), break in the lower (rarely upper) cortex of a lichen thallus, which is round or ovate forming a gaping hole, and in section appears as a cup-like structure lined with a layer of loosely connected, frequently globular, cells formed from the medulla (Fig. 7a). See also pseudocyphella.

decumbent, lying flat on the substratum with the ends turned up (cf. revolute).

decorticate, having no cortex, but with one at an earlier stage of development (cf. ecorticate); of substrata, lignified tissues from which the outer bark layer has fallen away.

determinate, well-defined, well-delimited, definite (cf. effuse).

dichotomous, branching, frequently successively, into two more or less equal arms (cf. anisotomic, isotomic).

digitate, finger-like.

distoseptate (of spore walls), having the individual cells delimited by a wall formed within the outer wall, usually with small angular lumina. Examples are *Pyrenula* and *Rinodina* spp.

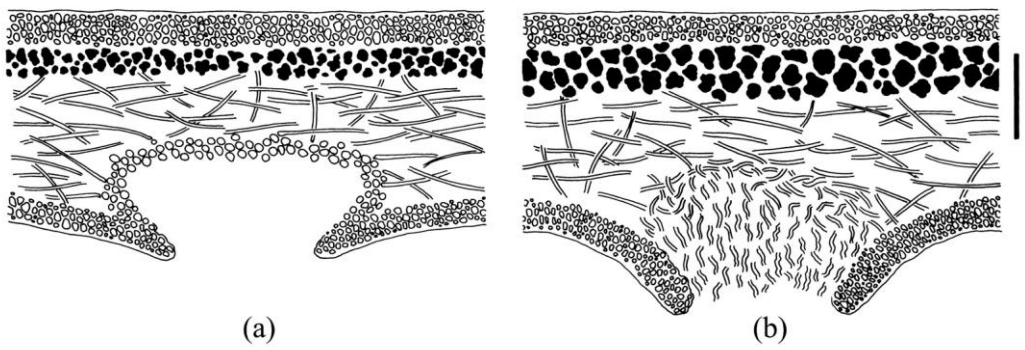

Fig. 7. Cyphella and pseudocyphella in section. (a) Cyphella (*Sticta sylvatica*); (b) pseudocyphella (*Pseudocyphellaria intricata*). Scale = 100 μm.

doliiform, barrel-shaped.

e-, lacking, without.

ecorticate, without a cortex and never having had one, cf. decorticate.

effigurate, obscurely lobed thallus margin (e.g. the areoles of *Trapelia glebulosa*).

efflorescent, bursting out of, especially of soredia.

effuse, spreading growth without a distinct margin (cf. determinate).

endophloeodal, immersed (at least initially) in bark (cf. epiphloeodal).

endolithic, growing within the rock (cf. epilithic).

endospore, the inner wall of a spore.

endoxylic, within decorticated wood (lignin).

enteroblastic, (of conidial development) where succeeding conidia are formed internally and develop through the opening caused by secession (q.v.) of the preceding conidium, rather than from a new locus (q.v.) on the wall of the conidiogenous cell. This may involve proliferation of the conidiogenous cell wall to form a series of annellides (q.v), though some authors maintain that this constitutes holoblastic (q.v.) development.

entire, not torn; continuous; complete.

epicortex, a thin homogeneous polysaccharide-like layer over the surface of the cellular cortex (e.g. in *Parmelia* s. lat.), which may have regular pores when viewed by scanning electron microscopy.

epihymenium, technically a thin layer of interwoven hyphae on the surface of the hymenium. This term has often been used as a synonym of epithecium but other lichenologists insist on the more precise definition. Epithecium is the preferred term in this work for the layer (often pigmented or crystalline) above the asci.

epilithic, growing superficially on rocks (cf. endolithic).

epinecral layer, a layer of dead, collapsed hyphae and algal cells over the cortex, with an amorphous appearance in microscope sections, and in which the cell lumina do not stain. Present in e.g. some species of *Verrucaria*.

epiphloeodal, developing on the outer surface of bark (cf. endophloeodal).

epipsamma, granular, oily or crystalline material interspersed between the tips of paraphyses; the granules or crystals present in the epithecium; either pigmented or not.

epispore, the fundamental and often outer wall of a spore which determines its shape (cf. perispore). When the epispore is ornamented (e.g. in *Bilimbia*) it has sometimes been referred to as its perispore. The elucidation of spore wall layers relies on electron microscopy and the layers may vary considerably between different groups. For practical identification purposes, the simple term ‘spore wall’ is effective. In this work, the term epispore is generally used when referring to a distinct layer of the wall itself that is visible using light microscopy.

epithecium, the upper part of the hymenium above the asci, consisting of the apices of the paraphyses embedded in a gelatinous substance which is often coloured and frequently inspersed with diffuse pigments, crystals, or granules.

erumpent, bursting through the surface (Fig. 18g).

evanescent, short-lived, breaking down at an early stage.

eu-, a prefix used to indicate: thoroughly, completely.

eutrophicated, nutrient-enriched.

excavate, hollowed out (Fig. 18h).

exciple, tissue forming the margins or walls of an ascoma, synonym: excipulum (Figs. 3, 15, 16). Lichenologists often distinguish between a proper (or true) exciple, formed only by the fungus, and a thalline exciple (or thalline margin), that also contains the photobiont. In perithecial taxa, sometimes referred to as a peridium (q.v.).

falcate, curved like the blade of a scythe or sickle (Fig. 1o).

farinose, very finely granular, like flour.

fascicle, a little group or bundle.

fenestrate, having (or appearing to have) windows or openings.

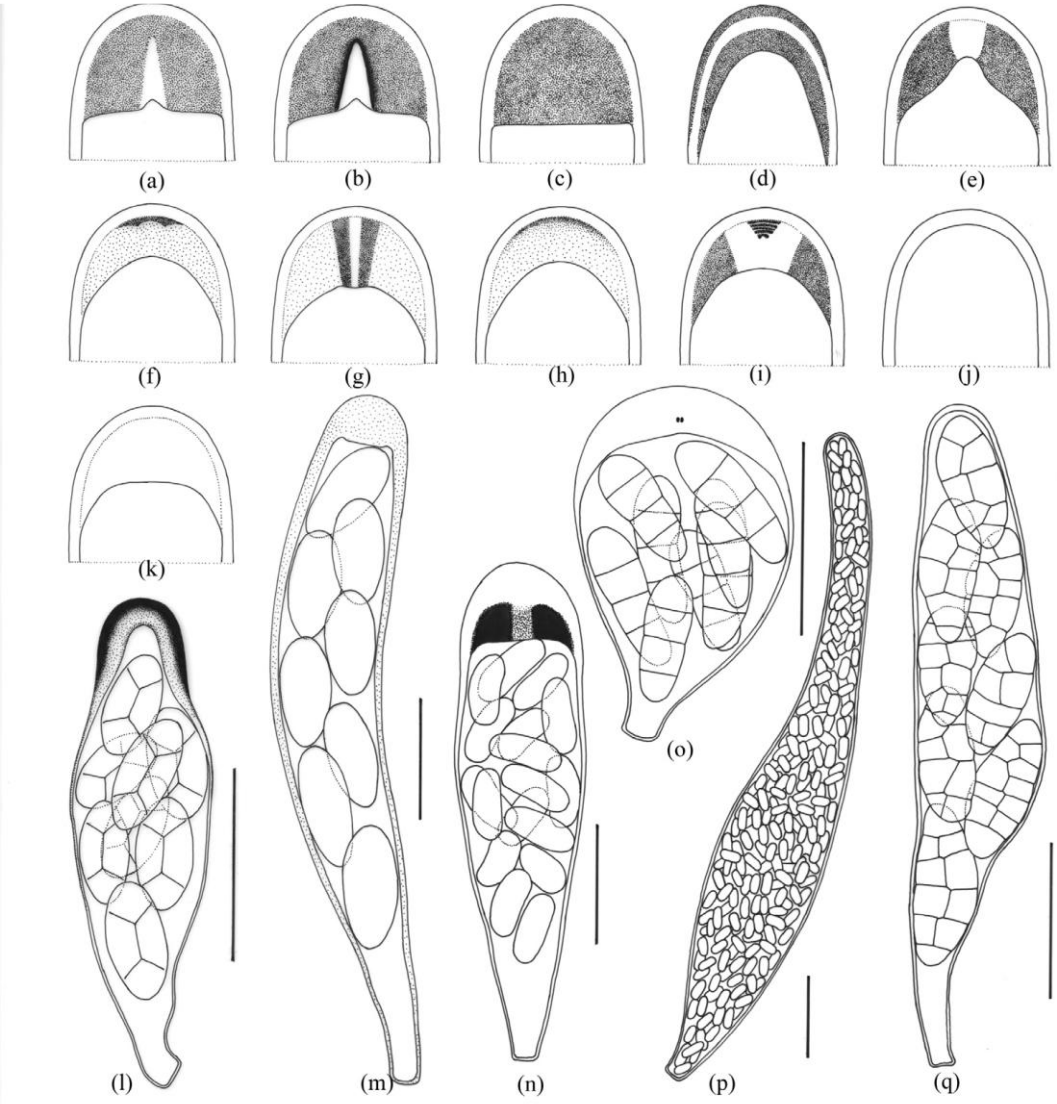

Fig. 8. Ascus structure (1). (a-k) ascus apex types and (l-q) examples. (a) *Bacidia*-type; (b) *Biatora*-type; (c) *Catillaria*-type; (d) *Fuscidea*-type; (e) *Lecanora*-type; (f) *Lecidea*-type; (g) *Porpidia*-type; (h) *Rhizocarpon*-type; (i) *Rimularia*-type; (j) *Schaereria*-type; (k) *Tremolecia*-type; (l) *Xanthoria parietina* (*Teloschistes*-type); (m) *Trapelia coarctata*; (n) *Candelariella vitellina* (*Candelaria*-type); (o) *Arthonia radiata*; (p) *Thelocarpon epibolum*; (q) *Gyalecta truncigena*. All in I (Lugol's) after pretreatment with K. Scale l-q = 20 µm.

fibril (*of Usnea*), a short simple branch, perpendicular to the main branches.

filamentous (of lichen thalli), comprising very narrow filaments, branched or not, the shape of which is largely determined by the shape of the photobiont colony (Figs. 20a, 31).

fimbriate, delicately toothed or fringed.

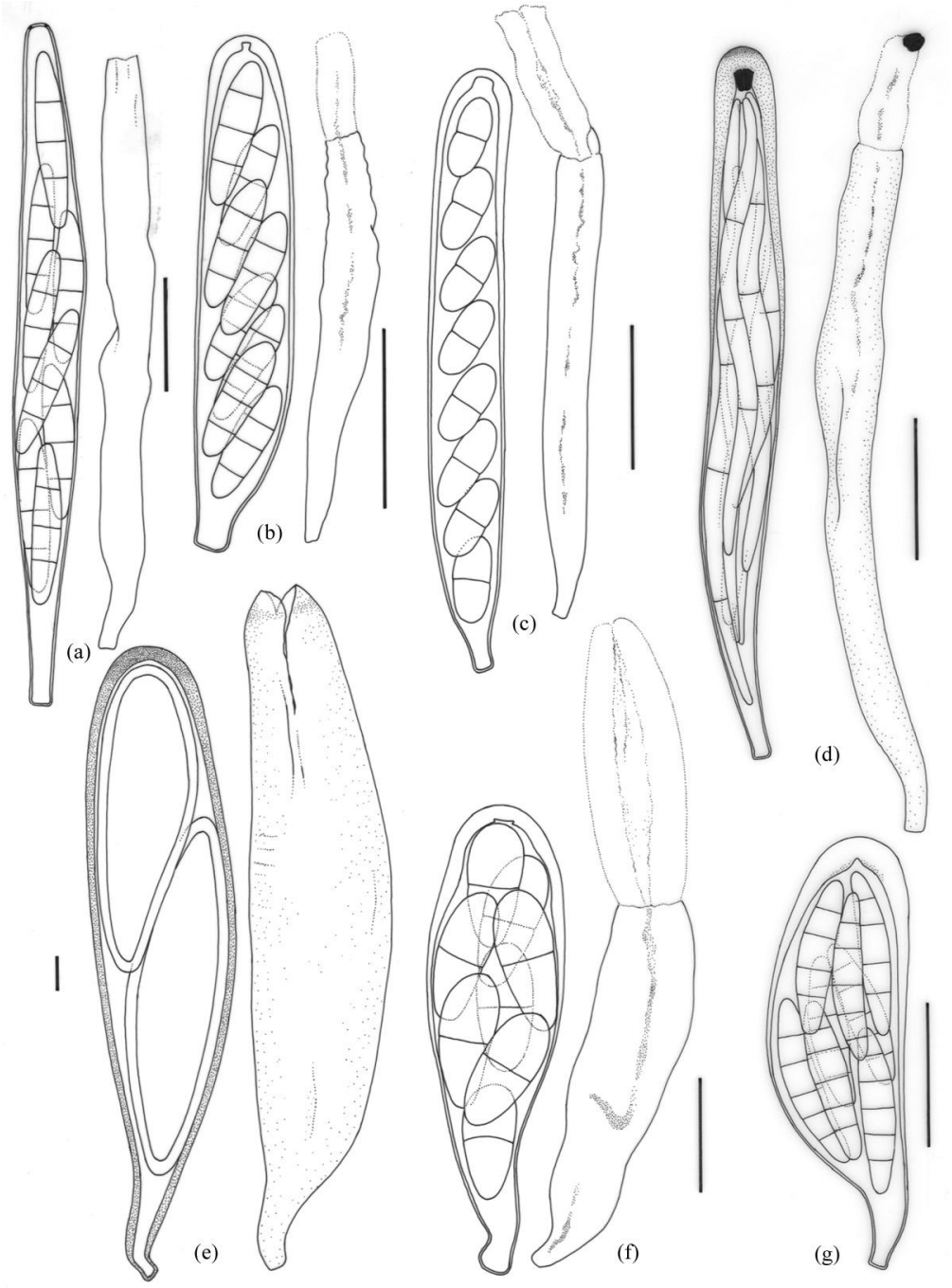

Fig. 9. Ascus structure (2). (a) *Porina lectissima* (in Congo Red); (b) *Strigula jamesii*; (c) *Anisomeridium biforme*; (d) *Peltigera hymenina*; (e) *Pertusaria pertusa*; (f) *Thelidium minutulum*; (g) *Alyxoria varia*. All mature or semimature asci, except (g) all showing dehisced asci. All in I (Lugol's) after 10% K, except (a). Scale = 20 μm.

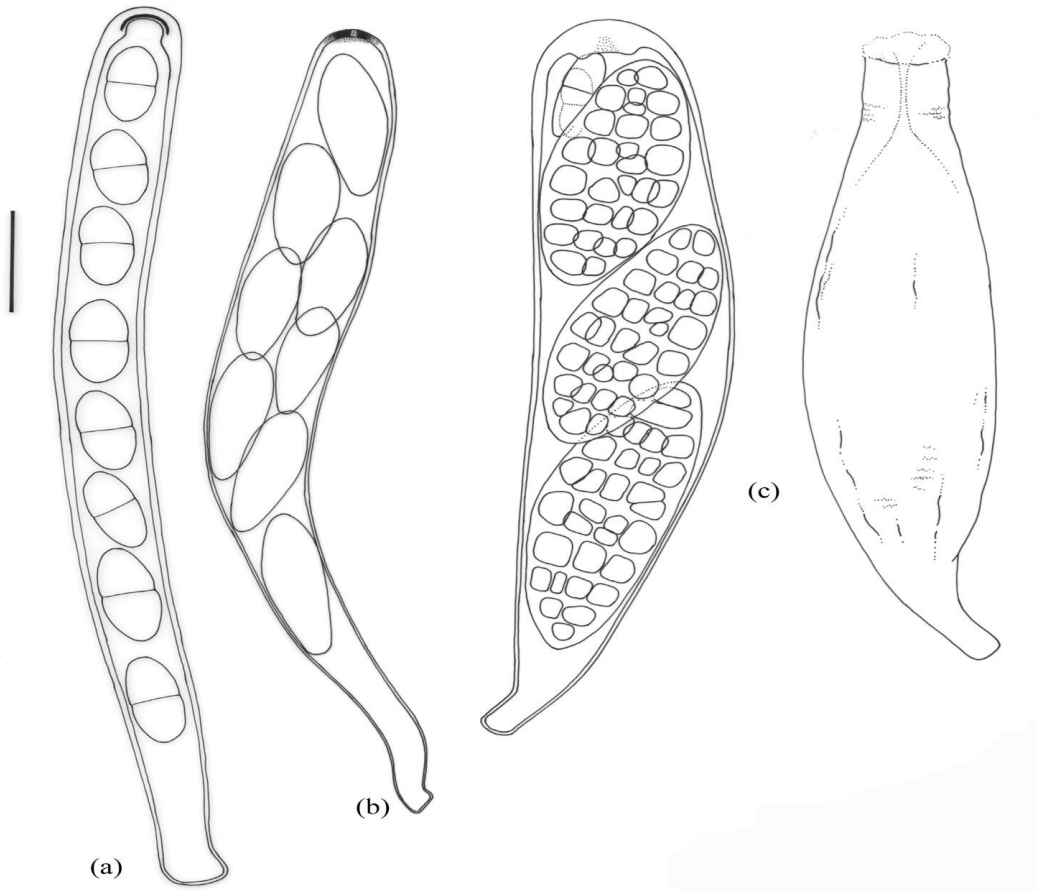

Fig. 10. Ascus structure (3). (a) *Acrocordia conoidea* (in Congo Red; (b) *Thrombium epigaeum* (in Lugol's iodine); (c) *Allographa anomala* (in Lugol's iodine, mature and dehisced asci). Scale = 20 μm.

fissitunicate, refers to asci with a wall composed of two functional layers which separate at the time of dispersal of spores, the outer layer fracturing and slipping down towards the base, and the inner layer extending with an apical pore through which the spores are released; (as in Fig. 9b-d,f). Almost all are found within perithecial structures. The extended ascus facilitates sequential discharge through the ostiole, with exhausted asci contracting to allow following asci to extend and discharge. See also rostrate.

flexuous (flexuose), wavy.

foliicolous, growing on leaves (usually living) of vascular plants.

foliole, a small leaf-like structure that grows out of the surface of a foliose lichen (cf. schizidium).

foliose (of lichen thalli), with a leaf-like growth form; that is, comprising one or more relatively broad, flattened lobes, that are not tightly attached to the substratum (though they may be closely appressed). Typically, there is an upper and lower cortex. Some lichens (e.g. *Evernia prunastri*) have rather narrow lobes which tend to develop into three dimensions, but these are interpreted as foliose as the

photobiont is found only below the upper surface (cf. *Ramalina farinacea* which has branches with the photobiont below both surfaces and is fruticose in growth form).

foveolate, of a pitted or dimpled surface.

fruticose (of lichen thalli), with a growth-form which is strongly developed in three dimensions, thus appearing shrubby, beard-like or worm-like; the photobiont is typically found on all sides of the branches (cf. some rather shrubby foliose lichens which have the photobiont restricted to an upper side).

furcate, forked.

fusiform, spindle-like; narrowing at both ends (Fig. 1f).

fuzzy coat (of asci), an outermost gelatinous layer of the ascus wall, often staining I/KI+ blue (Fig. 4a).

gelatinous sheath (of an ascospore), synonymous with halo; a useful neutral term for a gelatinous transparent outer coat that does not imply any precise developmental structure.

glabrous, smooth, without hairs or tomentum.

globose, spherical or almost so (Fig. 1a).

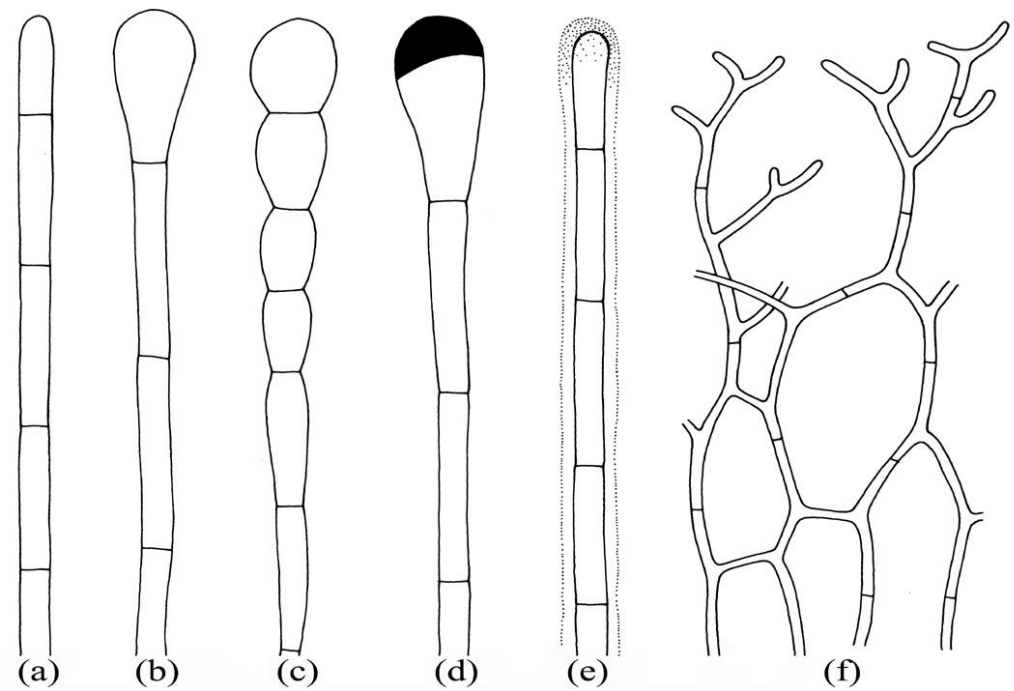

Fig. 11. Hamathecial elements. (a) septate; (b) apex swollen, capitate: (c) moniliform; (d) apex swollen with a pigmented cap; (e) apex not swollen, with pigment in a gel-like matrix surrounding the apex; (f) branched and anastomosing.

goniocyst, a group of algal cells surrounded by short-celled hyphae forming a minute vegetative granule. True goniocysts are considered to be derived from the division of a single original cell, and they do not form in soralia, though each individual goniocyst may closely resemble a soredium (Fig. 5h) (cf. soredium).

granule, a small, rounded lichenised unit for asexual propagation, which may or may not be corticate. The term has been used differently by different authors. In *Cladonia*, granules are used to distinguish larger sizes of soredia, over 50um or over 120um. In *Lepraria*, the term is used to describe the powdery and only lichenised parts of the thallus, distinguished developmentally as arising on the surface of the thallus and different from soredia, which arise from internal medullary and photobiont layers of stratified lichens.

granular, referring to soredia or similar powdery, rounded lichenised dispersal units of a lichen; often used in distinguishing relatively larger sized soredia (e.g. contrasting with farinose soredia). See granule.

guttule, small oil-like (highly refractive) inclusion within a spore.

guttulate (of spores), with one or more guttules.

gyrose, circularly folded or brain-like (Fig. 4d).

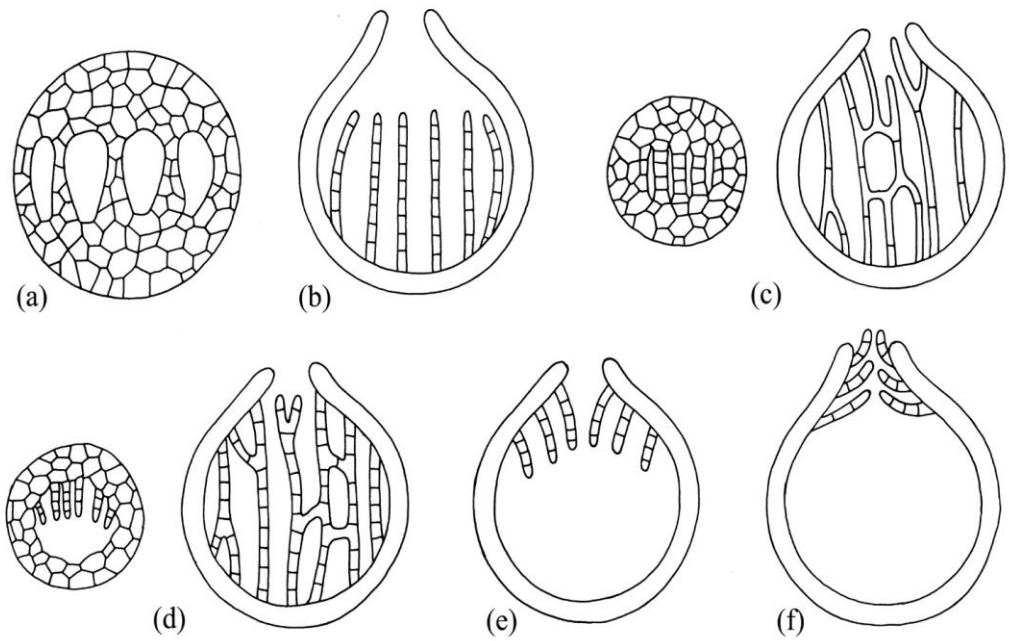

Fig. 12. Hamathecium types (adapted from Eriksson 1981). (a) Interascal pseudoparenchyma; (b) paraphyses; (c) paraphysoids (trabeculate pseudoparaphyses); (d) pseudoparaphyses (cellular pseudoparaphyses); (e) periphysoids (f) periphyses.

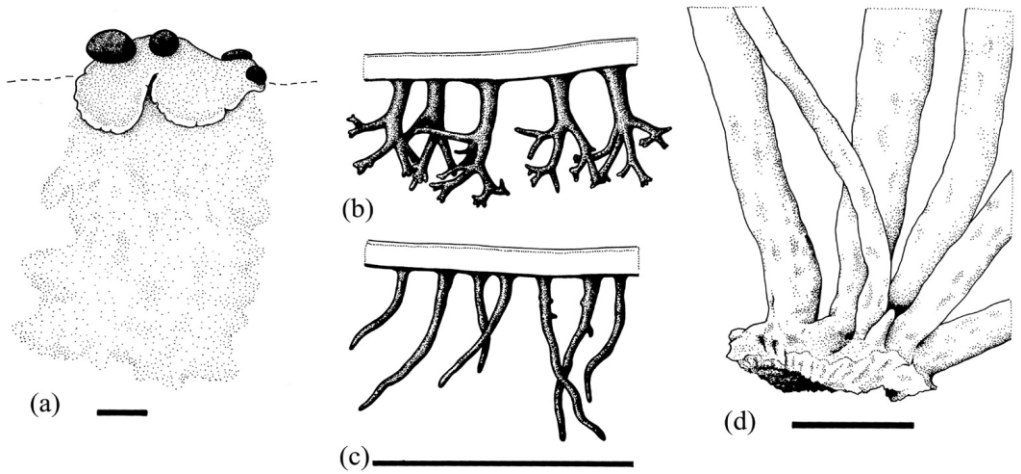

Fig. 13. Attachment organs. (a) hyphal net (*Psora decipiens*); (b) branched rhizines (*Hypotrachyna laevigata*); (c) unbranched rhizines (*Parmotrema crinitum*); (d) holdfast (*Ramalina cuspidata*). Scales: a–c = 1 mm; d = 5 mm.

halo (of an ascospore), a thick (sometimes irregular), gelatinous, transparent, outer coat. The term gelatinous sheath is a widely used synonym in studies of non-lichenized fungi and may also be found in lichenological literature. See also perispore.

halonate (of an ascospore), possessing a halo.

hamathecium, a neutral term for all kinds of hyphae or other tissues between asci (Fig. 12). Sometimes referred to as interascal tissue or interascal filaments.

hapter, a mass of highly adhesive hyphae which forms an attachment disc covering extensive or distinctly restricted areas of the thallus.

haustorium, a specialised hyphal branch for absorption of nutrients from a host cell. Lichenized fungi often interact with their photobiont by means of haustoria, which may penetrate the algal cell wall.

hepaticolous, growing on liverworts.

heteromerous, with distinct layers (opposite homoiomerous). Mostly seen in lichens symbiotic with green algae.

holdfast, a part of a thallus adapted for attachment (Fig. 13d).

holoblastic (of conidial development), where each conidium is formed from a single locus (q.v.) on the conidiogenous cell, with the surrounding cell wall not becoming thickened as happens when conidia form successively from the same locus.

homoiomerous, not layered; synonym: homeomerous (opposite heteromerous). Mostly seen in cyanobacterial lichens.

hormocyst, a vegetative propagule produced in a special hormocystangium comprising a few cyanobiont cells in chains within a gelatinous sheath (Figs. 5i, 14b). Note that a hormocyst (now often referred to as a hormocyte) as used in cyanobacteriology means a resting propagule which is a piece

of filament including sheath layers. The traditional lichenological usage of the term hormocyst refers to a hormogonium, which is a section of trichome (q.v.) released as a propagule.

hormocystangium, delimited structure producing hormocysts (Fig. 14a).

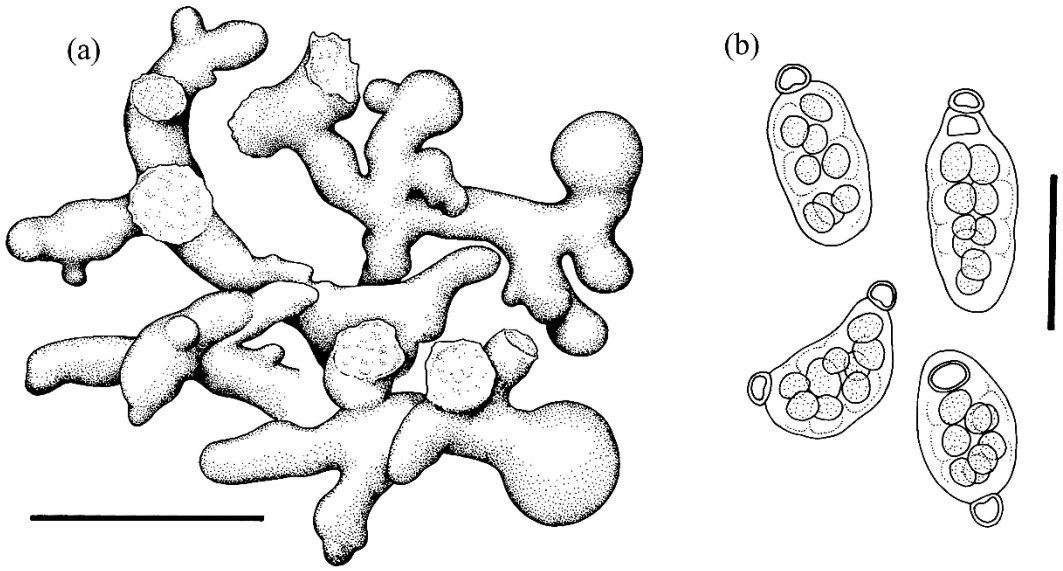

Fig. 14. *Lempholemma cladodes*, hormocystangia and homocysts. (a) thallus branches (moist) with old and developing hormocystangia; (b) hormocysts (not lichenized). Scale bars a = 1 mm, b = 30 µm.

hyaline, ± transparent, frequently used in the sense of colourless. In this edition the use of simple descriptive words is preferred.

hymenium (of ascomata and basidiomata), the spore-bearing layer of a fruit-body (Fig. 3). The height of the hymenium is sometimes an important character and is measured from the roots of the asci to the top of the epithecium. Some descriptions state how 'tall' the hymenium is, and some other authors refer to its 'thickness'. In all cases it is the height that should be measured.

hypha (pl. hyphae), an elongate, usually cylindrical multicellular fungal filament.

hyphophore, erect, stalked, asexual sporophore.

hyphomycete, conidial fungi in which the spores are not produced within an enclosed fruiting body.

hypophloeodal, immersed in bark.

hypothallus, a layer of spongy fungal tissue without photobiont cells on the underside of the thallus of certain macrolichens. Also used in crustose lichens to describe the basal, non-lichenized hyphae upon which the thallus develops. Not to be confused with the melanized lines separating colonies/thalli that abut on one another (sometimes referred to as zone lines.) See also prothallus.

hypothecium, the tissue below the hymenium and generative layer (Fig.3).

imbricate, overlapping.

immarginate, without a definite margin.

indeterminate, effuse.

innate, (of apothecia) immersed, for instance in the thallus.

inspersed (interspersed), mixed in with, especially used for oil droplets within hymenia and crystals within the epithecium.

intercalary (of conidial production), where conidia are formed laterally on the sides of conidiogenous cells (often appearing as branches from successive cells of a generative hypha), often just below each septum.

interthecial, **interascal**, between the asci.

involucrellum, tissue, usually pigmented, forming the outer part of a perithecium, distinct from and surrounding the exciple (the term clypeus is sometimes used more or less synonymously, although that term often implies that host tissue is incorporated into it). The involucrellum appears to be formed as a result of different developmental pathways in differerent taxa: in some species it develops from part of the ascoma primordium, but in others it develops by darkening of thallus cells adjacent to the ascoma. An involucrellum is usually regarded as present when it can be distinguished as a separate structure from the exciple. When the exciple itself is darkly pigmented this is not regarded as an involucrellum. (Figs. 15, 16).

involute, with the margins inrolled.

isidiose, having the appearance of isidia (cf. isidium).

isidiomorph, a secondary development in soralia where the individual or groups of soredia develop a ± complete cortex. They are easily detached and usually remain decorticate at their point of attachment. This is an important concept in *Usnea*.

isidium (pl. isidia), a structure developed by outgrowth of the cortex and containing photobiont cells. Isidia may be cylindrical, clavate, scale-like, coralloid, simple, or branched. A true isidium is always corticate, as opposed to a soredium. Isidia are considered mainly to be structures for vegetative reproduction (Fig. 5d).

isotomic, dividing in regular dichotomies into equal branches (Fig. 24b).

lacerate, with irregularly cut or torn margins.

labriform recurved, as in thalli with terminal soralia developing from upturned apices (e.g. in *Hypotrachyna revoluta*).

lacuna (pl. lacunae), a depression or pit.

lacunose, with lacunae.

lageniform, swollen at the base, narrowed at the top.

lamina, the thin flat main part of the thallus in foliose lichens.

laminal, located on the upper surface of the thallus. Cf. marginal.

lecanorine (of apothecia), with a thalline margin containing photobiont cells. In most cases the colour of the margin is distinct from that of the disc (Figs. 3, 4).

lecideine (of apothecia), without a thalline margin; having a margin exclusively consisting of fungal tissue. (Figs. 3, 4).

lenticular (of the lumina of spores), having the form of a double convex lens (Fig. 1l).

leprose (of thalli), composed entirely of a powdery or granular mass of soredium-like granules from the earliest stages of development. Some experience is needed to distinguish truly leprose thalli from

crustose thalli with abundant, diffuse soredia, but the latter will usually show some corticate, non-powdery areas, at least near the growing margin.

leptoconidium, a conidium that is filiform, often curved and narrow (up to 1 µm diam.) and non-septate; used for some genera (e.g. Lecanora) where two or more conidium types are involved but largely an archaic term.

lichenicolous, growing on lichens.

lichenized, (of fungi) growing in symbiosis with a photobiont.

lignicolous, growing on wood.

lignum, woody tissue, generally used by lichenologists to mean decorticated trunks, branches and timber. In this edition 'wood' is used preferentially as a synonym of lignum.

ligulate, strap-like.

lirella (pl. lirellae), a long, narrow apothecium; the hymenium may be easily visible or be reduced to a narrow slit. Sometimes curved, branched or contorted. (Fig. 4e).

littoral, the area of the seashore that is regularly submerged by the tide, and is dominated by barnacles, marine algae, etc.

lobate, lobed.

lobule, a small, often scale-like lobe growing from a foliose thallus either along its margin or from the surface, generally of the same colour and character of the parent thallus.

lobulate, possessing lobules.

locule, cavity, especially in a stroma or perithecium.

locus (pl. **loci**; of conidiogenous cells), the point on the conidiogenous cell wall from which the conidium develops.

lowland, occurring in lowland regions. A useful term which is, however, difficult to define exactly and not determined by absolute altitude. As examples, the Cotswolds and Chiltern Hills are considered lowland while the Pennines are upland.

lumen (pl. lumina), central cavity of a cell or other structure.

macroconidium, the largest conidium of a lichen that has more than one type of conidium.

macronematous (of conidiophores), hyphae morphologically different from the vegetative hyphae (cf. micronematous).

maculate, spotted or blotchy.

mammiform, breast-shaped.

marginate, with a well-defined edge.

mazaedium, a dry powdery mass of free ascospores and occasionally sterile elements on the surface of the ascoma, formed when asci deliquesce.

medulla, the loose layer of hyphae below the cortex and algal layer.

melanized, containing dark brown to black pigments (melanins).

mesoconidium, an intermediate-sized conidium in a lichen genus with three or four conidium types.

micareoid (of photobionts), green algae with a diameter of 4–7 µm, thin-walled, often occurring in pairs (e.g. those of *Micarea*).

microconidium, the smallest conidium in a lichen with two or more conidium types.

micronematous (of conidiophores), hyphae similar to vegetative hyphae (cf. macronematous).

moniliform, in bead-like chains.

mitosporic fungi, (Fungi Imperfecti, asexual fungi), a rather obsolete term for an artificial assemblage comprising the residue of conidial fungi which have not been correlated with any meiotic (sexual) states. Conidial fungi which have been correlated with sexual states (teleomorphs) in the ascomycetes and basidiomycetes can be termed anamorphs.

monoblastic, producing a conidium from only one area of the conidiogenous cell, with no subsequent proliferation.

monophyllous, referring to a foliose thallus formed of a single lobe (e.g. *Dermatocarpon meiophyllizum*)

montane, restricted in occurrence above the natural (potential) tree-line (c. 750m). Not used to mean 'in a montane area' which could be at a much lower altitude.

morph, a particular shape or form.

morphotype, a group of morphologically differentiated (but similar) individuals of a species of unknown or no taxonomic significance.

mucronate, ending in a short, sharp point.

muriform (of spores), divided by both transverse and longitudinal or oblique cross walls, derived from the approximate similarity of appearance to that of a brick wall.

muscicolous, growing on or over mosses.

necral, of dead tissue, giving a white, granular appearance.

nitid, smooth and clear, lustrous.

ob-, inversely.

ocular chamber, the finger-like protrusion of the inner part of a bitunicate ascus into the inner wall; synonym: apical beak (Fig. 4e).

-oid, resembling, like.

ostiole, the pore-like opening of a perithecioid ascoma or pycnidial conidioma.

palisade, a tissue comprising hyphae tightly packed together ± perpendicular to the surface.

palmate, hand-shaped, radiately lobed or divided.

papilla (pl. papillae), small, wart-like protuberance (see Coppins & Bennell 1979).

paraphysis (pl. paraphyses), a slender, branched or unbranched hypha growing upward and basally attached in an ascoma (cf. pseudoparaphysis) (Figs. 11, 12b).

paraphysoid, interascal or pre-ascal tissue stretching and coming to resemble pseudoparaphyses; often remotely septate, anastomosing and very narrow (Fig. 12c).

paraplectenchyma, tissue consisting of more or less isodiametric cells, which may be rounded or angular; synonym: pseudoparenchyma.

parasitic, (of lichenicolous fungi and some lichens) used here in a broad sense, growing in or upon and gaining nutrition from a different (usually lichenized) fungus, often pathogenic to the host.

parasymbiotic, of lichens with a secondary symbiont.

pectinate, like the teeth of a comb.

peltate, plate-like with a stalk from the centre of the lower surface.

percurrent (of proliferation), where conidia are formed successively from the same point on the conidiogenous cell wall. See also enteroblastic.

periclinal, curved in the direction of, or parallel to, something else, e.g. to the surface or the circumference of a structure.

peridium, the wall of a perithecial ascoma (cf. exciple).

periphysis (pl. periphyses), upward-pointing hypha inside the ostiole of a perithecium.

periphysoid, a short interascal filament growing down internally from the ostiolar region of a perithecium, or perithecium-like apothecium (e.g. in *Ramonia*) (Fig. 12e).

perispore, a colourless, often gelatinous layer enveloping a spore outside the main spore wall (see also epispore, gelatinous sheath and halo).

perithecium, a subglobose or flask-like ascoma in which the hymenium is not exposed. As it is usually used now, the term perithecium is purely descriptive of the shape and does not imply any particular mode of development. Despite this, it is possible to see in the literature phrases like 'ascomata apothecia, but perithecium-like'. In some of these cases the taxon in question has ascomata which open by a narrow pore, whereas its close relatives have cupulate ascomata with narrow openings which are similar in structure but have at least a narrow disc. In other cases, although the ascoma appears to open by a narrow pore in dry material, when the ascoma is wet the pore may gape open to some extent so that the hymenium is more or less exposed, and the ascoma is functionally an apothecium. (Figs. 15, 16).

photobiont, a photosynthetic symbiont which may be either a green alga or a cyanobacterium (blue-green alga) (Fig. 17).

phialidic, conidiogenous hypha from the tip of which conidia are continuously generated.

phyllidium, a dorsiventral leaf-like growth constricted at the point of attachment, serving for the vegetative reproduction of the lichen. Phyllidia are sometimes difficult to distinguish from flattened isidia (Fig. 5f).

phyllocladia, squamule-like structures occurring in *Stereocaulon*.

placodioid, crustose thalli with radiating, lobed margins (Fig.19d).

plectenchyma, tissue formed by fused, often twisted and intertwined, hyphae. Derived from the Greek for 'woven tissue' because some types of plectenchyma consist of hyphae twisted together.

plicate, folded into pleats.

pleurogenous (of conidia), formed on the side of conidiophores from intercalary conidiogenous cells.

podetium (pl. podetia), morphologically, the lichenized stem-like portion of an apothecium; in *Cladonia*, when present, it comprises the upright, fruticose part of the thallus, although apothecia are frequently not developed. By definition the podetium is formed of the tissues that correspond to the apothecial stalk, so superfically similar structures in other genera are referred to as pseudopodetia. In

Thamnolia vermicularis, the cylindrical thallus units are not considered to be podetia since they are not associated with tissue that has the potential to develop into apothecia.

polarilocular (of ascospores), two-celled, the septum often thick, the cells being connected by a narrow canal (Fig. 26b-f). See also distoseptate.

polyblastic (of conidiogenous cell), producing conidia at several points on the cell surface.

polyphyllous, multi-lobed.

polysporous (of asci), containing many (more than 8) ascospores.

poriform, pore-like.

primary (of thallus parts), some fruticose lichens (e.g. *Baeomyces, Cladonia, Stereocaulon*) have two types of thallus, the primary one (crustose or squamulose) giving rise to fruticose structures (podetia or pseudopodetia). A stricter interpretation of primary thallus parts (not adopted here) has to do with their ontogeny, non-primary structures (e.g. podetia) developing from the generative tissue of apothecia (a feature which may be difficult to ascertain).

proliferating (of podetia), with new growth occurring at the centre or margin of a scyphus, potentially giving rise to a new tier of scyphi.

prosoplectenchyma, a tissue composed of loosely or tightly intertwined cells with elongated lumina.

prothallus (of crustose lichens), marginal zone from which a lichenized thallus develops, composed only of fungal hyphae, normally with a different colour and texture from the thallus itself. Conspicuous prothalli are seen in e.g. *Lecanora campestris* and *Placynthium nigrum*. (The dark lines formed at the junction where adjacent thalli abut are often not true prothalli. Instead they may consist of a barrier of substances and tissue stimulated by the antagonism between competing individuals). Cf. also hypothallus, a spongy basal layer with no colonising function.

pruina (adj. pruinose), having a white or coloured frosting or a bloom (like a plum); this may have various causes, for instance a layer of crystals on the surface, or dead, air-filled cells overlying darker tissues.

pseudo-, false, spurious, looking like.

pseudocyphella (pl. pseudocyphellae), dot-like to fusiform or irregular pale areas of the thallus where the medulla is exposed at the surface (and not surrounded by specialized cells). They may be linear-elongate (e.g. in *Parmelia sulcata*), reticulate (e.g. in *Parmotrema reticulatum*), or punctiform (e.g. in *Punctelia subrudecta*) (Fig. 6b).

pseudoisidium, an outgrowth from the surface of a lichen thallus resembling an isidium but lacking algae.

pseudoparaphysis (pl. pseudoparaphyses), hyphae originating above the level of the asci and growing downwards between the developing asci, finally becoming attached to the base of the cavity and then often free in the upper part; often regularly septate, branched, and anastomosing (cf. paraphysis) (Fig. 12d).

pseudoparenchyma (-tous), a tissue formed from tightly compacted, globose or angular cells synonym: paraplectenchyma.

pseudopodetium (of *Stereocaulon, Leprocaulon, Dibaeis, Baeomyces* and *Pilophorus*), a solid, upright stalk derived from the thallus, erect or ascending, rarely dorsiventral, generally unbranched but branched in some genera. A strict interpretation of the difference between podetia and pseudopodetia has to do with their ontogeny (see primary).

pseudoseptum, a protoplasmic or vacuolar membrane looking like a septum (cf. distoseptate), or a narrow section of cytoplasm between two juxtaposed guttules or oil droplets making a spore appear septate.

pubescent, having soft, short hairs (cf. tomentose).

pulverulent, powdery.

pulvinate, cushion-shaped.

puncta (pl. punctae), small spot or pit.

punctate, with small spots or pits.

pustule, a blister-like swelling of the thallus; often precursor to an erumpent soralium or spore-mass. The thallus surface of *Lasallia pustulata* is pustulate, as is the tissue from which the soralia of *Hypotrachyna afrorevoluta* develop.

pustular, having, or arising from, pustules.

pycnidium (pl. pycnidia, adj. pycnidial), a structure (frequently flask-shaped) in which conidia are produced. They resemble perithecia in having an ostiole, which is typically minute but is gaping in some species. They are mostly, but not always, dark-coloured, often immersed in the thallus, appearing as tiny dots. Sometimes, however, they become prominent, and they may be white or variously coloured.

pycnoascocarp, ascoma arising from a pycnidium.

pyrenocarp, a perithecium. Used colloquially as a term for any fungus with a perithecium-like ascoma.

pyrenocarpous, possessing perithecia.

pyriform, pear-shaped (Fig. 1r).

reniform, kidney-like (Fig. 1p).

reticulate, like a net, netted. refracted, bent or curved back.

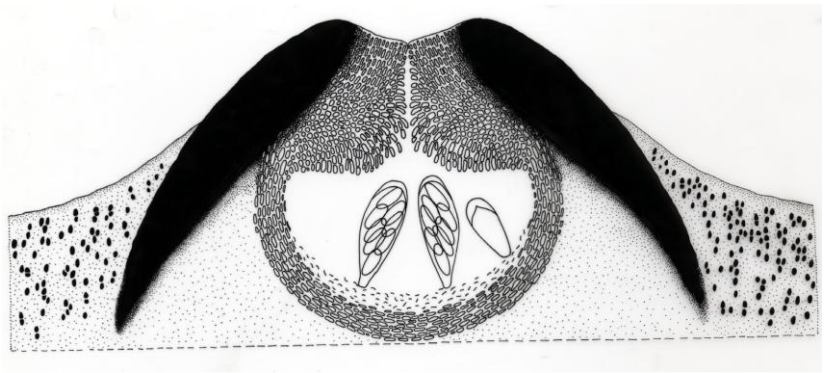

Fig. 15. Structure of perithecia showing involucrellum, exciple, subhymenium, asci and periphyses.

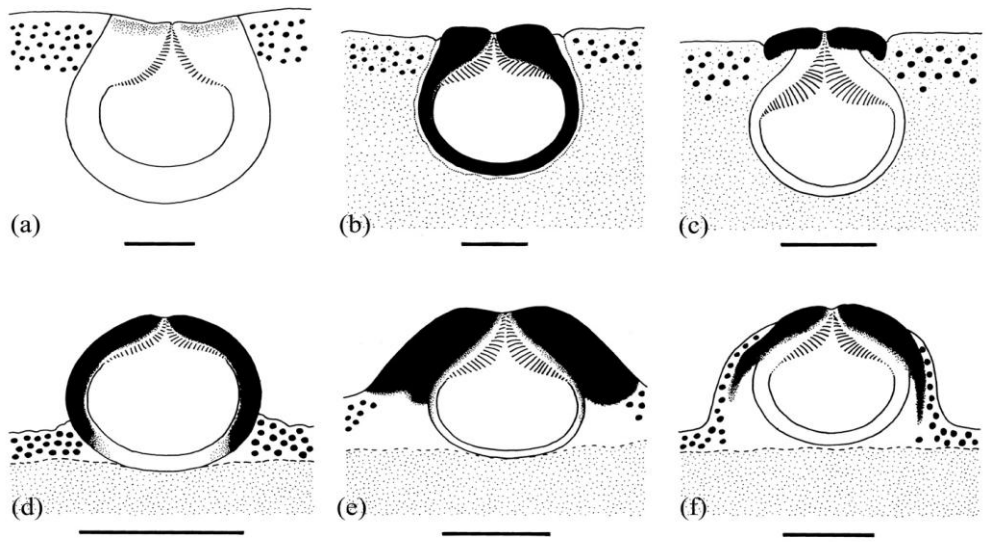

Fig. 16. Types of perithecia, omitting asci and subhymenial tissues. (a) immersed in foliose lichenized thallus, involucrellum absent, exciple pale (*Dermatocarpon miniatum*); (b) immersed in limestone, involucrellum absent, exciple black and friable (*Verrucaria hochstetteri*); (c) immersed in limestone, involucrellum lid-like, exciple pale except at the apex (*Verrucaria baldensis*); (d) prominent, involucrellum absent, exciple black and friable above, pale at base (*Thelidium minutulum*); (e) involucrellum well-developed, exciple pale below (*Thelidium papulare*); (f) immersed in thalline wart, involucrellum present, exciple pale below (*Polyblastia cruenta*). Scale = 200 μm.

refractive, used for apical structures within asci that are glassy in appearance and do not stain with iodine.

reticulate, with a net-like ornamentation.

revolute, lying flat on the substratum with margin turned down (cf. decumbent).

rhizine, a root-like hair or thread, consisting of a bundle of hyphae, acting as an attachment organ, e.g. in *Peltigera* (Figs. 13b, c).

rhizinomorph, rhizine-like structure which does not function as an attachment organ. Typically found on the lower surface of umbilicate lichens (e.g. *Umbilicaria*).

rhizohypha (pl. **rhizohyphae**), a single hypha arising on the lower thallus surface for attachment (e.g. *Endocarpon*). Rhizohyphae should not be confused with rhizines, which originate from the lower cortex, and are stouter, being composed of bundles of hyphae.

rimose, irregularly cracked in all directions, the cracks originating within the established thallus.

rimose-areolate (or cracked-areolate), with small islands of thallus formed by cracking of the thallus. Cf. areole.

rugose, roughened.

rostrate, similar to fissitunicate (q.v.) but where the inner wall of the ascus extends prior to discharge but the outer wall does not contract. Most asci of this type are ovoid or pyriform rather than cylindrical, and are found especially in the Verrucariales.

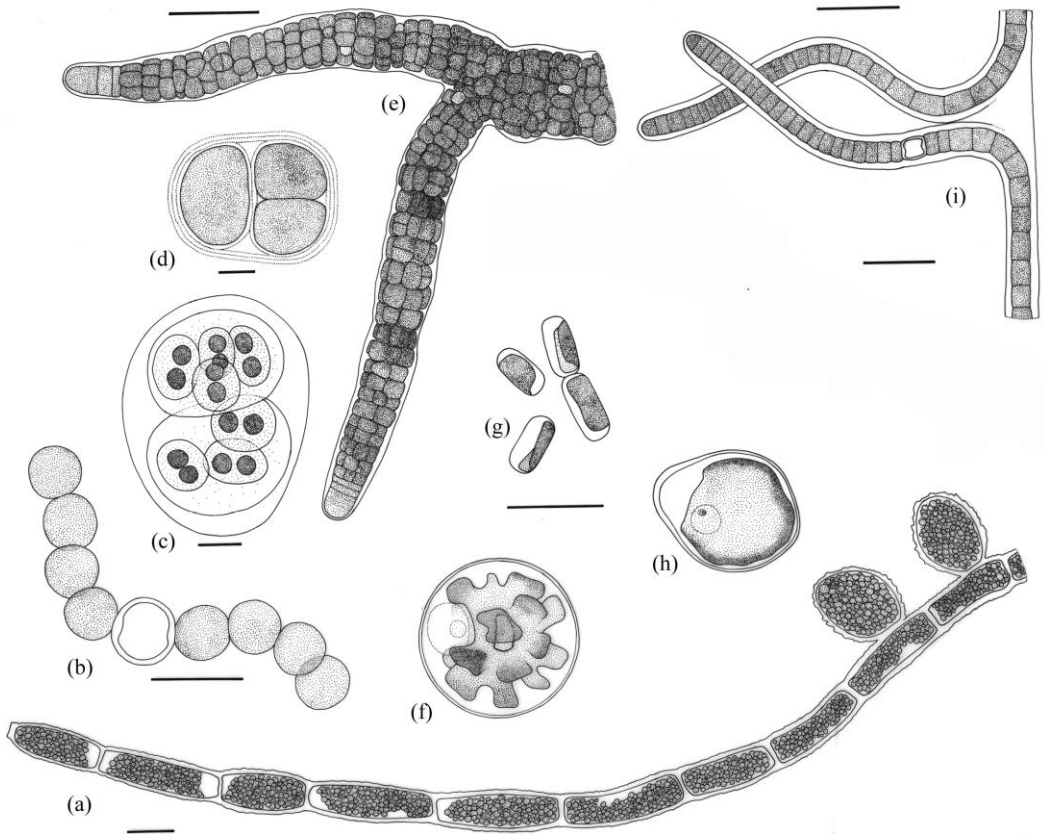

Fig. 17. Photobionts, free-living examples of selected genera (redrawn from a variety of sources). (a) *Trentepohlia* (Chlorophyceae); (b) *Nostoc* (Cyanobacteria); (c) *Gloeocapsa* (Cyanobacteria); (d) *Chroococcus* (Cyanobacteria); (e) *Stigonema* (Cyanobacteria); (f) *Trebouxia* (Chlorophyceae); (g) *Stichococcus* (Chlorophyceae); (h) *Myrmecia* (Chlorophyceae); (i) *Scytonema* (Cyanobacteria). Scale a–d, f–h = 10 μm; e, i = 100 μm.

saccate, sac-like (esp. of asci).

saprotroph (adj. saprotrophic) an organism obtaining nutrients from non-living organic matter. Also referred to as saprobe/saprobic.

saxicolous, growing on rock.

scabrid, synonym: scabrose, having a minutely roughened surface, as if covered with tiny scabs or scurf, generally caused by an accumulation of dead cortical material (e.g. *Peltigera scabrosa*).

schizidium, a propagule formed by upper layers of a lichen thallus splitting off as scale-like segments from the main lobes. They have the same function as isidia and phyllidia, but they are corticate only above (cf. foliole) (Fig. 5g).

scleroplectenchyma, a tissue in which the hyphae are often twisted and fused together, composed of very thick-walled conglutinate cells.

scyphus, a portion of the podetium which is widened and concave above, thus goblet-like when well-developed, found in some *Cladonia* species.

secession (of conidia), the process by which conidia break away from the conidiogenous cell.

septum, cell wall forming a partition.

sessile, not immersed, sitting directly on the surface, without any sort of stalk.

sigmoid, curved like the letter S (Fig. 1n).

simple (of spores), without septa. The term aseptate is preferred.

sinuate, having rounded angles; having a wavy or sinuous margin.

soleiform, shaped like the sole of a shoe (of spores & conidia).

soralium (pl. **soralia**), a structure or region of a thallus bearing soredia (Fig. 18).

sorediose, having the appearance of soredia (cf. soredium).

soredium (pl. soredia), a vegetative propagule produced in a soralium, generally derived from the medulla, and lacking a cortex. Each soredium consists of a cluster of photobiont cells and hyphae. They produce powdery or granular masses (Fig. 5j–l) (cf. blastidium, goniocyst)

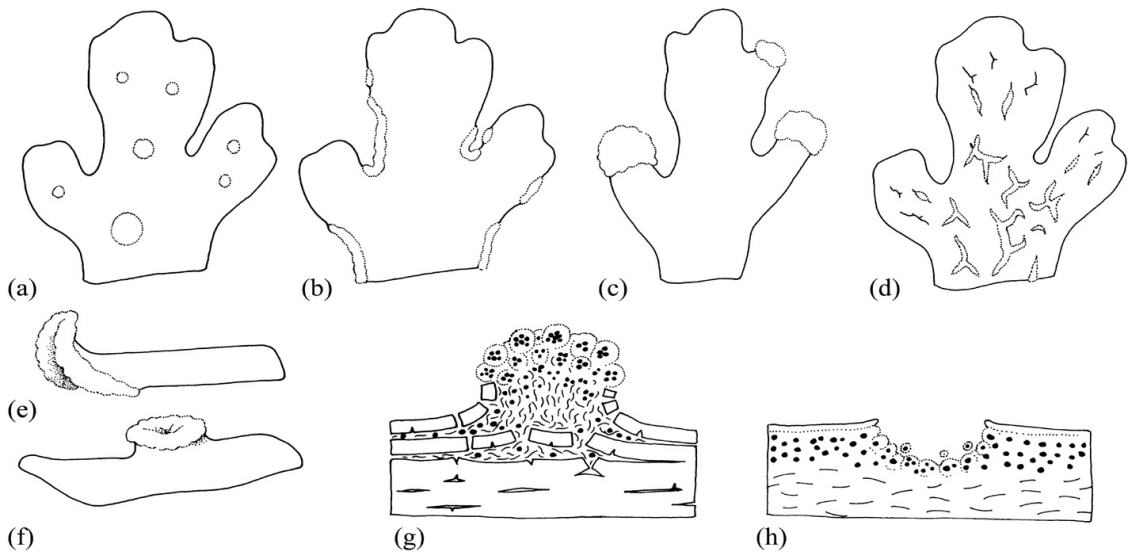

Fig. 18. Soralium types. (a) laminal; (b) marginal; (c) terminal; (d) fissural; (e) labriform; (f) cuff-shaped; (g) erumpent; (h) excavate.

spathulate, spoon-like (Fig. 1v).

spermatium (pl. **spermatia**), a conidium-like structure that functions as a male gamete, always aseptate and usually bacillar or filiform in shape. Probably most "conidia" in lichens have this function.

spinule, a small spine; in *Usnea*, a small cylindrical outgrowth whose central axis does not connect with the axis of the parent branch.

spinule, a small spine constricted at the base (Fig. 5c).

sporodochium (pl. **sporodochia**), a cushion-like group of conidiophores and associated conidia.

squamule, a small, scale-like lobe attached only at its edge or centrally. The term is also sometimes used for convex areoles in e.g. *Toninia*.

squamulose, (of lichen thalli) with a scale-like growth form, composed of one or more squamules; this represents a smaller, less-developed growth form than foliose thalli, but it is scarcely possible to distinguish the two precisely.

squarrose (of rhizines), bottle brush-like, with groups of divergent hyphae.

stellate, star-like, with radiating branches.

sterigma (pl. **sterigmata**), a usually spike-like or filamentous extension of the basidium (q.v.), from the tip of which the basidiospores develop and discharge. Most basidia produce four sterigmata.

stipe, stalk of an ascoma or basidioma.

stipitate (of apothecia), possessing a stalk (e.g. the apothecia of *Baeomyces*).

striate, marked with more or less parallel delicate lines, grooves, or ridges.

stroma (pl. **stromata**), a thick compact mass of hyphal tissue, frequently black, hard and carbonaceous, often covering or supporting a group of ascomata, which may develop as locules.

sub-, under, below; frequently in the sense of approximating to the condition qualified.

submuriform (of spores), weakly muriform, with only a few longitudinal septa which may not extend the whole length of the spore.

subulate, slender and tapering to a point; awl shaped (Fig3x).

sulcate, furrowed.

supralittoral zone, the area of the seashore that is never submerged but is splashed or experiences wind-borne seawater spray (cf. littoral).

symbiont, one of two or several partners living together.

sympodial, branching where the main axis is composed of many lateral branches, each arising from the one before and not from the original apex. Of conidial development, where successive conidia are formed from different loci on the conidiogenous cell wall (cf. holoblastic).

tartareous, comprising a thick, rough, crumbling crust.

taxon, any rank in a classification scheme (family, genus, species, subspecies etc.).

terete, circular (not angular or ridged) in section.

terricolous, on the ground.

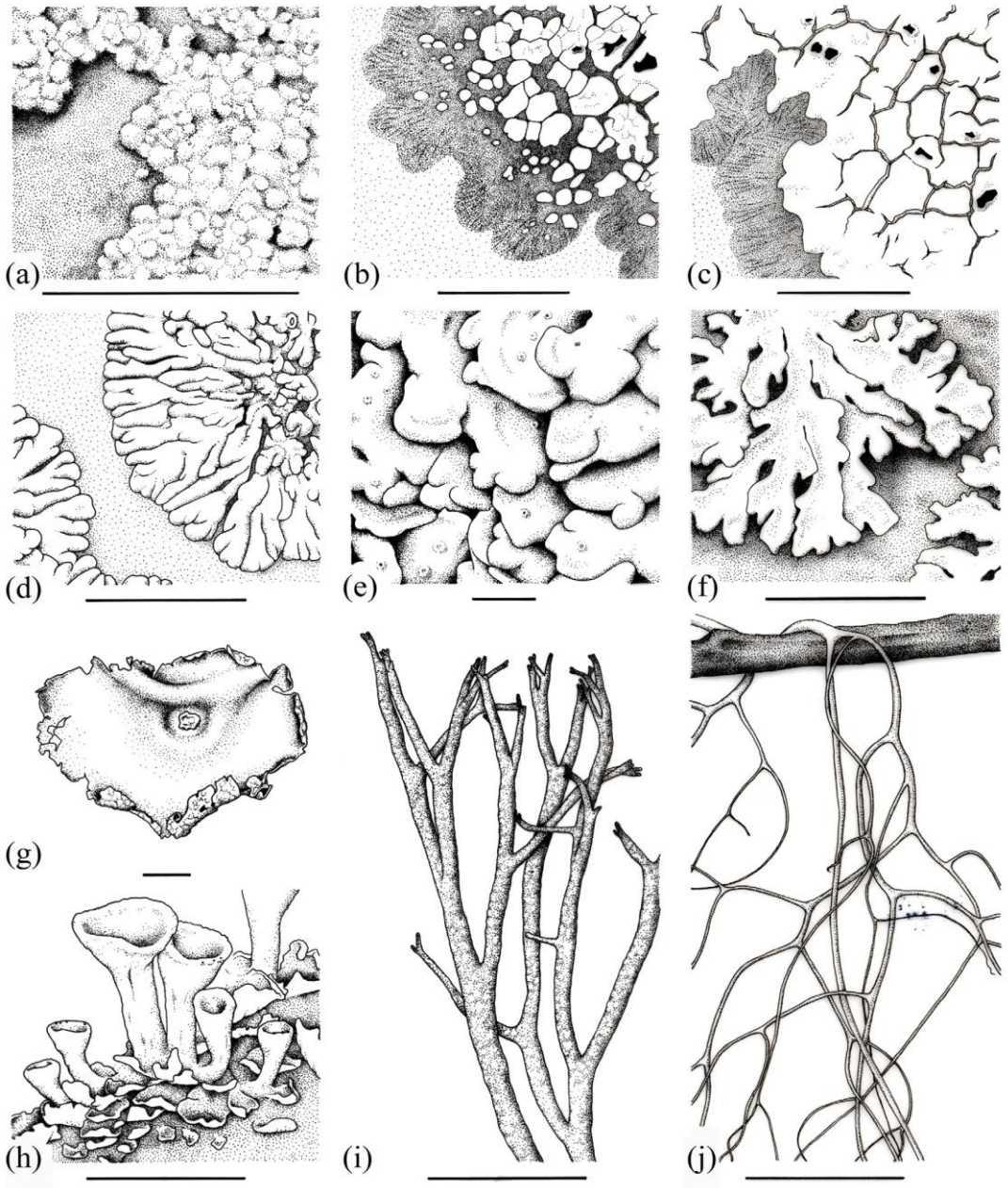

Fig. 19. Thallus types. (a) crustose: leprose (*Lepraria diffusa*); (b) crustose: areolate (*Buellia ocellata*); (c) crustose: rimose (*Buellia disciformis*); (d) crustose: placodioid (*Variospora thallincola*); (e) squamulose (*Endocarpon adscendens*); (f) foliose (*Physconia distorta*); (g) foliose: umbilicate, underside (*Umbilicaria proboscidea*); (h) fruticose: cup-like (*Cladonia humilis*); (i) fruticose: shrub-like (*Cladonia furcata*); (j) fruticose: beard-like (*Bryoria capillaris*). Scales: a–c, e = 1mm; d, f–j = 5 mm.

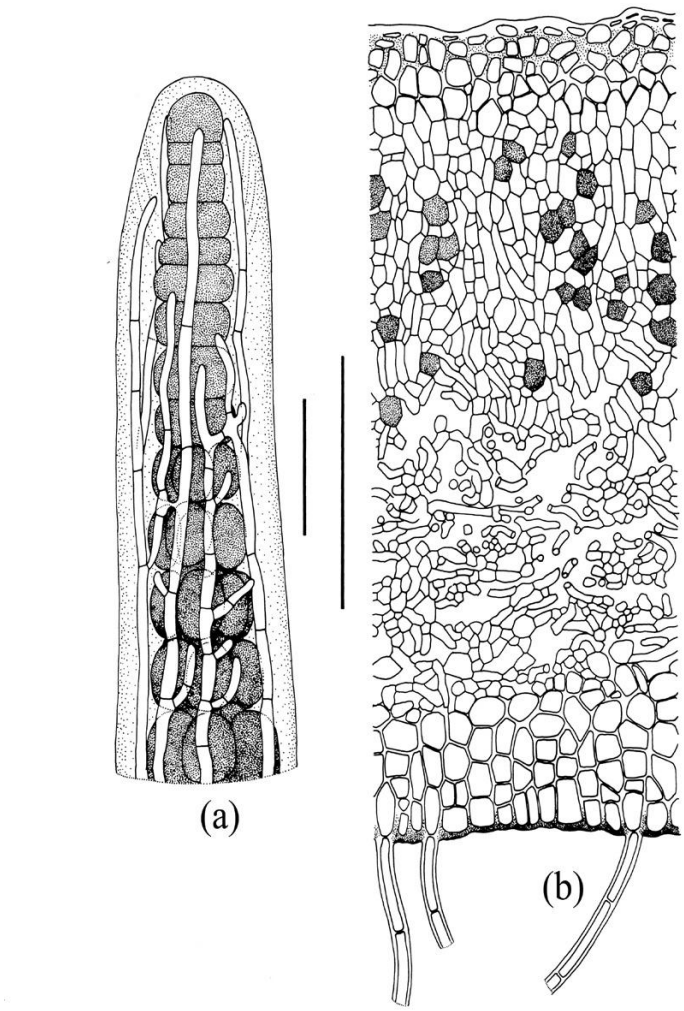

Fig. 20. Thallus structure.

(a) Filamentous (*Ephebe lanata*);

(b) squamulose (*Placidium lachneum*) but also the typical cellular arrangement of a foliose lichen.

Scale bars: a = 20 µm, b = 100 µm.

testaceous, having the red-brown or brown-yellow hue of bricks

tetrachotomous., with four equal branches formed at the same level.

textura angularis, pseudoparenchyma of compact, angular, isodiametric hyphae.

textura intricata, prosoplectenchma of long, thin-walled, generally loose and intertwined hyphae.

textura oblita, prosoplectenchyma of long, thick-walled, agglutinated cells. ***Textura porrecta*** is used in *Thelenella.*

thalline margin (thalline exciple), the margin of an apothecium which contains photobiont as well as fungal cells; usually of the same colour and consistency as the thallus (Fig. 4b).

thalloconidium (pl. thalloconidia), uni- to multicellular, dark brown to black propagules produced from unspecialized cells (e.g. *Umbilicaria*), often on the undersurface of the thallus, or prothallus (e.g. *Protoparmelia*, *Sporostatia*). They may be confused with soredia, which, however, contain photobiont cells, while thalloconidia are formed only by the mycobiont.

thallus, here used to indicate the vegetative structure of a lichenized fungus, and hence excluding structures such as fruiting bodies. Non-lichenized species may form visible wefts of hyphae, or may alter the colour of the substratum, but by this definition these phenomena are not considered to be thalli. In more general biological usage, the term thallus is given to undifferentiated vegetative tissue in diverse groups which were previously known as thallophytes (including algae, fungi and others).

thecium, synonymous with hymenium, the hyphal layers of an apothecium derived directly from the primordium excluding the outermost layers.

tholus, the thickened inner part of the ascus wall in the ascus apex of fissitunicate asci (Fig. 4b); synonymous with apical dome.

tomentum (-ose), felt-like mat of hyphae; a special case of pubescence in which the soft hairs are matted and usually pressed close to the surface.

torus, a ring of thickened wall around the septum of the spore.

trama, the layer of hyphae in the central part of a lamella of an agaric fungus.

trichogyne, the receptive hypha containing the female gamete within fertile structures in ascomycetes, with which spermatia (q.v.) fuse. Very difficult to observe.

trichome (of cyanobacteria), a hair-like structure or filament composed of a series of cells, often encased in a sheath.

trichotomous, with three branches formed at the same level.

true exciple (proper exciple), an exciple derived from the ascocarp which lacks photobiont cells, usually of a different colour from the thallus (see lecideine) (Fig. 4a).

truncate, ending abruptly, as though with the end cut off.

tubercule, small wart-like protuberance.

turbinate, like a spinning top in form, i.e. like a truncated, inverted cone.

turgid, swollen.

ulcerose, ulcer-like.

umbilicus, the central holdfast occurring in some foliose lichens.

umbo, raised, often sterile, tissue in the centre of apothecia.

umbonate, having an umbo(s).

unciform, shaped like a hook.

undulate, wavy.

uniseriate (of ascospores), in a single row within the ascus.

unitunicate (of asci), with one functional wall layer, the wall layers not splitting apart at discharge; non-fissitunicate.

upland, occurring in upland regions. A useful term which is, however, difficult to define exactly and not determined by absolute altitude. The Cotswolds and Chiltern Hills are considered lowland while the Pennines are upland. It often implies a preference for the cooler, damper conditions of the north and west of Britain.

urceolate, pitcher-like, deeply concave, hollow and contracted at the mouth.

vegetative (of reproduction), non-sexual. In lichens vegetative reproduction can involve both partners of the symbiosis (e.g. in soredia, isidia, blastidia), or the mycobiont only (e.g. in thalloconidia).

veins, elevated, sometimes branched and anastomosed ridges; of particular importance in identification of *Peltigera* species, where they occur on the underside of the lobes.

verruca, a wart-like swelling.

verrucose, having small rounded processes or 'warts'.

verruculose, delicately warted.

xeric, a dry environment.

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